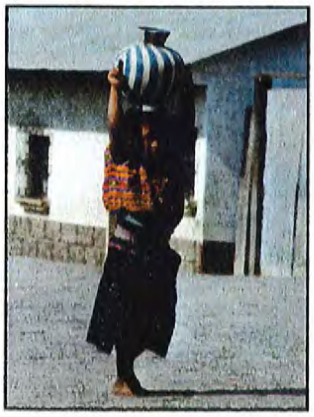
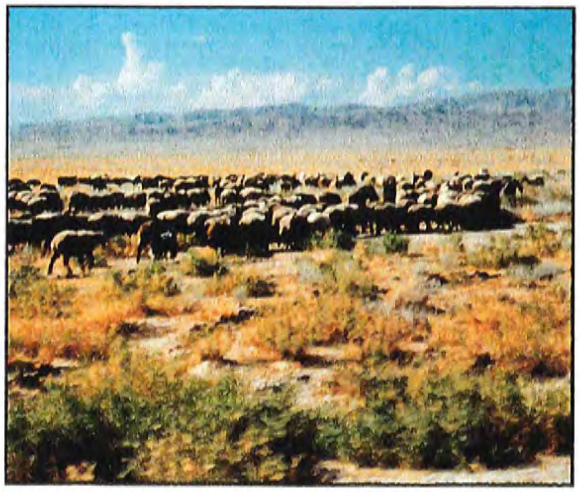
Small Ruminant Global Livestock

C · R · S · P

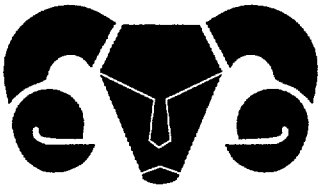
Building on a Foundation

GRANT RENEWAL
1998 - 2003





SMALL RUMINANT GLOBAL LIVESTOCK C·R·S·P



GRANT RENEWAL 1998 - 2003

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EXECUTIVE SUMMARY

Over the last two years, while supporting ongoing programs in Indonesia, Bolivia and Kenya, the Small Ruminant/Global Livestock Collaborative Research Support Program (SR/GL-CRSP) has re-engineered itself to become a more efficient and effective program. In the process, a comprehensive planning and assessment procedure which consisted of: three major regional conferences which set program priorities in East Africa, Central Asia and Latin America; the selection of 11 assessment teams (ATs); the organization of over 20 regional workshops for grass roots input; an extensive interactive process to develop results-oriented project proposals; and an objective and diversified process to insure that the very best projects were selected. The SR/GL-CRSP now has seven projects, involving 13 U.S. universities, three international agricultural research centers, and 69 foreign institutions including 10 non-governmental organizations, which are linked into regional and global programs addressing the most important topics in the international livestock development sector.

In the re-engineering process four areas of focus were developed, with global implications. The four areas are linked by a theme of agriculture at risk in a changing environment. First, economic growth in animal agriculture is considered critical to the economies and social and political stability of developing countries. Agriculture is a dominant component of these economies, contributing 40% of the Gross Domestic Product (GDP) and livestock represents 27% of agricultural GDP (FAO 1996). Establishing strong capacity to participate in global markets, yet maintain food security at the household level is an objective of SR/GL-CRSP and because of the consistent importance of livestock worldwide, this focus has global implications.

Second, achieving economic growth and food security while maintaining and enhancing biodiversity and natural resources is a critical balancing act with major consequences for developing countries. Not only does crop agriculture, generally and livestock grazing specifically, use vast quantities of the land (estimates are that one-half of the earth's land surface is grazed (Durning and Brough 1992)), its impact has often been in conflict with the maintenance of biodiversity. Estimates by the United Nations Environment Program (UNEP) indicate that 73% of the world's 3.3 billion hectares of dry rangeland is at least moderately desertified, having lost 25% of its carrying capacity. This conflict is apparent in East Africa. Here the CRSP has a project where some of the most valuable diversity of large mammals (tourism in Kenya and Tanzania annually earn $400 M and $258

M respectively) sits in juxtaposition to areas of high potential for agriculture in a region straining to feed its populations. The need for compatibility in livestock and conservation systems is a worldwide challenge with some timely examples in our own national parks such as Yellowstone where domestic and wild species are in direct conflict. The value of eco-tourism worldwide in 1994 is estimated at $166-250 billion and for wildlife $83-166 billion (Ecotourism Society 1998).

Third, human nutrition and particularly child survival and development (both cognitive and physical) are a global issue. The malnutrition observed today in children will be a legacy of reduced creative and cognitive function that slow the ability of countries to compete in the global market, solve their domestic problems and develop their national capacity to develop themselves. The World Bank estimates that the costs of micronutrient malnutrition are 5% of GDP for developing countries (World Bank 1994). The link between micronutrient deficiencies and child development and survival is emerging as a major theme in development. Animal source foods (ASF) are an effective, efficient and sustainable means to remove the major deficiencies. The problem of malnutrition affects 840 million people or approximately one-half the world's population (Combs et al. 1996). An estimated 2 billion people live at risk of disease resulting from deficiencies in vitamin A, iodine and iron (major sources of vitamin A and iron are ASF). Iron deficiency, linked directly to cognitive development and achievement, is the most prevalent micronutrient deficiency affecting 2.1 billion people, mostly women of reproductive age and pre-school children.

Fourth, globalization has a major impact on policy for developing nations. A comprehensive analysis of the development of national economies indicates that in Africa the role of policy is critical to the growth of agriculture (Cleaver and Donovan 1994). The SR/GL-CRSP approach considers the policy environment to be equally as important to development as the biological and physical environment. Because national agricultures are faced with increasing exposure to global forces, issues of agricultural growth at the local, national and regional level must incorporate new policies. The interaction of livestock and the environment and the protection of biodiversity require a coupling of information and projections with appropriate policy reform to be successful (WRI, ICUN and UNEP 1992). The changes from central controlled, command to market economies in Eastern Europe and Asia represent a major perturbation in the policy environment to which agriculture must respond.

Since the legislation of Title XII of the International Development and Food Assistance Act of 1975, significant progress has been made in addressing the problem of food production. Nonetheless, malnutrition and famine persist, and projected population trends threaten to undercut what progress has been made. However, increasingly significant is the fact that elevated aggregate production of food does not guarantee alleviation of hunger and malnutrition. Beyond problems of the production and distribution of food, resource-poor families lack the incomes needed to purchase or produce food. In this respect, livestock

production has multiple advantages, as it increases both the overall supply of food and the incomes of small producers. Inasmuch as animal agriculture is a dominant sector of developing country economies, improved livestock production can have a dramatic impact on the growth of the agricultural sector. Since accelerated agricultural growth has been shown to boost the economy, the importance of animal production to overall economic growth should be carefully considered.

The importance of animal agriculture to overall economic growth, to the vast use of land and to human physical and cognitive development brings into perspective the need to study the differential impacts of livestock production on the environment. As livestock grazing is the principal use of land globally, its management has major implications for biodiversity maintenance. The protection of biodiversity and the natural resource base upon which production depends requires the development of environmentally sound food production systems. The demands of economic growth and human nutrition, on the one hand, and of the environment, on the other, are countervailing tendencies that need to be studied in tandem to prevent systemic imbalances.

GLOBAL PROBLEM MODEL: MANAGING RISK IN AN UNPREDICTABLE WORLD

The world is undergoing dramatic change. The Global Problem Model (GPM) is a conceptual view of the critical forces impinging on development and food security. The model projects that the elements of weather, globalization and population are changing rapidly, and their impact on agriculture and food systems will require adaptations. The new environment will be one in which unpredictability is great and risks are high. The SR/GL-CRSP proposes to develop the capacity to predict risk so it can be better managed, improve the tools to cope with risk, and contribute to the mediation of risk. The SR/GL-CRSP has chosen to work in ecosystems and regions where human populations and natural resources are most vulnerable and in most cases, where biodiversity is most valuable. The model of risk management is most highly developed in our East African program where the four complementary projects cover prediction, adaptation and management of risk.

Weather

In the coming decades, agriculture faces the prospect of adapting to a changing climate (Reilly 1996), and feeding a predicted doubling of the world's population by 2060 (UNPF 1991). Weather is a major driving variable in food production, either directly through impact on photosynthesis or indirectly through disease and structural damage. The present state of the weather, with El Niño effects worldwide (record rains in the height of the dry season in East Africa, drought in Indonesia and the strongest eastern Pacific warming ever recorded) suggest that unpredictability and variability will be a major force shaping food production (Schneider and Rosenberg 1989). Severe weather events will be more frequent and more intense. Simulations of crop production indicate greater variability in yields with increasing temperature and weather variability (Geng and Young 1997).

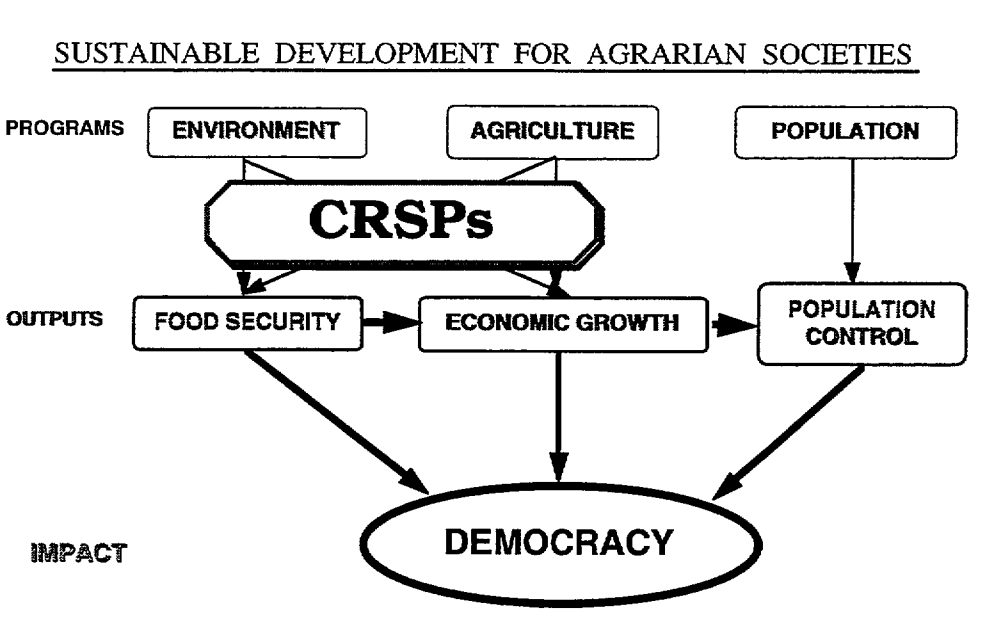
Global warming will require major adaptations of agriculture to feed increasing world populations. These adaptations will need to be greater in the tropics and subtropics than the higher latitudes (Rosenzweig et al. 1993 using crop simulation models from USAID's IBSNAT, Reilly 1995). The incidence of "food poverty" is projected to increase under all scenarios of climatic change with a decrease in food security for developing countries (Rosenzweig et al. 1993). Low farmer adaptation and poor economic growth create the worse case scenarios in their projections. A similar conclusion is reached by Rosenberg (1992) who asks, "Will the developing world have the capacity to cope as easily (as the developed world to climatic change?)" These demands fall hardest on the most vulnerable ecosystems particularly the semi-arid and arid areas where the cost of adaptation could create a major burden for most developing countries (Reilly 1995).

Globalization

Globalization is creating new financial and trade relationships, effective information flows between countries and contributing to the fall of political barriers that open markets and foster a more global community. The availability of stand alone communication systems (digital and satellite phones, satellite TV reception), the proliferation of the internet, and the progress on trade liberalization along the lines suggested in the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) are all forces in today's economic and social environment. Yet the benefits are not shared equally and the unpredictability of change is disproportionately dispersed. For example, the opening up of markets in developing countries has not been matched by the Organization for Economic Cooperation and Development (OECD), placing the developing world at a further disadvantage (Pinstrup-Andersen et al. 1997).

Population

World population is projected to rise to 7.67 billion people by the year 2020 (UN 1996). While new estimates indicate a reduced population growth rate from previous projections, the impacts of population additions of this magnitude (2 billion people in the next 25 years) will be substantial. Malnutrition in children under 6 years is expected to decline 10% in the next 15 years but still represents 165 million, while Sub-Saharan Africa could increase by 45% by 2020 (Pinstrup-Andersen et al. 1997). Although the number of countries experiencing food insecurity is expected to decline worldwide, Sub-Saharan Africa is expected to have 70% of the world's food insecure people; every third African will be food insecure by 2010 (Pinstrup-Andersen et al. 1997). Beyond the increased food requirements, population has indirect impacts by further subdividing production. Increased numbers of people also use greater quantities of natural resources, and of particular importance to livestock, cause the further subdivision of the land.



DEVELOPMENT AND LIVESTOCK SYSTEMS

The world is at food risk. Growing populations, degradation of the natural resources upon which food production depends, and changing climate all require adaptation and intervention to provide economic growth, increased equity in distribution of worlds wealth and resulting food security. The prerequisites to democracy are economic growth, food security and population control. Population control occurs when individuals have effective mechanisms for population control and feel secure that they have an economic future and food security sufficient that their children are likely to survive and grow to healthy adults. At that point they lower their reproductive rates (Bongaats 1994). Economic growth, responsible natural resource management and food security are heavily influenced by the agricultural sector in most developing countries and it is here that the CRSP makes its contribution.

Global Issues

In the grasslands, savanna and woodlands of the world where grass dominate, most ruminant livestock production occurs. These systems represent 47% of the earth land surface (Williams et al. 1968). In fact 80% of the food required for livestock production originates from forages of this ecosystem (Semple 1970). These systems are high in biodiversity, especially in Africa, and Latin America. African systems contain almost as much species diversity per unit area as rain forests and in Latin American systems are often higher. However these systems are characterized by unpredictable weather events where conventional temperate concepts of stocking rate are meaningless. The mean rainfall rarely happens and the variance is a key statistic (Ellis 1994).

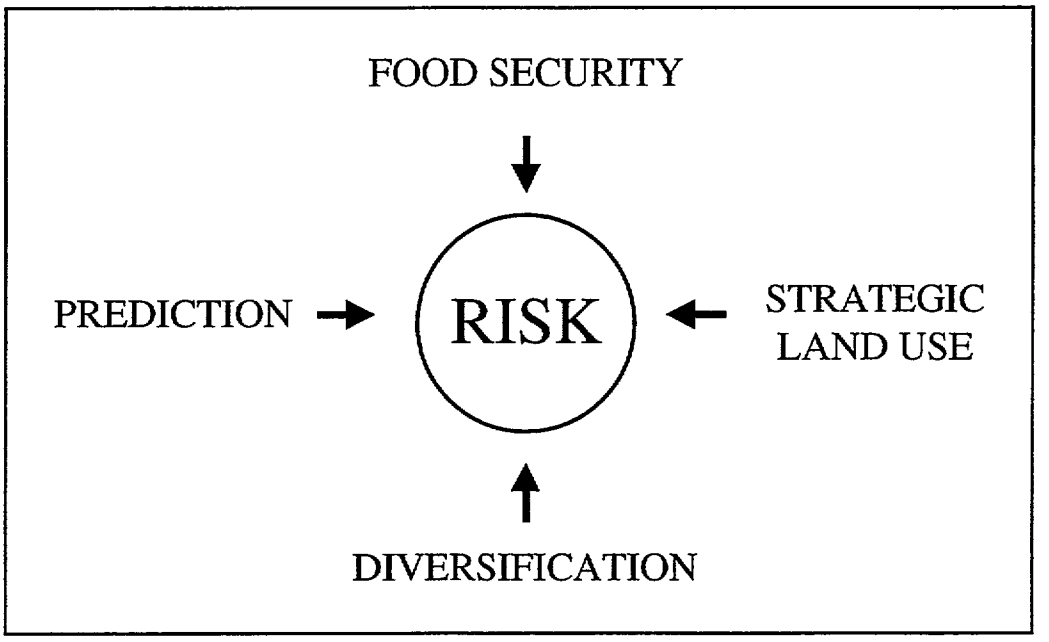
The extensive land area and its heterogeneity are a resource that pastoralists have used traditionally to deal with perturbations and cope with risk (Ellis 1994). The land available to additional non-pastoral populations is increasingly marginal for crop agriculture yet brings them into intense conflicts with traditional grazing rights of pastoralists (Little 1996). The spatially restricted pastoralists are less able to respond to environmental perturbations and as a result often have a negative impact on biodiversity and habitat. This additional population has also converted lands from forest to farms and pastures depleting one of the richest sources of biodiversity, the sub-tropical mountain forests of Central and South America.

Increasing population changes the nature of the environment in ways that make indigenous systems less adaptive than they were in their traditional conditions. Pastoralists are left with no alternatives but to try to survive the boom and bust cycles where they inevitable lose resources on an overstocked range. Estimate of losses in these cycles over the last 17 years for the Borana people of southern Ethiopia and Northern Kenya (250,000 people) are $298 million (SR/GL-CRSP study in preparation by Desta and Coppock). Competition between pastoralists and between pastoralists and farmers are major source of conflict globally. Ethiopia and Kenya each received more than $500 million in net transfers in 1995 for drought and conflict related relief. The World Food Programme in 1996 estimates that it provided 1.8 million tons of emergency and project food to pastoral and agropastoral communities worldwide, representing 25% of global food aid, up sharply from 10% a decade earlier. The answer is to destock the range. The question is how.

The impact of overuse of rangelands is critical to global carbon balances. Although biomass levels per unit area are not great in rangelands, they occupy more than 50% of the earth's surface (Holechek et al. 1995) and are an important component of global carbon cycle. However their carbon budgets are neither well measured nor functionally well understood (Allen-Diaz 1996). The vast but highly degraded rangelands of Central Asia have the potential through rehabilitation to not only absorb the equivalent of a 30% reduction in all anthropogenic carbon emissions from the former Soviet Union (ENN 1998) but also provide answers to the location of the missing carbon sink from global carbon balance models (Watson et al. 1990).

RESEARCH AND DEVELOPMENT PLAN

While the role of livestock in research and development figures differently from region to region, many of the methodologies to be used in funded projects and the overall complex of development needs are similar. Projects in all three regions bring new, sophisticated analytical tools to the table and propose innovative means for linking research and development. Land-use studies balancing food security needs and environmental concerns are underway in three regions; studies linking livestock development and overall economic growth have been undertaken in East Africa and Central Asia; human nutrition is being incorporated as an essential component in all projects; and the study of global warming to be conducted in Central Asia has international significance.



MANAGING RISK

Predict the Future

The project, *Early Warning System for Monitoring Nutrition and Livestock Health for Food Security of Humans in East Africa*, headed by Texas A&M University System (TAMUS), addresses risk by adapting already successful U.S. technologies to East Africa in order to increase the lead time on the forecast of drought and famine, and allow policy makers to visualize the impact of their interventions on food crises. The region is particularly prone in recent years to more frequent drought and famine. In addition, these regions are subject to frequent and infrequent drought, sometimes generating long wet-dry cycles. The results can be devastating on livestock and people (Ellis et al. 1993, Hiernaux 1993, Coppock 1993, 1994). United States Agency for International Development (USAID) reported that East Africa experienced the worst drought in 50 years in 1991; an estimated 2,700,000 people were affected. The northeast of Kenya, a pastoral region, was most severely impacted. This was exacerbated by an influx of refugees from Somalia, Ethiopia and Sudan that followed due to civil strife and drought in their countries. In 1992 the U.S. declared the region a disaster area.

Project Goal: To establish a capacity to more effectively monitor and predict famine for East Africa that provides more timely information to policy makers and international monitoring programs to evaluate alternative mitigation strategies and more appropriate livestock interventions.

The project combines predictive and spatial characterization technologies with the formation of a network of collection and measurement sites in East Africa. The data from these sites, in coordination with the Famine Early Warning System (FEWS) project, will allow 6-8 weeks of increased lead-time for drought forecasting. One of the technologies employed in the project is already used in the U.S. and is projected to save American ranchers $187 million per year. The technology has broad applicability to Africa and with modification and tuning, to other semi-arid regions of the world where drought is intense and common.

Mitigating, Coping and Adapting to Perturbations and Change

The project, *Integrated Modeling and Assessment for Balancing Food Security, Conservation and Ecosystem Integrity in East Africa*, headed by Colorado State University (CSU), addresses the relationship between pastoralists and wildlife conservation in the context of the unpredictability of semi-arid environments (65% of Sub-Saharan Africa is considered semi-arid and some African savannas systems have 2590 spp/10000 km2 which is greater than the continent's rain forests; Menaut 1983). The project is focused in East Africa, which has the highest diversity of large mammals and the world's most species-rich grasslands (Menaut 1983). Tourism is the world's fastest growing industry. The UNEP estimates that by the turn of the century, revenues will reach U.S.$3.2 trillion. According to the World Tourism Organization (which estimates that the industry is already worth U.S.$3.4 trillion in 1995), most of the increase in tourism revenues will be attributable to the rise of ecotourism. The value of ecotourism, estimated at $233 billion by Filion et al. 1992 worldwide and worth $400 million for Kenya in foreign exchange, is directly threatened by other demands for land use and food. This project will adapt models already in use in U.S. national parks to assist policy makers at the national and local level to establish approaches that are compatible with both pastoral life and conservation of biodiversity. The Serengeti Natural Park and Ngorongoro Conservation Area were chosen as the central focus of the project because they are considered among the world's great natural resource, declared by UNESCO as a World Heritage Site and accepted as a Biosphere Reserve (Perkin 1997). The success of the project is therefore likely to reach a broad audience and have a high level of adoption.

> ***Project Goal:*** Increase food security in the pastoral ecosystems of East Africa while conserving wildlife, biodiversity, and ecosystem integrity, by increasing the capacity for a wide range of stakeholders, planners, and policy makers to accurately assess interactions between livestock, wildlife, and natural resources.

Pastoralists are particularly vulnerable to food shortages (Bohle et al. 1994). Though pastoralists are co-resident with the wildlife they rarely benefit from ecotourism revenues (ODA 1994). In addition, these regions are subject to severe weather events that can have considerable impacts on people and livestock. (Ellis et al. 1993). Food insecurity affects

health and nutrition. Pastoralists, under normal conditions are living at the lower end of nutritional well-being (Galvin 1992, Galvin et al. 1994). This project intends to identify, in an integrated manner, the tradeoffs of different management decisions on wildlife conservation, livestock production and pastoralist food security and health. The solutions provided by the project will have wide applicability in Africa and elsewhere. This is particularly true for the U.S. where the modeling done on this project will be incorporated into existing models for U.S. national parks, including Yellowstone.

The project, *Improving Pastoral Risk Management on East African Rangelands, headed by Utah State University* (USU), uses four systems to cope with risk and destock livestock in semiarid ecosystems: resource tenure, closer links to markets, rural finance and public service delivery. These activities represent mechanisms to allow asset diversification, improved ability to interact with markets, increased investment in rural institutions and commerce, and better capacity to cope with an unpredictable environment. The impact of these alternatives will likely reduce conflict, improve the economic conditions of pastoralist and their communities, provide higher productivity and stability to their livestock systems and greater protection for the biodiversity in their environments.

Project Goal: Improve well-being of East African pastoralists by enhancing their capacity for risk management using four tactics: asset diversification, income diversification, improved use of information, and increased access to external resources.

In the Borana study area alone, conflict and its consequences have required approximately $75 million in interventions per year (Little pers. com.). The conflicts are primarily over the land required for pastoralist to maintain high livestock populations caused by the lack of alternative investment opportunities for capital. This conflict is particularly intense in Africa for most of the 30 million pastoralists who occupy this environment and is likely to have applicability for the Central Asian steppe and Mongolia as well. The credit and banking schemes proposed in coordination with World Council of Credit Unions (WOCCU) and the Ethiopian and Kenya National Banks are targeted to relieve this pressure.

The project, *Impacts of Economic Reform on the Livestock Sector in Central Asia,* headed by the University of Wisconsin-Madison (UW), acting in a region of major economic and political transition, strengthens the capacity of governments to formulate effective agricultural policies on ownership, use-rights, and institutional organization that engender stable and democratic societies. The rapid and somewhat unpredictable nature of the transitions in former Soviet Union require input in knowledge and experience for

Project Goal: To contribute to the development of policies and technologies that improve the profitability, income distribution, and biological efficiency of Central Asia's livestock sector.

success. A large and diverse number of farming types are emerging in the Central Asia and developing effective policy will require knowledge of these systems to make effective projections. In the livestock sector there are clear signals for intervention. The collapse of the Russian wool industry, a depression in the world wool market, and an increasing demand for meat both within the region and from China and the Middle East necessitate the rapid conversion from a wool to meat producing sheep. The project will introduce the genetic material and techniques to insure high rates of reproduction of appropriate genetic animal stock to allow adaptation to the new economic conditions. The approaches and technologies introduced by the project have regional significance for the economic growth of Central Asia and Russia.

In Latin America, the project *Livestock-Natural Resource Interfaces at the Internal Frontier,* headed by the University of Wisconsin-Madison (UW), deals with the impact of increasing human population on the conversion of forest and the management of integrated livestock systems that protect and use the biodiversity of these ecosystems. The importance of water emanating from the mountain forest is central to the project, which is organized at the watershed level. The project is focused in countries with some of the highest and most threatened biodiversity in the world (Mittermeier et al. 1997). The project uses a strong community based involvement, successful in African conservation efforts (ODA 1994), to address how to develop productive, profitable and environmental sustainable food systems in marginal environments for livestock production. This project has major regional application for the highlands of Latin America and if successful will support the protection of some of the world's richest communities of biodiversity, water supplies for millions of urban dwellers and provide a sustainable income for a considerable rural population.

Project Goal: To develop and promote sustainable management of livestock and natural resources by communities of small landholders that maintains the high biodiversity of mountainous forested areas of Latin America.

The project, *Integrated Tools for Livestock Development and Rangeland Conservation, in Central Asia,* headed by the University of California-Davis (UCD), emphasizes both adaptation and mitigation. This project will have significant global and local impacts in four main areas: atmospheric CO_2 sequestration, rangeland conservation, enhanced productivity and sustainability of livestock systems, and human nutritional welfare. The population of Central Asia (presently estimated at 50 million) is heavily dependent on rangeland production for meat, wool and other products. Their reliance on rangeland production is higher than most areas of the world on a per area basis. According to Kurochkina (1995), the percentage of

Project Goal: To design and promote dissemination of low-cost livestock production systems, and agricultural policy instruments for the long-term improvement of rural family welfare in an ecologically sustainable way.

rangelands that are overgrazed is 45% in Kazakhstan, 34% in Uzbekistan, and 28% in Turkmenistan. These conditions evince themselves in low animal productivity, loss of biodiversity and alarmingly high levels of child malnutrition, particularly in micronutrients (Chen et al. 1992). The project will design and demonstrate sustainable range management plans that, if widely adopted, increase the forage productivity of the region by 40%. A proportional increase in livestock production and productivity will be achieved. Management will be based on a novel integration of natural forages, seasonal grazing schemes and seeded pastures.

A link between anemia and consumption of red meat will be tested, as well as the relation between type of livestock enterprise and meat consumption. The project will directly evaluate the nutritional status of more than 900 families in the region. These families will receive advice on how to improve their nutrition and how to change their production practices in order to achieve an income and mixture of in-farm products that eliminate deficiencies. If project recommendations are widely adopted, the productivity of the rural population (about 50% of the total population) will likely increase by 10%. The intellectual capacity of rural people will also increase, but no quantitative estimate of this is available at this time.

A considerable body of scientific evidence indicates that improved management and reclamation of deteriorated rangelands (phtyo-amelioration) can markedly increase their productivity and can transform deteriorated rangelands from sources to sinks for carbon (Fisher et al., 1994). Long-term studies of range management in Turkmenistan (Nechaeva, 1985), Uzbekistan (Momotov and Faizier., 1973; Shamsutdinov, 1991) and Kazakhstan (Nikolaev et1—l., 1977; Karibaeva and Kurochkina, 1991; Zhambakin, 1995) demonstrated that rangeland productivity of overgrazed, eroded rangelands may increase three to six times, and the total reserve of organic carbon could be increased by 20 to 50% with improved management and phyto-amelioration.

The project, *Role of Animal Source Foods to Improve Diet Quality and Growth and Cognitive Development in East African Children*, headed by the University of California-Los Angeles (UCLA), targets mechanisms to cope with malnutrition of rural populations, particularly children. While deficiencies in calories and protein are of concern, particularly in disasters, work by the Nutrition CRSP and the World Health Organization shows that micronutrient deficiencies are widespread in children (Vitamin A: 70% in South Asia, 50% in Africa; Iron over 50% of children and pregnant women). The compelling issue with micronutrients is that their deficiency has permanent impact on child cognitive and physical development (World Bank 1994, Murphy and Allen 1996). Once stunted cognitive capacity is always diminished and often results in 10% loss on intelligence scores and 6% loss in

Project Goal: To improve the cognitive function, growth and health of rural East African children through the increased consumption of animal source foods.

income (Allen 1993). Cereal based diets, so prevalent in developing countries, are rich sources of calories but they actually retard the absorption of critical micronutrients such as iron and zinc. They are the classic empty calorie. Considering the gain of creative capacity to developing countries with proper nutrition and the cost without, coupled with the demographic structure of most of these populations, the micronutrient problem in children may well be one of the most extensive, important global issues in international development.

The problem can be approached in a number of ways. Fortification and supplementation are effective in some situations but suffer from logistical and economic constraints in others that make their sustainability questionable. However, animal source foods (ASF) are rich sources of these nutrients with high bioavailability (Murphy and Allen 1996). In a broad set of correlative studies in Mexico, Egypt and Kenya the intake of animal foods was the only dietary variable that consistently predicted child physical and cognitive development (Allen 1993). Although animal foods are present or potentially available with appropriate intervention for most families, education and awareness, as well as appropriate mechanisms such as credit and motivation are required to implement the solutions. The first step in this process is to definitively test the link between ASF and cognitive and physical development in children. If the project's field test of the link between ASF and cognitive development is positive then this fact will have a major impact on interpretations for micronutrient malnutrition worldwide. Such a test will lead to broad support for intervention with ASF. Additional project work, after testing, will consider the effectiveness of different interventions in delivering ASF into the diets of children.

Regional Programs

While the SR/GL-CRSP global program builds effectively on complementarities between projects in different regions, each region has a set of unique development problems. The East Africa program focuses primarily on pastoral societies coping with climatic unpredictability and diminishing resources for mitigating risk. The Central Asia program addresses a rapidly changing and unstable political and economic environment, where little effort has been made, particularly in rural areas, to "cushion" the effects of transition to a market economy. The Latin America program faces sustainability issues, with a growing population, more firmly entrenched poverty, and a rapidly diminishing resource base.

The organization of regional programs is also unique and appropriate to the circumstances of each region. In East Africa, three projects focused on pastoral systems tie into the three objectives of the Association for Strengthening Agricultural Research in East and Central Africa (ASARECA) Crisis Mitigation Program. The ASARECA tie-in gives the program regional coherence. In Central Asia, a collaborative network of organizations has been formed by linking the University of California, Davis (UCD) and University of Wisconsin-Madison (UW-Madison) projects with the BASIS CRSP, International Centre for Agricultural Research in the Dry Areas (ICARDA), International Fund for Agricultural Development (IFAD), and the Overseas Development Institute (ODI). Finally, in Latin

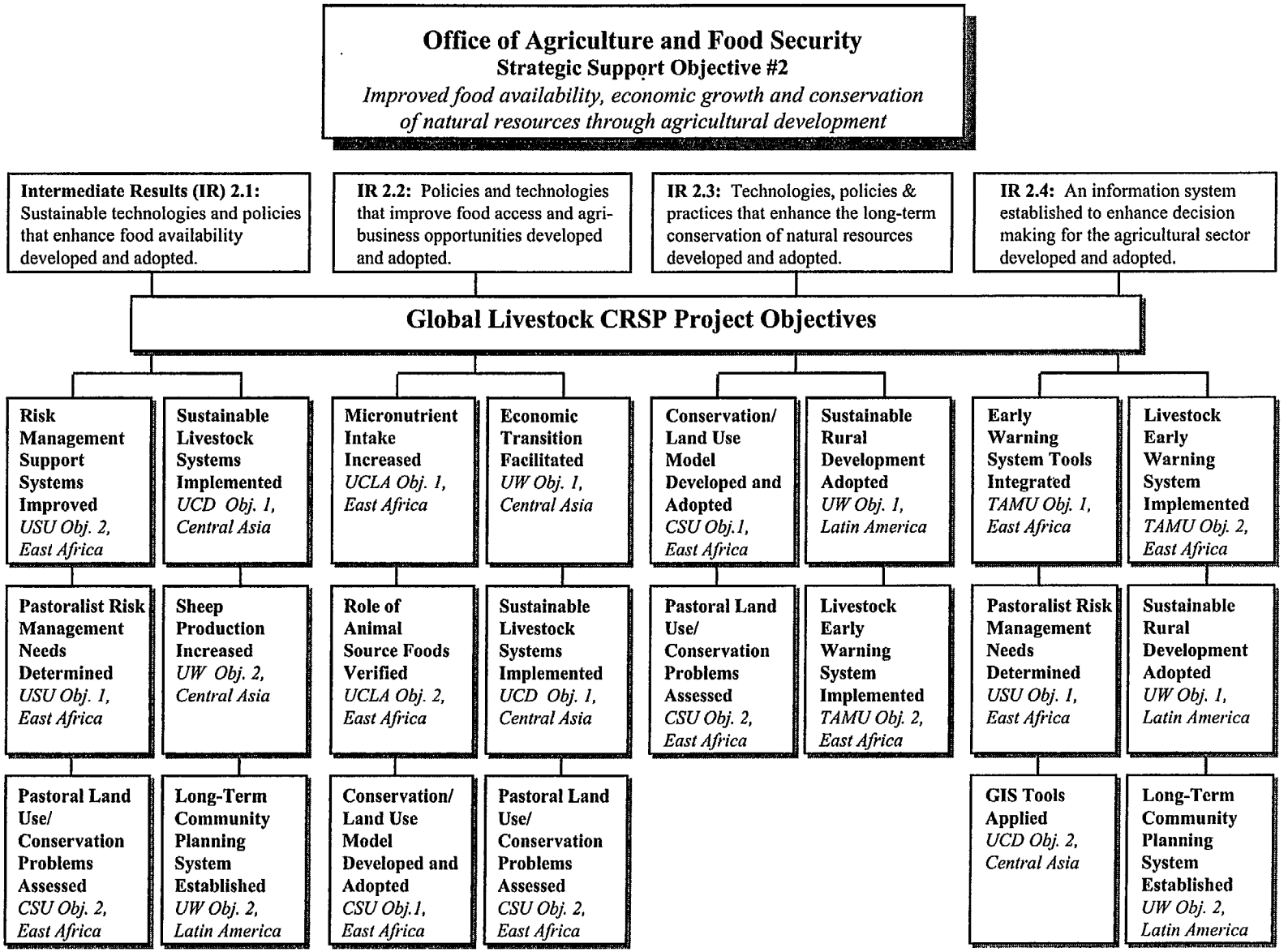
America, the one project funded is exceptionally broad-based, with extensive institutional linkages in each country of operations (Mexico, Bolivia and Ecuador).

Women and Gender Component

Gender is addressed at two levels within the program. First, directly through training of both host country nationals and U.S. participants, women are provided the scientific tools to advance their careers in agriculture, environmental sciences, social sciences and human nutrition. The program will be training an average of 30 plus students and scientists per year of which approximately 35% are women. In the seven projects, 19 women occupy leadership roles, either as principal scientists, country coordinators or site managers.

Second, because women are a key component of livestock systems in developing countries, especially with respect to pastoral systems and some of the new topics that the SR/GL-CRSP has incorporated in the renewal grant, the role of women is an explicit focus of each of the seven projects. The pastoral projects in East Africa will analyze the role of women in the production system by considering the impact of asset diversification and management on women and children, and the past and future roles of women in financial management systems (the focus of one of the USU/WOCCU studies). They will consider the impact of potential landuse scenarios on the welfare of women and children within the context of balancing livestock production and wildlife/biodiversity conservation both in East Africa and Latin America. In Central Asia the UW project is addressing the role of women in the transition from centrally controlled economies with wool based production to free-market with meat based production.

The SR/GL-CRSP has a global theme in human nutrition related to the role of micronutrients in child development. The East African project on human nutrition has a gender specialist who will investigate feeding and nutrition issues of girls to address time constraints on their education and causes of poor attendance at school. The key element of micronutrient nutrition often resides with the condition of the mother during pregnancy and lactation. The quality of nutrition available to women is key to our understanding of how to solve the micronutrient deficiencies in project communities. The UCD project in Central Asia is investigating the allocation of nutritional resources within the household, considering how alternative interventions would affect the nutrition of women and children, and proposing new technologies to improve the nutritional status of families. The CSU and the USU projects are considering the nutritional status of women in policy interventions they will recommend based on their investigations. In Latin America household welfare is being measured and projected for alternative land management strategies. With full funding a nutritional component that would parallel the East African and Central Asian projects has highest priority for funding.


Office of Agriculture and Food Security
Strategic Support Objective #2
Improved food availability, economic growth and conservation of natural resources through agricultural development
Intermediate Results (IR) 2.1: Sustainable technologies and policies that enhance food availability developed and adopted.
IR 2.2: Policies and technologies that improve food access and agri-business opportunities developed and adopted.
IR 2.3: Technologies, policies & practices that enhance the long-term conservation of natural resources developed and adopted.
IR 2.4: An information system established to enhance decision making for the agricultural sector developed and adopted.
Global Livestock CRSP Project Objectives
Risk Management Support Systems Improved USU Obj. 2, East Africa
Sustainable Livestock Systems Implemented UCD Obj. 1, Central Asia
Micronutrient Intake Increased UCLA Obj. 1, East Africa
Economic Transition Facilitated UW Obj. 1, Central Asia
Conservation/ Land Use Model Developed and Adopted CSU Obj.1, East Africa
Sustainable Rural Development Adopted UW Obj. 1, Latin America
Early Warning System Tools Integrated TAMU Obj. 1, East Africa
Livestock Early Warning System Implemented TAMU Obj. 2, East Africa
Pastoralist Risk Management Needs Determined USU Obj. 1, East Africa
Sheep Production Increased UW Obj. 2, Central Asia
Role of Animal Source Foods Verified UCLA Obj. 2, East Africa
Sustainable Livestock Systems Implemented UCD Obj. 1, Central Asia
Pastoral Land Use/ Conservation Problems Assessed CSU Obj. 2, East Africa
Livestock Early Warning System Implemented TAMU Obj. 2, East Africa
Pastoralist Risk Management Needs Determined USU Obj. 1, East Africa
Sustainable Rural Development Adopted UW Obj. 1, Latin America
Pastoral Land Use/ Conservation Problems Assessed CSU Obj. 2, East Africa
Long-Term Community Planning System Established UW Obj. 2, Latin America
Conservation/ Land Use Model Developed and Adopted CSU Obj.1, East Africa
Pastoral Land Use/ Conservation Problems Assessed CSU Obj. 2, East Africa
GIS Tools Applied UCD Obj. 2, Central Asia
Long-Term Community Planning System Established UW Obj. 2, Latin America

Training

In the past the SR CRSP conducted a considerable graduate degree-training program. On an annual budget four times greater than the minimum proposed in this grant request (Budget A), the SR CRSP supported an average of 30-40 students per year in M.S. and Ph.D. programs. The major advantage of the CRSP program design was that a research project was the center of the training program. Host country graduate students, who were able to do their data collection and much of their analysis in their own country, could build and maintain linkages with their scientific and governmental colleagues, stay in touch with their national science scene and develop the range of contacts necessary for successful future employment. The program did not isolate them by long stints in the U.S. for training and research. Instead the CRSP conducted course and laboratory training in the U.S. but the research project and data collection were conducted in the host country. Connections with national colleagues are critical elements to the future of graduate students as scientists in their host countries and it is the potential of the future that draws them back. CRSP programs have amongst the highest rates of return of graduate students to their home countries. We plan to emphasize this strategy in our new program.

In spite of operating at a much-reduced budget (25% of what we received in 1986) and in spite of the high costs of training non-resident students, the SR/GL-CRSP remains committed to training. However there has been a shift in focus and process. Our training for the first year of the new grant emphasizes short-term training. Five workshops are planned where over 300 individuals are anticipated to receive training in policy, Geographic Information Systems (GIS), nutrition, modeling and watershed management. In specially tailored programs, nine host country scientists will be trained by U.S. counterparts. Instead of being the sole support of student training the CRSP now is leveraging funds from other sources, largely U.S. universities, to support graduate students. In the first year of the grant eight M.S. and nine Ph.D. students will be supported in the program, as well as six postdoctoral fellows. In all training both long and short term the SR/GL-CRSP will be training 32 individuals and, counting those identified thus far, they represent 72% host country nationals and 35% female. Despite the sharp cut back in funding, the projects have been remarkably successful in obtaining funding resources to maintain a substantial training program.

AGENCY FOR INTERNATIONAL DEVELOPMENT STRATEGIC OBJECTIVES

The Figure on the previous page indicates how the objectives of the SR/GL-CRSP projects support the Intermediate Results (IR) and Strategic Support Objective (SSO) #2 of the Global Bureau's Office of Agriculture and Food Security (G/AFS). The broad and even coverage that the CRSP project objectives give to the four IRs is due in part to the planning process implemented during re-engineering. The CRSP chose to focus on four issues, tailored for the livestock sector that were connected with the SSOs of G/AFS. Hence food availability (IR 2.1) is addressed directly by five projects and six objectives, economic growth

(IR 2.2) by three projects and six objectives, and conservation of resources (IR 2.3) by three projects and four objectives. A fourth IR (2.4) addresses information systems to enhance decision-making. This IR is closely connected with policy, the fourth issue in the CRSP portfolio and the focus of the Policy Division under which the SR/GL-CRSP falls in G/AFS. Four projects and six objectives support this IR. The distribution of the objectives and the depth of effort across the range of agricultural development goals of G/AFS are a clear indication of the close communications between G/AFS and the CRSP during the re-engineering process.

NEW INITIATIVES

Russia and Ukraine

Between August 31 and September 18, 1997, a Task Force appointed by the Gore/ Chernomyrdin Commission (GCC) and funded by the SR/GL-CRSP visited the Russian Federation. The purpose of the trip was to explore the possibility of university partnerships between the U.S. and Russia, and possibly also the U.S. and Ukraine. The GCC Task Force visited the Ministry of Agriculture and Food (MOAF) and other institutions in Moscow, along with institutions and agribusinesses in five oblasts (provinces).

The Russian agricultural sector is depressed and the livestock component especially so. Within the agricultural sector, no component has been hit harder, yet holds more investment potential, than the livestock sector. The sector has lost 60% of its 1990 contribution to the GDP, the largest loss of any economic sector (BISNIS 1997). Herd sizes, admittedly maintained at unproductively high levels in Soviet times, have been drastically reduced since the breakup, down 40%. On the other hand, a revitalized livestock industry would have broad implications for Russia's rural populations both economically and nutritionally. Livestock production integrates both animal and crop agriculture bringing a set of value added products to the rural communities. In doing so, the recovery of the livestock sector requires improvement of crop production and soil management upon which feed production depends. This year 70% of all grains grown in Russia is for animal consumption (FAO 1997).

Improvements in production efficiencies would likely affect grain production for human consumption as well. Furthermore, the transformation to a market economy has left most scientific institutions with out of date management and administrative structures, and agriculture with limited ability to use its scientific resources to solve its practical problems. The team proposed a broad based program, following the Promoting Russian Agriculture through Regional Investment (PRARI) approach, aimed at selected oblasts that distinguish themselves in reform, to solve the problems of the livestock sector and create a new institutional framework that connects basic and applied science to teaching, research and technology development. Since feed production is a critical deficient aspect of animal

production in Russia (USDA FAS 1996, BISNIS 1997), a strong focus on crop production and its integration with animal production will be a critical link in the collaborations. This broad focus also provides the maximal opportunity for American investment.

Mongolia

Mongolia is an extension of the Asian steppe and provides an opportunity to extend and combine the technologies and approaches being applied in Central Asia and Africa. In Mongolia, like Kazakhstan, the Virgin Lands program brought marginal lands into grain production. These lands were depleted of nutrients and suffered considerable erosion causing production to decline. In recent years, considerable food shortages have occurred (FAO 1997). Presently, grains production is half the level of seven years ago and one quarter of the country's children are suffering from chronic malnutrition. The livestock sector, which contributes 88% to the gross agricultural production, has been hard hit by the transition. Like East Africa, as the terms of trade have turned against livestock, there has been a growing pressure to compensate by increasing animal numbers (FAO 1997) which portends range degradation and rural poverty. The FAO mission (1997) to Mongolia recommends among other things training and research. However Mongolia has great animal production potential, and with its location next to China and Russia, a ready market for its products.

As in Russia, feed supply is a critical factor in production and traditional methods of grazing that once protected the forage resource, now, as in East Africa, are maladaptive. New systems must be developed that are productive and sustainable. Unlike most of Central Asia, the Mongolian steppe is not severely degraded but may well be without intervention. The importance of the steppe for the economy and social well-being of Mongolia justifies rapid development of a project that provides the tools for proper management and production. Approaches being developed in Kazakhstan by the UC-Davis and UW-Madison projects would be directly transferable to Mongolia to improve range management, productivity and human nutrition. The location of a carbon flux monitoring station in the country is also proposed. The need for the rural population to diversify from a livestock base is similar to East African pastoralists. Also like East African pastoralists, Mongolian herders live and graze their livestock in close association with a rich diversity of wild ungulates. Both the USU and CSU projects in East Africa provide a framework to apply their approaches in Africa to the Mongolian steppe.

Indonesia

Recent economic turmoil has wreaked havoc on the Indonesian poultry industry, an industry that supplies nearly all protein requirements for Indonesia's population of more than 200 million (Morgan 1998). Prior to the current crisis, the poultry industry, with a growth rate of 15%, was the fastest growing livestock sector in Indonesia. In 1997, poultry meat made up 58% of the total meat production (Hartano and Alam 1997). Since the crisis, however, nearly 70% of the breeding farms have closed (Ministry of Agriculture 1998).

Industry leaders are predicting little or no growth for 1998 due to oversupply, drought and less consumer purchasing power.

A February 1998 review of the Indonesian poultry industry by the Food and Agriculture Committee of the US-ASEAN Business Council found severe weaknesses in technology and human resource development for the industry. The Indonesian Coordinating Minister for Production and Distribution, Ir. Hartarto Sastrosoenarto, told the 15 firms and institutions including representatives of Tyson Foods, Inc., Cargill, Pioneer Hi-Bred, Tricon Restaurants International, McDonald's Corporation and others, that the development of technical and managerial expertise in agriculture is the first priority of the Ministry. He strongly recommended that the US-ASEAN task force assist Indonesia in training and research for the poultry industry.

Firm after firm, farmers and processors and retailers, pointed to the lack of technology in Indonesia has undermined the capacity of the poultry industry to produce feed and a safe supply of poultry products for Indonesian consumers. Poultry scientists at Indonesia's pre-eminent agricultural university, Institut Pertaninan Bogor, flatly stated there is no indigenous source of technology in Indonesia, and there is no relationship whatsoever between the university and poultry industry.

Currency devaluation and unavailability of bank letters of credit have closed off imported feed supplies. With essentially no domestic feed stuff production, and no knowledge of alternate rations, breeder farmers have slaughtered most breeding stock, fertile eggs, and millions of chicks. With trade and production at a standstill, visiting U.S. firms as well as Indonesians are convinced that future US-ASEAN poultry product and feed trade will depend upon the development of a viable, complementary indigenous capacity to produce feed and production technology and managerial expertise.

In response to the crisis situation, the Small Ruminant/Global Livestock CRSP will address the issue of alternate feed supply and feed safety through technology assessment to be undertaken in cooperation with the US-ASEAN Business Council from April through September 1998. Degree training of two Indonesian poultry scientists will be initiated through the sponsorship of US-ASEAN firms and SR/GL-CRSP universities. Pilot, short-term technical and managerial training will be conducted by the firms and universities, in the priority areas, at the end of the initial 6-month period. Pending USAID Mission support, the Small Ruminant/Global Livestock CRSP will incorporate a substantial research/training effort for the Indonesian poultry industry, over the succeeding five years, on poultry feeds, nutrition, feed and food safety, and market information.

SR/GL-CRSP and World Bank Livestock Specialist

Common development objectives of both the USAID/CRSP and Agricultural Research and Extension Group (ESDAR) could be furthered by seconding a Specialist to the World

Bank. The Specialist would address those objectives held in common, namely: analysis of global research system development, development of research linkages and collaborative research activities, and coordination of technology system development activities and donor assistance to developing country NARSs. In the case of the SR/ Global Livestock CRSP Specialist, work would focus on livestock research-related activities. A U.S. academic would fill the position on sabbatical leave from their university.

The focus of the position would be to promote increased partnerships and international collaboration on research and technology systems, reinforcing development of a *global agricultural research system* (one of the main goals of ESDAR). The Specialist would work collaboratively with the ESDAR Group and the World Bank Rural Sector Family's Agricultural Knowledge and Information System (AKIS) Thematic Group.

The CRSP Livestock Specialist's involvement in the Bank's Rural Sector activities would be dependent on needs and opportunities to support ongoing programs. This may involve analytical work, research, or participation in country project operations. It is expected that most involvement would be in the context of the multi-donor Livestock-Environment Initiative dealing with issues related to:

- integration of livestock and wildlife production in communal grazing areas;
- conservation of domestic animal diversity;
- optimal nutrient recycling under conditions of extreme land pressure;
- area-wide integration and zoning of industrial livestock production systems; and
- livestock and deforestation of tropical rainforests.

These issues are strongly linked to programtic themes of the SR/GL-CRSP. The Specialist would be a post-doctoral fellow or a staff member on sabbatical leave from a U.S. university supported by funds from SR/GL-CRSP, USAID/AFS, World Bank and U.S. universities.

BENEFITS TO THE UNITED STATES

Collaborations between U.S. and host country researchers will result in scientific networks representing a wide range of knowledge and a diversity of perspectives. Through these collaborations, U.S. faculty and students will gain practical international experience and, at the same time, education in agricultural sciences at U.S. institutions will be effectively internationalized. At the farm level, the "farmer to farmer" exchanges proposed for the Latin America program will introduce U.S. farmers to alternative strategies for sustainable production.

The technologies to be developed or adapted for East Africa and Central Asia will have applications in the United States. As the technologies employed in the Colorado State University (CSU) and Texas A&M University System (TAMUS) projects were originally

designed in the U.S., enhancements for the East Africa setting will also have significance for U.S. rangelands. TAMUS technologies will reduce drought- and market-induced risk to U.S. livestock producers, while addressing rangeland health issues. The value of this type of management technology is estimated at $140+ million per year. CSU technologies will assist in confronting disease transmission between livestock and wildlife populations in and around U.S. national parks. The model used in the Serengeti will enhance the ability to manage conflicts in U.S. National Parks. Technology supported development of improved risk management portfolios by Utah State University (USU) may serve to buffer or re-vitalize agricultural communities in the U.S. Risk management and asset diversification are a neglected component of ranching in the U.S. and adoption will likely result in major benefits (Holechek et. al. 1995).

Work on the desert rangelands of Central Asia will have relevance for the Great Basin areas of the United States, as the two regions have similarities in terms of both ecology and use. The carbon balance measurements for U.S. rangelands will be enhanced by measurements in Central Asia and vice versa. From an economic point of view, Central Asia is a rapidly developing market for U.S. exports, while U.S. investments in the area are growing. Producers and associations from the U.S. can both contribute to and significantly profit from Central Asian expertise in livestock production. From a strategic point of view, the region contains some of the world's richest oil deposits and is located along the borders of Russia and China.

At the most fundamental level, strategic support for small scale livestock producers will benefit the global community in facilitating development of thriving economies and stable governments. The increased incomes and food security of rural populations will translate into capital to invest, human capital for development, and attention to the maintenance of ecosystem integrity and biodiversity. Economic and political stability and sustainable agricultural development will preclude the necessity for frequent and costly interventions, whether to provide relief or to restore order. Fostering livestock-related agricultural development in resource-poor communities in developing regions would seem to be in the best interest of the United States.

Micronutrient deficiencies are not uncommon in urban America especially in some ethnic populations. Clear messages concerning the importance of small quantities of animal products as a source of these micronutrients would have major effect on how parents allocate food within the household. A definitive study such as the one in Kenya would be of sufficiently high profile to provide strong evidence to effect consumer behavior in the U.S.

DIMENSIONS OF LIVESTOCK-CENTERED DEVELOPMENT

As the Small Ruminant/Global Livestock CRSP prepares to enter the twenty-first century, there is an increased awareness of the complexity of international research and

development. To address the many dimensions of livestock-centered development, broad-based interdisciplinary and collaborative undertakings are crucial. The past two years have witnessed a process of focused change and institutional reorganization which demonstrates the readiness of the redesigned CRSP to undertake the challenges of the coming century.

Central to the new approach is a multi-dimensional model capable of embracing the multiple aspects of the development problem. This problem model, representing the new SR/GL-CRSP approach, serves to focus different disciplinary perspectives on the single issue of development through enhancements to animal agriculture. It is a three-dimensional model with the three axes representing economic growth, human nutrition, and environmental integrity, respectively. Previously, the work of CRSPs focused narrowly on economic growth and production. New knowledge and decades of experience have revealed the multifaceted nature of agricultural development. The present proposal presents a novel way of conceptualizing the problem of livestock development. This concept underlies both the design of the new CRSP and the process through which it was created.

The Small Ruminant CRSP and Characteristics of the Old CRSP Model

In the past two decades, the Small Ruminant CRSP research results and technological innovations have profited small ruminant producers in both the United States and collaborating countries. SR-CRSP production packages (including new, more productive breeds, health technologies such as vaccines, feed production, and animal management systems) have proven remarkably effective. Two advances in particular have had global significance: the development of the dual-purpose goat in Kenya and the grazing of sheep under rubber trees in Indonesia. In addition, students trained by the CRSP hold responsible positions in countries where the program has been active, while regional institutions and institutional networks developed through CRSP efforts continue to provide research support. The CRSP model, pioneered by the SR-CRSP in 1978, was built on the structural strengths of U.S. land-grant universities. Four characteristics ensure the effectiveness of this model:

Collaboration with U.S. land-grant universities

By enlisting the participation of U.S. land-grant universities, CRSPs draw on the richest resource of agricultural scientists in the world. International collaboration provides scientists at institutions abroad with a range of expertise not available in their own countries. The CRSP model incorporates research, training, and institution building as areas of development in which U.S. land-grant universities excel.

International training

The CRSP model provides an effective training mechanism for developing host country students. Students receive course training in the United States but return to their home

country to participate in CRSP research projects, thereby maintaining links with their national institutions and colleagues which insures a high rate of return and subsequent productivity. A second aspect of CRSP training has been the internationalization of U.S. universities by providing overseas research opportunities to U.S. scientists and graduate students. Academic researchers returning from sites abroad provide students at their home institutions with a broader base of information and a wider perspective.

Long-term scientific relationships

The CRSP framework links research and training in developing countries in order to improve human capital, to develop institutions, and to foster linkages that produce bilateral economic benefits. Graduate education integrates science and training to produce independent scientists capable of delivering a development product. This process brings about the long-term changes that "revolving door" approaches fail to produce.

Program cost-effectiveness

To maximize utilization of resources, the CRSP draws on existing institutions, both domestic and foreign, to provide administrative personnel and infrastructure. The CRSPs use American faculty whose salaries are already paid, whose houses are already bought, and whose laboratories have already been built. U.S. scientists form partnerships with host country scientists, whereby they also gain access to existing laboratories and scientific resources overseas. Significant leveraging of outside funds augments these savings.

Planning for the Re-Design of the SR-CRSP

In 1995, in response to United States Agency for International Development's re-engineering efforts and the changing needs of the international development community, representatives of the SR-CRSP met with other development professionals to discuss the future of the SR-CRSP's program. The proceedings of two meetings set the agenda for the program's extension, expansion and re-design. Following the Synthesis meeting, held on May 8-9, 1995 at Winrock International in Petit-Jean Mountain, Arkansas, an Advisory Panel was formed to oversee the transition and re-engineering process. Subsequently, extensive meetings were held with representatives of USAID/Washington and the first AP meeting took place on October 19-20, 1995 at the UC Davis Center in Washington, D.C.

The aim of these meetings was to facilitate the broadest possible base of input from experts in international development. Participants at the Synthesis meeting included SR-CRSP investigators, staff of the Management Entity (ME), and representatives of USAID and other donor agencies. Additional participants represented SR-CRSP sub-grantees, international agricultural research centers (IARCs), non-governmental organizations (NGOs), and the private sector. The formation of the Advisory Panel (AP) expanded the

breadth of expertise available to support CRSP organization and management, and this panel (re-named the Program Administrative Council) has since become a permanent component of CRSP administration.

A BLUEPRINT FOR CHANGE

The new design of the CRSP, developed through these consultations, is based on the collaborative, international and interdisciplinary strengths of the former CRSP model. It elaborates that model by incorporating a broader, more complex perspective on international development. In the new model, research is predicated on the following development philosophy:

- Research should be demand-driven and problem-oriented, with considerable resources invested in problem assessment at the grass roots level.
- Impact should be re-defined with emphasis on human outcomes, involvement of local communities, facilitation of research-extension links, and the building of partnerships with other stakeholders.
- Identification and communication of relevant policy issues should be a critical component of program planning and implementation.

As research imperatives in the growing global economy have become regional and international in nature, the scope of research has been expanded from a country to a regional focus. Greater emphasis has been placed on impact, with increased attention to extension efforts, participatory methods, and consortia building. Finally, policy issues, which will either facilitate or obstruct development efforts, will be addressed within the framework of both program and individual project designs.

As the CRSP model has long provided an integrated framework for studying, at the local level, problems of national, regional and global importance, it is a natural vehicle for the exploration of policy considerations. Through incorporation of a policy component, CRSP activities will be more closely integrated with USAID's country and regional strategies. On-site investigators will seek to develop analytical techniques and to gain experience in policy analysis, in order to support USAID in fostering policy change at the national level.

SELECTION OF REGIONS

Participants of the May 1995 Synthesis meeting proposed that SR/GL-CRSP activities be focused in regions where needs, opportunities, and comparative advantages are matched. Responding to these recommendations in October 1995, the SR-CRSP Advisory Panel, with considerable input from USAID Global and Regional Bureaus, considered several regions for

research and development efforts: Central Asia, East Africa, Eastern Europe, Latin America, South Africa, South Asia, and Southeast Asia. Agreement was reached on East Africa and Central Asia as priority regions for CRSP operations. Latin America was selected as a third region through later discussions.

TOP-DOWN, BOTTOM-UP APPROACH

In the spirit of USAID's new demand-driven model for agency planning, the participants at the Synthesis meeting recommended that regional participants be integrated into CRSP activities from the planning stages of research projects. To facilitate this, the SR-CRSP Advisory Panel proposed employing a renewal process using both top-down and bottom-up inputs. There was general consensus at both the Synthesis and AP meetings that in order to incorporate bottom-up planning and emphasize the team building inherent in that approach much more specificity was required in the planning process. Thus the proposal renewal process has placed considerable resources at the planning and team building level to ensure that problems are identified and projects developed with appropriate specificity and potential for impact.

Client Participation

In response to USAID's mandate for re-engineering, the new SR/GL-CRSP has incorporated a strong client participation component. The past experiences of the SR-CRSP have shown that the collaborative efforts of the CRSP are enhanced by participation of developing country scientists in the planning of research projects. To maximize effectiveness, the new research and development framework will involve intended beneficiaries in the planning, implementation and evaluation of projects. This approach is consistent with USAID's new demand-driven model for agency planning and constitutes the rationale for organizing regional workshops as part of the grant renewal process.

Regional Workshops

At the beginning of 1996, the SR/GL-CRSP organized a workshop in each of the three regions selected for activities. The organization of workshops was part of a three-phase process for program planning. This three-phase process was instituted to address the needs of three sets of clients, each having a unique and critical role to play in program planning.

Level one—programmatic level clients, such as USAID, the Congress, and the domestic livestock industry.
Level two—national research institutes, governmental agencies, and universities in developing countries.
Level three—end-users of research results: small-scale producers and their families and consumers of livestock products.

The new program of the SR/GL-CRSP has been developed with input at all three levels.

The Synthesis and Advisory Panel meetings in 1995 provided a forum for level one input. In this forum, wide-ranging discussions took place and consensus was reached on a broad agenda: identification of research themes, selection of geographic regions for CRSP activities, and definition of procedures for soliciting and awarding projects.

The organization of regional workshops was designed to identify and prioritize potential areas for research and development. As forums for client input, the workshops were intended to maximize the opportunity of regional professionals to present their views on the development issues confronting them. To do this, they developed problem models to establish the scope for activities within the region. Each workshop was held in collaboration with a regional organization active in the region. The SR-CRSP teamed with ASARECA in East Africa, ICARDA and the Uzbek Academy of Sciences in Central Asia, and the Interamerican Institute for Cooperation in Agriculture (IICA) in Latin America. Workshop participants included representatives of individual countries, universities, national agricultural research systems (NARS), International Agricultural Research Centers (IARCs), non-governmental organizations (NGOs), the private sector, and USAID.

Assessment Teams

Input into program planning at the grass roots level was solicited through the activities of assessment teams organized to investigate problems identified at regional workshops. The problem model was the central component of the assessment process, each model representing one of a set of regionally-identified problems developed by workshop participants. The models became the basis of a Request for Proposals (RFP) issued by the Management Entity to invite researchers at U.S. land-grant universities to propose the formation of assessment teams. Ten such teams were funded to compete amongst themselves for full research and development support. Competing with these teams was also a regionalization project from one of the ongoing CRSP projects. Assessment teams were charged with refining their problem model through in-field explorations and selection of additional team members appropriate to the demands of the problem.

External Reviews and Final Selection of Proposals

The final selection of research proposals was based on the results of the assessment process. Full proposals identified major issues associated with a specific problem; local, regional, and international collaborating institutions; potential solutions; an analysis of the assessment process; a budget; and a plan for technology transfer. Both U.S. and regional professionals independently reviewed full proposals. Regional Panels, chaired by a regionally recognized authority in agricultural research, were formed to evaluate and rank proposals. Final awards were based on reviews and consultation with the SR/GL-CRSP Advisory Panel. In the end, seven of the eleven projects submitting full proposals were funded.

Program Operations

Mechanisms through which the SR/GL-CRSP will operate have also been re-designed. Managerial re-structuring, administrative re-organization, and greater accountability for research impact are all distinctive features of the re-engineered program. The functions and responsibilities of executive committees have been clearly defined, and program objectives have been focused to achieve results. Finally, an expanded program framework allows for extensive collaboration and networking, facilitated by new communications technology and an emphasis on research-development links.

Knowledge Management

New knowledge solves problems directly and indirectly provides information so others can solve problems. Knowledge generated by the CRSP will be communicated directly to key user groups. Because they were identified early in the assessment process, key user groups have either bought into the problem solving process or are in a position to assist in the dissemination of knowledge within the region and country. A considerable portion of the knowledge generated by the projects will assist policy makers to chose effectively between alternative scenarios. The incorporation of those policy making institutions into the planning, design and implementation of research projects will enhance the probability that the appropriate knowledge is generated and that it will be used in the policy making process. The SR/GL-CRSP will organize knowledge management at four levels, global, regional, national and project, by means of electronic communication fora, traditional scientific exchanges such as publications, workshops with user groups and meetings. The goals will be to enhance global themes by inter- and intra-regional comparisons, improve understanding of development constraints by identifying principles that transcend national and eco-type differences, provide access to regional knowledge and developing proposals for funding of global and regional themes emerging from the analysis.

Program Management

The transition and re-engineering process through which the renewal proposal has been developed incorporated a radical re-structuring of program management. The Program Administrative Council (formerly the Advisory Panel) has replaced the former Administrative Council and Board of Directors. The functions and responsibilities of other executive committees supporting the work of SR/GL-CRSP have been re-defined to affect 1) greater independence in program development; 2) a more rational framework; and 3) infusion of a broader spectrum of development perspectives.

Management Structure

Primary responsibility for program management rests with the Program Director (PD) who is the Principal Investigator for the grant. The PD will manage the activities of the SR/

GL-CRSP, in consultation with the Program Administrative Council (PAC) and the USAID Program Officer, in accordance with the terms of the grant. The PAC, the members of which will be chosen for current expertise and active involvement in science or international development, will be the central coordinating committee. The Technical Committee (TC), composed of principal investigators and other team members drawn from participating projects will advise the PD and the PAC.

Management Philosophy

The new CRSP model will incorporate a results-driven framework, the keystone of which will be a continuous cycle of evaluation. While the nature of this process will vary from project to project, the inclusion of an assessment component will be required in the design of each project. The performance of CRSP projects will be followed as part of routine management, and continuation will be contingent on the team's ability to deliver results. Projects may also be graduated as the research and development needs of a region change, or as new issues of global importance come to the fore.

Program Administration

The SR/GL-CRSP will be administered as a grant to the University of California Davis, which, acting through the ME, will administer subgrants to participating U.S. institutions and maintain fiscal accountability. Responsibility for program administration will rest with the Program Director, who, in accordance with the provisions of the grant, will 1) take the lead in program development, 2) coordinate the activities of projects across and within regions, and 3) oversee the daily operations of the SR/GL-CRSP. In these various functions, the PAC, the TC, and the staff of the ME will support the Program Director.

Program Evaluation

Extension of technologies and evaluation of impact will be an integral component of the SR/GL-CRSP process at all sites from project inception to project renewal. With a greater emphasis on impact, teams will develop technology along with the strategies through which technologies will be transferred.

Title XII establishes the mandate for international research and development and, consequently, the measuring stick against which progress will be evaluated. The program will focus on human-centered development, and impact will be measured with respect to human outcomes: increased food security, increased incomes, better health, stable and equitable economic gvowth, professional training and community education; increased research and development capacity, etc. Specific outcomes are projected for each project and each locale. Appropriate—human-centered—measures of impact, and mechanisms for linking research and outreach, will vary from project to project and from site to site.

Project review

As ongoing assessment will be a major component of project management, progress toward stated goals will be intermittently gauged, and project modifications will be made as required. Workplans will be submitted on an annual basis and scientific findings presented at a year-end conference. These different occasions will provide multiple opportunities for feedback on project progress, by reviewers such as the External Evaluation Panel or colleagues in the field. In addition, ad-hoc reviews may be conducted by the Program Director on an as-needed basis.

External Evaluation Panel and program review

The External Evaluation Panel (EEP) will have principal responsibility for overall program review. Unlike the past practice of the EEP, the re-engineered process calls for program review at the year-end conference. This new practice will have several advantages: 1) direct contact with U.S. and regional representatives of all projects; 2) review of projects in-the-field; and 3) economies in time and expense for all participants. In addition, the EEP will gauge program progress toward targeted impacts by review of the SR/GL-CRSP annual report and other reports (e.g. publications, training, benefits to U.S., financial status, etc.), as available.

In another departure from former practice, the EEP will include among its members expertise from academic institutions other than land-grant universities. Currently, professionals from Harvard, Purdue, and Dartmouth have filled the three positions on the EEP. Along with the EEP review, USAID will conduct a tri-annual internal management review. This review will concentrate on the policies and procedures of the Management Entity with respect to administration of the program as a whole. The report of the management review committee will provide recommendations for greater efficiency in program operations.

BUDGET REQUESTS AND PROGRAMMATIC SCENARIOS

The challenge for the SR/GL-CRSP and USAID is to find, on limited funding, an appropriate balance in the allocation of funds between sufficient concentration to have quality projects on one hand and ample diversity to have a global program on the other. Three budget scenarios are presented. Budget A ($2.5M FY1999) is a bare minimum budget for a global program, defined as activity in three regions. Under this scenario strong activity is planned for East Africa, a minimal program in Central Asia, and a small project in Latin America. Under this scenario, little additional funding is available for global coordination, new initiatives, regional synergistic activities and graduate level training. Budget B ($4.06M FY1999) provides adequate funding for full projects (including graduate training) in all three regions, full integration of the projects at the global and regional levels, a new program in

Mongolia that is highly complementary to our Central Asia projects, a new position at the World Bank to increase U.S. university/ World Bank/ USAID communications and project development, and a new project to revitalize the poultry sector in Indonesia. The highest level request, Budget C ($5.0M for FY 1999) adds a Russia program, based on a USAID/ GCC team study and recommendations, that addresses the broad spectrum of issues constraining the production of animal products in Russia from the soil to the market. This project would be modeled after the successful PRARI initiative and focus on institutional reform in the educational and research sector using an active research/development project as the catalyst for institutional change

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Part One

THE SMALL RUMINANT/GLOBAL LIVESTOCK CRSP RE-ENGINEERED

As USAID continues its efforts to improve agricultural development in a period of re-structuring and re-direction, the Collaborative Research Support Program (CRSP) model is the best institutional alternative for implementation of programmatic change. The CRSP framework has been highly effective with respect to the purposes it was designed for: generating research solutions to priority global problems and strengthening the capabilities of institutions in resource-poor countries. As the needs and priorities of international development change, the CRSP model has the capacity to evolve to meet the demands of new challenges.

The CRSP framework was first instituted in 1978 by the Small Ruminant CRSP (SR-CRSP). This framework, later employed to create a succession of other programs, was designed to implement Title XII of the International Development and Food Assistance Act of 1975. The aim of Title XII has been to develop long-term solutions to the food and nutrition problems of low-income food-deficit countries. To accomplish this, Title XII mandates funding collaborative international research efforts which draw on the expertise and vast resources of U.S. land-grant universities. The aim of these programs has been to "prevent famine and establish freedom from hunger," while strengthening the capability of U.S. land-grant universities to apply the agricultural sciences to problems of food and nutrition generally.

SMALL RUMINANT CRSP

Seven of the eight original CRSPs were agricultural in nature, focusing on subsistence crops (beans, cowpeas, sorghum, millet, and peanuts), soil management, small ruminants, and fish. As there was adequate support among donors, at the time, for research on cattle, the Small Ruminant CRSP was designed to address the production problems of other ruminants. The goal of the SR-CRSP was therefore to improve the production of meat, milk and fiber, from sheep, alpacas, llamas and goats, in order to increase food availability and the incomes of low-resource producers. At the same time, the program has sought to strengthen the research capacity of overseas and U.S. agricultural institutions.

The SR-CRSP has been successful in all the traditional areas of development—research, training, and institution building. In the past two decades, SR-CRSP research results and technological innovations have profited small ruminant producers in both the United States

and collaborating countries (See Appendix C for a summary of SR-CRSP achievements and benefits to the United States). SR-CRSP production packages (including new, more productive breeds, health technologies such as vaccines, feed production, and animal management systems) have proven remarkably effective. Two advances in particular have had global significance: the development of the dual-purpose goat in Kenya and the grazing of sheep under rubber trees in Indonesia. In addition, students trained by the CRSP hold responsible positions in countries where the program has been active, while regional institutions and institutional networks developed through CRSP efforts continue to provide research support.

The activities of the SR-CRSP have also helped to reverse or slow the decline, in the United States, of expertise in small ruminants. The work of the SR-CRSP in one U.S. university has led to development of a dairy goat research facility which houses important artificial insemination projects and provides hands-on learning experiences for students. Meanwhile, research results have been made public at national meetings of scientists and producers, so that benefits to the U.S. accruing from the program can be quickly understood and implemented. By linking U.S. and developing country scientists the United States shares in the technological benefits of international aid while, at the same time, building a base for international, political and economic cooperation.

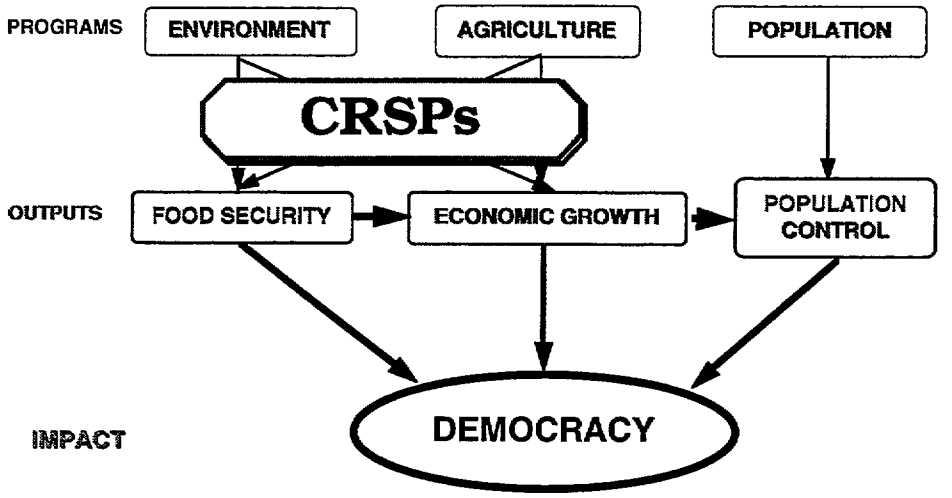
A BROADER CONTEXT FOR INTERNATIONAL AGRICULTURAL DEVELOPMENT

The re-design of the SR-CRSP has aimed to confront the changing needs of international development. Declining funding for cattle research since the 1980s has encouraged an expansion of research focus to include cattle and other livestock. The broader livestock focus has also been extended to incorporate the critical role of livestock with respect to food security, economic development and protection of the environment in developing countries. The expanded program also proposes to increase benefits to the United States. To accomplish these far-reaching goals, the CRSP's potential for livestock research and development will be enhanced by modifications to the CRSP model.

These modifications represent a greater awareness of the complexities of international development. For example, the Clinton administration's development agenda has included a strong emphasis on population control and environment. These areas of development are conceptually linked to agriculture, but they have been separated administratively. The separation means that important development problems, lying at the intersection of these fields, face institutional barriers that prevent effective solutions. The CRSP has sought innovative means of broadening the scope of research and linking a diverse spectrum of institutions.

Economic growth, population, environment and democracy constitute an integrated set of challenges—a matrix within which agriculture has a multifaceted and critical role to play. In addressing problems of economic decline, expanding populations, environmental

Figure 1: Sustainable Development for Agrarian Societies



degradation, and political unrest, the importance of agriculture cannot be overlooked. In agrarian societies, development of the agricultural sector drives economic growth, while economic growth is a prerequisite for the development of free, democratic governments. The quantity and quality of food consumed affect human social, political and reproductive behavior, while agriculture, as the greatest use of land by man, has a large potential for environmental impact.

Successful development programs will require integrated approaches, with agriculture as a central factor in program design. Concern about population growth and maintenance of ecosystem integrity only increase the importance of agriculture. Figure 1 illustrates the argument that for democracy to develop and to be maintained, three elements must be in place. First, economic growth must provide people with security and the means to pursue their aspirations. Second, agriculture must be environmentally sustainable, to ensure the necessary quantity and quality of food for children to develop into productive adults. Third, it is argued that, with economic growth and food security, reproductive rates will fall faster than with any other measure of population control. Then economic growth, food security and reduced population growth will combine to form the necessary context for development of democracy.

From this perspective, the Small Ruminant/Global Livestock CRSP proposes a program of livestock research and development focused on three broad themes: 1) economic growth, 2) human nutrition, 3) environment. The importance of livestock production to economic development, the potential of coupling animal and plant production systems for better nutrition, the need for proper management of livestock production for environmental protection, and the opportunity for Americans to participate in future markets are all compelling arguments for investment in a CRSP with broad livestock capabilities.

THE CRSP MODEL

The original CRSP model was built on the structural strengths of U.S. land-grant universities. It was designed for success in the traditional areas of development: research, training and institution building. Four characteristics can be identified to illustrate the effectiveness of the model: 1) collaboration with U.S. land-grant universities, 2) international training, 3) long-term scientific relationships, and 4) program cost-effectiveness.

Collaboration with U.S. Land-Grant Universities

By enlisting the participation of U.S. land-grant universities, CRSPs draw on the richest resource of agricultural scientists in the world. Most U.S. land grant universities have more soil scientists on a single campus than the entire system of the Consultative Group on International Agricultural Research (CGIAR). The productive relationship between scientists and farmers in the United States has helped to ensure a secure, inexpensive and profitable supply of food. International collaboration has provided scientists at institutions abroad with a range of expertise not available in their own countries. Greater success in linking research and development abroad will be facilitated by the recent expansion of collaborative mechanisms, which will, in turn, have important implications for future extension efforts in the United States.

The net of collaboration has been expanded in several ways. First, the executive management of the CRSP has been re-organized to bring in a broad spectrum of development expertise. Second, the research framework has been established through problem identification by regional professionals at workshops held in participating regions. Third, assessment teams have been funded to investigate regionally-identified problems through collaborative activities among: 1) scientists at U.S. land-grant institutions; 2) scientists from other U.S. universities, 3) scientists at collaborating universities, national agricultural research systems (NARS), and regional agricultural organizations, and 4) representatives of donors, international agricultural research centers (IARCs), non-governmental organizations (NGOs), government agencies and the private sector. Finally, assessment teams have interacted with local communities to elicit their participation in the research and development process.

International Training

The CRSP model has also provided an effective training mechanism for developing country students. Students receive course training in the United States but conduct their thesis research for the CRSP project in their native country. This process ensures students make key scientific contacts in their own system that are critical to their establishment as scientists in their own countries. They develop professional relationships and build a supportive network in their own countries but continue to maintain contact with U.S.

mentors. The success of the CRSP approach can be gauged by the number of CRSP trainees who have advanced to high positions. These former students provide important links to the U.S. for maintaining free trade and international understanding.

Training of overseas personnel will continue to be a central component of CRSP activities, particularly as it is a need strongly expressed by regional representatives. Professional training and institution building are critical to the sustainability of research and development efforts. In addition to these efforts, technical training and community education are needed to enhance the effectiveness of development. Technical training will give collaborating institutes entree into use of advanced technologies, while community education will contribute to the health and well-being of rural communities. The introduction of participatory methods will also provide a basis for enhancement of self-improvement and self-sufficiency at the regional, national, and community levels.

A second aspect of CRSP training has been the internationalization of U.S. land-grant institutions by providing overseas research opportunities to U.S. scientists and graduate students. Academic researchers returning from sites abroad provide students at their home institutions with a broader base of information and a wider perspective. New courses, improved facilities, short courses and campuswide interest have all been generated through this process. Meanwhile, graduate students who have the opportunity to conduct research abroad experience education in an international setting. They broaden their personal and social perspectives, learn to respond sensitively to cross-cultural differences, and develop international associations.

Since 1978 more than 300 U.S. scientists have participated in extensive agricultural research with SR-CRSP projects. These scientists now hold positions in the United States that are essential for maintaining the long-term competitiveness and sustainability of U.S. agriculture. SR-CRSP-trained students and scientists enter professions in the U.S. better equipped to deal with international problems, and this understanding of applied science in international settings will enable the United States to take a leading role in the growing scope of international trade and development.

Long-Term Scientific Relationships

While the appropriate costs of development assistance are often debated, it is clear that the cost of intervention far exceeds that of programs aimed at preventing crises. Effectively delivered development assistance can provide a powerful means of addressing poverty, mass migration, rapid population growth, political instability, and environmental degradation. Long-term strategies for building local capacity require time and resources, but investment in programs aimed at sustainable development will eliminate the necessity of sporadic and costly relief efforts. To this end, the CRSP model has incorporated research, training, and institution building as areas of development in which U.S. land-grant universities excel.

The SR-CRSP has linked research and training in developing countries in order to improve human capital, to develop institutions, and to foster linkages that produce bilateral economic benefits. This is significant because improved food security in low-income food-deficit countries will depend on scientists trained to undertake agricultural research in programs such as those operating in the United States. Graduate education integrates science and training to produce independent scientists capable of delivering a development product. This process brings about the long-term changes that "revolving door" approaches fail to produce.

Many scientists and technical staff in countries where the SR- CRSP has operated have been exposed, for the first time to multidisciplinary approaches. It has been the nature of CRSP research to confront multisectoral constraints—biological, physical, socio-economic, and cultural. The experience of participating in multidisciplinary research has been instrumental in developing the capacity to access and integrate diverse disciplinary perspectives in search of solutions to rural problems. In some cases, this collaborative process has been extended toward resolution of other problems of national importance.

A recent external review of the CRSPs has indicated that the development of human capital has been a major output of the program. In the course of time personnel trained by the CRSP in countries where the program has been active will move into positions of responsibility. SR-CRSP trainees in Kenya, for example, now comprise the professional core of the animal science and animal disease components of the Kenya Agricultural Research Institute (KARI). International relationships built during the course of CRSP programs also provide a foundation for the long-term stability of national institutions. This institutional stability is necessary for scientific and technical creativity and accomplishment.

Program Cost-Effectiveness

To maximize utilization of resources, the CRSP framework draws on existing institutions, both domestic and foreign, to provide administrative personnel and infrastructure. Unlike programs which pay for salaries, overseas housing, laboratory construction and maintenance of scientists, the CRSPs use American faculty whose salaries are already paid, whose houses are already bought, and whose laboratories have already been built. U.S. scientists form partnerships with host country scientists, whereby they also gain access to existing laboratories and scientific resources overseas. Consequently, USAID funding is focused directly on program operations.

The CRSP framework has also produced significant leveraging of outside funds. Title XII legislation requires U.S. universities to match 25% of USAID funds, and, in addition, CRSP programs have attracted other support. On average the CRSPs have added $.74 for each dollar contributed by USAID. As displayed in Table 1, USAID funding over the first 15 years of the program was $198 M; universities contributed $48.5 M, host countries $59.3 M, and other contributions amounted to $7.2 M. By investing about $18 M/year or about

Table 1: CRSP Financial Allocations and Cost Sharing
(from external review of CRSPs conducted in 1994 by TRD under contract to AID)

CRSP	Total USAID Appropriations	Actual USAID Authorizations	Actual USAID Funds Disbursed	Reported University Cost Sharing	Reported Host Country Cost Sharing	Reported Total Buy-Ins	Reported Other Leveraged Funds	Ratio Leveraged to Aid Funds
Soil Management	$ 38,946,000	$34,000,000	$31,607,000	$5,564,250	$13,309,750	$5,500,000	1,654,480	0.82
Sorghum/Millet	47,232,202	46,720,002	46,720,002	11,779,754	3,886,915[a]	20,639,232[a]	n.r.[b]	0.77
Bean/Cowpea	48,007,927	41,458,000	38,212,409	8,287,679	6,353,982	1,222,765	767,000	0.44
Fisheries Stock Assessment	6,000,000	5,614,000	4,581,320[d]	1,286,889	n.r.[b]	0	0	
Pond Dynamics and Aquaculture	12,200,000	12,119,000	10,925,373	2,960,706	3,828,581	1,855,001[e]	n.r.[b]	0.79
Peanut	23,456,961	20,455,929	18,232,029	4,033,144	n.r.[b]	1,457,800	3,800,000[f]	0.50
Small Ruminant	**53,366,000**	**48,777,031**	**47,843,182**	**15,845,149**	**31,860,743[g]**	**1,670,000**	**934,287**	**1.05**
Totals CRSP	$229,209,090	$209,146,962	$198,121,315	$48,470,652	$59,239,972	$32,344,798	$7,155,767	0.74

Sources: Information compiled from financial documentation supplied by the individual CRSPs in July and August 1994 and the information contained in the Evaluation Team's Scope of Work.

a. University cost share, host-country cost share, and buy-ins reporting only for current grant, 1990-95
b. Not reported
c. The sum of $767,000 in 1993 only plus $109,697 from the 1980-86 grant budgeted for doing host-country audits
d. Research costs only reported; figure does not include management entity costs
e. Figure for project years 1989 to 1994 only.
f. Federal and state contributions to the University of Georgia research funds for peanuts.
g. Figure for project years 6 to 14 only.

$2 M per CRSP, USAID captured, on average, a 74% increase in matching contributions, while the SR-CRSP, in particular, more than doubled USAID funding. This level of matching contribution is unprecedented among USAID programs and will be strengthened in the future by the increased leveraging of funds associated with consortia building.

THE RE-DESIGN OF THE CRSP

The new design of the CRSP is based on the collaborative, international and interdisciplinary strengths of the former CRSP model. It develops that model by incorporating a broader, more complex perspective on international development. In the current model, research is predicated on the following development philosophy:

- Research should be demand-driven and problem-oriented, with considerable resources invested in problem assessment at the grass roots level.

- Impact should be re-defined with emphasis on human outcomes, involvement of local communities, facilitation of research-extension links, and the building of partnerships with other stakeholders.

- Identification and communication of relevant policy issues should be a critical component of program planning and implementation.

As research imperatives in the growing global economy have become regional and international in nature, the scope of research has been expanded from a country to a regional focus. Greater emphasis has been placed on impact, with increased attention to extension efforts, participatory methods, and consortia building. Finally, policy issues, which will either facilitate or obstruct development efforts, will be addressed within the framework of both program and individual project designs.

PROGRAM DESIGN

The design of the new SR/GL-CRSP and the process through which it was formed were developed at two agenda-setting meetings that took place in 1995. A Synthesis meeting was held on May 8-9, 1995, at the Winrock International Conference Center, Petit-Jean Mountain, Arkansas. Participants included SR-CRSP investigators, staff of the Management Entity (ME), and representatives of USAID and other donor agencies. Additional participants represented SR-CRSP sub-grantees, international agricultural research centers (IARCs), non-governmental organizations (NGOs), and the private sector.

In the wake of this meeting, an Advisory Panel (AP) was formed to assist the Program Director in implementing the Synthesis meeting recommendations and designing a process for transition and re-engineering. The AP first met on October 19-20, 1995, at the UC Davis Center, Washington, D.C. The AP was composed of experts who represented a mix of interests, with a variety of perspectives on livestock production in the context of international development. With the institution of the new CRSP program, the former Advisory Panel has been re-named and will continue to serve as the Program Administrative Council.

Characteristics of the Re-Engineered CRSP

The re-engineered CRSP is based on characteristics of desired change identified by Synthesis meeting participants, suggested by USAID's own re-engineering process, and the SR-CRSP's two decades of experience in the field. Through the transition and re-engineering period, this new direction has come clearly into focus, and the efficacy of the structure and the process created is borne out by the high quality of research to be undertaken by selected research teams.

To enhance the effectiveness of the SR/GL-CRSP's international research and development effort, the new program incorporates several principles:

Top-down/bottom-up process

The re-engineered program has combined the merits of both top-down and bottom-up processes. Initially, the ME, with advice from experts in livestock development, identified research issues of global importance and regions where the CRSP would have a comparative advantage. Then mid-level advice was solicited from regional experts to identify specific

problems, and an assessment process was put into place to enable extensive bottom-up input. This grass roots input, within the broad framework established by the top-down process, constitutes the foundation on which the new program has been built.

Regionalization

Similar to other USAID programs, the SR/GL-CRSP has expanded the focus of its operations from a country to a regional focus. The new model differs from other programs, however, by implementing regionalization at the individual project level. The activities of these regional projects are then further coordinated within the region, so that the model is characterized by overlapping collaborative networks rather than by regionally-coordinated individual country programs.

Interdisciplinary, problem-oriented research

The assessment process has been founded on a research approach that is both interdisciplinary in nature and problem-oriented. The disciplinary mix of an assessment team constituted to investigate a particular regional problem is determined by the specific nature of the problem addressed. As a problem model is defined and re-defined through the assessment period, in an iterative process, the composition of the assessment team is also changed to better approach the problem. It is expected that this iterative process of problem model refinement and team adjustment will continue through the research and development phase of each project.

Community-based planning, implementation, and evaluation

Extensive effort has been put into soliciting input from local communities. The aim has been to ensure that end-users are involved in all phases of project development, from planning to evaluation. This effort recognizes that to maximize impact in diverse communities a variety of context-specific needs must be met. The process brings problems of regional and global scope to the community level, while providing a mechanism for accessing indigenous knowledge and assessing local risks.

Policy-relevance

Problem model refinement and team-building efforts have included extensive investigation of the policy environment through which technology is developed and transferred. Attention has been given to identifying relevant policy issues and enlisting appropriate expertise to confront these issues. Projects have been designed to strengthen decision making at both the management and policy levels, and participation of policy analysts and national government representatives has been sought through team-building activities.

Broad-based partnerships

To incorporate a wide range of development perspectives and maximize efficiencies, collaborative and cooperative ties were developed with multiple agencies. Collaboration was sought with other universities, as well as with international, regional, and national agricultural research organizations. Representation from both government and private organizations, in the U.S. and abroad, was solicited. In particular, emphasis was placed on cooperation with non-governmental organizations and local community groups with capacity for extension.

Sustainable development

Project impact is conceived in terms of significant and continuing advances in the well-being of developing rural societies. Improvements in food security and quality of life, as variously defined by local populations, are being sought through increased availability and utilization of animal products. The sustainability of these efforts is viewed within the complex matrix of cultural, socio-economic, biological and ecological factors upon which successful development depends.

Results-driven framework

Evaluation is seen as an integral part of the process through which research will be conducted. Feedback and iterative development are central to project evolution as the conceptual model is continually adapted to on-the-ground realities. Program representatives, regional representatives, and external reviewers will also evaluate projects at regular intervals. Regional priorities will be periodically re-assessed, and projects will be graduated accordingly. The program will also allow for flexibility to introduce new thematic concerns, change geographic areas of concentration, or respond to emerging programmatic opportunities.

DEVELOPMENT OF PROGRAM DESIGN

At the meeting of the Advisory Panel in October 1995, a top-down, bottom-up process of program renewal was initiated to achieve the characteristics identified as desirable by participants at the Synthesis meeting (see Appendix D). General direction for the AP meeting was provided by earlier consultations with USAID administrators including representatives of the Office of Agriculture and Food Security, the Europe and New Independent States (ENI) Bureau and Africa Bureau. As a result of these consultations and meeting discussions, three themes were selected to form an overarching framework for the research program: economic growth, human nutrition, and environment. Three regions were identified as areas where the SR/GL-CRSP would have a comparative advantage: East Africa, Central Asia, and Latin America.

When the general shape of the new CRSP had been defined, the AP established the process through which the CRSP would be re-engineered.

Regional Workshops

The first phase in the development of the SR/GL-CRSP began with the organization of workshops that played a significant role in establishing the CRSP's new design. Workshops were organized in each of the regions selected for CRSP activities. A workshop was held in East Africa (Entebbe, Uganda) in January 1996, in Central Asia (Tashkent, Uzbekistan) in February 1996, and in Latin America (San José, Costa Rica) in April 1996. (For more detail, see the regional plans and Appendix D). As a forum for beneficiaries to discuss their needs and preferences for potential CRSP projects, the workshops produced a set of problem models that served both as the basis for an Request for Proposals (RFP) and as a framework for the later work of assessment teams.

These workshops contributed significantly to the design and structure of the CRSP's re-engineering. Their purpose was to identify, within the parameters established by the AP and USAID, regional livestock development problems needing to be addressed and potential resources for addressing them. The AP formulated the following objectives for conducting regional workshops:

- Existing regional networks were to be used as the means of setting up workshops.
- Workshops were to be organized to ensure that major niches for CRSP operation could be identified.
- Resident scientists were to be asked to help identify potential participants, including private sector interests and farmer organizations. Individuals were to be invited with expertise in specific themes, e.g. wildlife-livestock interaction, livestock policy, nutrition, etc.
- Invitees were not to be limited to those involved in networks.
- Teamwork was to be emphasized for the planning and conduct of workshops, as well as for the subsequent formation and performance of assessment teams.
- Summaries of the workshops were to be included in the call for assessment team proposals.

Workshops were attended by regional and national representatives, including representatives of local NGOs, USAID missions, regional businesses and organizations, livestock producers, national agricultural research systems, international agricultural research centers, and potential donors.

Focusing on the three themes established as areas of global concern, the meetings identified and prioritized perceived problems and potential areas for research and development. The format of the workshops afforded maximum opportunity for representatives to identify regional issues and rank them according to priority. The set of problems identified has established the scope of the SR/GL-CRSP's regional activities and forms the topical basis for the present renewal proposal. The proceedings of the regional workshops, including workshop papers, have been published in four separate volumes (the Central Asia volume was published in both Russian and English).

Problem Models

Each of the three regional workshops produced a set of problem models. The problem model approach is based on the collaborative strength of the original CRSP framework, which recognized the need to draw on a range of disciplines to address specific production and development problems. The new CRSP structure takes collaboration a step further by focusing interdisciplinary efforts on solution of a single, central problem of high priority. The benefit of this problem-oriented approach lies in the unique matrix created by disciplinary links. The interdisciplinary matrix provides a context that is unavailable to the scientist who might approach the problem from a single disciplinary perspective.

Each problem model produced at the regional workshops provided a springboard for further investigation, and, as problem models were regionally identified, they represented the priority needs of potential beneficiaries. A condensed version of each set of regionally-developed problem models was incorporated into an RFP for formation of regional assessment teams. Proposals were solicited from scientists at U.S. land-grant universities who wished to form study teams to work in-region to assess individual problems. The RFP was issued by the ME in June 1996 and was available for review on the SR-CRSP website.

Assessment Teams

Applicants wishing to submit an assessment team proposal were encouraged to attend a Bidders' Conference that was held on July 22, 1996 in Chicago, Illinois. The Program Director began the conference with a short presentation detailing the new approach and the responsibilities of assessment teams. His presentation was followed by a question-and-answer period, during which potential proposers could request clarification on any aspect of the new SR/GL-CRSP program design or on the assessment team proposal procedure.

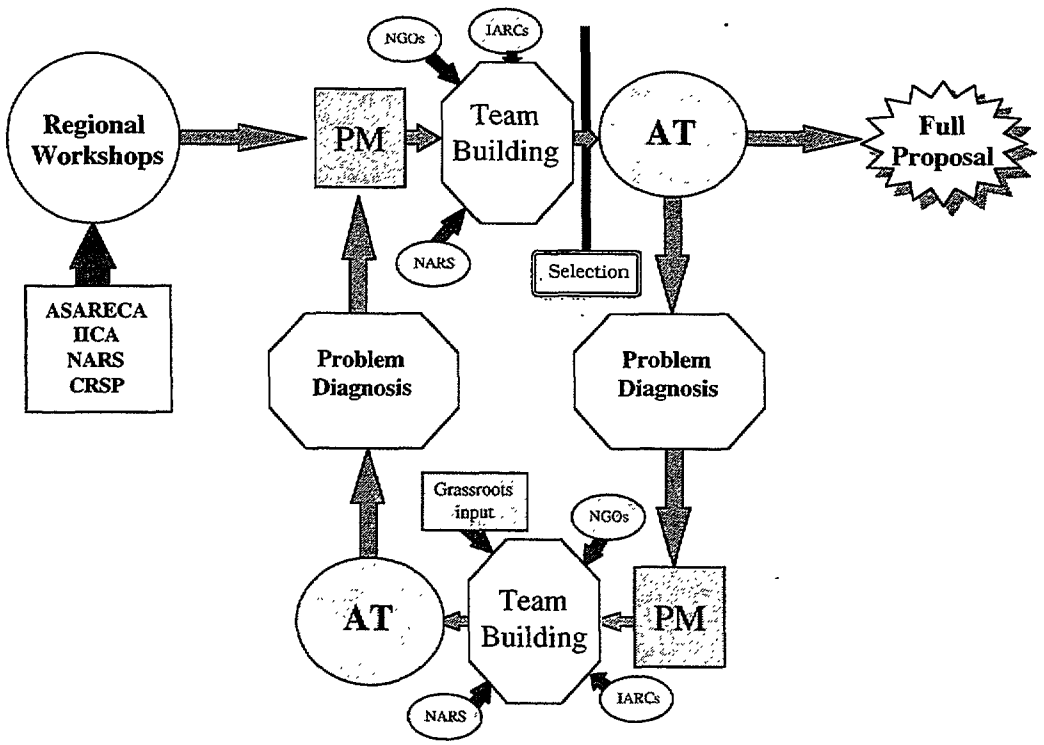
Submitted proposals were evaluated by an independent panel of reviewers according to selection criteria listed in the RFP. Awards were made by the Program Director based on reviews and consultation with the Advisory Panel. Formal notification of awards was made in October 1996. Ten assessment teams were selected on a competitive basis: four teams for

East Africa, two for Central Asia, and four for Latin America. The availability of funds and the quality of the proposals received determined the number of awards. Decisions were announced by written notice to the principal investigators submitting proposals.

Scientists led assessment teams from U.S. land-grant universities and addressed problems identified by participants of regional workshops. Teams had nine- months to identify constraints, seek input from local communities, develop ties with potential collaborating institutions—both U.S. and regional—and develop a research workplan and budget. The task was to develop a fully articulated problem model and appropriately chosen team of experts to investigate it. Although a number of assessment teams were funded for each region, only a subset of those submitting full proposals would be selected for further funding.

The assessment process was iterative in nature, based on progressive modification of the conceptual problem and disciplinary mix of research team members. The aim of this approach was to align project design as much as possible with the demands of the problem being investigated. This iterative process of problem assessment is depicted in Figure 2.

Figure 2: Proposal Development Cycle



Selection of Research Proposals

The assessment phase was initiated to facilitate participation by regional representatives as well as extensive involvement of grass roots agencies. It was also expected that teams would engage in broad networking activities, including linkages with the newly emerging regional institutions for agricultural research, overseas organizations, both governmental and non-governmental, and agencies in the private sector. To familiarize team leaders with the new strategy for research project development, an Assessment Team (AT) Orientation Workshop was held at UC Davis in November 1996 . Ten teams and one regionalization project entered the assessment phase. (For a listing of assessment teams funded and workshop agenda, see Appendix D).

Regionalization Projects

Components of the old SR-CRSP program amenable to regionalization and showing high potential for change were invited to compete for grant support. Extension of national accomplishments to other countries in the region is a means of capitalizing on previous investments in research and development. SR-CRSP activities represented substantial scope for regionalization, and long-term associations had been built between U.S. scientists and the personnel of institutions abroad. Existing projects might also propose a re-direction of activities, if desired. In the end, one proposal emerged in East Africa to compete for funding. The proposed regionalization project competed with assessment teams on an equal basis.

Extensive Feedback to Assessment Teams

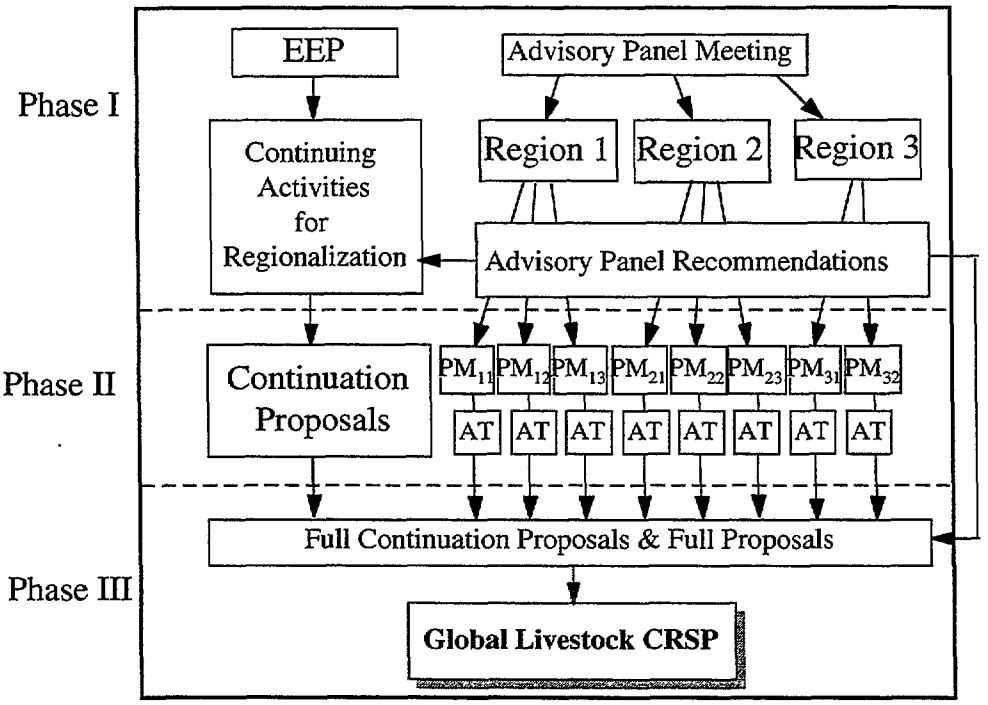
Assessment teams were closely monitored for progress toward assessment goals. Periodic ad-hoc reviews were requested by the Program Director, and teams were required to submit a mid-point report. In June 1997, assessment team representatives presented assessment results at a Year-End Conference at Tufts University (see agenda in Appendix D) and full proposals were submitted one month later. The assessment period allowed ample time for evaluation.

Teams profited from feedback throughout the assessment process: 1) the original AT proposals were evaluated by external reviewers; 2) the AT Orientation Workshop provided the opportunity for extensive team-building exercises; 3) in consultation with the AP and other reviewers, the Program Director gave AT members extensive feedback on mid-term reports; 4) the Year-end Conference at Tufts provided an additional forum for interaction; and 5) full proposals were evaluated by outside reviewers and specially organized Regional Panels of development experts.

External Reviews and Final Selection of Proposals

The final selection of research proposals was based on the results of the assessment process. Full proposals identified major issues associated with a specific problem; local,

Figure 3: Small Ruminant/Global Livestock CRSP Grant Renewal Proposal



regional, and international collaborating institutions; potential solutions; an analysis of the assessment process; a budget; and a plan for technology transfer. All teams had been advised that the grant process involved competition, with the probability that only 50% of the assessment projects would be funded at the full proposal level.

Final awards were based on criteria laid down in a call for research proposals, issued exclusively to competing participants (the ten assessment teams and the one regionalization project). Both U.S. and regional professionals independently reviewed full proposals. Regional Panels, chaired by a regionally recognized authority in agricultural research, were formed to evaluate and rank proposals. Final awards were based on reviews and consultation with the SR/GL-CRSP Advisory Panel. In the end, seven of the eleven projects submitting full proposals were funded.

The grant renewal process is depicted in Figure 3.

ORIENTATION AND REGIONAL COORDINATION WORKSHOP

The top-down, bottom-up process came full swing when project proposals developed on-the-ground with participation of intended beneficiaries were finally funded. In October 1997, principal investigators and other team members of funded projects met at a Regional Coordination Workshop at the University of California, Davis. (See agenda, Appendix G). Project representatives who attended this meeting brought the specificity of their projects and the effect of close grass roots association to bear on development of regional plans and the new global program. Complementary top-down and bottom-up processes provided the foundation for program renewal.

PLANNING FOR THE FUTURE

Implicit in the process instituted during the transition and re-engineering phase of CRSP renewal is the assumption that the process will be continuous. As development needs change, the program will require a built-in mechanism for adapting to change. The establishment of the regional workshop/assessment team/research project continuum as a cyclical process will benefit the program in a number of ways. The process will enable greater programmatic flexibility; maximize regional input; institute accountability; provide for regular, open and competitive granting procedures; and leave room for responding to emerging new opportunities. The efficacy of the assessment process has been demonstrated through the development of this proposal, and it is being considered for use elsewhere in the Agency. (See USAID administrative management review, Appendix E, and External Evaluation Panel report, Appendix F).

Program operations mechanisms through which the SR/GL-CRSP will operate have been re-designed. Managerial re-structuring, administrative re-organization, and greater accountability for research impact are all distinctive features of the re-engineered program. The functions and responsibilities of executive committees have been clearly defined, and program objectives have been focused to achieve results. Finally, an expanded program framework allows for extensive collaboration and networking, facilitated by new communications technology and an emphasis on research-development links.

Part Two

RATIONALE: PERSPECTIVES FOR THE NEW MILLENNIUM

The availability and access to food affects people's social, political and reproductive behavior. This in turn has a major impact on the ability of countries to develop and to become economically self-sufficient. As animal agriculture is a dominant constituent of developing country economies, environmentally-sound improvements in livestock production have the capacity to increase food security, enhance human capacity, and promote the growth of national economies.

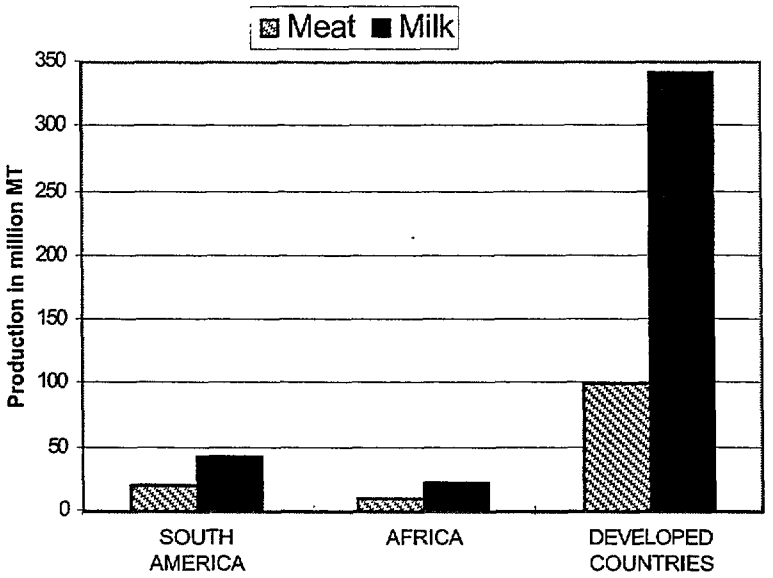
Title XII was legislated to address the problem of serious food shortages among vulnerable populations throughout the world. The efforts of agencies worldwide have resulted in significant progress, as the total number of countries unable to assure adequate food energy needs of 2200 calories per person per day has dropped from 45 in the late 1970s to 25 in the 1990s. On the other hand, the world's population is expected to increase significantly, from 5.4 billion in 1990 to about 7.2 billion in 2010, with most of the growth taking place in developing countries. This increase is expected to have a major impact on patterns of food production, marketing and consumption, as well as significant implications for world peace and stability (Wilson, Ehui and Mack 1995).

To meet the increased demand for food, there is substantial scope for improvements in livestock production capacity. Developing countries have two thirds of the world's livestock, but their combined output is less than a third of the meat and a fifth of the milk produced globally (see comparison of production in Africa and Latin America to developed countries in Figure 4). As livestock comprise fifty percent of agricultural Gross Domestic Product (GDP) and more than twenty percent of the total GDP of these countries (Wilson, Ehui and Mack 1995), improvements in the livestock sector can be expected to have a significant impact on overall agricultural productivity. It is also known that in agrarian societies growth in the agricultural sector is a pre-condition for industrial growth. The potential of livestock to increase the availability of food and the incomes of small producers, while enhancing overall economic growth, underscores the importance of investment in international livestock research and development.

LIVESTOCK'S CONTRIBUTION

As the importance of livestock in agricultural development is re-affirmed, the Small Ruminant/Global Livestock CRSP (SR/GL-CRSP) has proposed to expand its focus. Research aimed at improving the production, consumption and marketing of livestock and

Figure 4: Comparison of Meat and Milk Production, 1997



Source: FAO Production Statistics, 1997

livestock products must take into account many interrelated factors. There is no single constraint to production but several, which interact in dynamic and complex ways. Food security is often measured in terms of the availability of food grains, although forty percent of the total food energy consumed by half the population of sub-Saharan Africa is from foods other than cereals. The contribution of livestock to food security and agricultural development is especially underrated. Livestock contribute both directly and indirectly to agriculture, and the non-food outputs of livestock are often overlooked. In addition to providing a quality food, livestock play multiple and varied roles. They constitute a valuable capital asset, and they provide cash income (from livestock products), employment, draught power, and manure for fertilizer and fuel (Sansoucy, Jappar, Ehui and Fitzhugh 1995).

Increased aggregate production of food does not guarantee alleviation of hunger and malnutrition. Beyond problems of production and distribution, resource-poor families lack the incomes needed to purchase food of sufficient quantity and quality. Livestock production increases both the overall supply of food and the incomes of small producers, which helps to assure adequate access to food. (Sansoucy, Jappar, Ehui and Fitzhugh 1995). At the same time, as populations have increased and the availability of land has declined, farmers have expanded cultivation to fragile, marginal lands using practices that have resulted in depletion of natural resources. Since the main reason for extending cultivation to marginal lands is poverty, increasing farm incomes through livestock-centered activities can also mitigate damages to the environment.

Improvements in Intensive Systems

Animal production is an effective tool for agricultural intensification on lands with high production capacity, as animals consume the waste and by-products of crop production and convert them into a human edible form. Since small-scale farms are family-based, the nutritional advantages resulting from diversification are immediately available and not dependent on distributional infrastructure. Integration of crop and livestock production also contributes to nutrient recycling with consequent benefits to the environment. Finally, sustainable income from livestock and livestock products enhances food security and provides necessary capital for agricultural improvements.

Preserving the Rain Forests in Indonesia

The Indonesian program was a classic example of sustainable development. While the conversion of rain forest to plantations in Indonesia has caused concern globally, a growing population and a rapidly expanding per capita demand for meat limit Indonesia's ability to keep pace with requirements without converting forest to pasture. The SR-CRSP team of Indonesians and Americans foresaw this problem and developed what has been called the "sheep under rubber" production system.

By developing a new breed, composed of exotic and local genes, coupled with a forage production system between plantation rows and animal care technology packages, the Indonesians increased their capacity to produce meat to such a level that they were able to sign the Northern Triangle Trade Agreement for the exportation of three million sheep per year. This production can be accomplished simultaneously with preservation of the rain forest and a reduction in herbicide enabling a potential savings of $40 million per year to plantation growers.

Intensive systems are dominated by small-scale farmers, who have shown a notable ability to assimilate new technologies (Jarvis 1985). In systems such as these, where equilibrium conditions predominate, technological intervention can result in substantial improvements in animal production. The SR-CRSP has demonstrated that new management strategies (housing, nutrition and disease control), combined with an improved breed, constitute a remarkably efficient package for improving smallholder welfare.

Household level technological interventions also have clear implications for national strategies for economic development. The SR-CRSP in Indonesia, for example, developed a sheep production scheme for small-scale farmers that link rubber plantations to forage production. This scheme enabled the Indonesian government to enter the Northern Triangle Trade Agreement, by which Indonesia has agreed to supply Malaysia with 3 M sheep per year. Increasing agricultural production through extension of cultivation to marginal lands produces less food, with minimal contribution to economic growth, and damages the natural resource base which sustainable agriculture depends on (Waggoner et al. 1994).

"I first visited Marsabit in 1949. It is a mountain in the desert in northern Kenya which catches just enough rain to have formed a lovely forest with springs and crater lakes.... Outside the forest on the drier slopes, cattle owners suffer heavy losses from diseases and drought. Water points are scarce and unreliable and the markets of Isiolo and Nairobi far away and expensive to reach.... The pastoralists are not allowed into the forest and I am aware that they are getting a raw deal. This is their forest. They have done it no harm ...

We learn from Arthur Neumann that in 1895 the Samburu kept their cattle in the forest (on Kulal) all the time for fear of raiders ... In 1922, Radclyffe Dugmore was unable to take game photographs at Lake Paradise because thousands of Boran cattle came to drink and stayed all day to graze.... Limited use of these dry forests ... does no harm. The people are desperately poor... There are other lovely forests in northern Kenya with similar problems. Range management is an important part of game management and while I am not qualified I feel strongly that we need better marketing techniques with holding grounds and special trucks and freezers so that cows can be sold before they starve. All this is too much for Kenya Wildlife Service to do and it would be logical for the ministries dealing with the environment and agriculture to analyze what is needed."

Lowis, R. 1997. "Help tap Marsbit's potential." Daily Nation, 24 May.

Improvements in Extensive Systems

Appropriate livestock development strategies depend on the ecology of production systems. New technology and management strategies developed for intensive systems are inappropriate for systems characterized by low rainfall and unpredictable weather events. Earlier livestock development efforts in sub-Saharan Africa attempted to apply models developed for systems in equilibrium, but recent research has shown that under conditions of unpredictable rainfall development strategies need to focus on management of risk (Behnke and Kerven 1994, Scoones 1994). Appropriate technological interventions and policy recommendations will accommodate the unpredictable nature of the environment.

In arid and semi-arid conditions, interventions need to vary with the state of the system, and drought should be addressed as a continual risk rather than as an unexpected catastrophe (Behnke and Kerven 1994). In systems dominated by abiotic factors, stocking rate—an equilibrium concept—is meaningless due to rapid plant resource changes. Development strategies which increase immigration and emigration of animals into and out of pastoral systems to accommodate drought and production cycles are of greater utility. In such systems, policies which provide mechanisms for absorbing fluctuations in the market availability of animals or for protecting grazing lands critical to opportunistic management will produce greater benefit than focusing on one dependent biological variable such as livestock numbers (Behnke and Kerven 1994).

The grazing of livestock in extensive systems is the dominant anthropogenic use of land. One-third of the earth's surface (two-thirds of Africa) is comprised of such lands. Consequently, proper management is a prerequisite for maintaining a large portion of the resource base upon which developing countries depend for water, animal production, and income generated by activities such as tourism. Reducing risk to food security and household income, increasing animal production, and maintaining the natural environment through sustainable development practices constitute an integrated set of problems. In this complex matrix of development needs, improvement in animal agriculture has the capacity to provide multiple benefits.

THE ADVANTAGES OF SMALL RUMINANT PRODUCTION

Small ruminants play a large role in risk management strategies in drought-prone areas. Perhaps as much as fifty-three percent of the world's sheep and ninety-four percent of the world's goats are raised in the semi-arid or arid desert lands of Asia, the Near East, Africa, and Latin America. Most small ruminants are owned by farmers with limited resources and contribute significantly to the food supply and economies of many developing countries. They also constitute one of the few resources controlled by women, giving them greater access to wealth and power within their families and communities.

Small ruminants are well-suited to the capabilities of smallholders and to the conditions prevailing in developing countries. Sheep, goats, and other small ruminants:

- have low initial and maintenance costs.
- can sustain agriculture through grazing on crop residues or by grazing on land unfit for cropping.
- provide fertilizer to maintain soil fertility and improve crop production.
- are easily cared for by many different family members.
- produce fiber and skins that sustain cottage industries.
- produce milk and meat in small, readily usable quantities.
- enhance income, improve cash flow, create employment opportunities, and reduce risk.

The low initial and maintenance costs of small ruminant livestock place them within the reach of the small scale producer. Feed costs are minimal since animals are grazed on lands unsuitable for food or feed crops. The cost of labor for supplying feed or for the supervision of grazing is again minimal, since children can be given these tasks. Skins and fiber help support cottage industry, and meat and milk outputs come in small quantities which can be readily consumed or locally marketed.

As populations grow and farm size decreases, the economic and management flexibility that the small ruminants' size provides means that development of small ruminant production holds significant potential for meeting the needs of a growing population. Five

Contributing to Self-Sufficiency of Women

The introduction of the dual purpose goat in Kenya has contributed to the self-sufficiency of women by enhancing their roles in small ruminant production. Through the distribution of dual purpose (meat and milk producing) goats to farm households headed by women, as well as to women's groups in Kenya, the SR-CRSP has enhanced the role of women in the country's extensive livestock industry. SR-CRSP activities benefit small-scale producers in other countries also, thus substantially increasing disposable income and expanding international markets.

or six goats can be supported on the land required to raise one cow. Much of the technology needed for improving small ruminant performance in developing countries is already in existence. Research and development initiatives are required to adapt this technology to farmers' needs, to recommend policy for effective extension, and to link research and intervention in pursuit of measurable impact targets.

Small ruminant production is also an integral component of agropastoral production systems where livestock are linked to crop production. Income from small ruminants (either from sale of animals or animal products) can be used to buy seed, fertilizer, foods, or other crop production inputs, in many cases serving to subsidize and stabilize the crop sector. At the same time, ruminants consume low quality fibrous feeds, which grow naturally or are cultivated on lands unsuitable for human food. The integration of livestock and crops in mixed farming systems enhances the short-term benefits of increased production while contributing to the long-term sustainability of agriculture.

Former USAID Administrator Alan Woods has observed that "improvements in livestock production are the key to raising income levels in developing countries" (USAID 1989). Improving the performance of ruminants, especially sheep and goats, under smallholder management offers a direct route to improving the food security and living standards of more than 100 million people living in some of the poorest and least hospitable areas of the world. The potential for livestock production to increase food security and generate income, particularly in rural areas, coupled with a growing demand for animal products as a result of increased incomes, urbanization, and population growth, has far-reaching implications.

GLOBAL RESEARCH

Successful development efforts require economic growth, but economic growth cannot be sustained without addressing the related issues of population growth, maintenance of a natural resource base, and the fostering of open and participatory decision making processes. Economic growth, population and human health, environment, and democracy constitute an integrated set of challenges—a matrix within which animal agriculture has a multifaceted and critical role to play.

The usefulness of livestock is so vast and varied that no single research program can address all the problems producers face or exploit all potential for development. Nevertheless, there is substantive agreement between producers and scientists about which problems are most important. Since its inception, the SR-CRSP has focused on and made significant progress in many of these high priority problem areas. The new framework for livestock-related research and development, recommended by USAID and the SR-CRSP Advisory Panel, will build on three themes. These themes have been proposed to focus, but not limit, the CRSP program for the next five years: 1) economic development of the livestock sector, 2) human nutrition and its implications for child development, and 3) livestock impact on the environment.

ECONOMIC DEVELOPMENT OF THE LIVESTOCK SECTOR

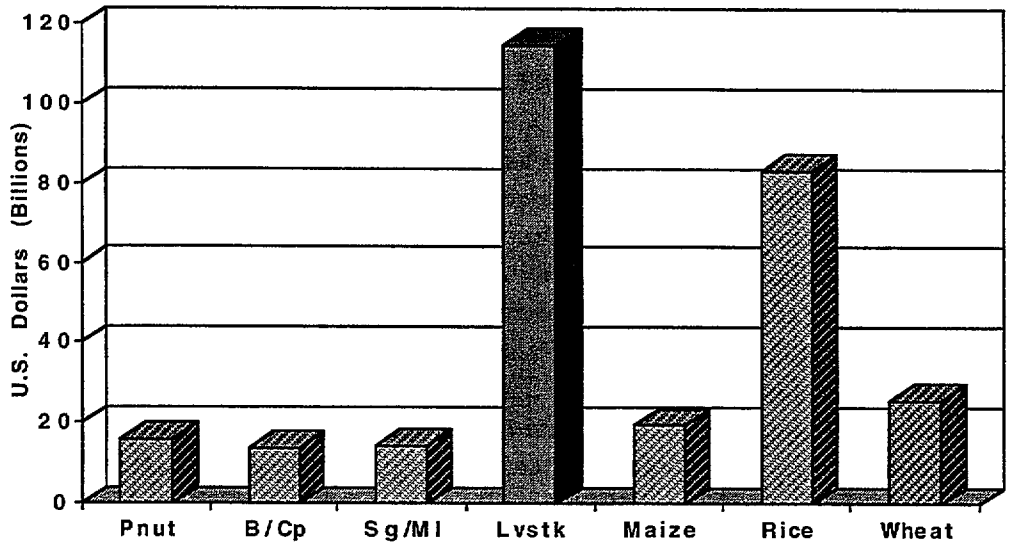
Agricultural research and development has a broad impact on economic growth and is situated at the hub of the development problem (Timmer 1990). A recent study in Kenya found that the growth multiplier for agriculture was stronger (1.64) than for the non-agricultural sector (1.23); that is, agriculture in Kenya has contributed to the growth of the economy by positively affecting economic sectors outside of agriculture. The study recommends that agriculture should "remain at the core of economic development strategies" in most resource-poor countries (Block and Timmer 1994). While agriculture in these countries is the dominant sector of the economy, the development of this sector is closely linked to increasing animal production. Increases in agricultural output can no longer rely as they did in the past on expansion of farming into new lands. New technologies must be applied which can increase the productivity of existing land or bring marginal land into use in environmentally sound ways. Ruminants are particularly beneficial to agricultural development as they perform a myriad of functions. They provide food products, increase

income, generate employment, serve as capital, and increase demand for feedgrains. In areas such as Uruguay—where there exists an ample supply of land—beef, milk, hides, draft power, meat packing, leather curing and leather goods production account for 25 percent of total exports (Jarvis 1988).

As countries develop, the proportion of agricultural GDP represented by animal production increases. In lesser developed countries, livestock revenues account for approximately twenty-five percent of agricultural GDP, while in California, animal production accounts for more than one-half of the state's agricultural revenue. The annual value of livestock in developing countries is estimated at about $115 billion and it is compared in importance to other major commodities in Figure 5. In relation to human population, caput production of livestock varies greatly by continent. While in Asia per caput production is increasing steadily (Figure 6), in Africa the trend is consistently downward (Figure 7).

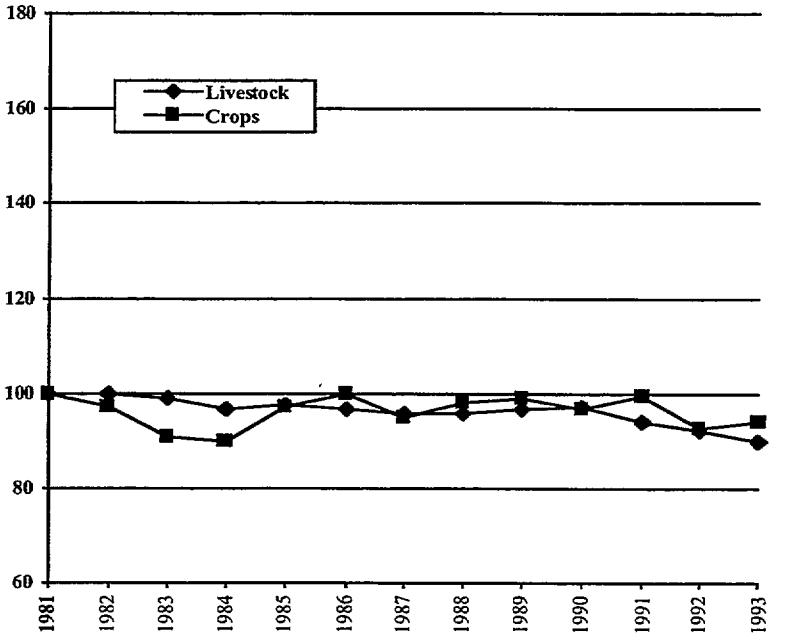
The potential for accelerated agricultural growth to boost the economy is demonstrated by the Green Revolution, where the dynamics of agricultural growth have called for a progressive diversification of products, beyond the initial dominance of cereals. If, as studies have shown, rapid agricultural growth is a prerequisite for general economic development, improvements in animal agriculture and expansion of mixed production systems has

Figure 5: Global Production Values of Major Commodities in LDC's



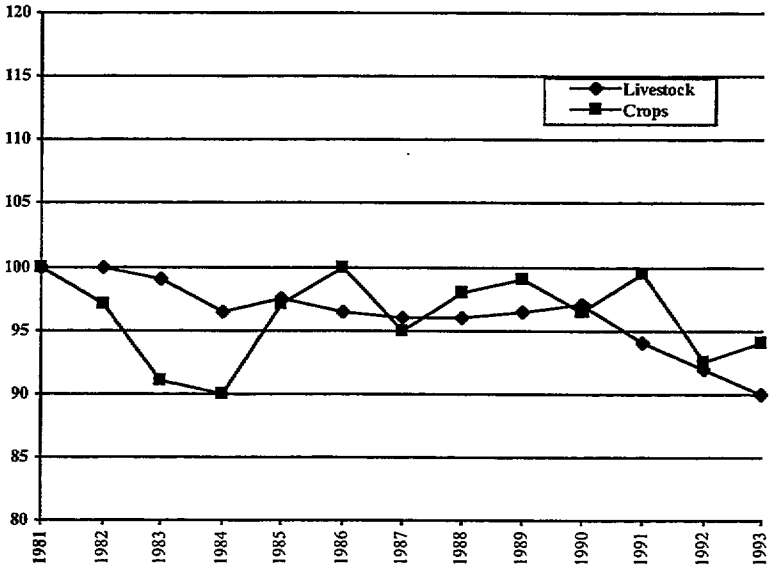
Source: CGIAR, 1992

Figure 6: Asia -- Trends in per caput production



Source: FAO Production Yearbook, Vol. 47

Figure 7: Africa -- Trends in per caput production



Source: FAO Production Yearbook, Vol. 47

significant potential for enhancing overall economic growth. A strong program for disseminating the results of agricultural research is indispensable to the success of agricultural research initiatives.

Government policies governing the regulation of product and input prices, land tenure, the development of new technologies, agricultural extension, the availability and terms of credit, animal health, sanitation and infrastructure can all strongly affect livestock production (Jarvis 1990b). Infrastructure is needed for timely access to inputs and for ease of marketing, and animal health programs can reduce losses from livestock diseases, as well as threats to human health. Expansion of agricultural research capacities, along with development of infrastructure needed to transfer technology and policies which encourage agricultural growth, are essential to the process of economic development. (Mellor 1990, Jarvis 1990a).

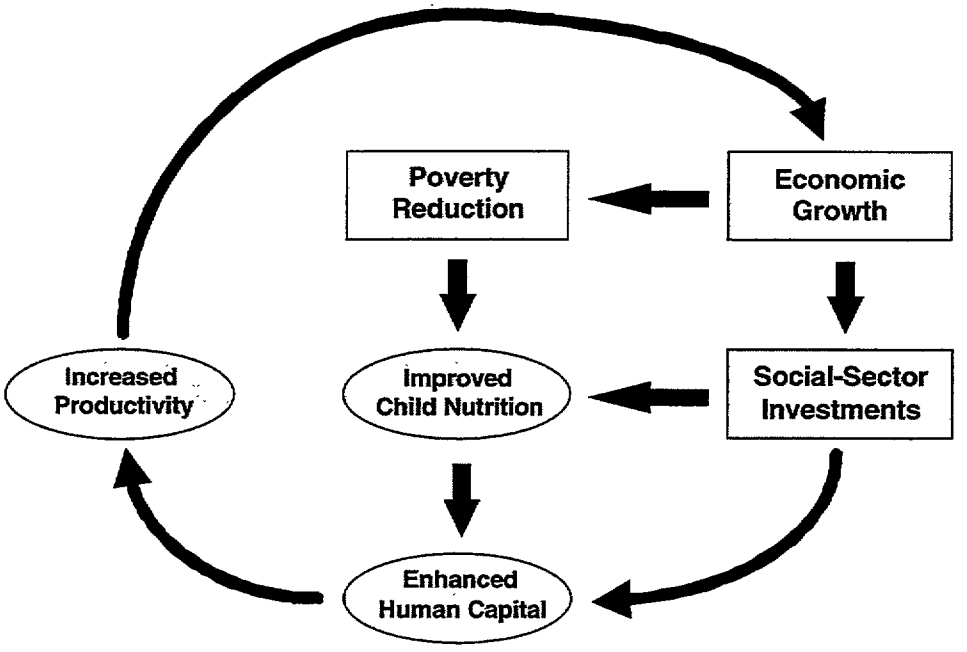
HUMAN NUTRITION AND ITS IMPLICATIONS FOR CHILD DEVELOPMENT

In 1980 the Nutrition CRSP was funded by USAID to examine the relationship between energy (food) intake and functions such as growth, psychological development, pregnancy and lactation outcomes, behavior, and morbidity. Research was conducted in three countries (Mexico, Kenya and Egypt) and focused particularly on the role of diet in child development. The results of research were highly significant in that they documented by field measurements the role of micronutrient malnutrition on women and children. A lack of essential micronutrients (linked to fat and animal protein deficits in Kenya) was associated with growth retardation, behavioral problems and deficits in cognitive capacities (Allen 1993, Neumann and Harrison 1994).

> "The results of the Nutrition-CRSP had important implications for investment in livestock research and development and we recognize the need for further assessment of the role of animal source foods in realizing the human potential of poor rural children in East Africa."
>
> Hank Fitzhugh, Director General, ILRI

In countries such as Egypt and Mexico, where households have responded to food shortages or low income by developing strategies to procure needed energy from staple foods, the quality of food is inadequate in terms of micronutrient content (Allen 1993). Of the estimated 2 billion people affected, 1.3 million are iron deficient. The consequences of iron deficiency include birthing complications among pregnant women, impaired cognitive and behavioral performance among preschool and school-age children, and reduced work capacity among adults. It has been suggested that the income levels of the absolute poor could be increased by 20 percent if iron intake was boosted to normal levels (USAID 1993).

Figure 8: From Good Nutrition to Greater Productivity



Source: Adapted from Stuart Gillespie, John Mason and Reynaldo Matorell, How Nutrition Improves, ACC/SCN, Geneva, 1996 by UNICEF

Women and children are the most frequently affected by marginal malnutrition (or micronutrient deficiency) in developing countries. In the three-country longitudinal study conducted by the Nutrition CRSP, fat and animal protein were found to be the most critical nutritional components in both the physical and mental development of children and the long-term health of women (Sigman, Neumann, Jansen and Bwibo 1989; Espinosa, Sigman, Neumann, Bwibo and McDonald 1992; Allen 1993). In the Solis Valley of Mexico, animal products were the only dietary component that predicted growth and performance. These and other studies suggest that malnutrition is a consequence not only of insufficient quantity but also of inadequate quality of food (Allen et al. 1991; Allen et al. 1992).

A fundamental question in assessing the sustainability of a production system is the degree to which farmers or herders are able to meet their nutritional needs, either with the crops or animal products they produce or with the income these generate. Attempts to address the problem of widespread malnutrition in developing countries will need to examine both the role of animal products in providing critical nutrients and strategies for increasing animal production. Evaluation of nutritional status will provide both a measure of physical

Livestock, Nutrients and Child Development

- Shortages in calories and protein are not as serious a problem as has been assumed.
- Shortage of suite of micronutrients implicated in growth stunting and irreversible problems in cognition, behavioral and physical development.
- Animal products in diet are the only dietary variable that predicted child development.
- Cereal diets are associated with micronutrient deficiencies, especially iron.
- Children 6 - 24 months cannot meet nutritional requirements for normal development without supplementation or fortification when animal products are not in diet (WHO).

Source: Nutrition CRSP

well-being and an indicator of the relationship between consumption and commercialization of food products.

The development of human capital, in particular the capability of children to think creatively and learn efficiently, is critical to national development. Animal products provide essential micronutrients that develop the ability of people to develop themselves. As access to animal products has been shown to bear on development of physical and cognitive abilities, improved patterns of animal production and distribution also have a role to play in dampening the effects of social stratification. The enhanced production of livestock, as both a source of food security and increased incomes and as a distributional mechanism for crucial micronutrients, can contribute to human well-being and equity in resource-poor food-deficit countries.

LIVESTOCK IMPACT ON THE ENVIRONMENT

The importance of animal agriculture to overall economic growth and to human physical and cognitive development underscores the need to study the differential impacts of various production systems on the environment. The protection of biodiversity and the natural resource base upon which production depends requires the development of environmentally-sound food production systems. As livestock grazing is the number one anthropogenic use of the land (see Figure 9), its management has major implications for biodiversity maintenance. The demands of economic growth and human nutrition, on the one hand, and of the environment, on the other, are countervailing tendencies that need to be studied in tandem to prevent systemic imbalances.

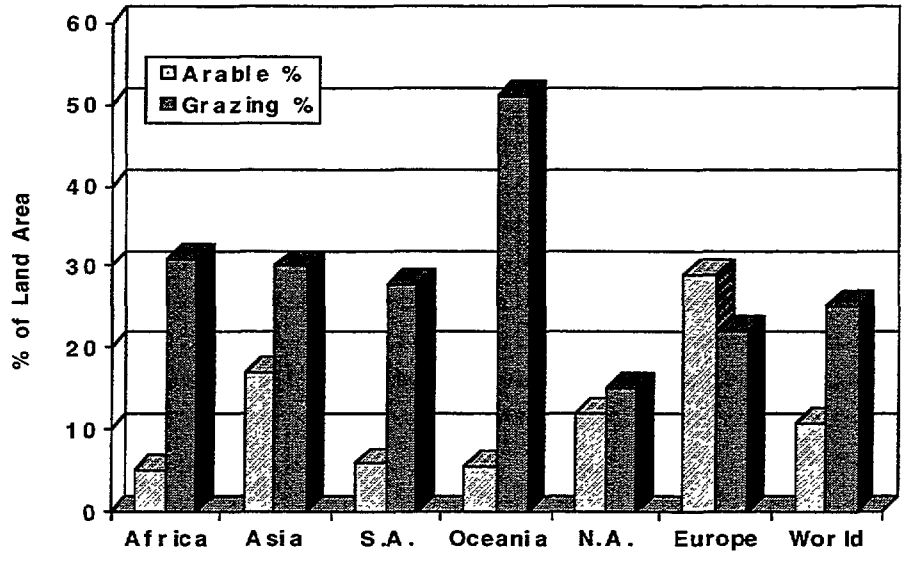
Recent studies in Africa have shown that the negative effects of livestock grazing on rangeland integrity have been exaggerated. Although soil degradation is more severe on range than on croplands, depletion of organic matter and nutrients appears to be the most common cause of degradation. More than 80 percent of burnt biomass is consumed by savanna fires, providing wood-derived charcoal for food preparation and heating in urban areas. Forty-two percent of gross atmospheric emission of CO2 is also attributed to fire,

Africa contributing more than the combined emissions of South America and Asia. Fuel wood use, which supplies 80-90 percent of the energy needs of rural Africa, also has a major impact on woody resources and vegetation structure. Additional sources of land degradation are deforestation and land clearing for crops (de Leeuw and Reid 1995).

Studies of the effects of livestock grazing on the dynamics of Sahel ranges indicate that livestock are not a major factor in degradation (ILCA 1992 and Fitzhugh 1993, cited in Sansoucy, Jabbar, Ehui and Fitzhugh 1995). Another study of the effects of grazing on rangelands concludes that grazing and drought have been confused. Even with severe overgrazing under conditions of drought, palatable and more productive plants are supplanted by less palatable and lower-productivity species only temporarily. Rangelands are remarkably resilient, with irreversible effects on vegetation confined largely to land around water points and permanent human settlements (Dodd 1994). An aggregate index of the relative contributions to environmental stress of food and feed crops, livestock, and fuel wood production would provide a more balanced approach to securing ecosystem integrity (de Leeuw and Reid 1995).

In Latin America, deforestation and the expansion of ranching into forests has sometimes been linked to the North American meat market and production profits. Studies have shown that the cause of environmental stress goes beyond these factors. The adverse effects of ranching have often been caused by government policies which subsidized livestock

Figure 9: Comparison of Land Use - 1992



Source: FAO Production Yearbook, Vol. 47

The Need to Learn More About Range Ecology

For many years the prevailing assumption has been that cattle are overgrazing and thus destroying African rangeland. The idea of "overgrazing" infers that a specific carrying capacity level of the biomass is known; however, such estimates of carrying capacity suffer from variability, error, and subjectivity. While estimation techniques are being revised, the new question is whether the concept of optimal carrying capacity is appropriate for Africa. In arid systems the amount of rain rather than cattle density is the controlling factor.

Opponents to cattle raising argue that grazing leads to the progressive destruction of the resource base. However, if this position is valid, one expects to find a long-term decline in livestock numbers as land degrades–which is not the case. It would seem desirable, therefore, for policy and spending to be based on the need to learn more about range ecology rather than on unsubstantiated ecological assumptions.

Mace, Ruth. 1991. Overgrazing overstated: Conservation biology. Nature 349, n. 6307.

credit, technical services, roads, favorable market prices and encouraged land speculation (Hecht 1989, 1992; Durning and Brough, 1992; Kaimowitz 1994; and McCorkle 1994, all cited in Sansoucy, Jabbar, Ehui and Fitzhugh 1995). Another cause of deforestation in developing countries has been expansion of shifting cultivation due to poverty and population growth (Cleaver and Schreiber 1992 and Winrock 1992, cited in Sancoucy, Jabbar, Ehui and Fitzhugh 1995).

Improved food security and nutrition, increased livestock production, economic development and sustainable natural resource management are not incompatible. The dual-purpose goat (DPG) production system technology, developed by the SR-CRSP in western Kenya, is an example of systemic research that balances nutritional, economic and environmental considerations. In DPG production systems, farm chemical use is minimal, and animal drugs are used only as a last resort. Goat manure is used on food and cash crops instead of inorganic fertilizers. Frequency of drenching with anthelmintics is reduced by fifty percent through forage wilting and semi-zero grazing, and acaricide usage is reduced by physical destruction of ticks. Finally, crop residues are converted to feed for goats, rather than being burned, while the goats produce milk and meat, for sale and consumption, providing needed income and animal protein essential to the development of human physical and cognitive capacity.

REGIONALIZATION

In line with USAID's current emphasis on regionalization, the new Small Ruminant/ Global Livestock CRSP (SR/GL-CRSP) program is planned, organized, and managed on a regional rather than a country basis. The concept of regionalization, promoted by the Office of Agriculture and Food Security of the Global Bureau of USAID, is based on the premise that priority should be given to problems that have broad regional applicability and potential for large and general impact. Focusing regionally will enable researchers to address problems relevant to all or most of the countries of a region, with the advantage of being able to make intra-regional comparisons. The regional framework will also facilitate comparative studies of national policies.

The CRSP mode of collaboration between U.S. and developing country scientists provides a nucleus of relations around which more extensive, more effective relations can be built. Expanding the collaborative nucleus will provide a framework for analyzing the needs of small scale producers within the context of broader regional and global problems. Emerging regional institutions for agricultural research, such as the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), constitute a logical institutional connection for regional activities. Cooperation with regional networks in conducting agricultural research will 1) facilitate exchanges of information, 2) help to reduce transaction costs, and 3) increase the impact of research findings.

A range of indicators suggest the move to regionalization:

- The shift of donor agencies to a regional approach.
- The current trend in USAID to formulate strategies on a regional basis.
- The emergence of regional organizations and host countries' growing recognition of the advantages of regional affiliations and linkages.
- The need to address issues which have a wider impact and application than a single country, such as trade matters, transhumanist issues, common currency exchanges and indefinite national borders, etc.
- The potential for comparative analyses of national policies and for the development of regionwide policy initiatives.
- The desire to maximize impact of the dollars and effort invested in the program.
- The proposed new focus on regions will also increase programmatic flexibility in the face of future changes in national policies or the status of individual USAID Missions.

SELECTION OF REGIONS

Participants of the May 1995 planning conference at Winrock International proposed that SR/GL-CRSP activities be focused in regions where needs, opportunities, and comparative advantages are matched. They also thought it desirable, wherever possible, to build on previous CRSP investments and experience. Responding to these recommendations in October 1995, the SR-CRSP Advisory Panel considered several regions for research and development efforts: Central Asia, East Africa, Eastern Europe, Latin America, South Africa, South Asia, and Southeast Asia. After a lengthy debate on the potential for and the difficulties of working in each region, agreement was finally reached on East Africa and Central Asia as priority regions for CRSP operations. Latin America was selected as a third region through later discussions.

East Africa

Research and development efforts in East Africa are recommended by the long history of CRSP activities in Kenya. Work in Kenya has been ongoing for two decades, beginning with the inception of the SR-CRSP in 1978. The CRSP has built an extensive network of

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> "The history of Kenya is littered with ... emergency responses to disasters. Huge sums of money have been used to respond to issues that would conveniently cost much less if tackled in time."
>
> "Will famine feature in the poll?" Daily Nation, 1997.

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former trainees and professional associations at Kenya Agricultural Research Institute (KARI) and has enjoyed a long-term relationship with the International Livestock Research Institute (ILRI) in Nairobi. The Greater Horn of Africa is a high priority area for USAID and an area where livestock production is important. Frequent and severe famines, affecting large numbers of people, call for a comprehensive program of livestock research and development to establish long-term solutions to food and nutrition problems.

Central Asia

The Newly Independent States (NIS) of Central Asia have a natural comparative advantage in livestock. Small ruminants have been the foundation of economic production in the region for centuries. Scientists of the Former Soviet Union are well-trained—although ill-equipped and out-of-touch with global trends—and the general population is highly literate. While the logistics of work in Central Asia are challenging, progress in agricultural research and development is expected to be both rapid and significant. Land tenure and

"At present the further development of animal husbandry is of great importance for our region. A great deal of scientific information ... in the field of animal husbandry, especially cattle-breeding has been accumulated by our colleagues ... and ourselves in the Uzbek Research Institute of Animal Husbandry. However, now [in light of] the transition to the market economy ... it's essential to develop more efficient methods of management in animal husbandry and cattle-breeding with allowance for modern demands."

Ubaydulla Nasirov, Professor and Director
Shavkat Akmalkhanov, Professor
Uzbek Research Institute of Animal Husbandry

marketing systems are in pressing need of re-orientation to adapt to the demands of an emerging global economy, while livestock production, as a tool for risk management and a valuable source of nutrients, may considerably ease the rural transition. Work in Central Asia also has long-term implications for problems of environmental protection.

Latin America

Latin America was chosen as the third site for SR/GL-CRSP activities because of a large percentage of resource-poor producers. The region has high potential for development, is strategically located, and is important to the economic interests of the United States. This importance is heightened by Latin America's having joined North American Free Trade Agreement (NAFTA). The SR-CRSP also has a history of work in Latin America, beginning in Brazil and Peru and eventually moving to Bolivia (see Appendix C). Research and development in the region have a clear cost advantage. Another major factor in selecting Latin America is the pressing need for development of sustainable agricultural practices. Animal production systems that are environmentally-sound and maintain biodiversity are critical to the future prospects of the region. Non-governmental organization (NGO) and communal organization around these issues in the region provide a rich foundation for CRSP activities.

RESEARCH AND DEVELOPMENT

Concerns about the relevance of SR-CRSP research for the productivity and welfare of small scale producers necessitates renewed consideration of ways to facilitate adoption of research results by large numbers of farmers. If research is to be useful and effective, research results need to reach and be used by target populations. Technological innovations need to be translated into significant improvements in human well-being. The ultimate goal of development is to ensure the greatest possible impact from technology transfer.

In order to translate research results into development successes, special efforts have been made during the diagnostic phase of project planning to gain knowledge of how development takes place in selected sites. Institutions that play key roles in production, marketing, processing, and policy decision making have been identified and joint strategies with key stakeholders have been defined to link research and development efforts. Collaboration with local and regional agencies specializing in technology and information transfer has also been secured, along with active participation of local communities. At the same time, special attention has been given to government policies which affect the marketing and pricing of inputs and products, as well as the conservation of natural resources.

WORKING WITH DEVELOPMENT PARTNERS

At its inception, the SR-CRSP pioneered the development of an integrated framework built on interdisciplinary collaboration on international development problems. The integrated framework at the core of the CRSP model provides a solid foundation for building still wider and more effective collaborative networks. While strong links with regional counterparts are of critical importance, interactions with other organizations that can contribute to research objectives or to the dissemination and adoption of research results has been strongly encouraged. The efforts which have been made to include these organizations are expected to facilitate outreach and commercialization, making research results more readily available.

Measurable improvements in human welfare and sustainability cannot be achieved by single institutions, especially in an environment of reduced funding. Significant results

require a continuum of activities from basic through strategic to applied research, including extension efforts. This can be accomplished only by comprehensive research and development projects, involving many collaborators in problem identification and in the planning and implementation of projects to address these problems. One means of doing this is to form consortia, comprised of U.S. and collaborating universities, IARCs, NARS, NGOs, and other agencies, which will be active throughout the life of these projects.

Great benefits can be derived from cooperation with IARCs of the Consultative Group on International Agricultural Research (CGIAR), NARS, governmental and non-governmental organizations, the private sector, and other groups with a related mandate, such as producers' groups or extension organizations. Reflection on previous cooperation reveals that the most successful collaborations occur when partners are involved from the initial stages of planning. It has also been found that the stronger the commitment of collaborators to the project, the better the prospects for project success. Integrated institutional approaches for promoting development, with combined expertise, pooled resources, improved communications and closer cooperation, are the most effective way to produce significant and long-lasting results.

IARCs, NARS and Regional Associations

The CGIAR system has shifted focus from a center-oriented to a program-oriented operation. The current program-oriented approach corresponds to regional efforts to form associations of NARS. Although individual CGIAR centers (IARCs) are relatively small, there are sixteen centers in all. These centers are located at strategic points in the developing world and recruit worldwide. IARCs have tended to be more stable and better equipped than NARS or collaborating universities, although some have established strong links with NARS through research networks. CRSP and IARC collaboration has been strongly recommended by USAID.

The program oriented-approach of the CGIAR has suggested the possibility of making formal linkages with regional organizations, such as ASARECA. Agreements for information exchange and joint research and priority-setting exercises offer benefits to the CRSP, while the CRSP can support and enrich regional research organizations by involving them in its organizational and planning meetings. Such meetings provide the opportunity to explore the modalities by which regional associations can be involved in and share in CRSP research. At the same time, future discussions can also be expected to contribute to the modification of specific research findings in a manner which will benefit other countries within the region.

Mechanisms for involving the CGIAR centers and regional associations in planning and information sharing are in the process of being developed. The advantages of such partnerships are many. By developing international and regional partnerships the SR/GL-CRSP will:

- have access to resources of related projects and programs (consultants, infrastructure, research grants, etc.) and be able to influence the orientation of resources.
- be able to replicate experiences or expand support for activities to countries where collaborating institutions have projects or investments.
- profit from the experience of agencies such as the International Fund for Agricultural Development (IFAD) in using the expertise of NGOs.

At present, formal relationships have been established with ICARDA, the International Center for Research in Agroforestry (ICRAF), the International Livestock Research Institute (ILRI), the International Food Policy Research Institute (IFPRI), and the International Service for National Agricultural Research (ISNAR).

Cooperation of Non-Governmental Organizations

In the past two decades there has been a rapid growth in the number of NGOs involved in agricultural development. Their involvement is recommended by a demonstrated capacity to reach smallholders in remote areas. NGO cooperation is sought by multi-national development agencies, because their personnel are motivated and their operations are cost-effective. Filling a critical gap created by downsizing in the public sector and reduction in extension services, they play a key role in applied research, rural development, and emergency relief. Some NGOs work at the grass roots level to assist in finding viable solutions to problems identified by local communities. Participatory research of this kind is highly effective in accessing indigenous knowledge and in gaining an understanding of target populations.

NGO personnel with local experience and contacts are able to recommend research sites, recruit research participants, and assist in overcoming logistical difficulties. As NGOs typically work across larger areas than research projects, their personnel can observe the spread of new technologies and help to determine their impact. At the same time, these agencies have a large capacity to extend the results of research. Where the SR-CRSP has involved NGOs early in project planning, as in Peru, technology transfer has been especially successful.

During the life of a research project, NGO personnel can provide valuable feedback and advice to researchers, as well as opportunities for U.S. university students to work overseas. Dialogue between scientists and producers, facilitated by NGOs has led to agrobiological research producing significant impacts. Dissemination of information related to small ruminant production has also been facilitated by integration into the extension activities of NGOs and other agencies. For example, financial support from the Food Industry Crusade Against Hunger (FICAH) enabled Winrock International to add extension of the Kenya Dual Purpose Goat (KDPG) to its On-farm Productivity Enhancement Program (OFPEP) in western Kenya.

Participation of Private Industry

Research links between the private and public sectors are not common, although private sector success in areas such as production of new seeds and machinery demonstrates the capacity to contribute to intensification of small scale farming. The greatest advantage of linking private and public research would be the ability to use public funds for research that would not attract private funding. The development of vaccines for animal diseases in developing countries, for example, have long-term cost-recovery profiles which would discourage investment by private enterprise. On the other hand, an initial grant to a public-sector research institution for preliminary studies might make later, private research on the production and marketing of vaccines more cost-effective. The private sector can also enhance agricultural development efforts through provision of essential services (inputs, technical assistance, marketing, and processing). The downsizing of government services makes private sector involvement all the more crucial. Also beneficial to public-sector institutions would be feedback from private firms engaged in marketing technology to smallholders. To establish such partnerships, collaborative projects will need to be based on open, entrepreneurial relationships. Partners will have to agree on common objectives, share costs and benefits, and develop mechanisms for encouraging efficiency, creativity, and flexibility.

Recruitment of private sector entities which have credibility with customers and are philosophically in tune with CRSP goals and objectives will be encouraged wherever possible. Involvement of national companies is highly feasible, as they have traditionally collaborated with NARS. Development of technology through CRSP and IARC research creates promising commercial opportunities. The KDPG, for example, will be bred, multiplied, and marketed by private livestock breeders. Forage varieties, feedstuffs, and vaccines are other products of livestock research with potential for private enterprise.

Public Information and Funding

There is a constant need to inform the U.S. public about what publicly-funded research and development is achieving. This information must be responsible and accurate but, at the same time, appealing and easily understood by lay persons. U.S. land-grant universities have well-developed information systems, while IARCs and NARS lack this capacity. On the other hand, IARCs and NARS have relatively better access to information on international research and development. IARC- and NARS-generated information can be used by public relations departments of U.S. universities in order to build support for common activities.

What the public believes the United States should spend on aid and what is actually spent is greater than is commonly believed. More accurate reporting of the amount of money spent on international development and the purposes for which that money is spent would help to ensure greater support. The consortia approach to increasing public awareness would reduce publicity costs for all parties by serving a number of institutions at one time.

The same information can be tailored to different purposes for use by U.S. universities, IARCs, NARS, and NGOs.

DEVELOPING LOCAL CAPACITY

To more effectively link research and development, the need for greater participation by local governments and local communities in the programmatic development and management of CRSP activities has recently drawn the attention of CRSP reviewers. A lesson learned in reviewing CRSP projects is that eliciting commitment to development projects requires not only involvement of in-region scientists and administrators but also participation of local communities in the planning, design and implementation of CRSP projects. As this experience is consistent with the client-oriented focus of USAID's re-engineering philosophy, closer involvement with local governments and local communities has been targeted as a direction for change in the current proposal. The approach of the new CRSP framework relies heavily on building grass roots capacity to fully utilize and profit from development efforts.

> "Indigenous knowledge, based on farmers own experiences with their local agro-ecosystems, provides a basis for technology development. Where innovation and experimentation by farmers have been stimulated through participatory technology development, rehabilitation of site-specific systems has succeeded."
>
> Reijnjes, C., B. Haverkort, and A. Waters Bayer. 1993. "Inspecting the tool box: A look at the means for acheiving sustainable agriculture." Ceres 25, n. 6.

While governments and other large organizations can mobilize resources, develop technologies, and promote the dissemination of research results, local groups, such as community groups, NGOs, cooperatives, and local governments are better able to identify constraints and recommend applications that will have long-lasting effect. Technology transfer also becomes easier, if, from the beginning, producers participate in the planning and conduct of research. Grass roots organizations are closer to the problems, are a valuable resource for indigenous knowledge, have logistical advantages, and demonstrate large capacity for public education.

The strategy of the SR/GL-CRSP has been to address the needs of regional, national and local communities as they themselves define them. SR/GL-CRSP projects have been developed in consultation with representatives of regional, national and communal organizations. The citizens of developing countries, as the intended beneficiaries of development efforts, should figure centrally in the planning, implementation, and evaluation of programs. The client-oriented approach will enhance impact and ensure that the CRSP is accountable to those who will live with the results of development efforts. It will also encourage free discourse and inclusive decision-making, while developing a sense of ownership and commitment at all levels.

Community Development

The approach of the SR/GL-CRSP to international research and development focuses effort at the community level and seeks to involve communities in all stages of project implementation. The goal of this effort is to enhance the capacity of communities to develop and to respond effectively to change. In many developing countries, the small-scale farm sector comprises up to 80% of the population (Barnes-McConnell, Demment and Yohe 1995). These areas represent both the highest potential for increases in global food

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Ismail Seregeldin, the World Bank's Vice President for Environmental Sustainability Development comments: "We have to do the hard work of dealing with the problems of the smallholder farms in remote areas ... for they are the real defenders against food insecurity."

Crossette, B. 1997. "Poor nations may lack food supply, study says." New York Times, October 27.

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production and the greatest threat to maintenance of a viable resource base. Enhancing the health and welfare of small scale producers through environmentally sound agricultural development is essential for securing global peace and prosperity.

Collaborative Regional Support for Community Development

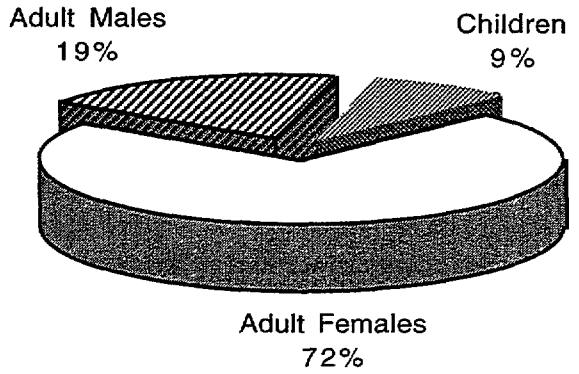
Livestock-related research and development is being undertaken within the context of communities which are regionally-linked. The matrix of projects within each region and of worksites within each project will constitute an extensive network of strategic support for community planning and development. Projects are designed to deal with a complex of issues within a framework of needs ranging from those of the individual to those of regional constituencies. The mechanism through which this has been done is the development of broad-based collaborative networks, put in place through extensive partnerships with a wide range of institutions. The comparative advantages of academic institutions, governmental and non-governmental organizations, donor and international relief organizations, private enterprise, and community organizations, have all been brought into play.

Accessing Community Resources

The ultimate goal of these livestock-centered agricultural initiatives—the yardstick by which impacts will be measured—is the improved health and welfare of smallholder communities. Income earning capacity and food security will be enhanced through improvements in animal agriculture. Recognizing also that communities, families, and individuals are differentially affected by research and development, attention will be given to community and household analysis. Consideration of the role of women in agriculture will

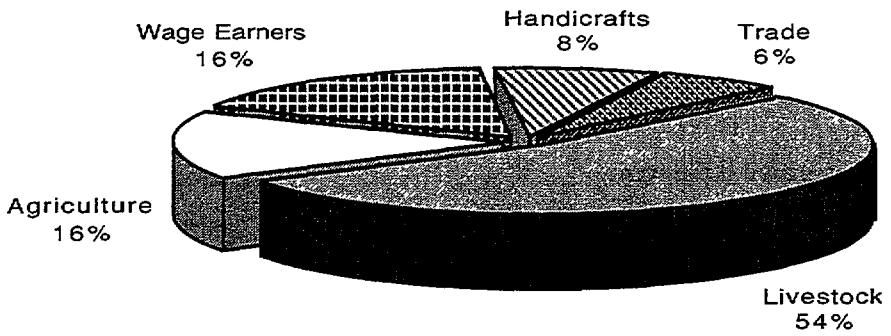
be especially important, as women contribute a large share to agricultural production in most developing countries. The participation of women in agriculture, especially livestock production, in Tanzania and Ecuador is illustrated in Figures 10 and 11. It is also significant that the results of studies indicate greater benefits accruing to children, in terms of money spent on health and education, from increases in women's, as opposed to men's, incomes (Quisumbing et al. 1995).

Figure 10: Percentage of time spent by women, men and children in agricultural activities in Tanzania.



Source: Carr, M. 1991. Women and Food Security. London.

Figure 11: Women's contributions to income by type of occupation in Equador.



Source: Campillo, F. 1994. Women Food Producers. IICA.

"In Uganda, women produce 80 percent of the food, according to the Vice President. They are responsible for 60 percent of planting of all food and nonfood crops, 70 percent of weeding, 60 percent of harvesting, and 90 percent of processing and preparation.... Improving women's incomes would improve nutrition in developing countries, particularly among children.... Women's incomes have a far greater impact on household food security and child nutrition than men's incomes, according to researchers. Women will spend a higher proportion of their income on the family, and especially on feeding the family," said Katrine Anderson Saito of the Agriculture and Environment Division in the World Bank's West Africa Department.... To improve women's incomes, and thus family nutrition, women need to have their own income-earning activities...."

2020 Vision News & Views, October 1995.
Interview of James Gustave Speth, Administrator,
United Nations Development Programme.

ENHANCING THE POLICY ENVIRONMENT

USAID's New Partnership Initiative, announced at the World Summit for Social Development on March 12, 1995, focuses on the building of local capacity within supportive enabling environments. The initiative is based on USAID's ability to work simultaneously at the grass roots and national levels, an approach which recognizes that local capacity building can only take place within a favorable national policy environment. As the extension of new technologies and the building of local capacity depend on enabling policy environments, the new CRSP framework calls for the incorporation of a policy component in each research project design.

A World Bank study written by Kevin Cleaver and Graeme Donovan (1994) stresses the importance of policy as a precursor to technological interventions in the development process. The USAID-sponsored Animal Agriculture Symposium Report of 1988 similarly concludes:

> *... In response to the question of why donor-funded livestock and livestock-related projects are not more evident in developing countries, it was agreed that inappropriate policies, particularly exchange rates and commodity price controls, carry much of the blame for the relative failure of livestock production in developing countries (USAID 1989).*

Because government policies towards the livestock sub-sector substantially influence the marketing and pricing of inputs and products, a thorough assessment of the political and policy environment through which interventions will be implemented should be an integral part of project scope.

> "The World Bank reckons that the poor countries today could wipe out micronutrient deficiencies at a cost of 0.3% of their GDP. It would be a good bargain, the cost of illness caused by these deficiencies is estimated at 5% of GDP. The trouble is that governments in many countries are still not fully aware of the importance of micronutrients. And others who are aware, prefer to spend their money on things like food subsidies, which benefit wealthy people as well as the hungry. Even the cheapest technological fixes will fix nothing without a bit of political will."
>
> Anonymous. 1996.
> "Hunger: Feeding frenzy."
> The Economist 341, n. 7993.

As the CRSP model has long provided an integrated framework for studying problems of national importance at the local, grass roots level, it is a natural vehicle for the exploration of policy issues. Incorporating a policy component into project design will provide a lens through which to view the articulation of on-the-ground development realities with policy at the national level. On-the-ground investigators will develop techniques for policy analysis and will provide evidence for policy delineation at the national level. Through addition of this policy component, CRSP activities will also be more closely aligned with USAID country and regional strategies.

Particularly important for yielding results in the short-term is the development of policy which will protect and encourage production improvements. While the SR-CRSP and other such programs have developed valuable technologies for the improvement of agricultural production, experience has shown that the policy climate is often a constraining factor in the adoption and extension of technologies. In-country policy dialogue on strategies for speeding up the process of technology transfer will enhance the ability of CRSP researchers to pursue development objectives more effectively.

As agricultural intensification and innovation is affected greatly by development policies, NARS should also be encouraged to carry out policy analyses. National policy research can be made more effective by collaboration of research organizations with U.S. universities capable of training NARS scientists in methods of policy analysis. IARCs can then assist the NARS in different countries to compare the effects of their respective policies. Finally, by working in different regions, the SR/GL-CRSP is also positioned to increase the reliability of information provided to development partners.

The ultimate goal of policy analysis is to empower local entities, or appropriate action agencies, to fill the development vacuum when assistance is withdrawn. The work of local communal groups, NGOs, and private firms is enhanced or hampered by the policy environment within which they operate. Sound economic policies—such as the development of responsive national regulatory mechanisms and a comprehensive strategy for resource management—will support economic growth. Policies designed to enhance the relationship between states and civil societies will improve the sustainability of development.

SUSTAINABLE RESULTS

Research in the international sphere is expensive, but the pay-off, particularly in human terms, is large. Not to engage in the research that allows technological advances to benefit less-developed countries with their burgeoning populations and unprecedented food supply problems would be to abandon millions to hunger and malnutrition. Due to the efforts of CRSP programs, small scale producers and their families around the world are now benefiting from basic research once considered exotic. With the added advantages of experience and perspective, re-designed programs such as the SR/GL-CRSP will broaden the scope of impact.

In the Green Revolution it was assumed that by increasing food production global food security would be assured. Likewise, efforts to develop sustainable agriculture have assumed that sustainable agriculture would secure rural welfare. However, in past decades, it has

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"... it is envisaged that any meaningful livestock development must contribute to improved nutrition of the household and alleviation of household poverty."

Ebong, C. and Mbuza, M. 1996. "Livestock Development Policy Issues and Concepts." East Africa Livestock Assessment Workshop Proceedings.

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become clear that the "critical leap" between production and food security—or sustainability and human welfare—does not take place automatically. In human-centered research and development the welfare of human populations is not assumed but rather clearly articulated as the ultimate goal. Increased production and greater sustainability are pursued in terms of measurable improvements in the welfare of vulnerable populations.

The SR/GL-CRSP projects have developed a variety of mechanisms for linking research and extension. Some projects have created strong linkages with NGOs, while others depend heavily on the participation of local communities. Just as the appropriate mechanism for linking research and development will be case-specific, so will measures of human welfare vary with context. Local communities have unique understandings of what constitutes

"human well-being." An agreed upon mix of new and traditional measures of rural welfare will differ for different projects and for different rural settings. Local participation in project design, implementation and evaluation will naturally include definition of human-centered measures of project impact.

ASSESSING IMPACT

As the success of overseas assistance can only be determined by the impact on local, national and regional communities, mechanisms for measuring results will need to be tailored to the specific activities of individual projects. CRSP projects will aim towards discrete, quantifiable objectives, such as the augmentation of food security, the creation of jobs, the enhancement of public health, the protection of natural resources, the capacity building of local institutions, and so on. These indicators will constitute the basis of impact analyses, which will be carried out as expeditiously as possible.

Impact analyzes will then be measured against the goal of sustainable development. Overall program objectives will provide for the training of personnel and institution building, as well as for the measuring of long-term economic, social and environmental impacts of research and development efforts. Impact analyzes will be designed to assess benefits to the United States as well. In terms of U.S. benefits, it is anticipated that SR/GL-CRSP projects will 1) create production benefits for low-resource farmers in the U.S.; 2) create opportunities for American businesses abroad; and 3) foster greater global security. Results will also be measured in terms of costs and benefits to determine how effectively funds have been used.

Despite the fact that animal research is of a long-term nature, a clear need to demonstrate short- to medium-term impact has been recognized. Milestones have been defined in research protocols to provide benchmarks for determining if research is on track for its promised impact. In the event of divergence from pre-set benchmarks, reasons will be appropriately assessed and information will be fed back into research management and design. Irreconcilable divergences may lead to early cancellation of projects, in order to minimize loss. This ongoing process of project evaluation and immediate feedback is expected to significantly enhance the quality of the CRSP program.

SUSTAINABLE AGRICULTURE: LONG-TERM PERSPECTIVES

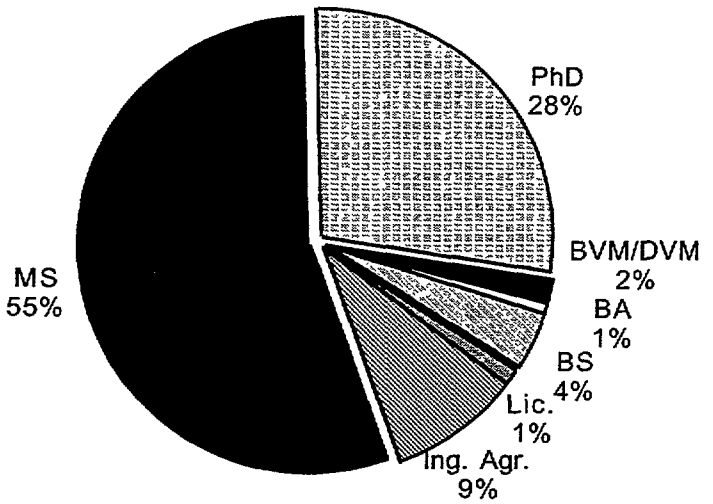
While returns on investments in agricultural research are high, environmental concerns in recent years have led to a shift in development targets from increased agricultural production per se to sustainable improvements in production. The issues of sustainable agriculture have had a major impact on the field of international development. Current development philosophies reflect two central issues of the sustainable agriculture movement: the long-term performance of systems and environmental impact. The time dimension highlights the importance of monitoring for negative impacts which are slow to appear, such

as degradation in the environment that has serious consequences for the food production system and the natural resource base.

Also important for long-term performance is the augmentation of human capacity: training, institution building and development of communications networks. These are areas which have long been stressed in CRSP programs, and they are areas in which the CRSP programs have comparative strengths. In addition to academic training, one of the most significant outputs of CRSP efforts (see Figure 12), CRSPs have conducted workshops, seminars, symposia, and short courses, for scientists, farm managers and livestock producers (Swindale et al. 1994). CRSPs have also contributed substantially to strengthening overseas institutions and the consolidation of regional and international research networks (see Appendix C).

Long-term solutions to food and nutrition problems require building of human capacity, to enable developing countries to continue research and extension efforts when international support is withdrawn. Regional panels of experts organized to evaluate SR/GL-CRSP research proposals stressed the importance of human resource development. The scope for building human capacity will be extended within the new CRSP framework by involvement of local communities. As the collaborative mechanism expands, extensive international linkages forged by scientists of the SR-CRSP in the past will provide a solid foundation for growth.

Figure 12: SR-CRSP Student Degrees, Undergraduate and Advanced, 1978-1994.



From 1978 to 1994, more than 400 students received a variety of degrees through associations with the Small Ruminant CRSP. The largest percentage of these received Master's degrees (55%); approximately 28% received PhDs. Smaller percentages in both the U.S. and in host counties received bachelor's degrees (B.S. or B.A.), degrees in veterinary medicine (B.V.M. or D.V.M.), or degrees unique to the host country institution (Lic. and Ing. Agr.).

SUSTAINABLE AGRICULTURE: ENVIRONMENTAL EFFECTS

The second major thrust of the sustainable agriculture movement has been the need to maintain a viable resource base. In the past, agricultural researchers focused on increased short-term productivity. Within a commonly defined set of production constraints, they concentrated on investigating lower level processes, often working at the molecular level. This reductionist perspective was based on the assumption that understanding lower-level phenomena would lead to improvements in production. In fact, production was improved; however, the environmental impacts of new production practices raised concerns about the efficacy of this approach. As a consequence, earlier findings are now being integrated into a broader understanding of the ecological, biological, social and economic systems of which production is just a part (Demment 1994).

As research focuses more aggressively on development of production systems with long-term viability, livestock are a valuable resource. Contrary to what is commonly believed, beef production does not compete for resources with food crops. In most cases, forage fed to cattle comes from crop residues or lands that have limited or no agricultural value (Gustafson and Ott 1991). Animals provide an efficient means for disposal of agricultural wastes (such as cottonseed hulls, soybean hulls, wheat middlings, rice bran, etc.), they convert nutrients unavailable to humans into high-quality protein- and micronutrient-rich foods for consumption. This feed-to-animal protein conversion is not a new discovery but rather a process used by human societies for thousands of years (Oltjen & Beckett 1996).

Animal Critics are Wrong

Critics who favor a meatless society believe animal agriculture is not compatible with sustainable agriculture. However, John Ikerd, professor of agricultural economics at the University of Missouri-Columbia, argues that animal production is a natural pattern of land use and that animals are a valuable resource for development of sustainable systems. He disagrees with the contention that animal production is an inefficient use of resources, as animals feed on plant material which cannot be consumed by humans. Moreover, he points out that "much of the land surface of this planet can not be cultivated for grain production without severe soil erosion. But it can sustain grass and forage production for cattle indefinitely."

USA Today (Magazine) 122, n. 2589.

When properly managed, grazing can actually increase plant diversity (Ann Dennis, cited in Gustafson and Ott 1991). Lands planted in forage helps to conserve soil fertility and soil structure for crop production, animals contribute to transfer of on-farm grazing to cropland through excretion of nutrients. Development of mixed crop and livestock systems is a means of making efficient use of available resources in a manner which is beneficial to the environment. Unless the productivity of fertile land is increased, it will not be possible to refrain from cultivation of fragile, marginal lands (Van Horn, Newton and Kunkle 1996). In this regard, livestock have an increasingly critical role to play in the development of sustainable agriculture systems.

U.S. AND WORLD ECONOMY

What really gives value to international development is a process that makes people healthier, more creative, and more productive. The resources we direct towards foreign assistance should, whenever possible, have both an international and a domestic impact. The recent record trade deficits and weak dollar are clear reminders that international trade is a critical component of our domestic agenda. Free international trade depends on our ability to establish mechanisms to create and open markets for American goods. When countries like Indonesia and Kenya attain higher level of economic development, they buy more U.S. goods. International agricultural development is an important mechanism for providing links to emerging markets and increasing the United States' competitiveness world-wide.

> "Developing countries are critical to our national interest. They buy almost 40% of American exports, directly supporting some 3 million American jobs. They are host to about a quarter of our overseas investment. Stable growth in developing countries will strengthen trends underway to expand democratic, accountable government, with direct benefits for Americans and global security."
>
> "Economic diplomacy: Key to domestic prosperity." Speech by Joan E. Spero, Under Secretary for Economic and Agricultural Affairs, 14 June. 1993. U.S. Department of State Dispatch 4, n. 24.

In addition to using American institutions, training U.S. citizens, and opening and creating markets for U.S. commerce, the SR/GL-CRSP also provides a model of democratic organization. The CRSP administrative structure is based on consensus and collaboration between: 1) regional and U.S. scientists, 2) U.S. scientists and the Management Entity, 3) the Management Entity and agencies in the United States government, and 4) the various administrative bodies of the CRSP itself—the Management Entity, the Program Administrative Council and the Technical Committee. In regions where the CRSP is active, democratic forums have identified and prioritized development problems and an extensive assessment process has emphasized community participation. At the global level, international networks and linkages between scientists have further enhanced the concept of democratic organization. Support for democracy abroad is essential to the peace and prosperity of Americans.

Part Three

GLOBAL PLAN: MANAGING RISK

The Small Ruminant/Global Livestock Collaborative Research Support Program (SR/GL-CRSP) is an international program of agricultural research and development. Funded by United States Agency for International Development (USAID) under Title XII of the International Development and Food Assistance Act of 1975, the program focuses on the food security and nutritional needs of low-resource rural populations. The intent of Title XII is "to prevent famine and eliminate hunger" by employing the efforts of U.S. land-grant universities to address the food and nutrition problems of developing countries. Title XII observes that land-grant universities have a demonstrated ability to work with institutions abroad to expand production "for both domestic and international markets." It also states that international research and development have benefited "agriculture in the United States."

While the SR/GL-CRSP is an expanded program targeting issues in animal agriculture in general, it builds on the past success of the Small Ruminant CRSP (SR-CRSP). (See Appendix C). The CRSP framework, a framework which has served a succession of programs, was developed by the SR-CRSP in 1978. The SR/GL-CRSP continues this pioneering tradition by establishing a new process for meeting the demands of a changing research and development environment. This new process recognizes that: 1) research imperatives have become regional and global in nature; 2) extension of research results is determined in large part by the unique circumstances of different locales; and 3) impact can be maximized through creative partnerships among governmental, non-governmental and private agencies.

Mission Statement

The SR/GL-CRSP will support long-term collaborative research projects which address problems of "food production, distribution, storage, marketing, and consumption" affecting low-resource producers. Environmentally-sound livestock development, led by U.S. land-grant universities in selected regions, will aim to enhance the well-being of producers. The capacity of U.S. institutions to meet the needs of farmers and consumers in the United States will also be advanced.

PROGRAM GOAL

The goal of the SR/GL-CRSP will be to increase food security and improve the quality of life of people in developing countries while bringing an international focus to the research, teaching and extension efforts of U.S. institutions. This goal will be met through collaboration between U.S. land-grant institutions and national and regional institutions abroad that are active in livestock research and development.

STRATEGIC OBJECTIVES

To achieve this goal, the following objectives have been identified:

- To strengthen the ability of institutions in developing countries to identify problems in livestock production and develop appropriate solutions.
- To increase employment and incomes among livestock producers and associated value-adding agribusinesses.
- To improve livestock production while monitoring the effects of production on the environment and exploring the integration of production systems with the rational use of natural resources, such as wildlife.
- To enhance the nutritional status of targeted populations through increased availability and utilization of animal source products.
- To provide support to decision makers in developing policies that will promote livestock production, marketing, and processing of animal products; human nutrition and child physical and cognitive development; and natural resource conservation and management.
- To identify, study, and strengthen communication systems (including but not limited to extension) among livestock producers, businesses, researchers, and consumers.

RESEARCH PLAN

The world confronting the international development community today appears radically different from the world in which development efforts began. While the urgency of food security persists, our increased knowledge of what food security requires, in a rapidly changing global environment, reveals the multiple dimensions of the task ahead. Although the advances of the Green Revolution have been dramatic, resulting in significantly greater food production, increased availability of food alone will not resolve the problem of global food security. The pressure of populations growing at high rates has put enormous stress on an increasingly fragile resource base. Even where food is abundant, many lack the income or the assets to purchase or produce food. Studies have also shown that the health and well-being of individuals, families and communities depend not only on the quantity but also on the quality of food.

The approach of the SR/GL-CRSP to international research and development focuses effort at the community level and seeks to involve communities in all stages of project implementation. The goal of this effort is to enhance the capacity of communities to develop and to respond effectively to change. In many developing countries, the small-scale farm sector comprises up to 80% of the population. These areas represent both the highest potential for increases in global food production and the greatest threat to maintenance of a viable resource base. Enhancing the health and welfare of small scale producers through environmentally sound agricultural development is essential for securing global peace and prosperity.

The success of community-based livestock development will depend largely on the policy environment within which interventions are carried out. In many countries, the transition to a market economy and more open and liberalized political systems has brought the active participation of interest groups at all levels of decision making. CRSP projects are designed to identify, evaluate and recommend policies with respect to needs at each level. A concerted effort has also been made to involve policy decision makers in projects from the beginning of project planning. Policy analysis will be a major part of project implementation, and feedback on policy issues will be solicited throughout the research and development process.

GLOBAL PROGRAM

While the role of livestock in research and development figures differently from region to region, many of the methodologies to be used in funded projects and the overall complex of development needs are similar. Projects in all three regions bring new, sophisticated analytical tools to the table and propose innovative means for linking research and development. Land-use studies balancing food security needs and environmental concerns are underway in three regions; studies linking livestock development and overall economic growth have been undertaken in East Africa and Central Asia; human nutrition is being incorporated as an essential component in all projects; and the study of global warming to be conducted in Central Asia has international significance.

Enhancing Research and Development Through use of Spatial Tools

Five of the seven funded projects are developing highly sophisticated spatial modeling tools that will enable integrated assessments of complex problems and evaluations of alternative mitigation or development strategies. Texas A & M University System (TAMUS) is integrating a variety of tools to enhance the early warning capacity of existing systems in East Africa. The project's Spatial Characterization Tool (SCT) enables spatial organization of diverse types of information, from soil, weather and biological data to policy, cartographic and demographic information and functions. Spatially explicit information generated by such systems can be used to visualize the impact of various kinds of change at multiple levels of decision making. Spatially explicit information and its analysis are a major breakthrough in the analysis of landuse and ecosystem scale problems. The scientists in the CRSP project have a high level of sophistication and expertise in spatial analysis that will be a major resource for the land-use and environmental components of the CRSP work. A workshop in Fort Collins (April 1998) was organized by the TC to acquaint all CRSP researchers with the spatial tools and methods being used by the projects, determine opportunities for standardization and collaboration and plan an agenda for future communication. In addition to enhancing research through improved analytical capacity, projects are developing innovative mechanisms for linking research and development. Some projects are working directly with community-based organizations. Other projects are linking research and development by working through action agencies (both governmental and non-governmental).

Wildlife Conservation, Managed Land Use and Maintenance of Ecosystem Integrity

The Colorado State University (CSU) project in East Africa and the University of Wisconsin-Madison (UW-Madison) project in Latin America concentrate on the dynamics of different ecosystems: pastoral-agropastoral ecosystems and montane forested ecosystems, respectively. While the ecological base is different, the problem is essentially the same: the managed expansion of livestock production into environmentally protected areas, to increase the incomes and food security of local populations. In Latin America, a strong correlation

between cattle density and deforestation highlights the need for managed expansion of livestock production and careful environmental monitoring. In Africa, there is strong support for balancing pastoral production needs with conservation of wildlife. In areas where expansion of agricultural production poses a threat to the environment, whether on arid or semi-arid lands or in forested mountains, integrating livestock and crop systems can be an effective means of intensifying agriculture.

Strategic Support for Economic Growth

While all CRSP projects are livestock-related with the goal of improving production, the benefits to be gained from increased production are dependent on effective integration into a complex of systems which interface with the livestock production system. The Utah State University (USU) project in East Africa examines this problem directly, by identifying four enabling systems: resource tenure, marketing, rural finance, and public service delivery. Through development of risk management strategies, the USU project seeks to link improvements in pastoral welfare to overall growth in the national economy. The UW-Madison project in Central Asia looks at many of the same issues, although regional political and economic instability, institutional fluidity, and the problems of distance and communication limit the scope of work that can be done. The projects in Central Asia will establish a baseline for economic studies, upon which more integrated efforts might be launched.

Food-Based Approaches to Micronutrient Deficiencies

The human nutrition studies of the SR/GL-CRSP will be led by the project in East Africa managed by the University of California, Los Angeles (UCLA). The UCLA project will implement a controlled study to establish the relationship between consumption of ASF and child health and development. Findings of the former Nutrition CRSP, in which many of the current project's team members participated, revealed a correlation between animal source foods (ASF) and child physical and cognitive development. An experimental intervention is necessary to prove this link and to determine whether ASF are important because of caloric or micronutrient content. A third objective of the study is to compare the respective benefits of meat versus milk. These issues are integral to enhancement of human welfare in all projects across the CRSP.

Significance of Introduced Pastures for Mitigation of Global Warming

The rangelands in Central Asia represent a significant portion of the total arid land area of the world. The processes occurring in this area, especially changes in carbon fluxes and reserves resulting from changes in cultivation, grazing use, and other forms of human activity (including dropping of the level of the Aral Sea and its consequences) may have regional as well as global significance. Quantitative data on net direction (accumulation or release) and rates of carbon flux on Central Asian rangelands, to be collected by the UCD project, will

contribute to an improved understanding of the global carbon cycle and its modification by humans. Transformation of 10 million hectares of abandoned farm lands into introduced pastures could result in both a significant resource for livestock production and a sink for atmospheric CO_2.

REGIONAL PROGRAMS

While the SR/GL-CRSP global program builds effectively on complementarities between projects in different regions, each region has a set of unique development problems. The East Africa program focuses primarily on pastoral societies coping with climatic unpredictability and diminishing resources for mitigating risk. The Central Asia program addresses a rapidly changing and unstable political and economic environment, where little effort has been made, particularly in rural areas, to "cushion" the effects of transition to a market economy. The Latin America program faces sustainability issues, with a growing population, more firmly entrenched poverty, and a rapidly diminishing resource base.

The organization of regional programs is also unique and appropriate to the circumstances of each region. In East Africa, three projects focused on pastoral systems tie into the three objectives of the ASARECA (Association for Strengthening Agricultural Research in Eastern and Central Africa) Crisis Mitigation Program. The ASARECA tie-in gives the program regional coherence. In Central Asia, a collaborative network of organizations has been formed by linking the UCD and UW-Madison projects with the BASIS CRSP, ICARDA (International Centre for Agricultural Research in Dry Areas), IFAD (International Fund for Agricultural Development), and the ODI (Overseas Development Institute). The organization of research and development in Central Asia will be facilitated by a Livestock CRSP Specialist, who will be assigned to work in the Agricultural Research and Extension Group (ESDAR) at the World Bank. Finally, in Latin America, the one project funded is exceptionally broad-based, with extensive institutional linkages in each country of operations (Mexico, Bolivia and Ecuador).

NEW INITIATIVES

A Task Force appointed by the Gore/Chernomyrdin Commission (GCC) and funded by the SR/GL-CRSP visited the Russian Federation (Russia). The purpose of the trip was to explore the possibility of university partnerships between the U.S. and Russia, and possibly also the U.S. and Ukraine. The Task Force recommended institution of such a program, with an initial focus on revival of the animal industry.

SR/GL-CRSP has also identified additional opportunities in which it has a comparative advantage based on its ongoing projects in other regions. A program for Mongolia is proposed that will strengthen the livestock sector, conserve biodiversity and reduce rural poverty by combining approached employed with pastoral systems and natural systems in

East Africa and Central Asia. Indonesia represents a special case where timely and urgent intervention is needed to support a floundering but critical livestock sector. A US-ASEAN Business council trip has made recommendations and support a program proposed by the SR/GL-CRSP.

Common development objectives of both the USAID/CRSP and Agricultural Research and Extension Group (ESDAR) could be furthered by seconding a Specialist to the World Bank. The Specialist would address those objectives held in common, namely: Development of regional agricultural networks for Central Asia, development of research linkages and collaborative research activities, and coordination of technology system development activities and donor assistance to developing country NARSs. In the case of the Livestock CRSP Specialist, work would focus on livestock research-related activities. A U.S. academic would fill the position on sabbatical leave from their university.

KNOWLEDGE MANAGEMENT AND GLOBAL INTEGRATION

Knowledge is useful for two purposes. First and most practically, new knowledge is the basis for effective intervention to solve problems and stimulate development that enhances the quality of life. Second, new knowledge provides the groundwork for more effective study of problems to permit future solutions. To ensure that knowledge generated by the research in the SR/GL-CRSP is effectively used and communicated, clients were identified early in the planning process and invited to join in the research project. These collaborating institutions have been strategically chosen because they are either key players in the decision making process or important organizations for the dissemination of new technologies. A considerable portion of the knowledge generated by the projects will assist policy makers to make effective choices of alternative scenarios. The incorporation of those policy making institutions into the planning, design and implementation of research projects will enhance the probability that the appropriate knowledge is generated and that it will be used in the policy making process. Their early collaboration in the design and conduct of the research will increase the likelihood of implementation. To insure that this outcome is achieved, the SR/GL-CRSP will conduct a Policy Workshop in East Africa in September of 1998 to review and critique our progress, explore mechanism to enhance this interaction by presentation of success stories in policy development in the region and to engage a wider audience of regional policy makers.

The program will manage the knowledge it develops at four levels: global, regional, national and project. New knowledge provides the basis for new perspectives that lead to solutions. In this regard the different scales of the program allow for the formation of powerful contrasts that enhance researchers abilities to understand their systems by providing multiple perspectives. Global comparisons of management of livestock and natural resource issues helps to identify common principles that underlie conflicts and their resolution regardless of culture and ecotype. At the regional level where often-similar environments exist, policy contrasts are very effective between countries. At the national level common

themes can be linked between studies to understand how, for example, human nutrition and risk management alternatives, interact.

Knowledge will be managed as follows. First, at the project level key institutions with technology transfer capacities have been identified and within projects they will have responsibility for knowledge transfer and adoption of policy recommendations with users. In most cases they are in effect the clients originally identified in the assessment process and have been incorporated as collaborators. Second, at the national level, a national coordinator for the project active in the country will be identified and that individual will be responsible for cross linkage of information between projects in the country and identification of key institutions and individuals within the country for dissemination of knowledge. Third, at the regional level knowledge will be managed by a regional coordinating body, such as ASARECA, and linked with the appropriate network within the regional organization. The network would be the key mechanism for reaching the NARS and development institutions. Fourth, the CRSP ME through the PAC and TC will lead the global integration. Depending on funding, the ME will organize meetings at least once a year where the projects will make presentations relevant to the global themes of the program, invite persons outside the program to give additional perspectives on thematic issues and develop grant proposals to enhance promising approaches to the global themes.

The SR/GL-CRSP has insisted on the development of regionally based projects, in part because of the strength of regional organizations in NARS and the emphasis on regional approachs by donor agencies. This means that a strong regional organizational structure already exists within projects Moreover because of the linkage with new regional organizations such as ASARECA, their networks provide an effective participatory framework for inter-project communication and direct links to NARS. In Central Asia, the CRSP has already established a network for NARS linkages in livestock and with the World Bank position described in this proposal where the first responsibility is the development of regional networks, the CRSP can greatly facilitate this process. At a recent ISNAR Expert Consultation on Agricultural Policy and Management in Central Asia and the Caucasus (June 1998), SR/GL-CRSP Program Director Demment presented a plan for using networks to stimulate NARS communication and organization in the region. The principle agreement resulting from the consultancy was that networks would be formed and used to enhance the NARS. The SR/GL-CRSP will work to assist and support the Central Asia regional livestock and environment networks and by doing so connect its projects to national and regional efforts in appropriate fields.

In East Africa, ILRI is proposing to donors to fund a network-like association of projects focused on the pastoral systems. In the region there are about seven projects, including the four from the CRSP, two from the ASARECA network and one from another U.S. University, that are working on complementary issues related to pastoral systems. The objective of the association is to identify opportunities for collaboration on specific issues between projects that if supported would give add-on value to the would not be achieved

with any project alone. The association would also improve inter-project communication, provide a strong regional research resource in rangeland issues (a weak area for most NARS), and be an opportunity to leverage USAID resources. The proposal is presently being offered to donors.

At all levels communication is the vehicle for knowledge management. Communication will occur through electronic conferences and other Internet connections at the global and regional level along thematic lines, and at the national level between projects. At least once a year the email networks will meet for presentation of results and development of new concepts to improve knowledge management. Regional and country coordination may occur more often in conjunction with other activities of the regional and national organizations. The responsibility for organization of this communication system will be the ME in conjunction with the TC and the national coordinators.

PROGRAM OPERATIONS

The transition and re-engineering phase through which the renewal proposal has been developed can be characterized in part as a radical re-structuring of program management. The former Administrative Council and Board of Directors have been replaced by the Program Administrative Council (formerly the Advisory Panel). Simultaneously, the functions and responsibilities of other executive committees supporting the work of SR/GL-CRSP have been re-defined to affect 1) greater independence in program development; 2) a more rational framework; and 3) infusion of a broader spectrum of development perspectives.

Management Structure

Primary responsibility for program management rests with the Program Director (PD). The PD will manage the activities of the SR/GL-CRSP, in consultation with the Program Administrative Council (PAC) and the USAID Program Officer, in accordance with the terms of the grant. The PAC, the members of which are chosen for current expertise and active involvement in science or international development, is the central coordinating committee. The PD and the PAC are advised by the Technical Committee (TC), composed of principal investigators and other regional team members drawn from participating projects. The managerial structure of the SR/GL-CRSP is depicted in Figure 13.

Program Director/Management Entity

The Program Director will take leadership in program planning and represent the CRSP and participating institutions to outside agencies. The PD ensures compliance with the regulations of the University of California as well as with those of other participating institutions. He/she bears ultimate responsibility for program impact and accountability. In carrying out the oversight of global and regional programs, the PD is supported administratively by the Management Entity.

Program Administrative Council

The Program Administrative Council provides input on overall program goals, recommends strategies for programmatic development, and will advise and concur on the program budget. Membership on the PAC represents a wide spectrum of development

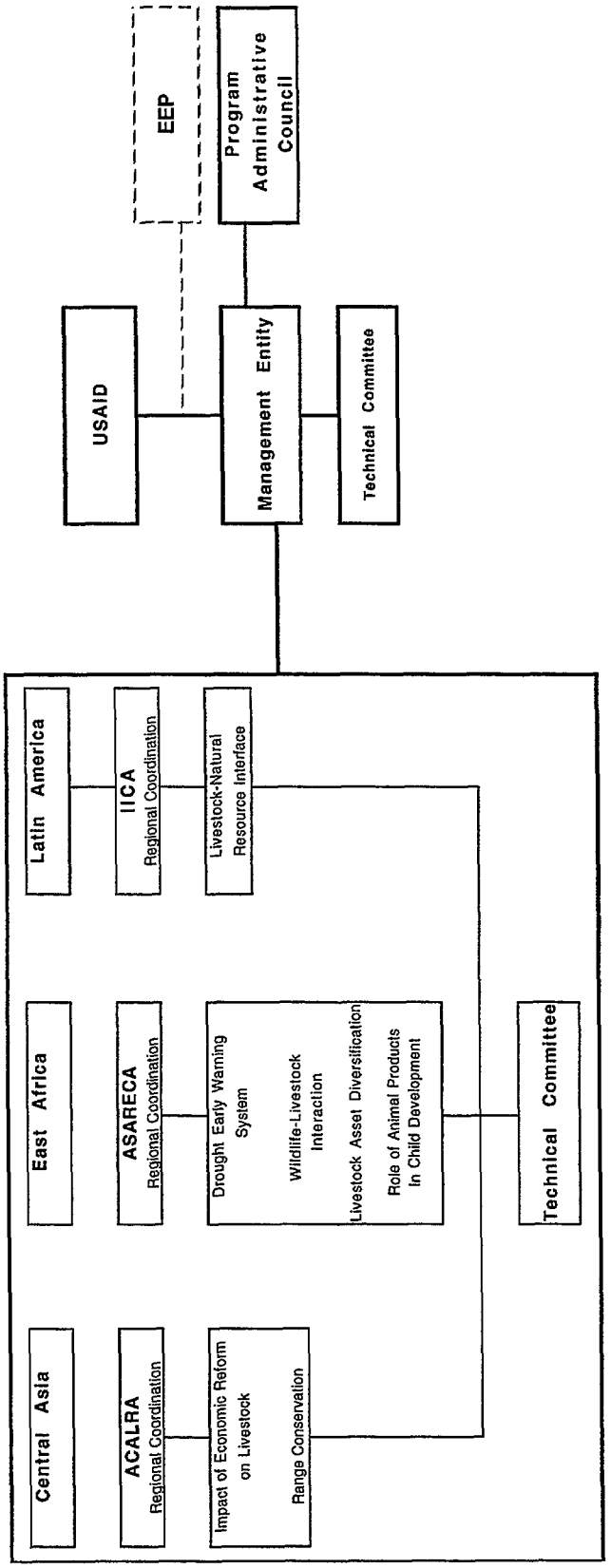


Figure 13: Small Ruminant/Global Livestock CRSP Programmatic Organization

expertise and includes members with links to IARCs, international NGOs, other donors, and the private sector. Current members of the PAC have links to International Livestock Research Institute (ILRI), IFAD, and the World Bank, as well as to governmental officials and business executives. Representatives of the ME and USAID serve as ex-officio members of the PAC. The functions and responsibilities of the PAC are outlined in the accompanying précis.

Technical Committee

The Technical Committee has an advisory function in program development and matters of science and technology. The TC recommends areas to research and strategies for advancing the CRSP at USAID and in the U.S. in general. Membership on the TC is comprised of the principal investigator and one selected regional representative for each funded project. The functions and responsibilities of the TC are outlined in the accompanying précis.

USAID

The USAID Program Officer will interact with the Program Director to provide general direction and suggest opportunities for program development. USAID will provide the core funding for support of research and development. The Agency will also have an evaluative function in 1) providing input on the External Evaluation Panel scope of work, 2) conducting tri-annual management reviews, and 3) organizing other periodic reviews. Through USAID, the SR/GL-CRSP will maintain a vital link to the U.S. government.

Collaborative Agencies

Collaborative agencies will provide supplemental advice on the management of SR/GL-CRSP operations. Expansive collaborative linkages are being built at three major levels: the global level (represented by the CRSP); the regional level (represented by regional programs); and the local level. At every level extensive relationships have been built with institutions having similar or complementary interests: other universities, other donors, IARCs and national agricultural research systems (NARS), NGOs, governmental agencies, and the private sector. The importance of these links has been given high relief in the new structure.

Management Philosophy

The new CRSP model will incorporate a results-driven framework, the keystone of which will be a continuous cycle of evaluation. This mechanism will provide for a more dynamic and effective program. Research opportunities and associated contracts will be made public and bidding for them will be nationally competitive. Project progress will be monitored on an ongoing basis, and budget allocation decisions will be based on performance.

Program Administrative Council

Purpose: The Program Administrative Council provides advice and guidance on the management of the Small Ruminant/Global Livestock CRSP to the Program Director.

Membership: The Program Administrative Council (PAC) shall consist of seven members appointed for terms of up to five years. The terms of appointment allow for approximately one-third of the Council to rotate off biannually. No more than three members can be from SR/GL-CRSP participating institutions. The membership should include a diverse mix of disciplines and expertise with interest in international development. The members are appointed by the Management Entity with the concurrence of the USAID Program Manager. The Management Entity will solicit recommendations for each PAC opening from the interested segments of the SR/GL-CRSP community. The USAID Program Manager and Program Director are non-voting, ex-officio members of the PAC. Minutes of each PAC meeting will be recorded and distributed by the Management Entity.

Chair: The Chair is elected by the Program Administrative Council for a term of two years. In the absence of the Chair, the Program Director will appoint an Acting Chair.

Responsibilities:

1. Advise the Management Entity on the long-term goals and objectives of the Program taking under advisement, comments of the External Evaluation Panel, Administrative Management Reviews, USAID, and communications from Team Leaders and/or Principal Investigators.
2. Recommend additions and deletions of projects, participating Principal Investigators, institutions, and geographic regions.
3. Review workplans and budgets and recommend project allocations.
4. Review progress reports and make recommendations as required for strengthening Program operations or support.
5. Assist the Program Director in identifying opportunities.
6. Assist the Program Director with information dissemination.
7. Advise on Program policies and procedures.

Meetings: A Program Administrative Council meeting can be called by the Program Director, USAID Program Manager or Chair of the PAC at any time but the Panel will meet at least twice per grant year. The meetings will be coordinated by the Management Entity and a call for agenda items will be issued at least two weeks before the scheduled meeting.

Quorum: Four members constitute a quorum.

Voting: Unless specified otherwise prior to the vote, a simple majority of the voting members present will decide all votes with the exception of changing the ME or Program Director. A two-thirds majority of the PAC and Team Leaders is required to change the Program Director and/or the Management Entity. Votes can be via electronic communication, e.g., fax, email, teleconference, as well as in-person meetings.

Conflict of Interest: No PAC member can be a Principal Investigator or have relationships or biases that would in any way prevent him/her from rendering fair and objective advice.

While the nature of this process will vary from project to project, the inclusion of an assessment component is required in the design of each project. The performance of CRSP projects will be followed as part of routine management and continuation will be contingent on the team's ability to deliver results. Projects may also be graduated as the research and development needs of a region change, or as new issues of global importance come to the fore.

PROGRAM ADMINISTRATION

The SR/GL-CRSP will be administered as a grant to the University of California, Davis, which, acting as the Management Entity, will administer subgrants to participating U.S. institutions and maintain fiscal accountability. Responsibility for program administration will rest with the Program Director, who, in accordance with the provisions of the grant, will 1) take the lead in program development, 2) coordinate the activities of projects across and within regions, and 3) oversee the daily operations of the SR/GL-CRSP. In these various functions, he will be supported by the Program Administrative Council, the Technical Committee, and the staff of the ME.

Meetings of the Program Administrative Council

The Program Administrative Council, as the Director's principal advisory organ, will assist the Director in program development. PAC meetings will take place twice annually. The PAC will make recommendations on agricultural development issues of global significance, prioritize regions for CRSP activities, and develop mechanisms for enhancing program effectiveness. The PAC will advise the Director on changing circumstances, new challenges, emerging opportunities, and novel directions for CRSP programming.

Meetings of the Technical Committee

The Technical Committee will be comprised of all principal investigators and regional representatives from CRSP-funded research teams. TC members will advise the Director on matters of intra-regional coordination and individual project management. Meetings of the TC will take place at an annual year-end conference, where research in progress will be presented and members of different teams will have a forum for interacting. The year-end conference will alternate between the U.S. and each region in turn, and the first such meeting will take place in East Africa at Arusha, Tanzania. In the U.S., preference for selection of conference site will be given to institutions participating in the CRSP program. Additionally, the year-end conference will serve as a mechanism for regional input and provide an opportunity for presentations by outside resource people.

Day-to-Day Administration of the Program

The daily operations of the SR/GL-CRSP will be coordinated through the office of the Management Entity at the University of California, Davis. In the day-to-day administration

Technical Committee

Purpose: To provide intellectual exchange and input on programmatic planning for the Small Ruminant/Global Livestock CRSP to the Program Director and Program Administrative Council.

Membership: The Technical Committee shall consist of each Team Leader and the Regional Co-Leader. Committee membership will be effective for the entire tenure as a Team Leader or Regional Co-Leader. The Program Director and USAID Program Manager are ex-officio members.

Organization: Subcommittees can be established as needed by the Technical Committee. Ad hoc committees can be convened at the request of the Technical Committee Chair or the Program Director to address a specific issue or purpose then disband. Subcommittees and ad hoc committees can include team members other than the Team Leader and Regional Co-Leader.

Chair: The Chair is elected by a simple majority of the Committee members.

Responsibilities:

1. Exchange scientific information.
2. Contribute to program planning and evaluation.
3. Identify and recommend new program opportunities.
4. Participate in information dissemination to various bodies, e.g. legislators, private sector, NGOs, USAID officers, etc.
5. Provide intellectual leadership to the developing communities.
6. Provide advice to the Program Administrative Council.
7. Assist with conflict resolution.

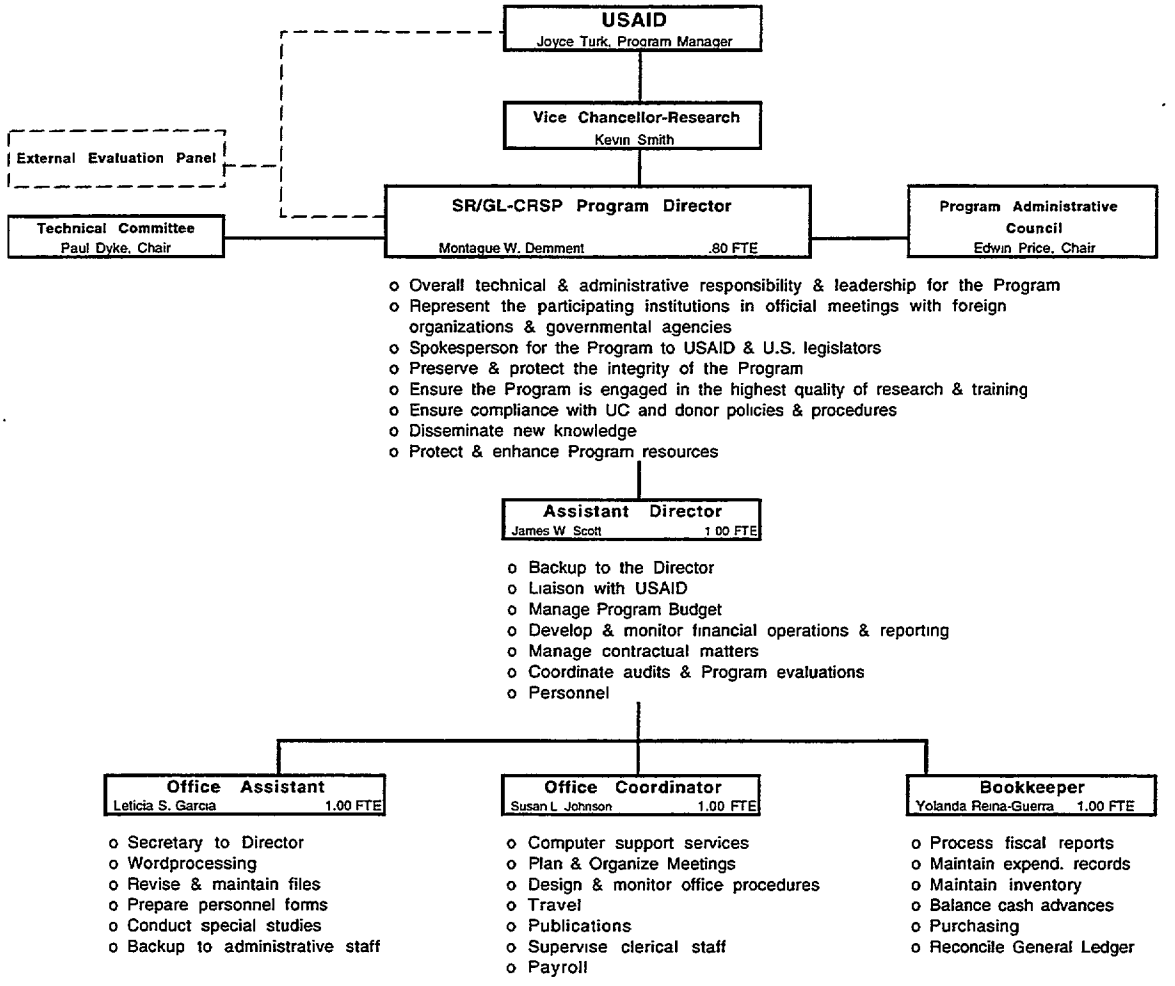
Meetings: The Technical Committee shall meet no less than once per year. A meeting can be called by the Program Director or TC Chair with at least two weeks advance notice. Meetings can be via electronic communications, e.g., teleconferences or electronic mail. Meetings will be coordinated by the Management Entity.

Quorum: A quorum consists of a simple majority of the total Technical Committee membership.

Voting: Unless specified otherwise prior to the vote, a simple majority of voting members present will decide all votes.

Records: Minutes and/or proceedings of each meeting will be published within thirty days of the meeting.

Figure 14: SR/GL-CRSP Management Entity Organizational Structure



of CRSP activities, the PD will be assisted by an Assistant Director, a Program Coordinator, a Bookkeeper, and an Administrative Assistant (see Figure 14).

The major functions of the ME will include:

- receiving on behalf of the SR/GL-CRSP funds committed by USAID and assuming accountability for their use.
- providing funds to participating institutions for SR/GL-CRSP activities and ensuring compliance with the terms of the grant.
- providing a focal point for interaction with administrative bodies within the CRSP and with external agencies outside the CRSP.

- executing decisions made through consultation with the PAC and TC and seeking ways to address concerns of external evaluation committees.

- maintaining liaison with regional subprograms and project directors and servicing them through provision of memoranda of understanding (MOUs).

- generating SR/GL-CRSP documents (including annual reports, minutes of PAC and TC meetings, reports of the External Evaluation Panel, budgets and fiscal reports) and providing these to USAID and external auditors, as requested.

Administrative Re-Structuring

In response to the National Performance Review and strongly supported in the Synthesis meetings, efforts have been made to reduce time, effort, and financial costs in program administration. The actions taken include greater efficiencies in program management, reduction in reporting requirements, and more extensive use of electronic messages for communication and coordination. The Management Entity, with strong support from the SR-CRSP Advisory Panel, has also recommended the initiation of multi-year funding.

Management efficiencies

Functions of executive committees have been re-defined for greater effectiveness, and costs to the program of multiple meetings have been reduced. The year-end conference has been designed to provide a focal point for multiple activities. In alternate years, the site of the conference will be located in a region where the CRSP is active. At such times, the conference will serve not only as a forum for team interaction but also as a regional workshop for programmatic review and input. Wherever possible, the annual year-end conference will also be combined with external and internal program reviews. As a mechanism for team interaction, regional input, program evaluation, and introduction of innovative resource material, the year-end conference will have several functions and will enable a reduction of cost.

Reduction in reporting requirements

The SR-CRSP Advisory Panel has argued that a CRSP competes with other programs for the best academic researchers. They have noted that inclusion of copious reporting and other bureaucratic responsibilities diminishes the ability of USAID to attract U.S. scientists. To remain competitive, steps have been taken to streamline and improve reporting procedures. Monthly and quarterly reports will no longer be required; only annual reports will be submitted. Requests for information will be made on an as-needed basis, and such information—designed to address special needs—will be more relevant and more current. The change will also free up valuable management time.

Extensive use of information technology

Economies of both time and expense have resulted from the initiation of regular use of electronic means for communication. The Management Entity has made a concentrated effort to put this technology in place in the U.S. and overseas, wherever possible. Communication and coordination of activities through electronic messages have become routine; a website has been constructed for public information and ongoing updates on program operation; grant applications have been made available for downloading; and internet sources are being utilized for research purposes.

Multiple-year funding

A continuing concern of SR/GL-CRSP administrators, for the long-term stability and productivity of the program, is the need for multiple-year funding. The Swindale report indicates that stable long-term funding is essential for the implementation of strategic research plans and the optimizing of development impacts. To meet this need, the ME has proposed, and continues to propose, that funding be allocated in multi-year committments. Adoption of this procedure would enable the USAID Contracts and Financial Management Offices to better address the objectives of USAID re-engineering efforts, while better serving the needs of its clients, on a timely basis.

PROGRAM EVALUATION

Extension of technologies and evaluation of impact will be an integral component of the SR/GL-CRSP process at all sites from project inception to project renewal. With a greater emphasis on impact, teams will develop technology along with the strategies through which technologies will be transferred. The study of technology transfer—of the exact mechanisms which effect transfer—will constitute a subset of scientific inquiry. Projects will be designed to quantify impact in the course of research, rather than after research is completed, to allow for project modifications to enhance potential, as research progresses.

Title XII has established the mandate for research and development and, consequently, the measuring stick against which progress will be evaluated. The program will focus on human-centered development, and impact will be measured with respect to human outcomes: increased food security, increased incomes, better health, stable and equitable economic growth, professional training and community education; increased research and development capacity, etc. Anticipated outcomes will be identified for each project and each locale. Appropriate—human-centered—measures of impact, and mechanisms for linking research and outreach, will vary from project to project and from site to site.

External Evaluation Panel

Purpose: To provide objective evaluations of the Small Ruminant/Global Livestock CRSP programmatic progress.

Membership: External Evaluation Panel members are accomplished research scientists and/or faculty members from institutions or organizations which are not active participants in the Small Ruminant/Global Livestock CRSP. The Program Director conducts an open solicitation for potential panelists with the qualifications required for a specific research area; the Program Director makes a recommendation to the USAID Program Manager for confirmation. The term of appointment can vary from one to three years to meet the Program needs. Panelist can serve up to a maximum of six years.

Organization: An evaluation can be requested by the Program Director or the USAID Program Manager at any time but no less than once each three years. Each evaluation is guided by a Scope of Work developed jointly by the USAID Program Manager and the Program Director.

Chair: The Chair is appointed by the Program Director with the concurrence of the USAID Program Manager. The term of the Chair is one year and can be renewed by mutual agreement.

Responsibilities:

1. Conduct a professional, unbiased review of the Small Ruminant/Global Livestock CRSP in accordance with the official Scope of Work.
2. Make recommendations to strengthen or improve the Small Ruminant/Global Livestock CRSP.
3. Review written material and obtain information essential to the assessment process.
4. Travel to the research sites as needed and subject to the availability of funds.
5. Submit a written report within 60 days of the close of the review.

Reports:

1. All working papers will be considered confidential and the property of the Panel.
2. The report will be in writing but can be supplemented with oral reports to the Technical Committee, Program Administrative Council, Program Director, and/or USAID.
3. The Program Director will circulate the EEP report to the Team Leaders for comments then can prepare a response which will be published with the EEP Report.
4. Clerical administrative support can be provided by the Management Entity at the request of the Chair of the EEP.

Compensation: Each EEP member will have a Consulting Agreement issued by the University of California, Davis which stipulates the amount of the consulting fees. The consulting fee cannot exceed the maximum allowed by USAID. All travel expenses will be reimbursed by the SR/GL-CRSP.

Project Review

Ongoing assessment will be a major component of project management. A process, such as the development of benchmarks, will be created, appropriate to each project. Progress toward stated goals will be intermittently gauged, and project modifications will be made as needed, rather than waiting until year's end. Workplans will be submitted on an annual basis and scientific findings presented at a year-end conference. These different occasions will provide multiple opportunities for feedback on project progress, by reviewers, such as the External Evaluation Panel, and colleagues in the field. In addition, ad-hoc reviews may be conducted by the Program Director on an as-needed basis.

External Evaluation Panel and Program Review

Several processes have been put in place for overall program review. The principal administrative unit charged with this responsibility is the External Evaluation Panel (EEP). Unlike the past practice of the EEP, the re-engineered process calls for program review at the year-end conference. This new practice will have several advantages: 1) direct contact with U.S. and regional representatives of all projects in operation; review of projects in-the-field; and economies in time and expense for all participants. In addition, the EEP will gauge program progress toward targeted impacts by review of the SR/GL-CRSP annual report and other reports (e.g. publications, training, benefits to U.S., financial status, etc.), as available.

In another departure from former practice, the EEP will include among its members expertise from academic institutions other than land-grant universities. Currently, the three positions on the EEP have been filled by professionals from Harvard, Purdue, and Dartmouth. The place of the EEP in overall program operation can be reviewed in the diagram of SR/GL-CRSP Programmatic Organization in Figure 13 and the functions and responsibilities of the EEP have been laid out in the accompanying précis.

Along with the annual EEP review, USAID will conduct a tri-annual internal management review. This review will concentrate on the policies and procedures of the Management Entity with respect to administration of the program as a whole. The report of the management review committee will provide recommendations for greater efficiency in program operations. Supplementing these regular reviews, occasional ad hoc external reviews, such as the recent evaluation conducted by Leslie D. Swindale et al., will provide additional feedback. The scope of change which has taken place within the CRSP, during the transition and re-engineering process, demonstrates the seriousness with which these reviews have been and will continue to be considered.

COMMUNICATION AND INFORMATION DISSEMINATION

Using the principles described in the Knowledge Management section above, the SR/GL-CRSP will use a number of types of communications to extend knowledge. As the SR/

GL-CRSP supports both research and development, the success of the program will be closely linked to dissemination and use of research results. Effective communication will be needed on several fronts: to connect research efforts; to link researchers with action agencies such as NGOs; to adapt research to diverse local circumstances; to coordinate institutional efforts, both internally and externally; and to inform the public. The ability to focus the resources of a wide range of organizations with differing agendas and differing philosophies on the solution of specific development problems will determine the ultimate efficacy of the program.

Dissemination of Scientific Findings

Research activities will be advanced using all traditional means: publications in peer-reviewed journals; participation in professional society meetings and conferences; and organization of institutional research networks. Special attention has been given in the design of SR/GL-CRSP projects to building collaborative ties with IARCs, other CRSPs, regional research associations, such as ASARECA, and individual country NARS. Within the United States, collaboration among researchers at land-grant and other universities and with representatives of the private sector has also been encouraged.

Extension of Research Results

The applied nature of the CRSP mission requires that each project develop a mechanism for linking research and development. One mechanism used by the SR-CRSP has been the development of technological packages (Tech Pacs). Tech pacs, translated into different languages, have been the principal means of making production practices available to farmers. Cooperative efforts with women's groups in Kenya, for example, have increased the utility of the Kenya Dual Purpose Goat (KDPG). To enhance development efforts in the new phase of CRSP activities, special attention will be given to developing linkages with NGOs and establishing locally-based training programs.

Communication Linkages and Information Exchange

Networking beyond the agricultural research and development community has several purposes. These include recommendation of policy to support development efforts, expansion of the resource base, the leveraging of funds, and broad-based consultation. An ongoing initiative to link CRSP researchers and collaborators through electronic messaging is actively underway. Development of an Internet web site has established a public forum, which serves to communicate information about CRSP activities, including funding competitions. In the CRSP's internal and external communication efforts new information technology has been used to the fullest.

Internal Reports

Administrative procedures for the day-to-day operations of the CRSP require internal reports of various kinds. Individual projects will submit annual workplans and progress reports, and the Management Entity will track overall program progress through a variety of reports to USAID and the general public. Routine reports include annual reports, External Evaluation Panel reports, quarterly newsletter and periodic summaries of achievements, publications, training, benefits to the United States, etc. Ad hoc reports of a limited and specialized nature may also be requested of project leaders by the Program Director or of the SR/GL-CRSP by the USAID Program Officer.

Public Media

While extensive literature exists on the processes of informing intended beneficiaries of new technologies, less attention has been given to providing information to those who fund research and development. To this end, public awareness initiatives will target appropriate decision makers and the public in general. For this, consortia building offers distinct advantages. U.S. universities, IARCs, and NGOs all have different information and diverse contacts, which they can call on to support their common interests.

Part Four

RESEARCH & DEVELOPMENT PLAN

As the Small Ruminant/Global Livestock CRSP prepares to enter the twenty-first century, there is an increased awareness of the complexity of international research and development. In part, because of the emphasis on the sustainability of development and particularly agriculture, the emphasis of development projects has shifted from a sole focus on development of technologies and innovations to the impact of those interventions. The shift in focus occurs because the sustainability of development and the implied long-term nature of the impact depend much more on the context of the intervention. For example, policy and production are linked: technologies that increase production are adopted only if there is a reward to increased production. Environment is the long-term basis of production: production practices that degrade the ability of the natural resource base to maintain production may provide immediate rewards at the expense of future productivity. Because these problem consider the longer term, are often large in spatial scale, and cross disciplinary boundaries to address their contextual issues, broad-based interdisciplinary and collaborative undertakings are crucial. The increased globalization of the world community adds another dimension to the problem that necessitates even more comprehensive considerations of development context. With two decades of experience in interdisciplinary and collaborative research, the CRSP provides the ideal foundation upon which to build future efforts. The past two years have witnessed a process of focused change and institutional reorganization which demonstrates the readiness of the redesigned CRSP to undertake the challenges of the coming century.

"An increasing number of farmers, development workers and scientists are coming to the conclusion that capital-intensive Green Revolution techniques are simply not feasible alternatives for the poorest of the 1.4 billion farmers who live in tropical regions with ecologically, geographically, and developmentally less favorable production conditions. In these relatively diverse, complex, risk-prone areas, far away from markets, external inputs are either too expensive or simply not available. To optimize productivity, farmers must depend on local resources and ecological processes, recycling and site-specific genetic material."

Reijnjes, C., B. Haverkort and A. Water-Bayer. 1993. "Inspecting the tool box: A look at the means for achieving sustainable agriculture." Ceres v. 25.

EAST AFRICA PROGRAM

FOOD SECURITY, ECONOMIC DEVELOPMENT, AND MANAGED LAND USE

The East Africa core program responds to an oft-repeated concern of the Small Ruminant CRSP (SR-CRSP) External Evaluation Panel—the need to concentrate more effort in the arid and semi-arid regions. The project managed by the Texas A&M University System (TAMUS) targets food security and drought forecasting in pastoral regions through the proposed development of a system to enhance existing early warning systems. The Utah State University (USU) team aims to increase food security and economic development in pastoral communities through asset and income diversification. The Colorado State University project addresses food security and pastoral welfare in relation to land use conflicts between livestock producers and wildlife conservation. Finally, the University of California, Los Angeles (UCLA) team proposes to investigate the link between consumption of animal source foods and child physical and cognitive development.

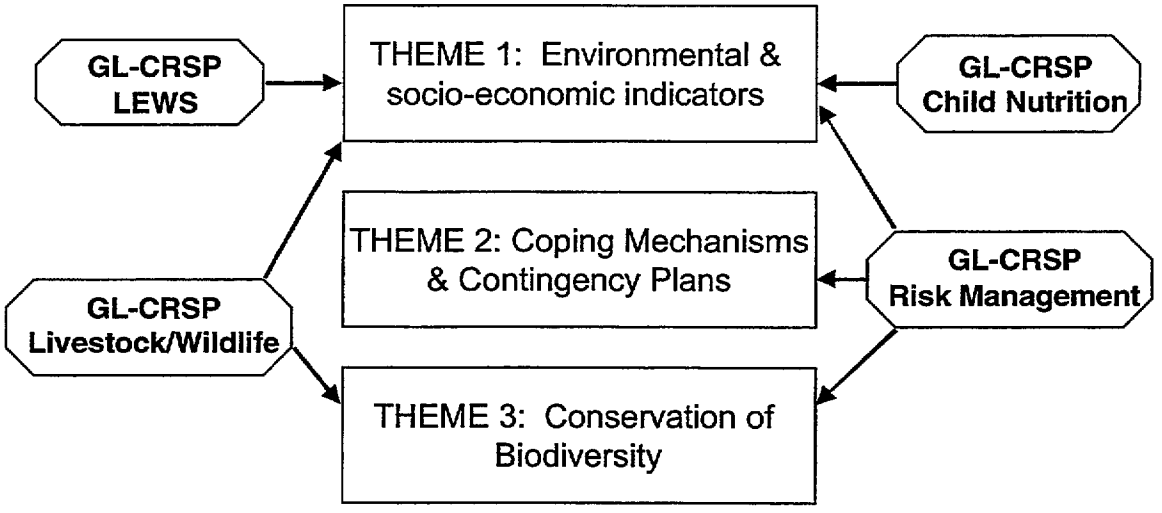
East African Communities Responding to Risk

The arid and semi-arid regions of East Africa, inhabited mostly by pastoral and agropastoral societies, appear caught in a downward spiral of widespread poverty, recurrent risk of famine, physical insecurity fueling ethnic conflict, and environmental degradation (Hogg, 1980; Little, 1985a,b, 1994; Hogg, 1986; Horowitz and Little, 1987; Oba, 1987; Moris, 1988; Fratkin and Roth, 1990; UNSO 1994; Grepperud, 1996). The peoples of these regions face myriad risks but have only a limited—and in some cases increasingly ineffective—arsenal of mechanisms with which to manage these risks.

Macro-scale external factors such as drought, political instability, and macroeconomic imbalances have played large roles in exacerbating local vulnerability of households and communities to various shocks in the drier regions of East Africa (Franzel et al., 1989; Webb et al., 1992; Coppock, 1994). Meanwhile, interactions among internal factors such

> "While Sub-Saharan African's food self-sufficiency stood at 98 per cent in 1961, it had declined to 78 per cent by 1978 and the situation has not improved since then... In contrast to every other region of the world, per capita production has declined since the 1960s. It is estimated that 40 percent of the population of Sub-Saharan Africa (SSA) presently goes hungry, and that the figure will increase to 50 percent by the year 2000. SSA is today worse off nutritionally than it was 30 years ago and hunger and malnutrition remain rampant....
>
> ... special efforts are needed by international development partners to provide the necessary support to the commendable efforts and innovative strategies Africans themselves are devising to lay a solid foundation for sustainable development in the next millennium."
>
> United Nations Fact Sheet, prepared for World Food Summit, Rome, November 1996.

Figure 15: Crisis Mitigation: ASARECA Research and Training Needs



Source: ASARECA Workshop on Crisis Mitigation, 6-11 July 1997

as human population growth, livestock population growth, inadequate delivery of support services, and limited economic diversification have also caught many communities in East African rangelands in a sort of low-level equilibrium trap of a fragile and volatile existence (Bonfiglioli, 1992; Coppock, 1994; Little, 1994).

Regional Collaboration: Integration with ASARECA's Crisis Mitigation Program

The core of the East Africa program targets the pastoral and agropastoral societies in these arid and semi-arid regions of East Africa. Proposed activities will focus on increased early warning capacity, risk management through asset and income diversification, and balanced land use systems incorporating both livestock production and wildlife conservation. The international, interdisciplinary teams which comprise the program represent a broad spectrum of expertise and bring to the table the most recent advances in computer technology. Adaptation of spatial modeling tools to East Africa conditions for support of political and economic decision making, coupled with in-depth regional research and training, will significantly increase regional resources for crisis mitigation and development among these vulnerable populations.

In July 1997, a representative from three of the Small Ruminant/Global Livestock CRSP (SR/GL-CRSP) East Africa livestock projects participated in a workshop on Crisis Mitigation in Livestock Systems, sponsored by the Association for Strengthening Agricultural Research in East and Central Africa (ASARECA) and the International Livestock Research Institute (ILRI). The workshop brought together practitioners in livestock development to

identify problems and activities in the region and develop mechanisms for effective crisis intervention. A second purpose of the workshop was to strengthen ASARECA's proposal to USAID's Greater Horn of Africa (GHA) Initiative entitled "Crises Mitigation in Livestock Systems in the Greater Horn of Africa: From Relief to Development."

Three of the projects in the SR/GL-CRSP East Africa program tie directly into the themes of ASARECA's proposed research framework. Enhancement of early warning systems (P.T. Dyke, Texas A&M University System), development of strategies for coping with risk (D.L. Coppock, Utah State University), and better managed land use for livestock production and wildlife conservation (M.B. Coughenour, Colorado State University) are all priorities for livestock development in the East Africa region. With reference to pastoral systems, ASARECA's strategic plan (item 3.3.2) also calls for development of regional, national and local early warning systems, evaluation of risk management options, and resolution of conflicts over access and use of land and other resources.

The Role of Animal Agriculture in the Physical and Cognitive Development of Children

A second component of the East Africa program addresses food security, particularly of children, with respect to both the quantity and quality of food intake. Observational studies conducted by the Human Nutrition CRSP in Kenya, and elsewhere, have shown that children who consumed animal source foods (ASF) in their diet consistently grew better and scored higher on tests of cognitive function and school performance than those who ate little or no ASF. For optimal physical growth and cognitive development, children require diets

- Meat supply in Sub-Saharan Africa (SSA) declined from 10.5 to 9.5 kilograms per capita between 1967-71 and 1980-90. The average supply of meat for all developing countries for the same period increased from 10.5 to 16.4 kilograms.
- In the year 2010 the meat supply per capita for SSA is projected to be back up to only 10 kilograms, whereas the average for the developing world is expected to go up to 25 kilograms per capita in 2010.
- Per capita milk supply is SSA declined from 28.1 to 27.6 kilograms between 1969-70 and 1988-90. During the same period, average supply of milk for all developing countries went from 27.4 to 35.9 kilograms per capita.
- The projected milk consumption per capita for SSA in the year 2010 is expected to decline to 26 kilograms, against an increase to 42 kilograms for the average of all developing countries.

Mukherjee, T. [USAID Washington] 1995. Pers. comm.

that are adequate in calories as well as micronutrients, particularly iron, zinc, calcium, vitamins A and B_{12}. Modest amounts of ASF can supply these needed micronutrients in the most efficient and digestible way. However, the predominant diet in Eastern Africa consists mainly of cereals and/or starchy roots with high phytate and fiber which reduces bioavailability of iron and zinc.

A controlled feeding intervention study (C.G. Neumann, UCLA) will attempt to establish the effect of consumption of livestock products on human physical and cognitive development, followed by community interventions to increase the availability and utilization of ASF in resource poor households. It will also tie into other projects in the East Africa region enhancing their impact. Nutritional components in the East Africa projects, the nutritional component of the Latin America project, and the nutritional needs identified for Central Asia by participants at a recent in-region workshop sponsored by the International Centre for Agricultural Research in Dry Areas (ICARDA) combine to underscore the importance of studying nutritional impacts on humans. Results of these studies will have far-reaching implications for worldwide efforts to enhance diet quality and ameliorate malnutrition, particularly with respect to young children.

Building on 20 Years of History

The East Africa core program builds on a long, productive history of work in Kenya, including strong associations with ILRI and the Kenya Agricultural Research Institute (KARI). SR-CRSP institutional partnerships have included government involvement in vaccine production through the Kenya Veterinarian Vaccine Production Institute (KEVEVAPI); participation of KARI, the Ministry of Agriculture, Livestock Development and Marketing (MALDM), and the Ministry of Health in CRSP regionalization efforts; interaction with non-governmental organizations (NGOs) including Heifer Project International and FARM-Africa; and cooperation with private sector groups in the breeding and multiplication of the Kenya Dual Purpose Goat (KDPG). The human nutrition project builds on a long-term association with the Department of Pediatrics and Community Health at the University of Nairobi and with the Central Bureau of Statistics. Emerging collaborations between the SR/GL-CRSP and regional institutions, such as ASARECA, will further enhance CRSP access to policy makers, action agencies and private interests throughout the region.

East Africa Regional Workshop

A regional workshop was sponsored by the SR-CRSP, in collaboration with ASARECA, on January 29 - February 1, 1996, in Entebbe, Uganda. (see workshop agenda, appendix D) The purpose of the workshop was to identify and prioritize research problems which would establish the scope and definition of regional activities in the renewal period. Seven of the ten ASARECA member countries were represented: Burundi, Ethiopia, Eritrea, Kenya, Madagascar, Tanzania, and Uganda. Other participants included representatives from

East Africa Livestock Assessment Workshop Participants
Entebbe, Uganda 29 January - 1 February 1996

Augusta Abate
KARI, Kenya

Isaac Aluba
USAID, Uganda

Montague Demment
SR-CRSP, USA

Cyprian Ebong
NAARI, Uganda

Alemu Gebrewold
IAR, Ethiopia

Kamau Githaiga
Kenya Wildlife Service, Kenya

Mark Infield
African Wildlife Foundation, Uganda

G.H. Kiwuwa
Makerere University Uganda

Ernest Manirambona
ISABU, Burundi

Maynard Lugenja
Ministry of Agriculture Tanzania

S.M. Mbuza
Dept. of Animal Prod. & Marketing, Uganda

Steve Mihok
ICIPE, Kenya

Geoffrey Mrema
ASARECA, Uganda

John S. Mugerwa
NARO, Uganda

Suzanne Murphy
University of California, USA

Jean Ndikumana
ILRI, Kenya

Peter K. Ngategize
Uganda Coffee Dev. Authority Uganda

Moses Onim
Lagrotech Consultants, Kenya

Christie Peacock
FARM Africa, U.K.

Jhon Rasambainarivo
MRAD/ FOFIFA, Madagascar

Patterson Semenye
SR-CRSP, Kenya

Ralph von Kaufmann
ILRI, Ethiopia

international agricultural research centers (IARCs), national agricultural research systems (NARS), local universities, USAID, NGOs and the private sector.

The workshop began with a presentation by G. Mrema, Executive Secretary of ASARECA. The presentation was followed by 1) country presentations, describing livestock production systems and policies governing land use in each country represented; 2) resource presentations, with information on livestock production, wildlife/livestock interactions, human nutrition, and NGOs; and 3) research priority setting exercises. Priority setting workgroups were organized around the following themes: Human Nutrition; Livestock Production, Wildlife Interactions, and Environmental Conservation; and Animal Production for Economic Development. The workshop ended with a ranking by participants of livestock research priorities.

The Fielding of Assessment Teams and the Selection of Research Proposals

Problem models defined at the Entebbe Workshop served as the basis for a Request for Proposals (RFP). The RFP issued by the SR-CRSP Management Entity in June 1996 called

East Africa Livestock Assessment Workshop:
Ranking by Workshop Participants

Ranking for SR-CRSP	Priority Problem Models	Ranking for ASARECA
1	•Ensuring food security and development needs of resource poor households	1
3	•Improving the ability of pastoral people to cope with and recover from drought	2
4	•Establishing enabling policy environment	3
2	•Identify and evaluate practical methods to increase animal products in children's diets	4
5, 6	•Matching livestock genotypes to ecological and economic environments	5
5, 6	•Improving input and output markets	6
9	•Conserving forage and browse plant and livestock biodiversity	8
7	•Optimising land use and natural resource conservation by integrating domestic and wild animal species	9
10	•Livestock/Wildlife Production Systems	10
8	•Livestock/Wildlife Policy	7

for the formation of assessment teams to conduct in-region investigations of specific research problem models. As a result of this competition, five assessment teams were funded to work over a period of nine months. Through an iterative process of research problem refinement and extensive region-wide team building, assessment teams developed full proposals to submit in a second competition. Four of the five funded East Africa assessment teams were selected to continue at the full proposal level.

Team members of the four successful projects then participated in an Orientation and Regional Coordination Workshop held at UC Davis on October 23-25, 1997. The aim of this meeting was to coordinate efforts between teams, to provide for regional administration, and to collaborate in formulating the global and regional plans for the CRSP renewal. The East Africa plan represents a remarkably comprehensive and cohesive program, with extensive regional participation. It addresses nearly all of the items identified as priority issues at the Entebbe workshop. In particular it targets the three research areas of highest priority: 1) assured food security and development initiatives for resource poor households; 2) improved diets for children; and 3) enhanced ability of pastoral communities to cope with and recover from drought.

EARLY WARNING SYSTEM FOR MONITORING NUTRITION AND LIVESTOCK HEALTH FOR FOOD SECURITY OF HUMANS IN EAST AFRICA

Principal Investigator: **Dr. Paul T. Dyke, Texas A&M University System**

PROJECT GOAL: To establish a capacity to more effectively monitor and predict famine for East Africa that provides more timely information to policy makers and international monitoring programs to evaluate alternative mitigation strategies and more appropriate livestock interventions.

OBJECTIVE 1: To create an effective methodology that integrates new tools for early famine warning into a system that will detect changes in the state of livestock in order to more effectively predict ecological perturbations.

OBJECTIVE 2: To develop a network of collaborators to implement a full-scale livestock early warning system in order to more effectively respond to ecological perturbations in East Africa.

A variety of programs have been initiated by donor organizations to reduce the risk of pastoralists in East Africa, among them USAID's Famine Early Warning System (FEWS). The current set of weather and remote sensing information generated by donor-based monitoring programs offers information on locations of "initiating conditions" while the on-ground monitoring programs of markets, human condition and animal herd situations reflect, mainly, "post-effect" appraisal systems. This project aims to develop a monitoring and analysis system which will bridge these two types of programs. The projected new system, based on NIRS livestock fecal profiling technology and spatially referenced modeling of emerging forage/crop conditions, can add a new dimension to the existing monitoring programs in East Africa. The ability to predict responses, such as impending livestock mortality by kind and class of animal, losses in forage supply and decline in milk production, allows more flexibility in decision making from the household level to the policy maker. The timely provision of this kind of information will facilitate the identification of mitigation strategies to enable pastoralists to cope with risk and will help to assure sustainable development through maintenance of ecosystem integrity.

PROBLEM MODEL

Due to unpredictable weather, expansion of human populations and changes in land use policies, famine and food insecurity in East Africa have become endemic. The scope for improving food security, however, is limited by environmental conditions. Inter-annual variability of rainfall has been increasing continually and, in certain areas, the probability of drought has risen from one in six years to one in three years. High variability in precipitation

along with frequent occurrences of drought have severely reduced the ability of livestock producers to retain their assets. This trend has been especially critical for pastoralists, whose well-being is determined almost entirely by the survival of their livestock.

During periods of crisis, curtailment of mobility and emerging market bottlenecks cause livestock prices to fall, often disastrously, resulting in severe losses through destocking. When livestock producers are prepared to restock, livestock prices are rising rapidly, causing additional losses in total assets. The impact of this dynamic on those in affected areas has been decreasing food security, loss of purchasing power and, in some cases, livestock enterprise failures. Meanwhile, ill-conceived policies intended to alleviate these circumstances have led to adoption of inappropriate short-term practices with negative long-term consequences, such as environmental degradation. This trend has put pastoralists at continual risk and has fostered East African dependence on international relief.

The TAMUS project seeks to establish the methodologies, analytical tools, organizational links and infrastructure needed to develop a system for monitoring livestock nutrition and health as an integral part of existing early warning systems. The aim of the proposed system is to provide more timely information to decision-makers at all levels, from community-based groups to national policy-making entities and international monitoring programs. By enhancing the capability of existing early warning programs (e.g. USAID FEWS, NOAH-USGS, FAO-GIEWS, NARS and ASARECA members programs) and providing extensive information for the evaluation of alternative mitigation strategies, agencies at various levels will be better placed to implement appropriate livestock interventions.

> "The Texas A&M proposal is expected to provide a strong scientific foundation to the [ASARECA regional proposal] "Crisis Mitigation in Livestock Systems," contributing to [the establishment of] an operational early warning system to detect impending crises affecting pastoralists in the Greater Horn of Africa region."
>
> Jean Ndikumana, Coordinator, ASARECA
> Animal Agriculture Research Network.

The analytical capacity of technologies TAMUS researchers bring to the table, combined with the robust network of professionals and organizations in East Africa, provide a rich foundation for research and development efforts. Participatory planning at three meetings in East Africa produced the following objectives for project operation:

1) The project will integrate livestock early warning tools into a cohesive spatial modeling methodology and demonstrate its effectiveness for East Africa (and possibly other areas of the world).

2) The project will develop a network of collaborators and partners to implement a full-scale Early Warning Livestock and Food Security program for East Africa.

> "The proposed Livestock Early Warning System ... is a welcome development in enhancing the effectiveness and timeliness of early warning activities. It is particularly important because the welfare of livestock in drought-prone areas is directly related to the food security situation of the population concerned. Moreover, since the five-country region in East Africa to which the programme is directed ... is one of the most vulnerable areas in sub-Saharan Africa, it makes the programme a worthwhile activity."
>
> Abdur Rashid, Chief, Global Information and Early Warning Service Commodities and Trade Division, FAO.

Based on NIRS fecal profiling technology developed by Texas Agricultural Experiment Station (TAES) scientists, the proposed system will evaluate the dietary protein/energy status of free-ranging cattle, sheep and goats on grazing lands throughout the region. Information from geo-referenced fecal profiles, along with livestock population surveys and continuous 10-day weather datasets, will provide a foundation dataset for creation of a meta-modeling system. The system will include modeling of livestock nutrition, livestock production and plant growth, and mixed farming crop systems. The NUTBAL nutritional decision support tool and forage and crop production information from the PHYGROW and APEX models (see description of tools below) will allow practitioners to project changes in animal/forage balance.

Fecal sampling combined with use of a GIS-based Spatial Characterization Tool (SCT) will produce spatially explicit analyses of diet quality, body condition and protein/energy balance of livestock. This capacity will enable trends in livestock condition (e.g., weight, mortality, milk, reproduction), forage supply, and crop stability to be identified earlier than is possible with current monitoring systems. Community-based drought preparedness coordinators at the Crisis Mitigation Workshop in Kenya, July 7-11 1997 (e.g. Drought Preparedness Project-Isiolo District Kenya, Drought and Livestock Project in Marsabit District-Kenya, Turkana District Drought Monitoring Group and Early Warning System for East Africa-Food and Agriculture Organization, U.N.) indicated that the proposed tools would provide an additional 6-8 weeks lead time on current early warning systems in East Africa. Improved response time can facilitate timely interventions to enable pastoralists to maintain their assets or to recover them more rapidly. Spatial information on trends of livestock well-being will also enable more rational decision making for crisis mitigation. At the same time, spatial modeling can help to maintain ecosystem integrity. These analyses, made available through current early warning communication channels, will add a new dimension to existing monitoring programs. They will enhance the ability of action agencies to respond to crisis and augment the capability of ASARECA to identify mitigation strategies for further research.

Effective prevention requires the ability to foresee, prepare for, and mitigate crisis. It requires monitoring and analytical capacity at local, national and regional levels, as well as the ability to respond immediately to warning signs. Many livestock changes (e.g. weight loss, body condition loss) have already occurred before the human eye can detect them,

regardless of the level of personal experience. Human indicators such as the upper arm diameter of children under five years or cereal/meat consumption ratios offer even more delayed monitoring. The proposed monitoring and analysis system will have the capacity to detect changes in the well-being of free-ranging livestock earlier than normally detected by pastoralists or crisis monitoring organizations. The adaptation of TAMUS technologies to East African conditions will provide high-quality information which will significantly increase response time to emerging crises and the capacity of regional institutions to respond.

Analytical Tools

A series of tools developed at the TAES will be integrated into existing early warning systems to provide more timely and better quality information to pastoralists, action agencies, researchers and policy makers.

1) NIRS/NUTBAL-Nutritional Management System

Although NIRS technology has been used extensively in agriculture to directly detect nutritional quality of hand-plucked forage species, this research program utilizes a new technique developed by the Ranching Systems Group at Texas A&M University. It predicts dietary concentration of protein and digestible organic matter from the spectral characteristics of feces which, in turn, reflect the end products of the digestive process; that is, the technology allows determination of diets selected by the animal under their unique forage conditions. At issue in formulating this project's proposal has been the transferability of the technology to African conditions. The question has been whether predictions would be accurate for the new environment. Preliminary studies have shown that the technology in its current form is adequate for use in East Africa, but it will need to be further developed as new conditions arise.

2) SCT-Spatial Characterization Tool

SCT represents a multi-scale, multidisciplinary integrating tool, providing capabilities for decision makers (from scientists to managers) to efficiently tap the potential arising from the integration of spatial data which thus creates spatial information. To date, the SCT has been used by scientists of the Consultative Group on International Agricultural Research (CGIAR), tropical disease researchers, the WMO, the Seeds of Hope II project, the disaster mitigation arm of USAID, the Rockefeller Foundation, the World Resource Institute, and Chemonics Inc., among others. Their feedback continues to motivate development of the database, improvement of analytic capabilities, and creation of user-friendly interface/access tools.

3) PHYGROW-Hydrologic-based Plant Growth/Runoff/Herbivore Simulation Model

PHYGROW is a hydrologic-based model used to predict rangeland forage production, runoff and herbivore grazing in rangeland ecosystems. The system simulates complex forage resources representing a wide array of forage species (point or spatially referenced) growing in complex soil catena, impacted by daily weather and functioning with multiple species of grazing animals which graze the landscapes in a selective manner. The model is sensitive to animal selectivity of plant species and translates these processes into animal production in terms of stocking rates. It is an object-oriented design model and, therefore, is well suited to link efficiently to the other models in the meta-modeling toolbox.

4) APEX-Agricultural Policy Environment Extender

APEX (Williams 1994, Kiniry et al. 1992) is a crop/agro-forestry simulation model which will be used to predict crop yields, runoff and erosion from cropland. The system allows depiction of multi-crop simulations, such as in agro-forestry or inter-cropping situations. APEX is built on the foundation of the EPIC model (Williams et al. 1984) for which the IIML has been instrumental in refining and supporting over the years.

5) Weather Data, NDVI and ENSO

Decadal weather data (10-day) from the FEWS data dissemination system, along with the El Niño and Southern Oscillation ENSO data from the NOAA Climate Prediction Center, will be spatially linked with the PHYGROW and APEX models to predict emerging forage/crop conditions and, likely, future conditions of forage supply and grain yields relative to known livestock density and planting dates within monitoring areas. ENSO geo-statistics will be used as a mechanism to improve short-range weather projections for the models. The International Center for Research in Agroforestry (ICRAF) will work with the group to relate NDVI pattern analysis with the NIRS fecal profiling predictions as a mechanism to predict status of livestock and forage in non-monitored areas.

Development of Spatial Sampling Framework

At three planning workshops consensus was reached on how to establish a methodology for spatial characterization that would allow for efficient use of funds. Criteria for derivation of effective environments, sample site characterization variables, and appropriate organizational links for information flow were agreed upon by in-country teams. Considerable discussion emerged with respect to critical information needed for each site, location and effective environment.

Validation Sites and Verification Process

Given the limited testing of the technologies to be integrated within existing early warning systems, there is a need for well-placed field validation and response verification sites. At least one validation site will be selected for each country. Intensive monitoring of vegetation and livestock responses will be measured on a frequent basis using the NARS networks of research officers in the project. Predicted outcomes in terms of animal body condition, forage supply and other supporting indicators will be compared to measured variables to ascertain the robustness of predictions and areas for modification.

Rapid deployment criteria will also be established to verify predicted conditions when monitoring systems are providing early indications of an emerging crisis situation. Rapid deployment teams will be comprised of a NARS officer on the team and local groups involved in monitoring site networks. Several of the local drought preparedness monitoring teams in operation have rapid assessment teams working under similar guidelines. These teams are essential elements of the verification process.

Information Flow and In-Country Organization Linkages

Team members from each country constructed an information flowchart for national governmental organizations that would disseminate early warning information to critical policy makers. The process revealed the uniqueness of information flow in various countries. In the initial phase of project implementation, detailed information on key organizations and communication infrastructure for each country where the project has a base of operations will be collected, from pastoral community-based monitoring programs to national policy making bodies. A preliminary assessment of various local systems and the Intergovernmental Agency for Development (IGAD)'s linkages to appropriate ministries suggests that an effective communication network for reaching responsible decision makers in each country can be established.

GEOGRAPHIC SCOPE

Through a consortium of scientists in ASARECA and ILRI, university professors, NGO staff, and regional pastoral monitoring organizations, a hierarchical network will be established in Eritrea, Ethiopia, Uganda, Kenya and Tanzania. A series of in-country core teams have been formed to help design a regional classification system which will allow spatial representation. Selected criteria will be used to define effective environments (i.e., areas with homogeneous characteristics), sampling locations and monitoring sites. Sampling routes and sites will be set up based on 1) accessibility, 2) institutional infrastructure (e.g., monitoring programs, NGO/PVO activities), 3) governmental infrastructure (e.g., universities, extension offices and experiment stations), 4) degree of pastoral community-based activity, and 5) security risks to samplers.

RESEARCH TEAM

The managerial structure of the project is based on a core group comprised of U.S. team members and an in-country coordinator for each country of operations. U.S. team members include P.T. Dyke, J.W. Stuth, J.D. Corbett, and J.R. Williams, all of Texas A&M University System. In-country members of the research team core are P. Osuji (Ethiopia), B. Kiflewahid (Eritrea), C. Ebong (Uganda), W. Mnene (Kenya), and N. Urio (Tanzania).

In addition, there are thirteen study areas in five countries, with a location coordinator for each area. Study site coordinators will form the in-country teams. Members of these teams are B. Kiflewahid and G. Asghedom (Eritrea); P. Osuji, G. Berhane, Z. Sileshi, A.T. Kumsa, A. Tegegne and V. Umunna (Ethiopia); W. Mnene, F. Wandera, and R. Shavulimo (Kenya); C. Ebong and F. Bareeba (Uganda); and N. Urio, A. Mwilawa, S.N. Bitende and R. Kidunda (Tanzania).

Integration with NARS scientists has assured collaborative research problem development and communication links between the project and ASARECA, the regional research decision-making body for East Africa. Cooperative undertakings will also link the project with ILRI-Debre Zeit, ILRI-Nairobi and ICRAF-Nairobi. Locally, location coordinators will establish working relationships with organizations that have established monitoring and reporting mechanisms for drought and crisis. In East Africa, there is a wide variety of resources for collective action, including governmental research and extension organizations, NGOs, PVOs and international relief organizations. Linkages with critical organizations at all levels in the decision-making environment will facilitate crisis mitigation.

TRAINING PLAN

Graduate training for S. Ossiya, a Ph.D. student from Uganda, who is being funded by a World Bank/NARO (National Agricultural Research Organization) program and the Rockefeller African Intern program, will continue. She will complete her program at Texas A&M University in December 1998 and will join the project's research team in Uganda. A research technician from ILRI-Debre Zeit will be trained at GAN Lab at Texas A&M University for 3-4 weeks in early 1998 in the use of the NIRS system, lab management and development of calibration equations. Finally, the field research activities of G. Berhane, a Ph.D. student from the Agricultural University of Norway will be supported. Berhane will be returning to Ethiopia to complete his research program and will focus on issues of goat nutrition needed to improve predictions of weight change in mature goats on grazinglands.

A series of regional level training workshops will be held for team members, including a GIS-Nutrition workshop in Nairobi November 17-21, 1997. In addition, a series of in-country spatial characterization training sessions will be conducted by John Corbett for each in-country team.

WOMEN AND GENDER COMPONENT

Although the project on drought early warning has direct impact on the lives of women the emphasis of the project is in the implementation of the system. In this regard a considerable number of women are involved. The program has six female scientists/ technicians directly involved in the livestock early warning system project. Three are zone coordinators, one is a science advisor and the other two are site managers.

In Uganda, Sarah Ossiya PHD Student is part of a NARO training program funded by World bank and is studying at Texas A&M. She is conducting diet fecal pair analysis in ILRI-Debre Zeit. Sarah is designated to setup and operate the NIRS Lab in Uganda in 98-99. Grace Ebiyau is the site assistant for management and has been a member of the team from the beginning. Dr. Emily Twinsamasiko will coordinate a sampling zone in Uganda. She is national research coordinator for vet medicine and animal health. In Tanzania, Stella Bitende is the Arusha Zone Coordinator. Stella is moving to Arusha to become the Zone Coordinator for Northern Tanzania. Margaret Kingamkono is Site Assistant to Stella Bitende. In Ethiopia, Zinash Sileshi, Animal Scientist, will be our zone coordinator for the Holetta region and assist in overall countrywide coordination in Ethiopia. A NIRS lab is scheduled at her research location by year 4 of the project where she will take over coordination of that laboratory.

The LEWS program is designed to be sensitive to types of livestock and sources of feed. In many of the geographic areas encompassed by the program, livestock ownership and management is a gender issue with females owning and having access to income from small livestock and chickens while the males control the larger animals. The program will address gender issues as they relate to these and other socio-economics practices.

ANTICIPATED IMPACT

A comprehensive and broad-based early warning system will provide pastoralists with greater perspective on risk, more adequate lead time, and the benefit of policies based on rational choices. A monitoring system with extensive organizational linkages will be an effective implement for crisis intervention. Improved organizational responsiveness will reduce time lost by delayed decision making and increase impact on economic stability and maintenance of ecosystem integrity. An environment richer in information will help to break the accelerating cycle of relief and shift the region back into a development mode. Reduced risk will allow pursuit of practices which improve efficiency of production and this, in turn, will lead to a higher standard of living.

The capacity to integrate on-the-ground monitoring technologies with spatially explicit analyses of rangeland landscape processes and human conditions, under specific conditions at given points in time, will be the basis upon which such an early warning system will be built. A comprehensive set of tools have been developed which can be integrated into on-the-ground monitoring systems to provide pastoralists and policy makers with timely

information. No other research team in the world can provide this technology and package it such that it is appropriate to East African conditions. Connectivity of policy makers, researchers, extension workers and users of the land is crucial to the effectiveness of information at all levels.

BENEFITS TO THE U.S.

The technologies developed in the course of this project will be directly transferable to U.S. rangelands. The new emerging Grazing Lands Conservation Initiative (GLCI) will be a direct beneficiary of the project, since the technology developed can be adopted by USDA-Natural Resource Conservation Service (NRCS) for application nationwide. This technology would reduce drought- and market-induced risk to U.S. livestock producers, while at the same time increasing efficiencies. These benefits are consistent with the objectives of the new Farm Bill and the Funds for Rural America program.

A technology package designed for East Africa would also address rangeland health issues in the United States. The technology has potential for establishing regional stocking advisory systems. It might also provide a framework for a remote client monitoring system for feedback to technical advisors (public, private, and corporate). Finally, access to such a technology package would significantly contribute to science education programs for rural America.

"The technologies developed for fecal profiling have been an integral part of our national nutritional management program, and to date, NRCS has committed or will shortly commit over $200,000 to work with over 500 producers nationwide in 42 states. The NIRS/NUTBAL nutritional management system mentioned in the proposal is an integral part of our national strategy to help producers understand the relationship between their management decisions and the consequences expressed in the nutrition of the animal.

"We are particularly supportive of the proposed integration of the nutritional management system with the PHYGROW simulation model, as this is an area we have been wanting to explore more with the Ranching Systems Group at Texas A & M University. The innovation in use of large scale modeling on rangelands to devise more user friendly decision support systems is of particular interest to our Institute. We are committed to providing support when resources allow to keep both the NIRS/NUTBAL technology moving forward and assist in new innovations that lead to improved monitoring and prediction of emerging crisis situations for the ranching industry in the U.S."

Rhett H. Johnson, Director, Natural Resources Conservation Service, USDA.

Table 2: Livestock Early Warning System, Goals and Objectives Matrix

Project Goal: *To establish a capacity to more effectively monitor and predict famine for East Africa that provides more timely information to policy makers and international monitoring programs to evaluate alternative mitigation strategies and more appropriate livestock interventions.*				
Objectives	**Research Outputs**	**Developmental Impacts**	**REDSO Strategic Objectives Intermediate Results**	**AID Strategic Objectives Intermediate Results**
1. To create an effective methodology that integrates new tools for early famine warning into a system that will detect changes in the state of livestock in order to more effectively predict ecological perturbations.	1. Produce model and spatial analysis tools as the basis for the overall system of early warning which allows the integration of weather, fecal analysis and plant response.	1. Improved allocation of resources in policy organizations using the LEWS tools.	6.1 Strengthened African capacities to respond to crises.	2.4 An information system established to enhance decision making for the agricultural sector developed and adopted.
	2. Integration of livestock and grazingland health information to create early warning tools that are tested and verified.	2. Improved response to drought by pastoralists using LEWS.	6.2 Reduced reliance on external assistance through enhanced target population.	2.3 Technologies, policies and practices that enhance the long-tern conservation of natural resources developed and adopted.
2. To develop a network of collaborators to implement a full-scale livestock early warning system in order to more effectively respond to ecological perturbations in East Africa.	1. An operational team of trained scientists, researchers, and data collection personnel with the scientific understanding and timely information established to make timely statements about the livestock and feed situation in the region.	1. An increase in use by policy makers, NGOs, and disaster management/mitigation personnel of LEWS generated information to make decision that will reduce livestock death losses due to drought.	6.3 Strengthened capacities to support good governance.	2.4 An information system established to enhance decision making for the agricultural sector developed and adopted.
	2. An improved understanding by the scientific and development community of the animal/ environmental interactions on semi-arid systems of East Africa to improve future management of these complex fragile ecosystems.	2. An improvement in pastoral practices as a result of the timely flow of information back to the livestock owners that increase household welfare.	1.2 Enabling environment for private sector led regional growth improved.	2.3 Technologies, policies and practices that enhance the long-tern conservation of natural resources developed and adopted.

Table 3: Livestock Early Warning System, Team Composition Matrix

Team Member Name	Affiliation	Role/Discipline	Nationality/Residence
Asghedom, Goitom Lecturer	University of Asmara, Dept. of Animal Science, Asmara, Eritrea	Animal Science	Eritrea
Bareeba, Felix Professor and Head	Makerere University Dept. of Animal Science, Kampala, Uganda	Animal Science	Ethiopia
Berhane, Gebre Ph.D., Head of Department	Mekelle University College Dept. of Animal and Range Science Mekelle, Ethiopia	Animal and Range Management	Tanzania
Bitende, Stell Niyikiza Scientist	Ministry of Agriculture, Livestock Research Centre, Tanga, Tanzania	Forage Scientist	Tanzania
Cheruiyot, Henry Associate Director for Rangeland Research	Kenya Agriculture Research Institution, Nairobi, Kenya	Range Research	Tanzania
Corbett, John Ph.D.	Texas A&M University - IIML -Blackland Research Center, College Station, TX	Spatial Data Leader/ Agricultural Geographer	American/USA
Dyke, Paul Ph.D.	Texas A&M University - IIML -Blackland Research Center, College Station, TX	Agricultural economist, Cropping systems modeling	American/USA
Ebong, Cyprian Ph.D, Director of Livestock Research	Namulonge Research Institute NARO Livestock Dept., Kampala, Uganda	Livestock Production/ Range Management	American/USA
Hamlett, Peggy Development Practitioner	Texas A&M University International Agriculture Development, College Station, TX	Development Practitioner	American/USA
Kidunda, Rashid Professor	Sokoine University, Dept. of Animal Science and Production, Morogoro, Tanzania	Rangeland Ecologist	Tanzania
Kiflewahid, Berhane Dean	University of Asmara, Faculty of Agriculture & Aquatic Sciences, Asmara, Eritrea	Agriculture and Aquatic Sciences	Eritrea
Kruska, Russell GIS	International Livestock Research Institute Nairobi, Kenya	GIS/Remote Sensing	American
Kumsa, Ato Tesfaye Ph.D.	Holetta Research Centre, Institute of Agricultural Research, Addis Ababa, Ethiopia	Animal Production/ Range Management	Ethiopia
Mnene, William Coordinator	KARI, National Rangeland Research Center Kiboko, Kenya	In-Country Coordinator/ Rangeland Management	Kenya

Team Member Name	Affiliation	Role/Discipline	Nationality/Residence
Mwilawa, Angelo Research Officer	Livestock Production Research Institute (LPRI), Mpwapwa, Tanzania	Animal Production/ Range Management	Kenya
Ndikumana, Jean AARNET Coordinator	International Livestock Research Institute (ILRI), Nairobi, Kenya	ASARECA Animal Agriculture Research Network (AARNET) Coordinator	Kenya
Ossiya, Sara Ph.D. Cadidate	Serere Research Station Serere, Uganda	Range Scientist	Uganda
Osuji, Paschal Ph.D., Animal Scientist	International Livestock Research Institute (ILRI), Debre Zeit and Addis Ababa, Ethiopia	In-Country Coordinator/ Animal Nutritionist	Ethiopia
Shivairo, Robert S. Professor	Egerton University, Dept. of Animal Health, Nairobi, Kenya	Veterinarian	Kenya
Sileshi, Zinash Ph.D.	Holetta Research Center, Institute of Agricultural Research, Addis Ababa, Ethiopia	Animal Production/ Range Management	Ethiopia
Stuth, Jerry W. Professor, Range Animal Nutritionist	Texas A&M University - RSG - Dept. Rangeland Ecology and Management, College Station, TX	Site Collection Leader/ Range Animal Nutritionist	American/USA
Tegegne, Azage Ph.D., Animal Scientist	International Livestock Research Institute (ILRI), Debre Zeit, Ethiopia	Livestock/Range Management	Ethiopia
Umunna, Victor Ph.D., Animal Scientist	International Livestock Research Institute (ILRI) Debre Zeit, Ethiopia	Animal Scientist	Ethiopia
Urio, Ndelilio Ph.D., Head of Department	Sokoine University, Animal Science Dept., Morogoro, Tanzania	In-Country Coordinator/ Animal Scientist	Tanzania
Wandera, Foustine P. Ph.D., Livestock Researcher Officer	Kenya Agriculture Research Institute (KARI), Machakos, Kenya	Site Coordinator/ Animal Production	Kenya
Williams, Jimmy Agricultural Engineer	Texas A&M University - IIML - Blackland Research Center, College Station, TX	Cropping Systems Modeler	American/USA

IMPROVING PASTORAL RISK MANAGEMENT ON EAST AFRICAN RANGELANDS

Principal Investigator: **Dr. D. Layne Coppock, Utah State University**

PROJECT GOAL: To improve the well-being of East African pastoralists by enhancing their capacity for risk management using four tactics: asset diversification, income diversification, improved use of information, and access to external resources.

OBJECTIVE 1: Determine the scope and cause(s) of local variation in risk-management needs among pastoral communities, households, and individuals.

OBJECTIVE 2: Determine how local risk-management needs can be met by improving four regional or sub-regional support systems: marketing, rural finance, natural resource tenure, and public service delivery.

The basic tenet of this project is that the nature, intensity, and frequency of shocks that threaten pastoralists have recently changed in ways that seriously impede pastoral system function and rural development. Pastoral risk management may be improved through context-sensitive combinations of traditional and novel interventions aimed at facilitating asset and income diversification, enhancing information flow and use, and increasing access to external resources. The goal is to identify appropriate interventions at different levels—from the individual to the marketing eco-region as a whole—to improve risk management and thereby mitigate poverty, improve food security, enhance animal production, reduce environmental degradation, and contribute to regional economic development.

PROBLEM MODEL

East African pastoral communities are subject to a variety of exogenous shocks, some of which are quantifiable (i.e. cause risk), others of which are not quantifiable (i.e. cause uncertainty). Risk and uncertainty seem to have risen markedly since the 1960s. Key sources of shocks include variation in climate, range fodder growth and market prices for livestock and grains, as well as declines in access to land, public services delivery and physical security. All are exacerbated by population growth of people and livestock; pastoral communities, households and individuals are therefore differentially vulnerable to mixes of shocks. Moreover, the multivariate stochasticity of the decision-making environment leads to a variety of mitigation (ex ante) and coping (ex post) behaviors (Alderman and Paxson, 1992). Pastoralist communities have many traditional means of mitigating and, especially, coping with risk and uncertainty, notably spatial mobility, social reciprocity networks, and diversification of activities and species (Reardon et al., 1988; Binswanger and McIntire,

1987). Nevertheless, traditional mechanisms for managing risk are increasingly inaccessible or overridden by external forces including aid.

There are three broad means by which pastoral groups mitigate or cope with risk and uncertainty: (a) increased access to information; (b) diversification of assets and income; and (c) increased access to external resources. Timely and reliable information—including forecasts—permits reduction in temporal risk associated with market prices, climate patterns, livestock disease outbreaks, etc. The principle underpinning asset and income diversification

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"... the proposal is realistic and addresses a crucial issue compromising food security in the GHA Region: economic diversification."

Joao S. de Queiroz, USAID/REDSO/ESA.

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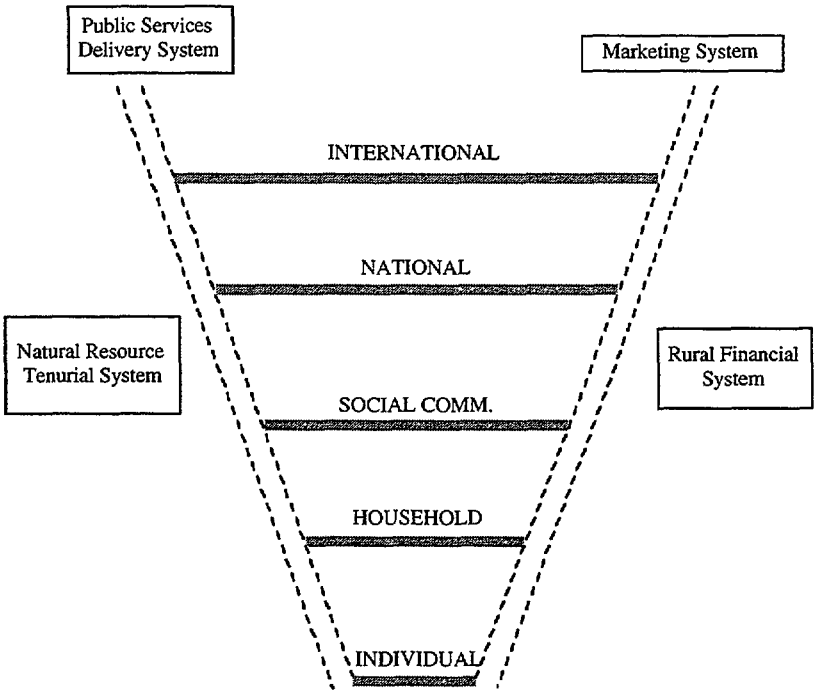
strategies is to reduce the variability of aggregate income or wealth by selecting a portfolio of activities and investments that are weakly (better yet, negatively) correlated. Thus, pastoralists might invest in the health and education of their children in order to improve their wage earning abilities and thereby reduce family dependence on livestock returns. Other relevant means of diversification might include "cashing out" some livestock into financial assets, gathering and selling natural products (e.g., honey, gum arabic, etc), diversifying livestock species, producing handicrafts, microenterprise activities, or revenue sharing from ecotourism. External financial and natural resources not only permit coping with unanticipated calamities—as in the cases of relief aid or dry season encroachment on grazing and watering areas—but also facilitate risk mitigation through preemptive investment, e.g., bush control to reclaim grazing lands, improved water delivery, or economic diversification.

"The emphasis on alternative investment strategies to improve animal production systems is very timely for the emerging demographic and crisis mitigation issues in the pastoral regions of East Africa."

Hank Fitzhugh, Director General, ILRI.

Four general, enabling systems show promise for facilitating risk management in East African rangelands by expanding diversification opportunities, information, and external resource availability: livestock marketing systems, rural finance systems, natural resource (land and water) tenurial systems, and public services (e.g. education, animal and human health, communications and transportation) delivery systems. These complementary systems may be seen as natural means by which to help stabilize the region's livestock cycles and productivity, increase self-reliance, improve biological and economic efficiency, reduce conflict, seize upside potential offered by external shocks and avert much downside risk.

Figure 16: Conceptual diagram of a hierarchy of spatial/human organizational factors as cross-cut by four enabling systems.



Especially in the wake of dramatic economic and political reform throughout the region, considerable changes are already taking place. This project seeks to identify and facilitate optimal intervention strategies specific to individuals (e.g., women and children), households (e.g., small herders, laborers without land or animals), communities (e.g., moderate potential settlements with little present economic diversification), subregions, and the study area in aggregate. Because risk is experienced and managed at multiple levels of analysis—individual, household, community, subregion, region—and because action agencies (GOs, NGOs) work at these different levels, a hierarchical approach is adopted to integrate research and outreach from micro to macro scales and, ultimately, to model the system for policy analysis (See Figure 16).

Vision Statement

The hypothesis that multifactorial stress lies at the heart of contemporary challenges in the East African rangelands has been widely endorsed. Most front-line development organizations and pastoral survey respondents contacted strongly confirm (1) the conceptual model of increasing system instability—crashes of pastoral livestock populations occurring with greater frequency and severity than in the past—and declining pastoral welfare, for a variety of reasons, and (2) the need for improved "enabling systems"—finance, marketing, resource tenure, public services delivery—to help mitigate this situation.

An integrative vision statement for this problem setting is set out below:

The cornerstone of a strategy among the Boran of southern Ethiopia is livestock asset diversification into non-traditional forms. This process involves modifying household-level investment patterns away from unbridled reinvestment in livestock, regardless of stocking rate, into hedging activities contingent on stocking rate and other production and market information. Reasonably widely adopted, such hedging behavior would likely yield a more conservative, but still opportunistic, range of stocking rates, minimizing animal mortality and thereby stabilizing the "boom and bust" cattle cycle by extending the period between herd crashes and reducing the amplitude of these swings. This system transformation should likewise reduce the variability of animal marketing throughput, thereby encouraging demand for private investment favorable to sustaining efficient marketing channels as well as increasing the supply of loanable funds available to finance such investment. Induced improvements to the marketing channel can help stabilize livestock and grain prices, further benefiting the community, not only those who divest (partially) of livestock, but all those who buy or sell through markets. More conservative stocking rates could also mitigate environmental degradation brought on by overgrazing and help improve security of land tenure and

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"... establishing a rural finance system will fill an important gap."
Nick Maunder, East Africa Regional Field Representative,
USAID, Famine Early Warning System (FEWS).

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territoriality. Increased local supply of loanable funds in the financial system could also permit private investment in (non-profit or for-profit) public services provision as the national government's presence declines. Investment in education and animal and human health, both on a personal and community basis, could significantly improve human well-being and system sustainability. Public works projects financed out of local savings might also permit high rate-of-return projects for land restoration, reclamation, or water development. They could also flow back as credit for herd rebuilding and affect destitute former pastoralists living near settlements, both in terms of restocking and job creation in settlements. Asset diversification through local finance appears likely in this setting to initiate a virtuous cycle of improved risk management, food security, human and environmental well-being.

Central Hypothesis

The overarching theme of pastoral systems under increasing pressure, with diminishing capacity to manage this stress through traditional means, and growing grass roots demand for supplementary risk management mechanisms—especially through marketing and financial systems, tenurial institutions and public services provision—has survived intense scrutiny by scholars, development practitioners, prospective end-users, and beneficiaries. The project's research and outreach plans are organized around the following central hypothesis:

> *Improved capacity to mitigate risk and uncertainty at individual, household, community, and regional levels will improve the well-being of pastoral peoples and the quality of the natural and social environments on which they depend.*

The core challenges behind this hypothesis are (1) to identify the nature and magnitude of the risks faced by different individuals, households, communities, and other strata and (2) to facilitate policies and programs appropriate to specific contexts through articulation of optimal intervention selection criteria. Constraints to enhanced risk management vary according to culture, social structure, resource endowments, sources of risk and uncertainty, and different scales of space and time. Communities, households and individuals are differentially vulnerable. Appropriate risk management is therefore context-specific.

Research Plan

Research design is interdisciplinary and problem-oriented. Issues have been defined for investigation by interdisciplinary subgroups of team members. These issues are subsets in a hierarchy that nests research questions according to eco-physical (e.g., region, subregion) and human scales (e.g., nations, social communities, households, and individuals). Key enabling systems are then studied at their intersection with each level in the hierarchy. This will facilitate integrated research and outreach on a micro-to-macro continuum.

Outreach Plan

Action agencies consulted agreed that pastoral risk management is crucial, and many are already involved in extending some sort of risk-management activity. The project proposes to serve as a facilitating network to assist local action agencies to refine and deliver comprehensive risk-management packages. In general, risk-management outreach can be categorized into four themes, namely (1) helping pastoralists better cope with acute stress (i.e., short-term crisis early warning and response strategies); (2) helping pastoralists better mitigate future stress over the medium-term (i.e., efforts to avert crisis before it occurs, including livestock species diversification, pilot cash savings schemes, improved market information, etc.); (3) helping pastoralists better mitigate future stress over the longer-term

(i.e., efforts to address underlying problems of land loss and need for education to facilitate out-migration of pastoralists); and (4) helping former pastoralists in towns rehabilitate themselves (i.e., this commonly involves income diversification and re-stocking).

GEOGRAPHIC SCOPE

The study area constitutes one intact ecological and livestock marketing region in northern Kenya and southern Ethiopia. It contains arid and semi-arid ecosystems occupied by ten pastoral and agropastoral groups. These are served by an international livestock marketing channel with a major terminus at Nairobi. The area is compact enough to make intensive field work feasible, yet it exhibits considerable variation along several dimensions, making it suitable for examining key issues and useful for generalizing findings elsewhere in eastern Africa.

RESEARCH TEAM

The research team is comprised of flexible, interdisciplinary subteams which will be organized around hypothesis-driven research problems and outreach initiatives. Team design is multi-tiered.

Individuals: Team Members and Collaborators

Team members are defined as individuals from the professional ranks who will have a regular involvement in project activities. Team members based in the USA will include L. Coppock (PI), C. Barrett (Co-PI), P. Little (Co-PI), D. Bailey, C. Doss, and J. Holtam. Team members based in East Africa will include A. Aboud, F. Lusenaka, and B. Swallow. An as-yet-to-be-named Ethiopian team member, affiliated with either an Ethiopian university or a national research organization will round-out the initial team composition. Team membership will evolve over time in an opportunistic fashion.

Collaborating individuals are those who have an irregular involvement in specific project activities in which they are especially expert. Collaborating individuals based in the USA will include Drs. P. Box, J. Moris, U. Lall, and G.A. Rasmussen. Other possible collaborators include Drs. M. Coughenour (modeling), J. Dobrowolski (ecological assessment), S. Gavian (economics), P. Hazell (economics), D. Jensen (climatology), E. Roth (anthropology), and D. Swift (livestock production, modeling). Collaborating individuals based in East Africa may include Drs. J. de Queiroz and Mr. J. Ndirangu (USAID/REDSO), S. Ehui (ILRI), G. Oba (Univ. Oslo), E. Rege, and P. Thornton (ILRI).

Organizations: Collaborating and Liaison

Collaborating organizations are those which are either home institutions of team members or are contributing resources to the project. For the United States these include Utah State University (USU), the University of Kentucky (UK), Williams College (WC), and the World Council of Credit Unions (WOCCU). For East Africa these include CARE-Ethiopia, Egerton University (EU) and the International Livestock Research Institute (ILRI). Coordination with an existing ILRI-IFPRI (International Food Policy Research Institute) collaborative research project on "Property Rights, Risk and Livestock" will be facilitated by its director, Dr. B. Swallow, a project team member.

Liaison organizations will initially have only liaison links to the project, but later joint projects may develop. Organizations for Kenya could include the Kenya Agricultural Research Institute (KARI), the Livestock Development and Marketing Department of the Kenya Ministry of Agriculture (IDM-MoA), ACTIONAID, the Drought Preparedness Intervention & Recovery Program (DPIRP), FARM-Africa, Famine Early Warning Systems (FEWS), German Technical Cooperation/Marsabit Development Project (GTZ-MDP), and the Semi Arid Lands Training and Livestock Improvement Centres of Kenya (SALTLICK).

In Ethiopia liaison organizations could include the Ethiopian Agricultural Research Organization (EARO), the Oromia Bureau of Agricultural Development (OBAD), the Pastoral Development Unit of the Ministry of Agriculture (PDU-MoA), Commercial Bank of Ethiopia (CBE), Save the Children/USA (Liben-Borana), and the Southern Rangelands Development Unit (SORDU). Regional liaison organizations could include ASARECA, IGAD, the Pastoral and Environmental Network for the Horn of Africa (PENHA), the Regional Economic Development Support Office (REDSO) of USAID-Nairobi, and the Arid Lands Resource Management Project (ALRMP) of the World Bank.

Advisory Board and Pastoral Panel

An advisory board organized for the project will include five dedicated and experienced professionals who provide periodic expert review and evaluation of the completed and ongoing work of the team. New members would be rotated in at two to four year intervals in such a fashion as to maintain institutional memory but also to adjust membership to suit the evolving foci of the team. The Advisory Board members for project Phase I will be: a nominated representative from KARI and EARO, and Drs. D. Adams (rural finance), J. Ensminger (economic anthropology), and D. Herlocker (ecology).

A pastoral panel will be composed of a group of distinguished and influential pastoral leaders representing the major ethnic groups throughout the study area. This group will be included in network activity for provision of continuous feedback on project activities. The group will also be convened at biennial workshops to provide input and commentary on deliberations. In this way, a feedback loop will be established among researchers, action agencies, and pastoral leaders to allow free exchange of ideas.

TRAINING PLAN

In terms of formal education, 4-8 master's candidates will be matriculated through Egerton University in Kenya. It is anticipated that 2-4 students will begin in 1998. These will be the main field data collectors for the project. In addition, 3 Ph.D.'s will be trained. One student. a Kenyan, will study pastoral development and marketing at the University of Kentucky. Another will be matriculated at USU in economics and systems analysis. An Ethiopian student, D. Solomon, formerly active with the SR-CRSP, will take his degree in range science at USU by 1999. Finally, three post-doctoral students will work on the project. An American, K. Smith, will begin in January 1998 and two others will be recruited. Post-docs will conduct and supervise field work in the region.

Informal training will include regionally organized workshops. Three workshops are in the planning for 1998: one at Egerton in June, 1998; one in Addis Ababa in August, 1998; and one in Nairobi in September, 1998. A seminar, similar in nature, will be held at USU during the spring of 1998. Workshops will be attended by a broad spectrum of participants, including team members, students, and development professionals affiliated through the project's liaison network. Extensive outreach through CRSP-NGO collaborations are projected, through later fundraising efforts, to intensify interaction with local communities. Modalities for enhancing community involvement and providing appropriate training will emerge as the project develops.

WOMEN AND GENDER COMPONENT

The project addresses asset diversification as a means of alleviating the impact of the boom-bust cycles in semi-arid pastoral systems. There will be a specific study, following up on the CRSP supported work of Solomon Desta (acceptability of the Borana to asset diversification), to understand roles of women in pastoral asset management among the Borana. Further focus on women's issues will result from the analysis of policy alternatives on the impact on women. Gender will be one focus of the WOCCU consultancies, namely the extent to which formal financial systems effectively cater to females. Many of the development agencies in the project's liaison network have subprojects specifically focused on females.

ANTICIPATED IMPACT

Strengthened rural financial systems and targeted outreach can be used to better capture millions of dollars of value otherwise periodically lost as animal mortalities in drought. The problems identified in this project and the enabling systems on which it focuses are the subject of many relatively narrow (if well-funded) initiatives presently underway in East Africa and elsewhere: to promote microfinance to assist the poorest, to identify means to establish and maintain secure access to crucial natural resources, to improve marketing infrastructure and the efficiency of newly liberalized economies, and to facilitate provision of

public goods and services in a fiscally sound manner. The contribution of this project will be to investigate and model these as alternative strategies with respect to context-specific cases.

Development of context-sensitive risk management packages—including improved marketing systems, information flows, and resource access—would help to mitigate poverty, improve food security, enhance animal production, reduce environmental degradation, and contribute to overall regional economic growth. Pastoral development could be revolutionized by facilitating recycling of savings into private and public investments for infrastructure, rural education and health, small business, and rehabilitation of rangeland resources.

Simulation modeling of a type proposed in this study would also enable explorations of policy alternatives. A number of important policy issues could be analyzed: At the national or international level these include trade restrictions or liberalization between nations, harmonized international animal and plant disease control measures, restrictions on fire-based management of rangelands, conversion of rangelands to crop cultivation or to protected areas for wildlife, quarantine restrictions for livestock, privatization of animal health services, and promotion of ecotourism. At local levels, such models could be used to explore the effects of strengthening or introducing formal financial institutions, investments in improved market infrastructure, changes to natural resource tenure regimes, changes in public services delivery, and credit, education or nutrition programs targeted at women or the very poor.

BENEFITS TO THE U.S.

Application of portfolio approaches for financial planning and risk management could help groups like American beef producers better mitigate negative effects of commodity price cycles, increased global competition, and drought (Holechek et al., 1994; Holechek, 1996). Population growth and increased competition to use agricultural lands for non-agricultural purposes has led to parcelization of agricultural and grazing landscapes, and less land for livestock producers means enhanced vulnerability to a variety of systemic shocks. Coppock and Birkenfeld (submitted) found a lack of some prominent risk-management skills among Utah grazing permittees, despite their prominent adoption of production technology. Improved risk management could play an important role in buffering or re-vitalizing some agricultural communities in rural America. The final project objective is to use knowledge and capabilities gained from the project to influence the research and outreach agenda in the western U.S. to include more attention towards risk management for livestock producers.

Table 4: Improving Pastoral Risk Management, Goals and Objectives Matrix

Project Goal: *Improve well-being of East African pastoralists by enhancing their capacity for risk management using four tactics: asset diversification, income diversification, improved use of information, and increased access to external resources.*

Objective	Research Outputs	Developmental Impacts	REDSO Strategic Objectives Intermediate Results	AID Strategic Objectives Intermediate Results
1. Determine the scope and cause(s) of local variation in risk-management needs among pastoral communities, households, and individuals.	1. An integrated spatial and temporal risk map of the study region identifying endogenous and exogenous sources of risk, pastoral coping ability, and need for risk management.	1. Increased adoption of risk-management tactics by pastoral communities, households, and individuals.	6.1 Strengthened African capacity to respond to crises.	2.1 Sustainable technologies and policies that enhance food availability.
	2. Local case studies demonstrating vital importance of enhancing risk management for pastoral communities, households, and individuals.	2. Increased adoption of action plans to facilitate pastoral risk-management by local development agents.	6.2 Reduced reliance on external assistance through enhanced target populations.	2.4 An information system established to enhance decision making for the agricultural sector developed and adopted.
2. Determine how local risk-management needs can be met by improving four regional or sub-regional support systems: marketing, rural finance, natural resource tenure, and public service delivery.	1. Identify key constraints for support-system services that limit local effectiveness of pastoral risk management.	1. Increased adoption of strategic interventions aimed at alleviating regional and sub-regional support-system constraints. This requires increased adoption of new policies, investment strategies, and technology by development planners.	3.3 Market-oriented agricultural production and marketing policies implemented.	2. 1 Sustainable technologies and policies that enhance food availability.
	2. Produce a simulation model, usable by decision-makers, which will permit local, sub-regional, and regional cost/benefit analysis for alleviation of key support-system constraints.	2. Further increases in local adoption of risk-management tactics by pastoral communities, households, and individuals that had been limited by key constraints in delivery of support-systems.	6.1 Strengthened African capacities to respond to crises.	

Table 5: Improving Pastoral Risk Management, Team Composition Matrix

Team Member Name	Affiliation	Role/Discipline	Nationality/Residence
Coppock, Layne , Ph.D. Associate Professor	Utah State University, Dept. of Rangeland Resources, Logan, UT	PI; Animal Science, Ecology	American/USA
Barrett, Christopher, Ph.D. Assistant Professor	Utah State University, Dept. of Economics Logan, UT	Co-PI; Economics, Policy	American/USA
Little, Peter, Ph.D. Professor	University of Kentucky Dept. of Anthropology, Lexington, KY	Co-PI; Anthropology, Economics	American/USA
Aboud, Abdillahi, Ph.D. Professor	Egerton University Nairobi, Kenya	Team Member; Socio-ecology	Kenyan/Kenya
Lusenaka, Frank	Egerton University Nairobi, Kenya	Team Member; Socio-ecology	Kenyan/Kenya
Swallow, Brent	International Livestock Research Institute	Team Member; Economics, Tenure	Canadian/Kenya
Holtam, Jordan Borana Project Coordinator	CARE International in Ethiopia Private Consultant, Addis Ababa, Ethiopia	Team Member; Liaison	American/USA
Doss, Cheryl	Williams College	Team Member; Economics, Gender	American/USA
Bailey, Dee Von, Ph.D. Professor	Utah State University, Dept. of Economics Logan, UT	Team Member; Livestock, Marketing	American/USA
Key Collaborators:			
Box, Paul	Utah State University Logan, UT	GIS, Modeling	American/USA
Moris, Jon, Ph.D. Professor	Utah State University, Dept. of Sociology, Social Work, Anthropology, Logan UT	Policy, Applied Anthropology	American/USA
Rasmussen, Allen	Utah Sate University Logan, UT	Range Management, Conflict Mitigation	American/USA
Lall, Upmanu	Utah State University Logan, UT	Climate Forcasting	American/USA

INTEGRATED MODELING AND ASSESSMENT FOR BALANCING PASTORAL FOOD SECURITY, WILDLIFE CONSERVATION, AND ECOSYSTEM INTEGRITY IN EAST AFRICA

Principal Investigator: **Dr. Michael B. Coughenour, Colorado State University**

PROJECT GOAL: To increase food security in the pastoral ecosystems of East Africa while conserving wildlife, biodiversity, and ecosystem integrity, by increasing the capacity for a wide range of stakeholders, planners, and policy makers to accurately assess interactions between livestock, wildlife, and natural resources.

OBJECTIVE 1: Integrated Modeling and Assessment System (IMAS) developed consisting of ecosystem computer modeling, geographic information systems, data synthesis, and field assessment methodologies that will improve policies, plans, and decision, which will improve land use and natural resource management to achieve the Project Goal. IMAS adopted by relevant land users, natural resource managers, land use planners, and policy makers.

OBJECTIVE 2: Application of IMAS to specific land use problems which are representative of problems encountered throughout East Africa. Specifically, to determine the impacts (1) of increasing human population, conservation policy, and disease in the Greater Serengeti Ecosystem, (2) of land use and enterprise scales in Kajiado, Kenya, (3) of land tenure in Lake Mburo, Uganda, and (4) of livestock-based agriculture on livestock production, human welfare, wildlife and ecosystem integrity in the East African Region as a whole.

There is a need to establish a more appropriate and sustainable balance between food security and natural resource utilization in the pastoral regions of East Africa. Ecologically unsound livestock development schemes, coupled with increased human population densities, have often led to overgrazing and environmental degradation. This project brings together U.S. and East African scientists, managers, and stakeholders to assess livestock-environment interactions in pastoral ecosystems. The goal of the project is to increase food security, while conserving biodiversity, wildlife, and ecosystem integrity in the region. An integrated modeling and assessment system (IMAS) will be developed, which will integrate spatial-dynamic computer modeling, geographic information systems, remote sensing, and field studies. The system will enable alternative policy and management strategies to be explored, debated, implemented, and reassessed. Regional analyses based on land use will identify areas of high and low conflict between pastoralists and wildlife, and these will facilitate development of sound policies for mitigation of unfavorable pastoral-wildlife interactions.

PROBLEM MODEL

Pastoralism or extensive livestock herding is the most prevalent form of land use in East Africa in terms of land area utilized. These pastoral regions also support some of the largest and most viable wildlife populations in Africa. Traditional pastoral livestock production has been highly compatible with wildlife conservation, but this compatible interaction is showing signs of disintegration in many parts of East Africa. Livestock and wildlife are viewed as competitors for limited forage. Livestock are seen as spreading disease into wildlife, and wildlife are seen as spreading disease into livestock. Spatial components of pastoral ecosystems have been disrupted by competing forms of land use, with negative implications for ecosystem persistence (Coughenour 1991c). Pastoral movements have been increasingly restricted by game reserves, agriculture, land subdivision, and privatization. Pastoralists who have cohabited with wildlife for centuries often reap little benefit from the income which wildlife generates through ecotourism (Norton-Griffiths 1995). Although the idea that livestock production and wildlife conservation are compatible is shared by many—and there are examples of successful integration (Western 1982, Cumming 1991a, b)—the number of compatible associations between pastoralism and wildlife seems to be diminishing (Arhem 1985, Galvin 1995).

"The nomads' dream is a world without borders where they are free to roam with their herds. The reality is a world with too many cows, too many people, too many guns, too little land and hostile governments. Kenya is no exception. There has been hardly any economic development in the north since independence in 1963. Though cattle are its main wealth, the region has no modern slaughterhouse.

The land available to nomads is shrinking, and the shortage becomes acute in times of drought. The Rendille used to head their herds for the slopes of Mount Marsabit when the plains got dry. No longer. That once-free land has been turned into a park for wild animals and tourists. Nomads and their herds are banned. In the drylands of southern Kenya, businessmen, many related to powerful politicians, use scarce water for their ostrich or flower farms....

Some nomads are beginning to fight back. Abdi Umar, leader of the Kenya Pastoralist Forum, founded in 1994, [observed,] ... 'The government cannot neglect us any more. Two-thirds of all Kenya's territory is inhabited by pastoralists; 70 percent of all wild animals live in pastoralist areas, where tourists come with their hard currency. And our cattle are becoming more and more important for the national economy. We have a powerful position, but we don't use it yet.' The vision of nomads economically productive while living harmoniously alongside wild animals in open lands could be realizable if roads and a slaughterhouse were built, and nomadic tribes were allowed to develop their own leadership."

Anonymous. 1997. "No pastures new: Nomads." Economist v. 342.

Ecologically unsound livestock development schemes coupled with increased human population densities have led to overgrazing and environmental degradation (Coughenour 1991c). The results for pastoral populations has been a decline in economic welfare and chronic states of undernutrition (Galvin 1988, 1992, 1997, Galvin et al. 1994). Alarming decreases in livestock and wildlife over the last two decades (Ottichilo et al. 1997) suggest that rangeland carrying capacity has declined, possibly from progressive rangeland degradation (Rainy and Worden 1997). Unfortunately, little data conclusively shows that range production has declined.

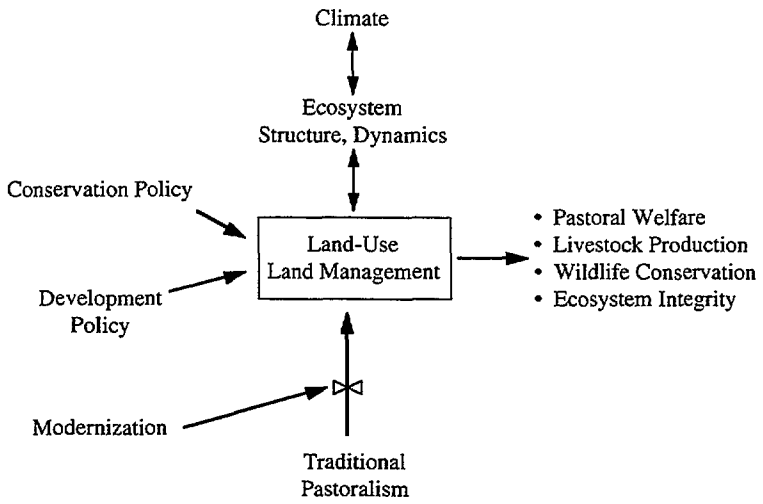
Efforts to maximize livestock production through ranching or other schemes have backfired because of a lack of understanding of livestock-wildlife interactions; failure to assess the direct and indirect effects of livestock development on wildlife and the environment; failure to recognize the importance of wildlife for economic development and long-term ecological viability in this region; and failure to recognize the ecologically adaptive features of traditional pastoralism. Pastoral development in the region requires integrated assessments of livestock-wildlife interactions and the resultant effects of interaction on human welfare.

Wildlife conservation and pastoralism are potentially complementary land uses. Pastoralists and wildlife have similar requirements for large ranges, opportunistic movements, water sources, dry season grazing areas, and dietary diversity. They also have several common enemies, including land and water preemption by cultivation and irrigation; lack of rights to access land; and lack of economic returns from wildlife conservation. The benefits arising from compatibilities of the two land uses can offset the costs of conflicts if ways can be found to accrue benefits from conservation. Pastoralism has considerable economic value which has not been factored into integrated assessments thus far. The combination of pastoralism and wildlife conservation may prove to be an economically successful use of land, from both a local and national perspective. This is because pastoralism is more compatible with wildlife than other forms of land use, and because wildlife is an economically important, and a premier generator of foreign revenue.

The requisite ecological characteristics of intact pastoral ecosystems, such as ability to move over large areas and access key seasonal grazing areas must be fully recognized, and either conserved or emulated for successful combined use. While pastoralism was a sustainable land use under free access to grazing lands, land use is now constrained. Constraints to land use might best be alleviated through strategic management and policy. The proposed IMAS will be aimed at the identification of these effective strategies.

Co-existence of wildlife and livestock populations also encourages transmission of viral, bacterial, and parasitic disease agents among animals. Resulting disease adversely affects livestock and pastoral welfare, as well as wildlife. Uncontrolled movements of livestock through trade routes and migratory responses to drought and civil strife, often across international boundaries, contribute to rapid disease spread. Major wildlife diseases that constrain livestock productivity include wildebeest-derived malignant catarrhal fever, buffalo-

Figure 17: Problem Model



associated corridor disease (theileriosis), trypanosomiasis, foot-and-mouth disease, and rinderpest. Although rinderpest is principally maintained in cattle, epidemics with high mortality have recently been observed in wildlife in Southern Kenya and Northern Tanzania.

The problem model governing project operations is illustrated in Figure 17. According to the model, land-use interacts with ecosystem structure and dynamics through such processes as primary and secondary production—which in turn are driven by climate. Development and conservation policy influence land-use, as does traditional culture, while land management, modernization and increasing interaction with society, at various levels, also have an effect. These factors taken together have a significant impact on pastoral welfare, livestock production, wildlife conservation efforts, and ecosystem integrity.

The IMAS Approach

The IMAS will be based upon an existing spatial-dynamic ecosystem model called SAVANNA, which was originally developed for a pastoral ecosystem in northern Kenya. The model simulates plant growth responses to soil, weather, and herbivore; foraging, energetic status, and population sizes of both wild and domestic herbivores; and energy flows to humans. During this research a user interface, a human ecology/economics, and animal disease components will be developed. The model will be capable of predicting interactions between livestock and wildlife in terms of spatial-dynamic competition for forage and disease transmission and effects. The model as well as the IMAS field studies will quantify the impacts of land tenure, enterprise scale, and conservation policy on four objective functions (as outlined above): pastoral welfare, livestock production, wildlife, and ecosystem integrity.

The IMAS will consider research conducted within the scope of this project as well as research carried out by parallel projects funded independently. Assessment will be made

based upon modeling and participatory involvement from stakeholders at the community level, and the model will be run at scales which are relevant to local land managers. Assessment results will then be used to develop environmentally and economically sustainable plans for resource utilization. Inventory and monitoring studies will measure impacts, and impacts will be evaluated at the community level for assessment modification.

Disease Studies

One component of the project will be the testing of the hypothesis that disease-related losses are no greater in mixed populations of livestock and wildlife than in livestock populations alone. Cause-specific morbidity and mortality data will be obtained for two groups of cattle herders along with serological parameters during a two year study period. In the second year a disease submodel will be implemented throughout the region and utilized in project efforts to develop alternative scenarios for sustainable increases in livestock production or alternative management strategies incorporating income from wildlife resources.

Human Ecology and Economics Studies

While measures of average income are often taken as the primary indicator of regional human welfare, income is not equally distributed among households nor are resources equally distributed among members of the same household. Consequently, there is a need to determine income stratification within and across regions. There is also increasing recognition of the need to include non-economic measures of welfare such as health or nutritional status within and among households, as key measures of welfare and development level (Cameron 1991, Martorell 1982, Pinstrup-Andersen et al. 1984, FAO 1982, Pacey and Payne 1985).

Four measures will be used to measure pastoral welfare. Food security will be assessed as access to adequate quantity and quality of food through production, market mechanisms, or social support. Gender differences in production, cash generation, and cash flow will also be assessed. Access to services, along with demographic pressure and nutritional status will be evaluated. In addition, pastoral representatives at the two workshops suggested that indigenous indicators of well-being be included (such as access to land, livestock/herd size, number of children, "influence" and "power", or size of extended family), as these factors have a significant influence on land use management decisions.

Through monitoring of management decisions and their impacts on different systems, the project will evaluate IMAS use. Comparisons will be made to the state of systems prior to IMAS adoption to assess the impacts of research. The same monitoring techniques will be useful to stakeholders for revising tactics and policies in a long-term process of adaptive management. Researchable issues can also be addressed and testable hypotheses formulated based on the changes observed through monitoring.

The IMAS might further be used in an iterative process of conflict resolution and risk analysis, the goal of which would be to converge on a solution that all stakeholders can accept. The IMAS would show the conflicts, risks, costs, and benefits to each stakeholder of multiple versions of proposed solutions. The solutions would then be revised with the aim of converging on a solution that is most acceptable to all. To this end integration of SAVANNA into a Structured Analysis Methodology (SAM) will be explored for stakeholders to identify their goals and objectives, and potential conflicts (R. Woodmansee, CSU, pers. comm.)

Regionalization

From cross-site comparisons the project will scale up to region to enable regional-scale modeling. At the regional level, the project will look at impacts on production, resource use, the nutritional effects of changes in land use, and economic activity. An expanded SAVANNA model with more complex economics modules will be able to provide the type of input-output coefficients that can be used in a number of other, more highly aggregated analytical frameworks such as economic surplus models and methods based on econometric production, profit or cost functions. In this connection, development of a regionally uniform format for database management would greatly enhance documentation of regional trends and facilitate policy decisions. Such a collaborative effort with donor agencies, international agricultural research centers, and appropriate governmental and non-governmental agencies will be sought. Regional-scale modeling will be used to identify areas of high and low conflict between pastoralists and wildlife in relation to policy. The team will work with regional-level organizations, such as ASARECA, to identify priorities for intervention or policy analysis.

GEOGRAPHIC SCOPE

The IMAS will be implemented at four sites during the first 3 years of the study. Using a multi-criteria evaluation process participants at two regional workshops selected three sites: Kajiado District, Kenya; Ngorongoro Conservation Area and Loliondo in Tanzania: and the region around Lake Mburo National Park in Uganda. A fourth site was selected at a late hour in the assessment process, when the SR/GL-CRSP team learned that the Tanzanian AID Mission had initiated an Environment and Natural Resources study in the Tarangire-Simanjiro Plains Region. The objectives of the CRSP project are consistent with the strategic objective which led to the formulation of the Mission project, making the synergistic potential for work in the area substantial. In later stages of the project, the IMAS may be implemented at 3-4 additional sites. Sites of high interest identified for possible future work include Laikipia (Kenya), Karamoja-Turkana (Uganda-Kenya), Awash (Ethiopia), and Katavi-Rukwa Valley (Tanzania).

RESEARCH TEAM

The project will be implemented by a relatively large, interdisciplinary team consisting of ten American-based, nine Kenya-based, five Tanzania-based, and three Uganda-based personnel. Nine team members are of native African origin.

Individual Team Members

The principal investigator, M.B. Coughenour, will be supported by a co-principal investigator, K.A. Galvin. The team will then be organized into Subproject Teams. The composition of Subproject Teams is as follows: Range Ecology (D. Child, M.B. Coughenour, L. Rittenhouse, J. Kinyamario, F. Banyikwa, M. Rainey, J. Acen), Wildlife and Conservation (J. Ellis, M.B. Coughenour, P. Moehlman, J. Else, A. Mugisho, J. Acen, E. Barrow), Livestock (L. Rittenhouse, J. Ellis, R. Kidunda, A. Mwilawa), Human Ecology (K.A. Galvin, T. McCabe, A.L. Magennis, E. O'Malley, M. Rainey, F. ole Ikayo, A. Mugisho), Modeling (M.B. Coughenour, P. Thornton, R. Reid, and a selected post-doctoral student), Disease (J. DeMartini, P. Rwambo, J. Grootenhuis, J. Else, R. Howe), Policy and Economics (P. Thornton, R. Davis, S. Mbogoh), GIS and Regional Analyses (R. Reid, R. Kruska, J. Ellis, M.B. Coughenour).

"Kenya Wildlife Service (KWS) expressed considerable interest in our IMAS approach in a recent meeting. If the funding were there, they would like to implement it immediately. Kenya, like other developing African nations, is experiencing increasing conflicts between wildlife and agriculture, driven by human population growth and intensified land use. At the same time, wildlife has considerable economic value. As wildlife is the number one source of foreign revenue in Kenya. KWS is now emphasizing the importance of wildlife conservation outside protected areas—with local participation. Much of the prime wildlife is in pastoral areas. While KWS acknowledges there is ample data, they are severely limited in their ability to integrate the data and make it meaningful for assessments which influence land use policy. A criteria put forth by donors for KWS to obtain further support is for Kenya to implement an effective land use policy. It is difficult for KWS to identify and justify such policies without integrated assessments of the type proposed by the University of Colorado project."

Coughenour, M. B. 1997. Pers. Comm.

Institutional and Organizational Collaborators

Formal commitments have been made by ILRI; KARI, Semi-arid Rangelands Research and Animal Health Programs; Project Coordination Unit of the Uganda Ministry of Tourism, Wildlife and Antiquities (UMTWA); Mpwapa Zonal Research Station of the Tanzania Ministry of Agriculture (TMA); Sokoine University; Explore Mara Ltd. (EML), a private company; and Ololepo Hills Landowners Association (OHLA), a private organization. Other collaborators include Inyuaat Maa, a pastoral NGO; the Departments of Botany (UNB) and Agricultural Economics (UNAE) of the University of

Nairobi; Institute for Resource Assessment (IRA); University College of Lands and Architectural Studies (UCLAS) and Zoology Department (UDZ) of the University of Dar es Salaam; and African Wildlife Foundation (AWF). Through linked research projects, there will also be ties to Serengeti Wildlife Research Institute (SWRI) and Ngorongoro Conservation Area Authority (NCAA).

Integration with Other Funding Sources

Independently funded research in the Greater Serengeti Ecosystem (M.B. Coughenour, K.A. Galvin, J. Ellis, T. McCabe) will be integrated with this project. The SAVANNA modeling projects of Coughenour, funded by USGS Biological Resource Division (BRD) and the National Park Service (NPS), will also be of benefit. The work of NGOs in the region will be integrated into project work as much as possible. Letters of support have been received from the Dutch Arid and Semi-Arid Lands (ASAL) Programme in Kajiado and the AWF in Tanzania.

TRAINING PLAN

A considerable effort will be devoted to training, mostly within the region. Three Ph.D.s and six M.Sc. degrees will be supported. In addition, there will be 120 months of support for field training of students and others, three workshops, two full-time positions for four different GIS and modeling trainees, and one full-time post-doctoral student. Training will also take place at the community level through citizen participation.

Training at the local level will provide opportunities for additional learning, enhancement of lifeskills and improvement in quality of life for citizens of the study area. Training and employment of local citizens for data collection can: (a) equip individuals with skills and information to benefit themselves, their families, and their communities; (b) create awareness of ideal versus actual behavior; (c) limit misapprehensions of project activities and objectives through participation; (d) address fears that information will be misused by regional or international level users to limit citizen's actions or take land; and (e) identify citizens to take on project-oriented responsibilities and higher-level training.

WOMEN AND GENDER COMPONENT

The project will analyze the policy alternatives to land managers to determine acceptable scenarios that allow a livestock production and wildlife conservation. The project will be addressing gender issues in studies of human ecology, economics, and land use. The studies are designed to show differential roles and responses of the sexes in affecting pastoral welfare and ecology. For example, household level analyses distinguish nutritional inputs by age and sex groups. Women in pastoral households and communities will be interviewed to consider their gender specific issues and problems, and their potential influence or lack of influence on the project objective (balancing food security). Gender will be a factor in assessing economic, land and herd decision-making processes.

ANTICIPATED IMPACT

The goals of this project are directly relevant to and aimed at improving the economic welfare and food security of pastoral communities by incorporating conservation-based economic activities with range livestock development. This coupling of conservation with livestock development provides opportunities for ecologically sustainable livestock enterprises, but there are challenges in the joint utilization of rangelands by livestock and wildlife species. The IMAS provides potential policy directives and management alternatives to meet the challenges of joint rangeland utilization while searching for opportunities to optimize economic welfare and pastoral food security. The IMAS does this by packaging scientific information in the framework of development policy, so that alternative development strategies may be evaluated.

Development efforts and policies of international NGOs and government agencies should benefit from the IMAS, as the IMAS will be structured to represent responses to policy at local through regional levels, of pastoralist production and well-being, and wildlife and biodiversity status. Policies and their effects on pastoral livestock production systems, and wildlife conservation systems in East Africa will be evaluated effectively. Policy influence will be assured by participation of government agencies, such as Tanzania National Parks (TANPA), the Tanzania Ministry of Natural Resources and Tourism, the Ngorongoro Conservation Area Authority (NCAA), Kenya Wildlife Service (KWS), the Uganda Ministry of Tourism, Wildlife and Antiquities, and government agricultural ministries.

BENEFITS TO THE U.S.

The core of the IMAS, SAVANNA, is a spatial-dynamic ecosystem simulation model which was originally developed for pastoral ecological research in Turkana District, Kenya in the 1980s. (Coughenour 1991c, 1992, 1993). SAVANNA has been further developed for assessing elk, bison, and wild horse carrying capacity analyses in several prominent Parks in the Rocky Mountain Region, with support from the National Park Service and USGS BRD. A project has been initiated to use the model to aid management of bison and brucellosis in Yellowstone and Grand Teton National Parks.

Four diseases are especially significant to livestock-wildlife interactions with respect to economic importance, agent type, mode of transmission, species affected, available data and collaborative research possibilities in the U.S. These include rinderpest, malignant catarrhal fever (MCF), corridor disease (bovine theileriosis, East Coast fever (ECF), and brucellosis. MCF occurs in North America where sheep and goats may serve as reservoir and is currently a problem in North American bison herds. Brucellosis is receiving much attention in Yellowstone National Park bison, as it constrains efforts to eradicate the infection from livestock populations nationally. Work on a linked disease-SAVANNA model will be undertaken in both Kenya and Colorado.

Table 6: Integrated Modeling and Assessment, Goals and Objectives Matrix

Project Goal: *Increase food security in the pastoral ecosystems of East Africa while conserving wildlife, biodiversity, and ecosystem integrity, by increasing the capacity for a wide range of stakeholders, planners, and policy makers to accurately assess interactions between livestock, wildlife, and natural resources.*

Objectives	Research Outputs	Developmental Impacts	REDSO Strategic Objectives Intermediate Results	AID Strategic Objectives Intermediate Results
1. Integrated Modeling and Assessment System (IMAS) developed consisting of ecosystem computer modeling, geographic information systems, data synthesis, and field assessment methodologies that will improve policies, plans, and decision, which will improve land use and natural resource management to achieve the Project Goal. IMAS adopted by relevant land users, natural resource managers, land use planners, and policy makers.	1. An ecosystem model further adapted for use by decision makers between and stakeholders to assess interactions livestock, wildlife and natural resources through time and space. 2. Identification of key information for the IMAS and development of methodologies which can be implemented in a timely and cost effective manner. 3. New model of household and community level economics, and animal disease developed to increase integration across disciplinary and institutional barriers.	1. Adoption of the IMAS by relevant decision and policy makers. 2. Pastoral ecosystems develops in ways that conserved wildlife, protects their global conservation value, maintains their ecosystem integrities, and developed their economic income derived from tourism. 3. Improvement of food security and human welfare in pastoral ecosystems, through the identification of ecological processes and patterns which provide the food and income derived from livestock grazing.	5.1 Increased access to E/NRM information by Africans. 5.2 African capacity to analyze and manage natural resources strengthened.	2.3 Technologies, policies and practices that enhance the long-term conservation of natural resources developed and adopted. 2.2 Policies and technologies that improve food access and agribusiness opportunities developed and adopted.
2. Application of the Integrated Modeling and Assessment System to specific land use problems which are representative of problems encountered throughout East Africa. Specifically, to determine the impacts (1) of increasing human population, conservation policy, and disease in the Greater Serengeti Ecosystem, (2) of land use and enterprise scales in Kajiado, Kenya, (3) of land tenure in Lake Mburo, Uganda, and (4) of livestock-based agriculture on livestock production, human welfare, wildlife and ecosystem integrity in the East African Region as a whole.	1. Developed knowledge base for impacts of increased population, conservation policy, and disease on land use, human welfare, and natural resources that is necessary for the IMAS to be adopted and useful for decision and policy makers in the representative study areas and the region. 2. Developed knowledge base of spatial explicit data to test for the impacts of spatial scale on land use, land tenure, human welfare, and natural resources that is necessary for the IMAS to be adopted and usefully applied.	1. Improved capacity of land and natural resource managers to make informed decision and change strategies based on integrated assessment that result in improved livestock production and conservation. 2. Land-use and natural resource management decision and strategies that result in improved livestock production and conservation developed and adopted. 3. Alternative solution for the management of animal disease. 4. Increased capacity of stakeholders to participate effectively in natural resource policy and decision making.	5.1 Increased access to E/NRM information by Africans. 5.2 African capacity to analyze and manage natural resources strengthened. 5.3 Informed regional dialogue for improved natural resources management. 5.4 Effective support to bilateral E/NRM programs	2.3 Technologies, policies and practices that enhance the long-term conservation of natural resources developed and adopted. 2.1 Sustainable technologies and policies that enhance food availability developed and adopted. 2.2 Policies and technologies that improve food access and agribusiness opportunities developed and adopted.

Table 7: Integrated Modeling and Assessment, Team Composition Matrix

Team Member Name	Affiliation	Role/Discipline	Nationality/Residence
UNITED STATES			
Child, Dennis, Dept. Chair, Professor	Colorado State University, Rangeland Ecosystem Science Dept., Fort Collins, CO	Leader, oversee range ecology research/Range Science	American/USA
Coughenour, Michael Senior Research Scientist, Assoc. Professor	Colorado State University, Natural Resource Ecology Lab, Rangeland Ecosystem Science Dept., Fort Collins, CO	Team Leader, oversee entire project/Plant ecology, modeling	American/USA
Davis, Robert Senior Associate	University of Colorado, Institute of Behavioral Science, Boulder, CO	Scientist, oversee policy work/Political science, policy analysis	American/USA
DeMartini, James, Professor	Colorado State University, Pathology Dept. Fort Colins, CO	Leader, oversee veterinary research/Veterinary medicine	American/USA
Ellis, James Senior Research Scientist, Assoc. Professor	Colorado State Univ., Natural Resource Ecology Lab., Rangeland Ecosystem Science Dept., Fort Collins, CO	Leader/Ecology	American/USA
Galvin, Kathleen Senior Research Scientist, Asst. Professor	Colorado State University, Natural Resource Ecology Lab., Anthropology Dept. Fort Collins, CO	Leader, oversee human ecology research/Anthropology, human ecology, nutrition	American/USA
Magennis, Ann Associate Professor	Colorado State University, Anthropology Dept., Fort Collins, CO	Scientist, oversee human demography and disease work/Anthropology, human biology, disease	American/USA
McCabe, Terrence Assistant Professor, Associate Director	University of Colorado, Anthropology Dept. Institute of Behavioral Science, Boulder, CO	Scientist, oversee land use work/Anthropology, culture, cultural ecology	American/USA
O'Malley, Elizabeth Ph.D. Candidate	University of Colorado, Anthropology Dept., Boulder, CO	Scientist/Anthropology, culture	American/Tanzania
Rittenhouse, Larry Professor	Colorado State University, Rangeland Ecosystem Science Dept., Fort Collins, CO	Scientist/Livestock ecology	American/USA
Kenya			
Barrow, Edward Community Conservation Advisor	African Wildlife Foundation, Nairobi, Kenya	Collaborator/Conservation	Irish/Kenya
Grootenhuis, Jan Veterinarian	Consultant, Nairobi, Kenya	Scientist, oversee vet research in Kenya/ veterinary medicine	Dutch/Kenya

Team Member Name	Affiliation	Role/Discipline	Nationality/Residence
Kinyamario, Jenesio	University of Nairobi, Dept. of Botany, Nairobi, Kenya	Scientist/ botany	Kenyan/Kenya
Kruska, Russell GIS Specialist	International Livestock Research Institute, Socioeconomics Unit	Scientist, oversee regional GIS work/geographic information systems	American/Kenya
Mbogoh, Stephen Economist	University of Nairobi, Agricultural Economics Dept., Nairobi, Kenya	Scientist/Agricultural economist	Kenyan/Kenya
Rainy, Michael Ecotourism and Education Instructor and Consultant	Bush Homes of East Africa, Nairobi, Kenya	Consultant, and ecotourism and education instructor, oversee research at the Kajiado site/ecology	American/Kenya
Reid, Robin Senior Ecologist	International Livestock Research Institute, Socioeconomics Unit, Nairobi, Kenya	Scientist, ecology, regional analyses/Ecology	American/Kenya
Rwambo, Paul Veterinarian	Kenya Agricultural Research Institute	Scientist, conduct veterinary field research/Veterinary medicine	Kenyan/Kenya
Thorton, Philip Economist	International Livestock Research Institute, Socioeconomics Unit	Scientist, economic modeling/Economics	British/Kenya
Tanzania			
Banyikwa, Feetham Adjunct Faculty, Research Associate	University of Dar es Salaam, Dar es Salaam, Tanzania, Syracuse University	Scientist/ Plant Ecology	Tanzanian/Tanzania
Kidunda, Rashid Assistant Professor	Sokoine University, Faculty of Agriculture, Dept. of Animal Science and Production, Morogoro, Tanzania	Scientist/ Range ecology	Tanzanian/Tanzania
Mwilawa, Angello Livestock Research Scientist	Ministry of Agriculture and Cooperatives, Zonal Research and Training Center, Tanzania	Scientist/Livestock ecology	Tanzanian/Tanzania
Moehlman, Patricia Biologist, Consultant	The World Conservation Union - IUCN, Equip. Specialist Group, Tanzania	Consultant, oversee research at the Tanzanian site/ biology	American/Tanzania
ole Ikayo, Francis Director	Inuyaat e-Maa (Maasai Pastoralist Group), Tanzania	Consultant, oversee pastoralist input into research and development of the DSS/Human welfare	Tanzanian/Tanzania
Uganda			
Acen, Joyce Management Systems Officer	Uganda Ministry of Tourism, Wildlife and Antiquities, Kampala, Uganda	Scientist/ likely to be a graduate student	Ugandan/Uganda
Else, James Veterinarian, Institutional Development Advisor	Uganda Ministry of Tourism, Wildlife and Antiquities, Kampala, Uganda	Scientist, oversee veterinary research in Uganda	American/Uganda
Mugisho, Arthur Community Conservation Coordinator	Uganda Ministry of Tourism, Wildlife and Antiquities, Kampala, Uganda	Scientist/ oversee the entire research in Uganda	Ugandan/Uganda

ROLE OF ANIMAL SOURCE FOODS TO IMPROVE DIET QUALITY AND GROWTH AND COGNITIVE DEVELOPMENT IN EAST AFRICAN CHILDREN

Principal Investigator: **Dr. Charlotte G. Neumann, M.D., UCLA**

PROJECT GOAL: To improve the cognitive function, growth and health of rural East African children through the increased consumption of animal source foods.

OBJECTIVE 1: To increase micronutrient intake of children through increased utilization of animal source foods in the diet (iron, zinc, vit. A, vit. B.)

OBJECTIVE 2: To verify previous observational findings that intake of animal source foods in the diet is causally linked to improved health, cognitive development and growth by conducting a school feeding, controlled intervention study of six to eight year old children.

The aim of this project is to design and execute a study to confirm the causal relationship between consumption of animal source foods (ASF) and improved child health and development. A second component of the project, to be initiated following the controlled study, is to carry out community interventions to increase child intakes of ASF by increasing the availability and utilization of animals in the household. The community intervention design includes increasing availability of animals by making goats, chickens and rabbits available through collaboration with diverse NGOs to promote ASF utilization using intensive participatory nutrition education. The findings from the two components of the proposed study have world-wide policy implications that will assist program planners and policy makers in the development, monitoring, and evaluation of strategies to improve availability and access to animals and to promote the products found to be most beneficial for optimal child development.

PROBLEM MODEL

Malnutrition is responsible for a large share of preventable mortality, morbidity, blindness, and poor cognitive development among children in developing countries. The cost of even mild to moderate malnutrition is high in terms of human capital and, ultimately, economic development of countries and regions (International Bank for Reconstruction and Development1993). Research findings from the Human Nutrition CRSP (NCRSP), a longitudinal observational study in Kenya, Mexico and Egypt, showed positive associations between animal source foods ASF in the diet and physical growth, cognitive development, and school performance. The associations remained significant even after controlling for

total energy intake, socio-economic status, parental education, and social factors (Sigman et al. 1989; Sigman et al. 1991). These findings were particularly important because they showed that quality of the diet, as measured by intake of ASF, had an effect on children's cognitive development. The effect was apparent even among children whose caloric intakes were adequate, suggesting that the micronutrient composition of ASF was of primary importance to optimal development.

"... 22.5 million African children are malnourished."

United Nations Development Programme,
Human Development Report, 1996.

While these results suggest that ASF are beneficial for cognitive development, an experimental intervention is necessary to prove this causal link. Previous results were based on observational studies in which other important factors were confounded with the availability of ASF. While statistical controls were utilized to separate these factors, one can never be sure with a correlational study that all confounds have been measured and controlled. Second, the question as to whether ASF are important because of the energy or the micronutrients provided can only be determined by comparing the effects of ASF with the effects of an equivalent amount of calories. Third, we do not know whether milk products are sufficient to bring about improved attentional and cognitive skills or whether meat products have more beneficial effects. Lastly, a controlled intervention study would provide much more powerful evidence of the value of ASF than the correlation study that we

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"It was...found that many school children walk long distances to school, often on an empty stomach. They carry no food to school and then return home for a mid-day meal receiving no food in school."

Neumann, C. 1997. Role of Animal Source Foods to Improve Diet Quality and Growth and Cognitive Development in East African School Children.
SR/GL-CRSP Workplan, 1997-1998.

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have conducted, not only for theoretical reasons, but also because the findings would have direct policy implications for promoting ASF as an intervention to improve school performance.

As important as is the need for an experimental demonstration of the efficacy of ASF for child educability, there is a pressing need to determine how to make ASF more available to poor rural children at a community level and to ensure its utilization for child feeding. Previous studies have indicated that severe micronutrient deficiencies, particularly of iron, zinc, and vitamin B12, have serious functional consequences such as stunting, anemia, infection, and blindness (Neumann and Harrison 1994; Penny and Lanata 1995; Prentice

"The prevalence of malnutrition in children is staggering. Globally, nearly 195 million children younger than five years are undernourished....

Undernutrition triggers an array of health problems in children, many of which can become chronic. It can lead to extreme weight loss, stunted growth, weakened resistance to infection and, in the worst cases, early death....

... A number of studies in Latin America, Africa and the U.S. reported that on intelligence tests children with a history of malnutrition attained lower scores than children of similar social and economic status who were properly nourished."

Brown, J. L., and E. Pollitt, 1996. "Malnutrition, poverty and intellectual development." Scientific American v. 274.

1993; Sazawal et al. 1995; International Bank for Reconstruction and Development1994). For young children, ASF, primarily meat, eggs and milk, offer the most logical and sustainable food-based approaches to preventing multiple micronutrient deficiencies. Meat, in addition to high quality protein, contains bioavailable iron, zinc, vitamin B12 and heme protein. The latter improves the bioavailability of iron and zinc from cereal and other plant sources. Milk offers calcium and vitamin A in concentrated form and eggs provide vitamin A as well (Murphy, Beaton and Calloway 1992). Furthermore, the amounts of such products required to be consumed in the context of children's diets are quite small for relatively large payoff in terms of micronutrient and total nutritional well-being.

Participatory Rapid Appraisals in three poor rural communities in Ethiopia, Kenya, and Uganda identified two general determinants of low ASF intake among children: (1) limited availability of livestock and other small animals to resource-poor households, and (2) low utilization of animals for household consumption. Availability is constrained by poverty, lack of credit, small farm size, and deficient agriculture extension services. Women lack decision-making power over use of animals for sale or consumption. Utilization is constrained by lack of parental knowledge, cultural beliefs, and intrahousehold food allocation patterns favoring men. Inadequate preservation and safe storage also limit ASF consumption.

The working hypotheses which will guide research and intervention projects are the following:

1) Increased intake of ASF will improve the growth, cognitive development, and overall health of children through improved micronutrient status.

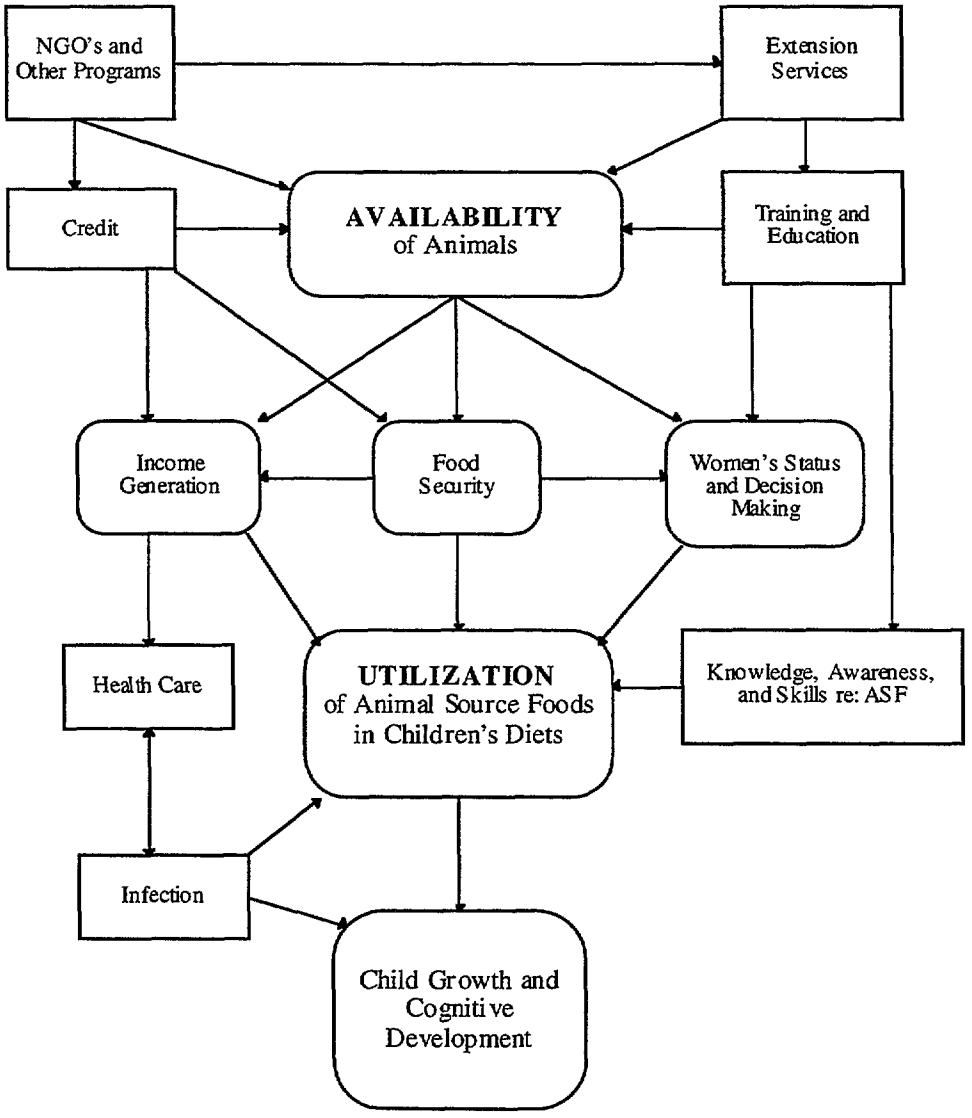
2) Increased availability of livestock and small animals, together with appropriate agricultural extension and nutrition, will increase utilization of ASF in the diets of children in poor rural communities. This in turn will promote their growth, nutritional status and cognitive development.

The project will consist of two related components:

1) A controlled intervention study among 6 to 9 year old primary school children in Kenya will establish conclusively whether or not daily meat intake, compared to milk-enriched and energy-enriched diets, improves micronutrient status, growth, cognitive function, school performance, behavior, and achievement.

2) Subsequent community interventions carried out in collaboration with community livestock programs (see Figure 18) to: a) increase the availability of livestock and small animals (chickens and rabbits) to households; b) increase utilization of ASF in the diet

Figure 18: Role of Animal Source Foods, Problem Model



through intensive nutrition education; c) enable households to increase their incomes; d) enhance household food security; and e) improve women's status. Given the central role of women in raising household animals and feeding children, the community interventions will target women.

Integration of Agricultural and Nutritional Programs

Linkages between livestock production and human nutrition improvement is a key theme which has shaped the development of activities in the proposed intervention. The emphasis on this linkage reflects the multidisciplinary approach required to address micronutrient deficiencies in the target communities in a sustainable way. Several activities will help formalize and promote these linkages:

District level joint training workshops

Nutritionists and agricultural extension workers will work together regularly from the initiation of the project. In addition, joint training workshops will be conducted for nutritionists and agricultural extension workers together concerning both human nutrition and animal husbandry topics. The workshops will also evaluate activities and synthesize preliminary results in preparation for national meetings.

National level meetings

In each target country, the program will sponsor meetings for agriculture, nutrition, child development/education, women's affairs, economics, extension, and community members. Participants will represent NGOs, Ministries of Health, Agriculture, Education and Planning and USAID Missions. They will review project progress, findings, and promote integration of nutrition and agriculture at the national level for policy development and economic planning.

Regional conference

At the end of the first three-year period, the program will sponsor a regional conference with the representatives listed above from each of the project countries. Regional organizations such as ILRI, ASARECA, the United Nations Children's Fund (UNICEF), and Winrock International will also participate. The conference agenda will report on research findings and share experiences and any impact data from intervention sites. Participants will identify policy options on a regional basis to promote the integration of agriculture and nutrition to support increased ownership of livestock and small animals by smallholders.

Linkages to Policy-Oriented Organizations

Linkages to multi-country regional organizations, government ministries, and parastatal organizations will promote consideration of policy issues. Because of the multi-disciplinary approach and nature of the team, there would be, for the first time, a firm linkage and integration of animal production with improvement of human nutrition and health as well as household economic improvement on the policy, planning and implementation level. Policy makers and economic planners need a greater awareness and appreciation of the linkage between improved nutrition and growth and development as a capital investment in the nation's development. To increase the quantity and quality of livestock and small animal ownership, government policies and those of agro-business are needed to assist the smallholder farmer, creating available breeding facilities at affordable prices. Pricing policies are needed in the markets to subsidize and make ASF affordable to poor rural families. Planning, policy and program formulation must be integrated at all levels for dietary improvement. Lastly, nutrition improvement efforts must be linked to utilization of health services for immunization, appropriate interbirth interval, improved sanitation and water, lest the nutrition gains be canceled out by increased infection and uncontrolled fertility (Neumann and Stephenson 1991).

GEOGRAPHIC SCOPE

The project will operate on three levels: 1) The controlled intervention trial will be conducted in Embu District, Kenya. 2) Community interventions implemented in collaboration with NGOs and other agencies experienced with livestock promotion are projected for Embu and Mbere Districts in Kenya, Eastern Hararghe in Ethiopia, and Mukono District in Uganda. 3) From the building of the assessment team to the selection of research and intervention sites, the project has striven for a regionalization approach. From workshops held in the region, it has become apparent that, despite differing ecologies and different staple foods, there is a commonality of problems of food insecurity and poor diet quality among East African countries. Policy formulation on a regional basis holds great promise for problem solutions, while bringing people from different countries together to interact around common problems and their solutions will contribute to mutual understanding and political stability in the region.

RESEARCH TEAM

The UCLA senior management and scientific core team consists of an interdisciplinary group who worked together in the NCRSP in the late 1980s. C. Neumann, as the PI, has primary oversight and managerial, scientific and technical responsibility. S. Murphy, the co-PI at UC Davis, is in charge of all technical and scientific aspects of diet quality, food composition, nutrient content, and bioavailability of micronutrients, and she will serve as Neumann's chief back-up for managerial matters. Murphy is also an expert on extension education. M. Sigman has primary responsibility for the cognitive and child development

aspects and for the controlled intervention study with backup by S. Souza, a Kenyan psychologist, who will carry out staff training and quality control. G. Harrison, a nutritionist and co-PI of the Egypt sector of the NCRSP, will be a consultant on household food security; A. Maretzki on health education; and L. Allen on biochemical micronutrient assessment methods.

In East Africa, an interdisciplinary team is planned for each country. The managerial, technical, and fiscal/accounting arrangements will differ slightly from country to country. For management aspects, each country has an experienced senior country coordinator and a core team to serve as a focal point for all activities and to provide leadership, cohesiveness, and guidance for all activities. There are experienced administrative organizations in each country to manage local funds, transport and other administrative details: FARM Africa in Ethiopia; the Child Health and Development Center, an autonomous research and management unit at Makerere University in Uganda; Winrock International, a consulting organization, in Kenya.

In Kenya, N. Bwibo, former co-PI of the NCRSP, will serve as the Kenyan co-PI with expertise in child growth and health. The country coordinator will be P. Semenye, who previously worked with the SR-CRSP and will be employed part-time by the project 15%, increasing to 20% when the community intervention phase is implemented. R. Mwadime will represent the Applied Nutrition Program (ANP) working 20% time with the project. Consultants will be supplied by the ANP with Dr. Mwadime as the liaison. His expertise is in epidemiology, nutrition, and food security. Winrock International will be included through participation of C. Kabutha, a gender specialist who will provide access to African social science research. H. Ommeh of the University of Nairobi will provide expertise in economic studies of the region. The main collaborating institutions will be the University of Nairobi, African Medical Research and Education Foundation (AMREF), and the Ministries of Health and Education.

For the future intervention phase in Ethiopia, T. Gebre-Meskel, the Ethiopian director of FARM Africa and his deputy, Y. Kettema, will each be involved for 15-20% time. They will work in partnership as a core team including G.H. Berhanu, a human nutritionist at Alemaya University in the new Department of Public Health, who is 20% time. H. Gebresselassie of the Ethiopian Health and Nutrition Research Institute (EHNRI) will provide laboratory facilities for analyses of some of the micronutrients. Z. Wolde-Gebriel, a senior nutritionist who is a consultant to the FARM Africa-International Center for Research on Women (ICRW) project, will play a role in extension education and community development and data entry. Participants may change as the project evolves.

In Uganda, the country coordinator J. Jitta, a pediatrician trained in Public Health and a long-time director of the Child Health and Development Center. The nutritionist, L. Sserunjogi, will be part-time with the community intervention. Other consultants at Makerere University are G. Kiwuwa in Animal Sciences, a rabbit expert, and C. Magala-

Nyago in Food Technology and Sciences. Joining them is the Heifer Project International (HPI) in Kampala, which will be the lead NGO collaborator. The director, B. Muyeya, and M. Makuru, a veterinarian, will spend 15-20% of their time on this project and will help supervise the HPI field staff. C. Ebong of NARO and the Ministry of Agriculture is an animal scientist with particular expertise in poultry and will be a technical advisor to HPI. A small project supported by Thrasher Foundation will be implemented in 1998 introducing rabbits into households to improve diet quality.

TRAINING PLAN

The proposed project will have training components ranging from village level volunteer training to graduate training. Training components which will occur as part of the community interventions are: 1) Paravets (assistant veterinarians) in each country with courses ranging from one week in Ethiopia to two weeks in Kenya. Village women are to be selected by the community for this training. 2) Extension worker training: The training and retraining of agricultural and health extension workers and school teachers will be held jointly and will be supplemented by short courses as needed, particularly in nutrition. 3) Nutrition education assistants: 6 to 10 women, selected by and from the animal credit groups, will be trained in community nutrition by project nutritionists. 4) Graduate training: During years 5 and 6, two Ethiopian graduate students will be funded to obtain Master's degrees in the Applied Nutrition Program in University of Nairobi, or Master's or doctoral training at UCLA, UC Davis, or at Pennsylvania State University. The Master's candidates may remain for doctoral studies, funding permitting. The training needs identified thus far are in Public Health/Community Nutrition and Child Development.

WOMEN AND GENDER COMPONENT

The focus of the UCLA led project is determining the role that animal products play in delivering micronutrients to children. The deficiencies are most serious early in life, affecting cognitive and physical development, and are directly related to the nutritional status of the pregnant and nursing mothers. Hence, in this project specifically and the theme of human nutrition the CRSP is emphasizing generally, the role of woman in household level nutritional activities is primary component of the project. The project also has a gender specialist, Dr. Kabutha, working on the project at all stages. She will assist the investigators on examining gender issues in the feeding and nutrition of girls and time demands on school-aged girls and their poorer attendance in school.

ANTICIPATED IMPACT

The scientific community has gradually evolved in its thinking about child nutrition. The importance of protein deficiencies was stressed in the 1970s, energy or total food intake was emphasized in the 1980s, and now micronutrient adequacy in limiting dietary adequacy

and quality is being highlighted (Calloway 1995). There is still major concern about diet quantity. Current efforts globally are focusing on strategies to reduce specific micronutrient deficiencies. However, in the context of marked resource limitations such as those of smallholder farmers in East Africa, single nutrient limitations are not nearly as important as overall dietary quality. The most efficient and sustainable way to improve dietary quality in these circumstances, and in concert with individuals' and households' perceived needs for improvement in diet, is to increase the consumption of animal products (Murphy, Beaton and Calloway 1992). There are sound biological reasons to believe that milk and meat are not interchangeable in this regard, since they not only contribute different micronutrients but also differ in ability to enhance micronutrient bioavailability from plant sources (Murphy et al. 1990). A definitive study is needed to be able to demonstrate the causal role of animal products, and specifically meat vs. milk, in preventing micronutrient malnutrition and promoting growth and cognitive function of children. At issue for the nutrition community is whether food-based approaches will offer more sustainable and more effective protection against malnutrition than single or even multiple-nutrient supplementation programs or fortification. This project would provide governments with policy options for promoting change and development in animal agriculture targeted to benefit the rural poor.

> "... I found [the] proposed study very meaningful, especially in view of the fact that most East African communities are basically vegetarian but with an evolving culture of meat consumption especially from the so-called small animals. The study results would be useful to both education and health planners in assisting to formulate strategies to alleviate hunger and protein and micronutrient malnutrition in both under-fives and school-going children."
>
> Jasper K. Imungi, Professor and Chairman,
> Department of Food Technology & Nutrition,
> University of Nairobi.

The need for cash by poor rural families has been steadily rising not only for basic expenses but also for animals and other agricultural inputs. Income generation through increased ownership of animals by rural smallholder farmers would improve household resources. Poor households are "cash hungry" in terms of meeting school fees, drugs and treatment for family illness, and for their animals and agricultural inputs. Land holdings are decreasing and farmers are becoming less and less self-sufficient in food. Families are being gradually forced into a cash economy to purchase even basic staples. Owning more animals will not only allow families to consume more ASF, but also sell the surplus offspring or animal products in the market and use the income for other productive activities. Income generation contributes to the welfare of families and enables them to accumulate some wealth and promote economic development.

Economic development is impeded by fragile food security in several important ways. Not only are malnourished or hungry individuals not able to be productive, learn or be

creative, but acute food crises and crop failures force people to sell implements and abandon their farms in search of employment or food, disrupting their production base (Downing, Gitu and Kamau 1989). Animal ownership can protect the family against the effects of crop failures and other disasters by giving them a ready source of ASF for consumption or staple foods. Households will be better able to feed themselves during periods of food shortages and they will become more self-sufficient.

BENEFITS TO THE U.S.

As in East African countries, iron deficiency (with and without anemia) and zinc deficiency are fairly widely documented in the U.S. among the most socio-economically disadvantaged groups. This often "invisible malnutrition" is a result of diets high in fiber and low in animal products. These deficiencies, especially iron, have been found to relate to poor school performance, poor attentiveness in the classroom, reduced activity, poor growth and cognitive delays, and increased morbidity. Small ruminant production can improve the chances of self-sufficiency and economic development for the rural poor in the U.S.

The project provides the basis for U.S. collaboration with host countries for exchange of ideas in the fields of agricultural science, nutrition, child development, and early education as well as the ability to implement these research ideas and increase training capabilities. For students and faculty at U.S. universities, this indicates an opportunity for practical research experience and the internationalization of U.S. institutions.

The project also promotes democracy in the following ways: 1) Improved food security, nutrition, and income generation allow community members to obtain better health and to become more active and creative participants in their communities. This leads to increased political stability which fosters participation in community governance. 2) The highly interactive and participatory style of operation of the assessment team has set the tone for the proposed project teams. Decisions have been mainly by majority vote or by consensus and this will continue.

Table 8: Role of Animal Source Foods, Goals and Objectives Matrix

Project Goal: *To improve the cognitive function, growth and health of rural East African children through the increased consumption of animal source foods.*				
Objectives	**Research Outputs**	**Developmental Impacts**	**REDSO Strategic Objectives Intermediate Results**	**AID Strategic Objectives Intermediate Results**
1. To increase micronutrient intake of children through increased utilization of animal source foods in the diet (iron, zinc, vit. A, vit. B.)	1. Improvement in the micronutrient nutritional status of children through increased intake of animal source foods (meat, milk) is definitively tested. 2. Create awareness, especially within the development community, of the role of the effectiveness of animal source foods in increasing the micronutrient content and quality of children's diets.	1. Enhanced micronutrient status will contribute to improved academic performance and achievement, better health (particularly reduction in anemia) and increased physical activity of children. 2. Increased understanding of the micronutrient nutrition and the role of animal products in the community will change the patterns of household food allocation to improve child nutrition and subsequent performance outside the study population.	4.5 Enhanced African capacity to implement household level nutrition and other child survival interventions.	2.2 Policies and technologies that improve food access and agribusiness opportunities developed and adopted.
2. To verify previous observational findings that intake of animal source foods in the diet is causally linked to improved health, cognitive development and growth by conducting a school feeding, controlled intervention study of six to eight year old children.	1. A definitive study of the role of animal source foods and the role of meat and milk, in improving cognitive function, physical activity, growth and health in school children done and accepted in scientific community that will provide a scientific basis for the quantity and quality of supplemental school feeding. 2. Increase in-country research on diet quality and micronutrients through provision of research training and experience of doctoral and masters level graduate students in East Africa and USA.	1. Provide a scientific basis for the modification of school feeding and policies and modification of home feedings practices that will improve the well being of children. 2. Increase production and use of animal products as a sustainable intervention in developing countries and the US to address micronutrient deficiencies.	4.3 Improved policy environment for improved child and reproductive health systems. 4.4 Country-level implementation of improved child and reproductive health systems.	2.1 Sustainable technologies and policies that enhance food availability developed and adopted.

Table 9: Role of Animal Source Foods, Team Composition Matrix

Team Member Name	Affiliation	Role/Discipline	Nationality/Residence
Abate, Augusta, Ph.D. Dept. Director of Animal Production	Kenya Agricultural Research Institute (KARI), Nairobi, Kenya	Animal nutrition and production, policy , access to Kenya Dual Purpose Goats	Kenyan/Kenya
Alumira, Jane, Ph.D. Extension Research Coordinator	Research Extension Liaison Division, Ministry of Agriculture, Nairobi, Kenya	Extension education, human nutrition, gender issues in agriculture	Kenyan/Kenya
*Bwibo, Nimrod O., MBChB, MPH, Professor of Pediatrics	Dept. of Pediatrics, University of Nairobi (formerly AMREF), Nairobi, Kenya	Child health and development, policy	Kenyan/Kenya
*Ebong, Cyprian, Ph.D. Animal Scientist	National Agricultural Research Organization (NARO), Kampala, Uganda	Animal nutrition and production	Ugandan/Uganda
*Gebre Meskel, Teffera, MSc Project Coordinator	FARM Africa Dairy Goat Development Project, Addis Ababa, Ethiopia	Administrative and field extension support, farming systems	Ethiopian/Ethiopia
Gebreselassie, Hailemichael, Ph.D. Director of EHNRI	Dept. of Food Science and Nutrition Research, Ethiopian Health and Nutrition Research Institute (EHNRI), Addis Ababa, Ethiopia	Nutrition and laboratory support	Ethiopian/Ethiopia
Gudahl, Daniel, MSc Program Director - Africa	Heifer Project International, Little Rock, Arkansas	Animal science trainer and educator, community development	American/USA
*Hailegiorgis, Berhanu, MSc Lecturer, Faculty of Health Sciences	Alemaya University of Agriculture, Dire Dawa, Ethiopia	Nutrition and field coordination	Ethiopian/Ethiopia
Harrison, Gail, Ph.D. Dept. Chair and Prof. of Community Health Science and Anthropology	School of Public Health, University of California, Los Angeles (UCLA)	Human nutrition, food security, nutritional anthropology	American/USA
*Jitta, Jessica, MBChB Director and Sr. Lecturer of Pediatrics	Child Health and Development Center, Makerere University, Kampala, Uganda	Child health, development, nutrition	Ugandan/Uganda
*Kabutha, Charity, MSc East African Coordinator/Program Manager African Women Leaders in Agriculture and Environment	Winrock International, African Women Leadership in Agriculture Education, Nairobi, Kenya	Gender issues in agriculture, policy for all three countries	Kenyan/Kenya
Kassa-Belay, Habtemariam Lecturer and Director of Farming Systems Research and Extension Coordination Office	Alemaya University of Agriculture, Dire Dawa, Ethiopia	Community development	Ethiopian/Ethiopia

Team Member Name	Affiliation	Role/Discipline	Nationality/Residence
Kettema, Yilma Field Extension Coordinator	FARM Africa Dairy Goat Development Project, Addis Ababa, Ethiopia	Field coordinator	Ethiopian/Ethiopia
*Kiwuwa, Gabriel H., Ph.D. Prof. and Head - Dept. of Animal Science	Dept. of Animal Science, Makerere University, Kampala, Uganda	Expert in rabbit breeding and management	Ugandan/Uganda
Kogi-Makau, Wambui, Ph.D. Sr. Lecturer, Head of Applied Nutrition Program and Coordinator of Nutrition Research and Training Improvement Network for Eastern and Southern Africa	Dept. of Food Technology and Nutrition, College of Agriculture and Veterinary Science, University of Nairobi, Nairobi, Kenya	Nutritional Anthropology	Kenyan/Kenya
Magala-Myago, Christine, MSc Dean - School of Agriculture and Forestry	Dept. of Animal Science, Makerere University, Kampala, Uganda	Food Technology	Ugandan/Uganda
*Makuru, Margaret, BVM (Vet.) Training and Extension Services Coordinator	Dept. of Animal Science, Makerere University, Kampala, Uganda	Veterinarian, extension training and education	Ugandan/Uganda
Muroki, Nelson., Ph.D. Lecturer - Applied Nutrition	Dept. of Food and Technology and Nutrition, College of Agriculture and Veterinary Science, University of Nairobi, Kabete, Nairobi, Kenya	Food preservation and processing of weaning foods	Kenyan/Kenya
*Murphy, Suzanne P., Ph.D. Adjunct Associate Prof. and Extension Food and Nutrition Education Program Director	Dept. of Nutritional Sciences, University of California, Davis (UCD)	Nutrient composition, micronutrients, extension education	American/USA
*Muyeya, Bernard R., HPI Representative, Uganda	Heifer Project International, Kampala, Uganda	Zero-grazing, expert farm management, community development	Tanzanian/Uganda
*Mwadine, Robert K.N., Ph.D., MPH Lecturer, Researcher	Dept. of Food Technology and Nutrition, College of Agriculture and Veterinary Science, University of Nairobi, Uthiru, Nairobi, Kenya	Food security, biostatistics and research design	Kenyan/Kenya
*Neumann, Charlotte G., MD, MPH Prof. Community Health Sciences and Pediatrics	Schools of Public Health and Medicine, University of California, Los Angeles (UCLA)	Nutrition assessment, maternal and child nutrition and health	American/USA
*Ommeh, Hellen, Ph.D. Lecturer, Examiner, and Researcher	Dept. of Animal Economics, University of Nairobi, Kabete, Nairobi, Kenya	Economics and policy analysis gender issues	Kenyan/Kenya

Team Member Name	Affiliation	Role/Discipline	Nationality/Residence
Bradford, Eric, Ph.D. Prof. Animal Science	Dept. of Animal Sciences, University of California, Davis (UCD)	Animal husbandry and genetics	American/USA
Guthrie, Don, Ph.D. Prof. of Biostatistics	Dept. of Biostatiscs, University of California, Los Angeles (UCLA)	Biostatistics	American/USA
Ihiga, Mary Anne, Ph.D., BVM (Vet.) Senior Research Officer	Kenya Agricultural Research Institute (KARI), Nairobi, Kenya	Veterinarian, training of paravets (veterinarian assistants)	Kenyan/Kenya
Knabel, Stephen J., Ph.D. Associate Prof. of Food Science	Dept. of Food Science, Pennsylvania State University, University Park, PA	Food technology, food safety and meat processing	American/USA
Knipscheer, Henk, Ph.D. Director of Agriculture Program	Winrock International, Institute for Agricultural Development, Morrilton, AR	Agricultural policy, sociology, development	American/USA
Maretzki, Audrey, Ph.D. Prof. of Food Science and Nutrition	Dept. of Food Science, Pennsylvania State University, University Park, PA	Nutrition and extension education	American/USA
Maritim, Gabriel K., Ph.D., MPH Director of Applied Human Nutrition Prog.	Dept. of Food Tech. & Nutrition, College of Ag. & Vet. Science, Univ. of Nairobi, Kenya	Nutrition policy, human nutrition, weaning-food production	Kenyan/Kenya
*Peacock, Christie, Ph.D. Dept. Executive Director	FARM Africa, London, United Kingdom	Animal science, goat breeding, community development	British/UK
*Semenye, Patterson, Ph.D. Animal Scientist	SR/GL -CRSP, Nairobi, Kenya	Animal science, farming systems	Kenyan/Kenya
*Shapiro, Barry I., Ph.D. Agricultural Economist	International Livestock Research Institute (ILRI), Addis, Ababa, Ethiopia	Livestock, economist, food security, research and training	Ethiopian/Ethiopia
*Sigman, Marian, Ph.D. Prof. of Biobehavioral Science & Psychology	Dept. of Biobehavioral Science, University of California, Los Angeles (UCLA)	Child development, cognitive assessment	American/USA
*Sserunjogi, Louise Nutritionist/Dietitian	Child Health and Development Center, Makerere University, Kampala, Uganda	Human nutrition, nutrition status assessment, diet assessment	Ugandan/Uganda
Ruel, Marie, Ph.D. Research Fellow	International Food Policy and Research Institute (IFPRI), Washington D.C.	Nutrition policy	Canadian/USA
Wandera, Foustine P., Ph.D. Senior Research Officer	Dept. of Animal Science, Kenya Agricultural Research Institute (KARI), Nairobi, Kenya	Animal production and researcher, consultant	Kenyan/Kenya
*Wolde,-Gebriel, Zewdie, Ph.D. Private Consultant on Nutrition and Health	FARM Africa, Addis Ababa, Ethiopia	Human nutrition assessment, micronutrient deficiencies, consultant	Ethiopian/Ethiopia
*Zimbe, Imelda Nutritionist	Child Health and Development Center, Makerere University, Kampala, Uganda	Community nutrition education	Ugandan/Uganda

CENTRAL ASIA PROGRAM

RURAL TRANSITION, ECONOMIC REFORM AND STRATEGIC SUPPORT

The breakup of the former Soviet Union in 1991 and the shrinking role of the state in the region's economies have had a number of important impacts on the Central Asian livestock sector. As state control of the economy recedes, 30 million rural inhabitants, more than half the region's 53 million people, are facing enormous changes. The outcome of this transition will play a major role in determining the distribution of income and property among the populace and hence the prospects for evolution of a stable, democratic society. The different types of rural organization that emerge will also affect the pace and nature of economic growth, and the impact of agriculture on the environment.

Farm Structure and Support for Societies in Transition

Although most of the former state-controlled farms in the region have nominally been converted to some form of private organization (e.g., joint stock companies, cooperatives), in reality, they still function much as they did before 1991, albeit with much less support from the state. Only a small percentage of the former members of these farms have opted to start their own small farms. A recent survey carried out by the Organization for Economic Co-operation and Development (OECD) of the Newly Independent States (NIS) indicated that among the countries surveyed, little progress had been made towards development of market-oriented agricultural policies. Nor had policy makers adequately addressed the problem of cushioning the eventual restructure or closure of large farms (OECD 1996).

The University of Wisconsin-Madison (UW-Madison) and University of California, Davis (UC-Davis) projects aim to strengthen the capacity of governments in the region to formulate effective agricultural policies. UW-Madison will conduct field surveys of former state-controlled farms to provide core information for policy analysis to assist the emergence of desirable new types of rural organization. New forms are starting to emerge within and among farms that may hold the seeds of the future of the region's rural economy. Some new forms of rural organization appear to be positive, while others seem to lock many farmers into the role of landless laborers in large enterprises that have been captured by the former kolkhoz (state farm) or sovkhoz (collective farm) managers and other entrepreneurs. The UW-Madison ethnographic work will be supplemented by data sharing with the UC Davis project, as both projects attempt to characterize socio-economic change in rural Central Asia to guide policy making in the period of transition.

Re-Orienting the Livestock Sector

The re-orientation of agriculture in the NIS of Central Asia has been accompanied by serious economic dislocation. The price of inputs needed for agricultural production has risen, while previously maintained marketing and delivery systems have disintegrated. In the

livestock sector, animal numbers and productivity levels have fallen sharply. At the same time, there is the added pressure of reduced demand, driven by higher prices (BISNIS 1996) and falling per capita incomes (USDA FAS 1996). For the sheep industry in Central Asia, these circumstances are aggravated by loss of the Russian wool market. This has occurred at the same time that world wool prices have dropped significantly. To strengthen the capacity

> "According to the State Committee on Statistics and Analysis, by 1995 prices for fertilizer, for example, had increased 29,402 times since prices were liberalized in 1991. A total of 96 percent of cereal crops, 86 percent of potatoes, 85 percent industrial crops, and 75 percent of vegetables were grown without benefit of mineral fertilizers."
> USDA, Foreign Agricultural Service, 1996.

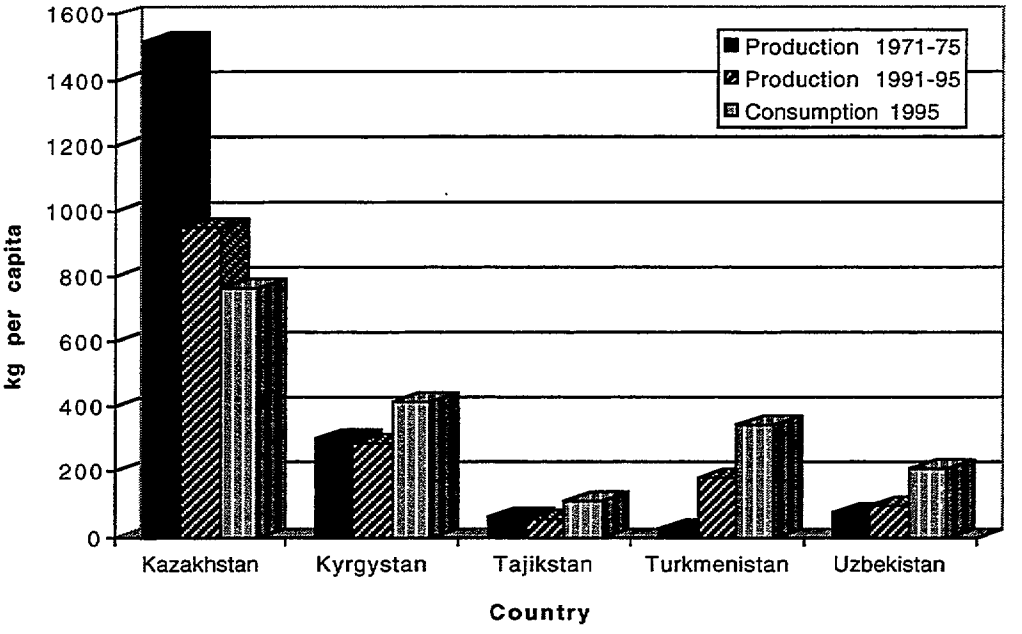
of Central Asian economies to access external markets, the University of Wisconsin is undertaking research to increase the productivity of sheep meat. This latter research would increase the number of lambs marketed per ewe by increasing the number of lambs born and surviving per ewe, thereby simultaneously improving rural incomes and lowering consumer prices, while maintaining or increasing the depleted breeding stock and conserving range resources.

Food Security and Pressures on the Environment

While contraction of the agricultural sector has had a critical impact on rural economies in Central Asia, declining consumption of animals and animal products and diminishing social supports have had far-reaching implications for the health and well-being of rural populations. Previously, regional food production had been supplemented by food imports from other countries through a centralized economic system. Since the collapse of the Soviet Union and disruption of the food supply, food security has become an issue (see Figures 19 and 20), and this has resulted in increased cereal monoculture (ICARDA 1997). These trends are reflected in consumption patterns (Figure 21) and the findings of the 1995 Kazakhstan Demographic and Health Survey (KDHS), which indicate that iron deficiency anemia has become a major public health problem (KDHS 1995).

The reduction in crop diversity also has serious implications for the long-term sustainability of agriculture in the region (ICARDA 1997). Intensified production of cereals is taking place without the use of adequate fertilizers; meanwhile, extensive cultivation is encroaching on fragile lands. The UC Davis project represents a consortia of research partners, including Utah State University (USU) and the International Centre for Agricultural Research in Dry Areas (ICARDA). Their combined expertise in geographic information systems (GIS), range ecology, animal production, production economics, and nutrition forms the basis for collaborative work on development of "sustainable and productive" smallholder livestock systems, through integration of feed resources and small ruminant production (ICARDA 1997). Development of integrated crop/livestock systems,

Figure 19: Production and consumption of all grains for feed and food: 20-year shifts in Central Asian Republics



Based on FAOSTAT.PC 1996 in T. Nordblom, 1997

Figure 20: Human Population (1965 - 1995)

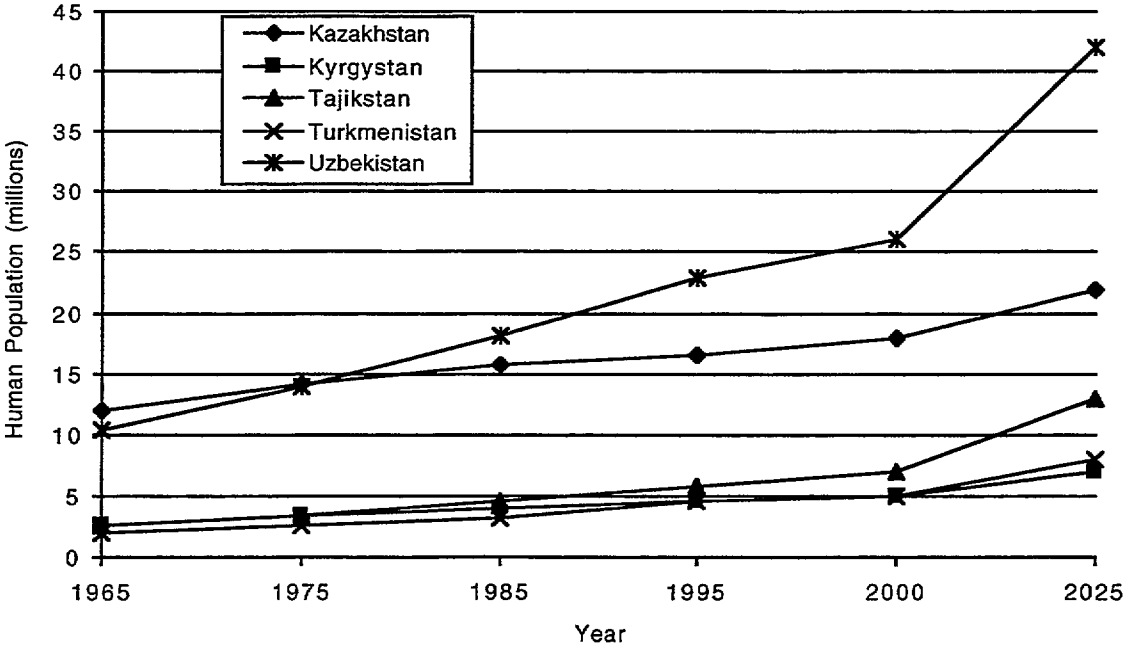
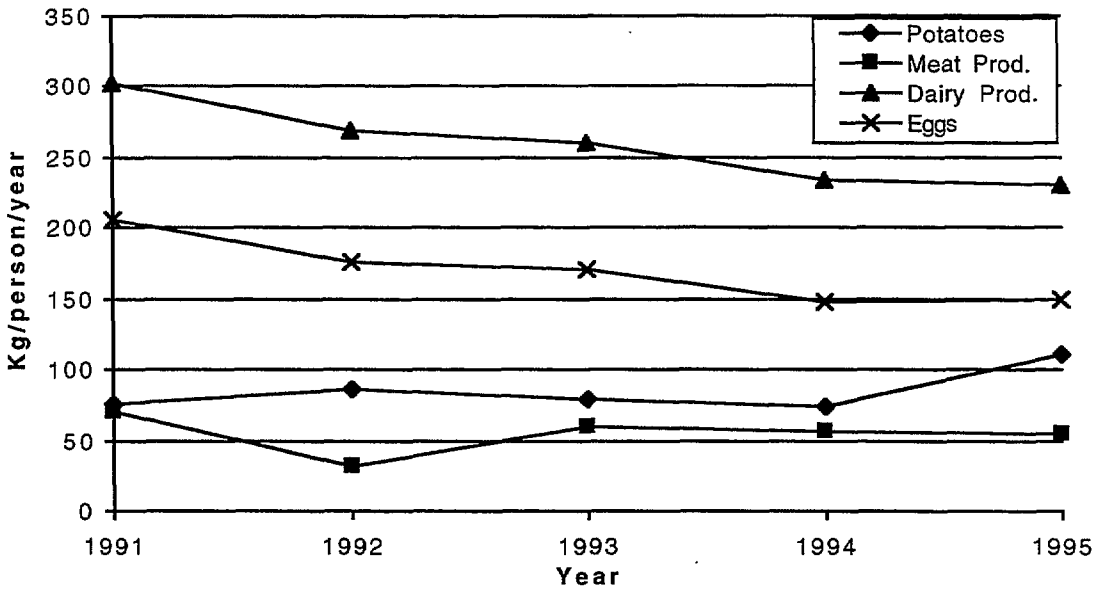


Figure 21: Food Consumption Patterns in Kazakhstan



for efficient nutrient cycling, is expected to increase the incomes and improve the diet quality of rural populations, while maintaining the ecological base upon which sustainable improvements depend.

Potential Break-Through on the Question of Global Warming

Properly managed rangelands under livestock grazing may also have a significance for global climate stability. Studies of global climate change have determined that atmospheric increases of CO_2 are less than predicted, suggesting an unknown carbon sink in the biosphere. Boreal forests and oceans have proven not to be the "missing" sink, whereas preliminary data encourage further study of rangelands. By increasing underground biomass and organic matter in the soil, rangelands may be responsible for the attenuation of atmospheric increases in CO_2 . The UC Davis project also intends to measure and model CO_2 budgets in a large network in Central Asia. If such a connection is demonstrated, the international interest and investment in tropical rainforests is an indication of the impact this project could have on the region.

Building on Past Achievements to Create a Regional Research Network

The Small Ruminant/Global Livestock CRSP (SR/GL-CRSP) projects have become the focal point for a collaborative regional research network, involving a broad spectrum of research and development partners. The UW-Madison project is working in tandem with the BASIS CRSP and University of Wisconsin's Land Tenure Center (LTC) to investigate land and water property rights issues related to dryland farming and the rangelands of

Central Asia. The UC Davis project is working collaboratively with USU and ICARDA, as well as with the Overseas Development Institute (ODI)/ Macaulay Land Use Research Institute in Scotland. The ODI will be studying pastoral institutions and management in Central Asia since the collapse of the Soviet Union. In addition, ICARDA has a proposal under consideration for funding by IFAD (International Fund for Agricultural Development).

This collaborative network builds on previous work in the area in a number of ways. Although ICARDA had had linkages with the Central Asian republics for some time, the first scientific mission to Kazakhstan took place in 1987. The environment of Central Asia is a natural extension of ICARDA's traditional region in West Asia and North Africa (WANA). The BASIS CRSP (through LTC) has also been active in the region with research on the transition of farms from state control to private farms in Russia and Kyrgyzstan.

The seeds of current regional collaborative efforts were planted in 1995 at a workshop organized by ICARDA in collaboration with GTZ/BMZ (German Assistance Agency/ German Ministry of Technical Cooperation) and the Uzbekistan Academy of Agricultural Sciences (UAAS). This workshop was followed by another in February 1996 organized by the Small Ruminant CRSP (SR-CRSP), ICARDA and UAAS. This latter meeting was attended by animal scientists, pasture and range specialists, and socioeconomists from the five Central Asian republics, the United States, the United Kingdom's Department for International Development (then the Overseas Development Administration), and ICARDA. Collaboration between these diverse agencies now continues under the direction of the two projects funded by the SR/GL-CRSP.

Central Asian Animal Products Regional Assessment Workshop

A regional workshop was sponsored by the SR-CRSP, in collaboration with ICARDA and the UAAS, from February 27 to March 1, 1996, in Tashkent, Uzbekistan (see workshop agenda, appendix D). The purpose of the workshop was to identify and prioritize research problems, which would establish the scope and definition of regional activities in the renewal period. All the NIS of Central Asia were represented at the workshop along with participants from NGOs, NARS, IARCs, local universities and the private sector. UAAS hosted the workshop. The workshop included 1) country presentations, describing livestock production systems and policies governing land use in each country represented; 2) resource presentations, with information on livestock-environment interactions, policy and institutions, etc; and 3) research priority setting exercises. Priority setting workgroups were organized around the following themes: Livestock/Environment and Policy/Economic Growth. Workgroups formulated problem models, but problem models were not ranked.

The Fielding of Assessment Teams and the Selection of Research Proposals

Problem models defined at the Tashkent Workshop served as the basis for a Request for

Proposals (RFP). The RFP issued by the SR-CRSP Management Entity in June 1996 called for the formation of assessment teams to conduct in-region investigations of specific work over a period of nine months. Through an iterative process of research problem refinement and extensive region-wide team building, assessment teams developed full proposals to submit in a second competition. Both of the funded Central Asia assessment teams were selected to continue at the full proposal level.

Team members of the successful project then participated in an Orientation and Regional Coordination Workshop held at UC Davis on October 23-25, 1997. The aim of this meeting was to coordinate efforts between teams, to provide for regional administration, and to collaborate in formulating the global and regional plans for the CRSP renewal. The two SR/GL-CRSP projects bring together a vast network of resources to address an area of rapid change with sweeping implications for emerging political and economic structures in the region. Although the transitional period poses significant challenges for regional research and development efforts, both the urgency of the need and the promise afforded by integrated, collaborative approaches to agricultural issues highlight the importance of this program. The network of regional research and development fielded by this endeavor will also provide a solid foundation for future political and economic cooperation.

Central Asia Workshop Participants, Tashkent, Uzbekistan 27 February - 1 March 1996

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Ministry of Agriculture
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Animal Research Inst.
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Thomas Nordblom
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Kazakhstan

Tjaart Schillhorn van Veen
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Kubanzerno Lukyanenko
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IMPACTS OF ECONOMIC REFORM ON THE LIVESTOCK SECTOR IN CENTRAL ASIA

Principal Investigator: **Dr. Kenneth H. Shapiro, University of Wisconsin-Madison**

PROJECT GOAL: To contribute to the development of policies and technologies that improve the profitability, income distribution, and biological efficiency of Central Asia's livestock sector.

OBJECTIVE 1: To provide policy makers with information that will help them facilitate the transition from state-controlled agriculture to new types of ownership, use-rights, cooperation, and institutional organization that increase the livestock sector's profitability and that engender a stable democratic society.

OBJECTIVE 2: To develop technological options to increase the production and the efficiency of production of meat from Finewool sheep.

To accomplish the goals and objectives of this project, field surveys of former state-controlled farms and new private farms will be conducted in areas where livestock are important in the region. These will provide a base for more detailed studies of farm organization; marketing and credit; and land law and administration. Information from these surveys and studies will be used in policy analysis to assist government officials. Technological options will also be developed to increase the number of lambs marketed per ewe, and these options will be disseminated through sheep multiplication networks.

PROBLEM MODEL

A large number of interviews conducted during repeated visits to the region have yielded a demand-driven model focused on the following priorities: (1) the need to understand the great diversity of new types of farms that are emerging and the many different processes that have produced them; (2) the deterioration of marketing and credit services for the livestock sector and the slow emergence of new providers; and (3) the transformation of the critically important sheep subsector toward much greater reliance on meat as the key to profitability. To investigate the policy environment for appropriate recommendations, a fourth component, legal and administrative studies, will be pursued in collaboration with the BASIS CRSP.

Field surveys of the employees and members of state-controlled farms, private farmers, and local and national government officials will provide core information for policy analysis

to assist the emergence of desirable new types of rural organization, marketing and credit. The surveys will also aid in strategic guidance of research to increase the productivity of sheep meat. In addition, the legal and administrative framework within which policy is formulated and implemented will be explored through related studies.

Evolution of New Forms of Ownership and Management

For centuries, livestock production in Central Asia was dominated by pastoral societies. These pastoral societies were mobile and typically organized by kinship groups. The Russian colonial and Soviet eras forced changes that were disruptive of traditional ways of life and costly for rural populations. During the Soviet campaign of 1929-1932 to collectivize agriculture, in Kazakhstan alone, nearly one-third of the population died or were removed from the region. In approximately the same period, the cattle population dropped from 7.4 million to 1.6 million and the sheep population from 21.9 million to 1.7 million. The forced collectivization and settlement of pastoral societies is a critical backdrop for understanding the unique nature of the emerging forms of ownership and management in the region.

> "The program, which undoubtedly has a great scientific and production importance for our Republic, will promote a more effective adaptation of Kazakhstan's economic-agricultural complex to the new market forces. In addition, the program will assist in the socio-economic development of certain sectors of the national economy, as well as certain regions of the country."
>
> V.S. Shkol'nik, Minister-President
> Ministry of Science and the Academy of
> Sciences for the Republic of Kazakhstan.

At present, most of Central Asia's rural population remains on the large farms that were formerly sovkhozes and kolkhozes. In Kazakhstan, with a rural population over 7 million, only 57,000 "private farms" were registered by 1997. (A similar situation exists in Russia where sample surveys found only about 4% of former sovkhoz and kolkhoz members have left to start their own farms since 1991.) Much of the recent literature deals with these two categories—the large, former state-controlled farms and the new, small private farms—as if each were a fairly homogeneous group. However, preliminary studies indicate that variation within each group is significant and may well hold the key to the future evolution of rural society and agriculture.

Some small private farms have developed close relationships with the former sovkhozes and kolkhozes they recently left. One, in Kyrgyzstan, has a long-term contract to raise heifers for the former kolkhoz. Another, in Kazakhstan, worked on a fee-for-service basis to mill the grain and dip the sheep of the former kolkhoz it left. Such arrangements provide large farms with needed services and give small farms a diversified income stream to supplement their own crop and livestock operations.

Other small farms are independent of the former state-controlled farms they left. One has a thriving dairy and sheep operation. Some of the milk produced was sold to one of the three processing plants serving Almaty, and the rest was sold along with the farm's sheep meat at a stall the farm rented in town. Others rely primarily on sheep, and one small farm relies on horse production and koumis (fermented mare's milk). Some small, private farms are buying their inputs from the former state-controlled farms, while others have formed an association to buy their own inputs, and still others have formed a small cooperative to sell their milk and meat.

Some former sovkhozes and kolkhozes are operating as modern businesses, selling milk to modern dairies or processing it with their own new equipment. Others have become large subsistence farms, paying members with produce and bartering the rest with nearby enterprises. The seemingly most successful cooperative we visited has recently been "purchased" by the manager and two outside partners, although it is doubtful that members receive any significant payment for their shares. The new owner also indicates plans for dismissing one fourth of the farm's workforce.

One can see the evolution of some forms of ownership and management that are consistent with the western model of an agricultural sector based on many family farms. One can also see patterns that could lead to variations on the Soviet model, with ownership of large farms transferred from the state to a small number of wealthy owners. A variety of other outcomes are possible as well, such as the development of new kinds of small farmer associations or of groups of small farms established around a large farm with a symbiotic relationship for certain services.

Field studies and interviews will (1) identify the main different types of ownership/use-rights, organization, and enterprise combinations that are evolving; (2) elucidate the implications of each type for future rural income distribution, agricultural productivity, export earnings, and domestic food supply; (3) signal the major constraints and opportunities facing each type in order to assess their prospects for future success; (4) facilitate development of a typology that will improve understanding of the rural transition beyond the current "large farm, small farm" classification; and (5) enable policy makers to develop more accurately targeted policies to assist desired new farm types.

It is essential to identify and analyze the different forms of ownership and management that are evolving and to assess their implications for future development. The different models that emerge will have varying implications for the distribution of income and property, the technologies employed, the pace of agricultural development, the impact on human welfare, and the way agriculture affects the environment. These differences, in turn, will have a major bearing on the extent to which democratic societies emerge in Central Asia.

Marketing and Credit

The state marketing channels of the Soviet era are being replaced by a variety of new arrangements for both the supply of farm inputs and the marketing of farm outputs. To varying degrees, the countries of the region have decontrolled prices, ended state delivery requirements, begun privatizing state marketing entities, and allowed new marketing firms to enter.

Initially, the successors of the state marketing enterprises continued to receive farm commodities, but they increasingly had difficulty paying for them in a timely fashion or, in some cases, at all. As a result, farms have been seeking alternative outlets, and new marketing channels have begun to develop. In the dairy industry, for example, a variety of cooperative dairy processing ventures have been observed.

While most supplies of farm inputs continue to flow to and through the former sovkhozes and kolkhozes, private farms in the Almaty-Taldykorgon Oblast of Kazakhstan have joined together to buy their supplies direct, without reliance on the local cooperative farm. It is difficult for both large and small farms to obtain credit, and, if available, it can be obtained only at high interest rates.

Marketing and credit play a major role in the costs and returns facing all farms, and they may differentially affect farms of different types and in different locations. Thus it is necessary to understand the status and prospects of marketing and credit in order to understand the rural transition. The objectives of marketing and credit studies will be: (1) to determine the efficiency of the marketing systems by analyzing marketing costs and margins; (2) to assess the availability of marketing services for farmers; (3) to identify possibilities for improving marketing efficiency and availability; (4) to analyze the cost and availability of agricultural credit; and (5) to identify prospects for lowering credit costs and increasing availability.

Transformation of the Sheep Subsector

In addition to improving understanding of the rural transition to assist decision making, this project also intends to deal with the major production challenge now facing the Central Asia livestock sector—to increase sheep meat production without further reducing the breeding flock and to do so in a manner that improves the efficiency of using feed resources. This objective will be pursued through research to increase the number of lambs marketed per ewe by increasing the number of lambs born per ewe and by improving management to increase lamb survival.

Sheep production, mainly for wool from finewool Merinos, has been the most important part of Central Asia's livestock sector. Before 1991, there were approximately four or five times as many sheep as cattle, and now that ratio is about 3 to 1. Since 1991 the

sheep industry has been in rapid decline due to: (1) rapid destocking as large and small farms sold or bartered sheep for needed consumer goods or farm inputs, and as many were eaten to meet subsistence needs; (2) the virtual elimination of Central Asia's main wool market in Russia; (3) the worldwide decline of wool prices; and (4) the end of USSR subsidies for feed and transport. The industry also is suffering from a long run deterioration of rangelands, but the recent destocking is already helping rectify this.

While world wool prices may recover somewhat, conditions in the world market and the Russian market are unlikely to allow the industry to rely so much on wool as in the past. As a consequence, sheep producers now look to meat as the basis for the industry's future

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"The support of Kazakhstan's private farmers, which now number 57,000 individual enterprises, will provide the project with a greater importance. We are convinced that the given project will greatly help Kazakhstan to develop the traditional area of farming, especially pastoral animal husbandry. In participating in the fulfillment of the named project, "KazAgro" hopes to obtain fruitful results, which will facilitate the further development of private farming in Kazakhstan."

Zh. A Zhambakin, General Director
National Private Farmers Federation of
Kazakhstan "KazGro Co-op."

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profitability. This was communicated by individual farmers, personnel at the Kazakh Research and Technological Institute for Sheep Breeding (KRTISB), and by scientists at a project-funded conference in St. Petersburg. As sharply lower animal numbers presage a shortage of meat and hence an increase in meat prices, increased meat production is a priority issue for consumers as well.

Crossbreeding can produce a sheep with any level of prolificacy desired between the prolificacy limits set by the prolific and non-prolific breeds. Research will focus on a comparison between two approaches: (1) introduction of the FecB high prolificacy gene from other finewool sheep; and (2) matings with rams from a Kazakh high prolificacy coarsewool flock. Improvement of prolificacy coupled with management strategies to ensure the survival of a large proportion of the lambs born is an effective method to increase the number of lambs marketed per ewe per year. Increasing the number of lambs marketed per ewe should simultaneously improve rural incomes and lower consumer prices, while maintaining breeding stock and conserving range resources.

Legal and Administrative Studies

The transition from state-controlled farms is proceeding in a framework determined by law and by administrative practice. All five countries have legislation permitting private

farms but stopping short of complete private land ownership. In many cases, the pace of transition depends less on national legislation and more on local administrators, who respond to a variety of stimuli. Kazakhstan and Kyrgyzstan have seen the largest creation of private farms, with the latest official count in Kazakhstan at 57,000. Uzbekistan has seen a modest emergence of "private farms," 14,000 by 1994, that operate as adjuncts to and within the large, former state-controlled farms. Uzbekistan's privatization legislation includes a decree of special interest to this research—every private farm must have at least 30 head of cattle. This is part of the Uzbek effort to decrease import of animal products. There has been little movement toward agricultural privatization in Turkmenistan or Tajikistan.

Legal, administrative and expanded political economy studies will be done in cooperation with the BASIS CRSP, led by University of Wisconsin's Land Tenure Center. The Center Director, W. Thiesenhusen, will serve as a member of the team and will be responsible for the land tenure portions of the field survey questionnaire used in the surveys. These surveys will provide a useful and initial database for the more detailed legal and administrative studies proposed under the BASIS CRSP. These will aid understanding of how current decollectivization has evolved and will be important as a basis for policy recommendations.

GEOGRAPHIC SCOPE

Field surveys will be conducted in Kazakhstan, Kyrgyzstan, and Uzbekistan during the first year. The first survey will be in the fall of 1997 in the Almaty-Taldykorgon Oblast, and it will serve as a pretest for materials used. During the spring of 1998, surveys will be conducted in the following areas: the Almaty-Taldykorgon Oblast and the Uralsk Oblast of Kazakhstan, the Chuisk Oblast of Kyrgyzstan, and the Samarkand Oblast of Uzbekistan. The geographic coverage will expand to other parts of these countries as well as to Turkmenistan and Tajikistan in years two and three.

RESEARCH TEAM

The research team has 22 members, 13 from the U.S. and 9 from the region. Team members have expertise in the following disciplinary areas important to the project: economics; anthropology; political science; land tenure; feed and range resources; and animal production.

Individual Members

The team will be lead by K. Shapiro and A. Khazanov, both of the University of Wisconsin. A. Khazanov, N. Masanov, and K. Shapiro will have primary responsibility for setting the framework of the social science components of the research, cooperating with E. Jesse, G. Frank, and J. Rowe on economic issues, with S. Klyashtorny, O. Naumova, M. Abuseyitova, Z. Zhambakin, E. Kazhibekov, and R. Zanca on socio-political issues, and with

W. Thiesenhusen and the BASIS CRSP—Land Tenure Center team on land tenure issues. E. Thomas, K. Medeubekov and N. Malmalkov will take the lead on the biological science research, cooperating with R. Gottfredson, Y. Berger, and M. Wattiaux on the animal science work, and with K. Albrecht, S. Sharrow, and J. Alimaev on the feed and range issues. Central Asia scholars have taken a leading role in developing this proposal, particularly the KRTISB and the Kazakh Institute for Oriental Studies.

Consortia Approach

Oregon State University is providing a range expert (S. Sharrow) experienced in dry areas of the developing world. The International Service for National Agricultural Research (ISNAR) will cooperate in strengthening research institutions in the region. The BASIS CRSP will play a major role in analyzing the current land tenure situation and its legal and administrative context. Volunteers in Overseas Cooperative Assistance (VOCA) will offer case studies of the farms and agribusinesses it has been assisting, and they will look to our research for more information on the generalizability of their work. The European Union's Technical Assistance to the Commonwealth of Independent States (EU-TACIS) will enter into a similar relationship with us. American Breeders Service Global, a leading international genetics firm, will share its experience in capitalizing farms in developing countries and will look to our research for greater understanding of Central Asia as a potential market.

TRAINING PLAN

The University of Wisconsin will provide three graduate student research assistantships each year of the project. In addition, two trips per year are planned for regional sheep researchers to come to University of Wisconsin for short-term training and research collaboration. Sheep researchers will be trained both at UW-Wisconsin and in Kazakhstan. They will receive training in the latest techniques in transcervical and intrauterine artificial insemination of ewes and in U.S. methods of freezing ram semen. Finally, the budget includes funds for training workshops in the region.

WOMEN AND GENDER COMPONENT

Central Asian economies are in transition from centrally controlled command to varying degrees of free market systems. In the livestock sector the major component has been sheep production with a focus on wool, yet the world wool market is depressed and the advantage of Central Asia to compete in this market is questionable. The answer is likely to produce meat not wool. Hence there are two currents of transition occurring simultaneously, one in market and the other in production type. The field survey questionnaire that is the major effort of the first part of the project has specific questions about the role of women in this transition. These data will be analyzed to determine the impact of these transitions on the welfare of women.

ANTICIPATED IMPACT

The project will attempt to identify and analyze the various options available, within the existing sociopolitical milieu of each Central Asian country, for the creation of new types of farms and agribusinesses. Dissemination of policy-relevant results will be pursued through the Kazakh Institute for Oriental Studies, the Ministry of Science, and the Ministry of Agriculture. Initial efforts in Kazakhstan will be followed by plans for regional dissemination.

Technological results from the sheep research will be disseminated through the KRTISB and possibly through University of Wisconsin's Babcock Institute. As the study progresses, the most promising prolific genetic resources identified through farm tests can be multiplied. In addition, results will be disseminated through annual regional conferences, and development of a regional research network will be pursued.

BENEFITS TO THE U.S.

U.S. sheep producers in the range states face the same economic problems from declining world wool prices and are looking to increase lamb production. The results of the experimental work in Kazakhstan on improved prolificacy in finewool flocks will have application to many U.S. range flocks. U.S. science will benefit as this project uses complementary expertise and resources at both KRTISB and University of Wisconsin-Madison to strengthen the sheep research programs at both institutions. As Central Asian economies rebound, this project will also provide opportunities for U.S.-owned international genetics companies, like American Breeders Service Global, to establish valuable market shares.

In addition, the field surveys and consequent policy recommendations will help the nations of the region develop stable economies and democratic institutions. The results will be important to U.S. strategic interests, as the region contains some of the world's richest oil deposits and is located along the borders of Russia and China.

Table 10: Impacts of Economic Reform, Goals and Objectives Matrix

Project Goal: *To contribute to the development of policies and technologies that improve the profitability, income distribution, and biological efficiency of Central Asia's livestock sector.*

Objectives	Research Outputs	Developmental Impacts	G/AFS Indicators	AID Strategic Objectives Intermediate Results
1. To provide policy makers with information that will help them facilitate the transition from state-controlled agriculture to new types of ownership, use-rights, cooperation, and institutional organization that increase the livestock sector's profitability and that engender a stable democratic society.	1. Improved understanding of the new forms of economic and social organization emerging in the transition of the livestock sector away from state control. 2. Identification and analysis of policy options for strengthening economic efficiency and equity in the livestock sector. 3. Expanded information for policy makers.	1. Accelerated growth of profitable forms of economic organization in agriculture that lead to equitable distribution of income and ownership.	2.2b Increased private sector participants in selected countries.	2.2 Policies and technologies that improved food access and agribusiness opportunities developed and adopted.
2. To develop technological options to increase the production and the efficiency of production of meat from Finewool sheep.	1. Compare the crossbred ewes sired by Kazakh Prolific and US Polypay rams with Kazakh Finewool ewes for lamb production. 2. Evaluate the potential for increased lamb production of Kazakh Finewool ewes through introduction of FecB gene for increased ovulation rate. 3. Determine the causes of lamb mortality and develop management strategies to increase lamb survival and growth. 4. Assess adequacy of mountain pasture to support increased lamb production.	1. Provide farmers with genetic option to increase lamb production. 2. Multiply and disseminate improved genetics through existing institutions. 3. Provide farmers with management techniques to increase lamb survival and growth. 4. Increase the amount of sheep meat produced, sold and consumed with resultant improvements in rural incomes, children's health, and consumer well being.	2.1a Increased yields and/or reduced production costs for targeted crops/commodities in selected countries. 2.1b Increased food production by region/country.	2.1 Sustainable technologies and policies that enhance food availability developed and adopted.

Table 11: Impacts of Economic Reform, Team Composition Matrix

Team Member Name	Affiliation	Role/Discipline	Nationality/Residence
Abuseyitova, Meruet. Deputy Director	Kazakhstan Institute of Oriental Studies	Socio/Political	Russian
Albrecht, K.enneth Professor	Department of Agronomy University of Wisconsin, Madison, WI	Forage Agronomy	American
Alimaev, Il'ia Il'ich	Kazakhstan Institute of Feeds & Pastures	Feed/Pasture	Kazakhstan
Berger, Yves Scientist	Department of Animal Sciences, University of Wisconsin, Madison, WI	Animal Science	American
Frank, Gary Scientist	Center for Dairy Profitability, University of Wisconsin, Madison, WI	Ag Economics/Dairy Policy	American
Gottfredson, Randy Program Manager	Department of Animal Sciences, University of Wisconsin, Madison, WI	Animal Science	American
Jesse, Edward Professor	Department of Agricultural and Applied Economics, University of Wisconsin-Madison	Ag Economics/Dairy Policy	American
Kazahibekov, E.	Kazakhstan Institute of Oriental Studies	Socio/Political	Kazakhstan
Khazanov, Anatoly Professor	Department of Anthropology, University of Wisconsin, Madison, WI	Socio/Political	American
Kliashtornyi, Sergei	Russian Institute for Oriental Studies	Socio/Political	Russian
Malmakov, Nurlan Scientist	Research and Technological Institute for Sheep Breeding, Kazakhstan	Animal Science	Kazakhstan
Masanov, Nurbulat Professor	Institute for Oriental Studies and Kazakhstan State University	Socio/Political	Kazakhstan
Medeubekov, Kiilybai Director	Research and Technological Institute for Sheep Breeding, Kazakhstan	Animal Science	Kazakhstan
Naumova, Olga	Russian Inst. for Ethnography & Anthro.	Socio/Political	Russian
Rowe, John	University of Wisconsin	Statistics	American
Shapiro, Kenneth Professor	Department of Agricultural and Applied Economics, University of Wisconsin-Madison	Ag Economics/Lead Principal Investigator	American
Sharrow, Steven	Oregon State University	Range Management	American
Thiesenhusen, William Professor	BASIS CRSP & Land Tenure Center, University of Wisconsin, Madison, WI	Land Tenure	American
Thomas, David Professor	Department of Animal Sciences, University of Wisconsin, Madison, WI	Animal Science	American
Wattiaux, Michel	University of Wisconsin	Animal Science	American
Zanca, Russell Postdocotoral Scholar	Department of Anthropology, University of Illinois,	Socio/Political	American
Zhambakin, Z.	Kazakhstan Federation of Private Farmers	Socio/Political	Kazakhstan

INTEGRATED TOOLS FOR LIVESTOCK DEVELOPMENT AND RANGELAND CONSERVATION IN CENTRAL ASIA

Principal Investigator: **Dr. Emilio A. Laca, University of California – Davis**

PROJECT GOAL: To design and promote dissemination of low-cost livestock production systems, and agricultural policy instruments for the long-term improvement of rural family welfare in an ecologically sustainable way.

OBJECTIVE 1: Implementation of productive and sustainable livestock systems based on a clear understanding of ecological and economic conditions and their variability in space and time.

OBJECTIVE 2: Use of a GIS tool to select and demonstrate impacts of different agricultural policy instruments on rangeland-based livestock production, adoption of recommended systems, and nutritional welfare of the rural population.

This project aims to assess technological and policy options for support of livestock production, natural resource conservation, and improved human nutrition. To achieve this goal, a modeling tool will be developed for decision making by farmers, policy makers, the private sector, and both local and international non-governmental organizations (NGOs). Four objectives form the basis for model development:

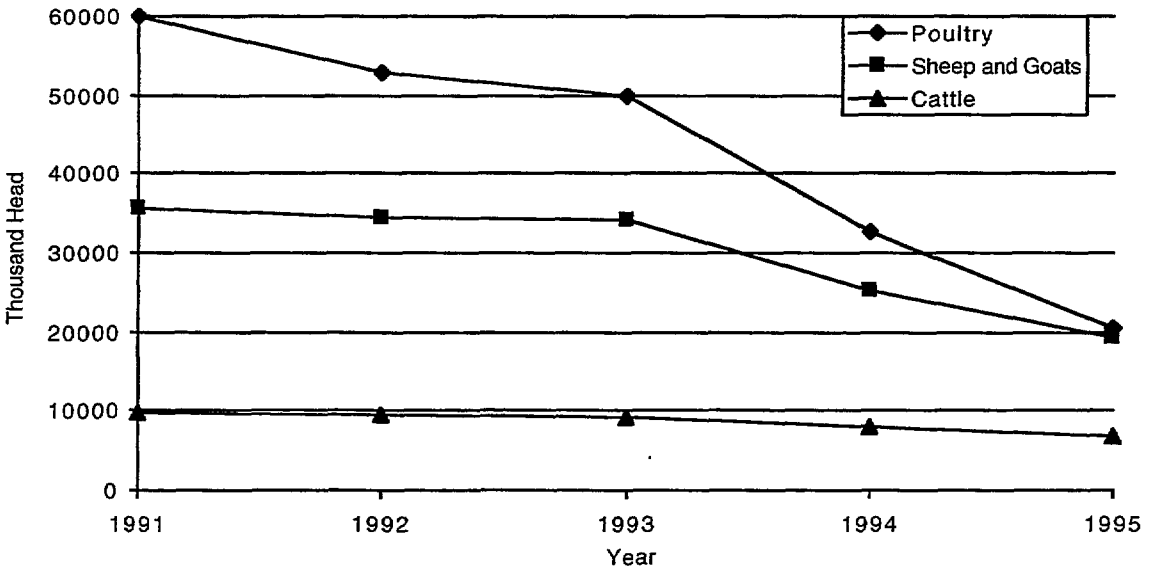
- To integrate existing data and generate new data for farmers and policy makers to assist in the transition to a market economy.
- To improve livestock productivity and restore degraded rangelands through identification of production and policy bottlenecks and formulation of recommendations for overcoming them.
- To investigate the link between livestock production and human nutrition to identify options for improving the nutritional status of rural populations.
- To test the hypothesis that the Central Asian rangelands are a major carbon sink, with implications for global climate change.

PROBLEM MODEL

Political and economic changes since the dissolution of the former Soviet Union (FSU) have had a dramatic effect on livestock production, conservation of rangeland resources, and human nutrition in Central Asia, especially in rural areas. Kazakhstan, a major food producer in the Soviet era, along with the other Newly Independent States (NIS) of Central Asia, has experienced substantial reductions in livestock production and productivity. Rangelands are at risk for extensive and irreversible degradation, as producers with limited resources try to adapt to the demands of a free market. A decline in the production of animals and animal products is paralleled by increasing incidence of anemia in women and children and stunting in children, particularly among rural populations (National Institute of Nutrition, Kazakhstan and Macro International Inc. 1996). Without alternative technological and policy options, it is unlikely that the situation will improve.

The transition to a market economy, in terms of liberalization of prices and privatization of state farms, has taken place in a piecemeal fashion and without the support of producers. The result has been systemic imbalances and critical reductions in agricultural stocks (World Bank 1993; Shend 1993). Division of state or collective herds into smaller private units has resulted in a loss of production capital and widespread decreases in animal stocks (see Figure 22). The decline in livestock numbers is also partly due to worsening terms of trade. Although product prices have remained under state control, input markets have been liberalized. With restricted access to inputs and a limited range of management options, the overall productivity of livestock is low. The decreased production and productivity of animals constrains the ability of rural families to generate income.

Figure 22: Livestock Numbers in Kazakhstan, 1991 - 1995



Another serious consequence of declining production is the decreased consumption of animal products and a concomitant rise in malnutrition. In Uzbekistan, between 1991 and 1992, consumption of animal products declined by 77%. Reduced consumption of animal products augments existing levels of micronutrient deficiencies. Rural populations in Kazakhstan, for example, have exhibited evidence of iron deficiency anemia for several decades (National Institute of Nutrition, Kazakhstan and Macro International Inc. 1996). At the same time, malnutrition and micronutrient deficiencies raise susceptibility to infectious and noncommunicable diseases. The threat of disease is aggravated by animal use of human water sources due the disrepair of wells.

> "General nutritional level of the population was reduced in the average from 3,380 kcal per day per capita in 1987-1989 to 2,552 kcal in 1993 (by 25%). [In 1993,] protein deficiency in consumable food products reached 25% and vitamin deficiency 50-60%. Over 20% of the population (34 million people) were systematically underfed."
>
> Country Report for the Russian Federation. International Conference and Programme for Plant Genetic Resources.

Despite the decline in livestock numbers in recent years, a shortage of winter forages has led to intensified use and deterioration of rangelands. Although rangelands are the most important feed resource for livestock in Central Asia (Nordblom et al. 1996), the uneven distribution of grazing has resulted in low production efficiency and increasing degradation. Continuous grazing, the concentration of livestock near populated areas and active wells, and hand-harvesting of range shrubs for feed and fuel are of particular concern. The gathering of forage and fuel by hand is one of the most common causes of desertification.

A wealth of data on natural resources is available in the region; however, most of the data is not in digital form and at risk of loss due to lack of financial resources and rapid

> NGOs can meet an important objective of rural farmers by linking environmental policy to that of agriculture, since often times rural programs forego one in favor of another.
>
> Eyzaguirre, P. 1996.

institutional change. Some data has become obsolete due to political and economic reform, and additional information is needed on the changes in livestock production methods and the nature of production enterprises since the restructuring of the economy. Reliable information on the de facto land tenure system within which state farms, cooperatives and private farms are operating does not exist. Combined with this paucity of data is a lack of low-cost technological alternatives from which producers can choose to respond to market signals. New technology and information are needed to provide technological and policy options for the rejuvenation of livestock production and the conservation of rangelands in a market-oriented economy.

To confront these issues, the project will take an integrated, interdisciplinary approach, involving on-farm technical solutions to problems constraining production and development of an instrument for assessing the effectiveness of different technological and policy options. Alternative options will be generated to address the need to increase production of winter forage, rehabilitate abandoned croplands, improve herd management and breed selection, and establish grazing methods for sustainable range utilization. To maximize success, these options will be developed in cooperation with farmers, policy makers, local and international NGOs, and the private sector.

The problem model takes a systems approach to six areas of study, which are integrated to create and disseminate technology and to assess policy impacts. The six areas are 1) basic natural resources and GIS, 2) range forage capacity and CO2, 3) animal production, 4) technological alternatives, 5) human nutrition, and 6) socio-economic integration and policy implications.

Basic Natural Resources and GIS

Basic natural resources for livestock production will be described and quantified in a geographic information system (GIS). Key layers will include: digital elevation map; vegetation type; grassland zoning by season of utilization; average forage productivity map; genetic soil classification; soil texture map, or at least percent of sand in top soil layer; map of soil structure; annual precipitation (by seasons); average and minimum January temperature; average and maximum July temperature; solar radiation; small ruminant numbers (goats and sheep); large herbivore numbers (horses and camels); human population, including rural population; phytoreclamation maps. In addition, a layer will be built with the current distribution of watering holes for livestock. A quantitative estimate of the availability and salinity of water available for livestock will be developed with a minimum resolution of approximately 10 x 10 km. This layer will be essential for identifying areas that produce forage but are not grazed due to lack of water. Other layers will incorporate the transportation network, potential elemental deficiencies in forage, and animal densities

Range Forage Capacity and CO_2

A GIS model of forage production in the major ecological regions of Kazakhstan, Uzbekistan and Turkmenistan will be based on continuous measurements of CO_2 fluxes. This model will be used to construct scenarios of seasonal range production in different zones and will provide an assessment of the role of rangelands on global C budget and climate change. The global productivity model will be based on the novel experimental protocol developed by the USDA-ARS CO_2 flux measurement network, as currently applied by the Forage and Range Research Lab in Logan, Utah (Held et al., 1990, McGinn and King 1990). This work is based on the establishment of polygons on different rangeland sites where a series of causal factors and CO_2 exchange are measured. Studies on the polygons will include measurements of plant biomass, production and gas-exchange dynamics

supplemented by ground meteorological and management records, and coupled with remote sensing information from aircraft and satellites.

Both phenomenological (statistical, correlative) and dynamic simulation modeling techniques will be applied to the data to construct predictive models for estimation of net primary production and forage production of different rangeland types. Combined with GIS and using appropriate climate change and human management scenarios these models may be used by decision makers as a tool for defining management strategies that combine livestock production, to satisfy the needs of the growing human population, and preservation of sustainable rangeland production. The results of this work will be integrated with the animal production studies below as a diagnostic tool to identify over- and under-stocked areas. The potential for increased production by a better spatial match between stocking rates and the rangeland productivity prediction tool (ANPP) will be estimated. This activity will be coordinated with the technological alternatives and natural resource studies to determine what areas have the greatest potential for successful extensive pasture improvements, such as seeding of shrubs, etc. The range forage capacity and CO_2 study will also provide weather and forage production scenarios for economic modeling and elaborate on the role of U.S. and Central Asian rangelands in the global C budget and climate change. Preliminary evidence suggests that rangelands are a major carbon "sink" that attenuates climate change. Confirmation of this role will bring international attention to the conservation of the vast Central Asian rangelands.

Animal Production

Animal production systems will be described on the basis of informal and formal surveys, and their main limitations to productivity will be identified. The animal production study will identify and characterize typical animal production and grazing systems in the main ecological regions. Information will be obtained from the published literature or by using interview/survey techniques. On the basis of a comparative and causal analysis of indices of productivity, limiting processes to be addressed in the technological alternatives study, will be identified. For example, farm observational studies can be carried out to determine if a low lambing rate is due to poor ovulation, poor breeding, poor pregnancy rates, or excessive mortality. Each stage can be linked to specific causes such as poor choice of breeding season, poor nutrition prior to breeding, poor nutrition immediately prior to lambing, etc. It is expected that systems and problems will differ between regions, and this will be catalogued in the GIS. A second objective for the animal production study is to determine stocking densities and grazing animal populations to be incorporated into the GIS.

Technological Alternatives

Technological alternatives to remove limitations, such as increasing livestock nutritional status during winter by supplementation, use of hay, and reserved forage plots, will be

evaluated and demonstrated in farms. Experiments in alternative management schemes, range improvements, and herd management options will be carried out in locations that represent the same major rangeland types where the range forage capacity group will work. Technological alternatives to consider will include seasonal-suitability and rest-rotation grazing methods, different improved pastures seeded in marginal agricultural lands formerly used for small-grain production, winter feeding options such as fenced forage-reserve plots, supplementation with grains, hay production, and fencing of land to attain exclusive and rational range use. On the basis of the simple models of production units constructed in the animal production and socio-economic studies, the technological alternatives group will explore the potential for improvements before they are actually tested.

Artemisia terra-alba was identified as a keystone species in the northern deserts between Almaty and Lake Balkash. This species is a preferred productive forage that tends to disappear under excessive grazing. There appears to be a threshold plant density below which the plant community does not recover, regardless of management. This threshold has to be defined quantitatively and can be used by the technological alternatives group to devise grazing management schemes that allow recovery of productivity and that are consistent with the resources available to livestock owners under specific land tenure conditions.

Human Nutrition

This activity will assess the nutritional status of farm families in light of proposed changes in production and policy. Nutritional status will be assessed by use of three indicators: food survey, anthropometry, and biochemical analysis. This information will be matched with data from the Demographic and Health Survey (Macro International 1996) and the National Institutes of Nutrition in Kazakhstan, Uzbekistan, and Turkmenistan, and

> "Attempts to build the assets of the poor must include strategies that are people centered, as a first priority, which translates into greater resource access: land/housing tenure, healthcare, education, and safe water sources."
>
> United Nations Development Program. 1997. Human Development Report. New York, NY.

these latter will be used to augment the sample. The nutritional data can be used to supplement socio-economic analyses and to assist in determining appropriate technological and policy interventions.

The human nutrition study will examine the role of the consumption of animals and animal products in preventing or alleviating micronutrient deficiencies. Attention will also be given to human consumption of wild edible grasses to identify potential competition between humans and animals for nutritional resources. In addition, the possibility that the

reduced availability of wells may have led to concurrent use of human water sources by animals, introducing greater likelihood of disease transmission, will also be examined.

Socio-Economic Integration

Production systems will be described along ecological and economic gradients in the three major rangeland types of Central Asia. Information on weather and rangeland productivity patterns and technical coefficients for different technological options (activities) and ecological regions will be obtained. Socio-economic assessment of current and improved production systems will be used to construct a simple economic model to predict productivity and profitability. The objective will be to integrate the information generated and translate it into policy implications for livestock development. Information will be collected in cooperation with producers and policy makers, such that the probability of implementing successful policies is maximized.

The effects of policies governing taxes, grazing permits, government investments in water and roads, regulation of marketing during times of forage scarcity, promotion of fencing, forage banks, etc., will be explored on the basis of information gathered during informal and formal rural surveys. These effects will be simulated for a variety of ecological and economic scenarios. The model developed will be used to numerically simulate the average and distribution of outcomes for each potential scenario. The effects of different policy instruments will be simulated by perturbations of prices and availability of resources (such as access to grazing lands or improved pastures) and changes in adoption of technology (as would be the result of extension efforts).

GEOGRAPHIC SCOPE

Work will be conducted in Kazakhstan, Turkmenistan and Uzbekistan simultaneously. The inclusion of these three countries will yield a unique set of case studies within a regional ecological, political and economic gradient between countries. Kazakhstan is primarily in the northern desert area and is most advanced in the transition to privatization and a market economy. Uzbekistan has an abundance of foothill rangelands and has made some movement towards transition. Turkmenistan is comprised mostly of southern deserts and has made minimal efforts to privatize or restructure politically. Studying the three countries will provide a broad spatial, ecological and economic range representative of the region.

RESEARCH TEAM

The project approach necessitates broad institutional and interdisciplinary collaboration, a fact which is reflected in the composition of the team. Members have expertise in the following disciplinary areas: agronomy and range management, animal production and health, anthropology, economics, GIS, human nutrition, mathematical modeling, plant physiology and resource monitoring. The team has 32 members

representing 24 institutions. Twenty team members are from the region and 11 are from the U.S., England, and ICARDA. In addition to the research team, project oversight will be provided by an advisory panel of representatives from each of the following sectors: farmers, policy makers, the private sector, local and international NGOs.

Collaborations among institutions and individuals are directly linked to the structure of the problem model. The team is divided into six groups, each working on one aspect of the problem model. Multiple institutions cooperate within each group to obtain information and create the products needed by other groups or by end-users. Although each group will produce outputs that are useful separately, the main goal will be achieved by the integration of all information. Physically, the integration will take place in the GIS, whereas scientifically the integration will be directed by the socio-economic group.

Each group is led by three to four researchers, including a scientist from the U.S., an English-speaking scientist working in the region, and a regional scientist. This organization will improve communication and promote international cooperation. Group leaders are responsible for mid-level management, overseeing and facilitating the activities within each group and preparing reports of group expenses and activities. Group leaders will also be responsible for annual meetings, during which research results will be presented and project monitoring will occur. The PI will be responsible for facilitating and coordinating the activities of group leaders. In consultation with team members, the PI will ensure that results from all groups are integrated.

TRAINING PLAN

The project provides training in a variety of skills, from institutional management and research techniques to farm practices. At the scientific level, one of the most important impacts will be the training of regional scientists in a new way of doing research. The project will establish links across institutes that traditionally have not interacted. At the technical level, training will be given in instrumentation (CO2 measurements), GIS, and methodologies for socio-economic and nutritional analysis. Local scientists in each country will be trained to operate CO2 field monitoring equipment and perform preliminary reduction of the field data. Regional scientists will also be trained in GIS, and a modest GIS lab will be established in each country. The human nutrition and socio-economic groups will train counterparts in survey techniques, including informal participatory rapid rural appraisals and formal sample surveys. Nutritionists will receive training in anthropometry and biochemical analysis.

The project will support a Central Asian M.S. and Ph.D. student. Additional funding for regional students to come to the U.S. is being sought with private and government institutions (Mac Arthur Foundation, Soros Foundation, U.S. Information Agency). On-farm research will involve collaboration of university researchers and farmers. Farm

managers will be actively involved in the data gathering and interpretation process and will be encouraged to propose solutions to perceived problems. Research performed on farms will also advance future extension programs. Links will also be established between private U.S. farmers/consultants and selected farms. Research results will be disseminated by direct interaction with farmers and policy makers, by print and broadcast media, and by web publishing distribution. The success of these efforts will be measured by the number of people reached.

WOMEN AND GENDER COMPONENT

The project examines the ecological and economic impacts of a range of projection interventions for the steppe of Central Asia. In this context the project hypothesizes that women with high or special nutritional requirements, such as pregnant or elderly women, will be the most affected by the changes in diet quantity and quality relative to production alternatives. They will be the focus of the human welfare study and of alternatives considered to ameliorate the situation based on both within-farm policy and donor approaches.

ANTICIPATED IMPACT

The stability and sustained development of this region are largely dependent on the new republics' ability to provide food security, to curb water problems and to reverse degradation of productive lands due to salinization and overgrazing. By providing a data-based tool for the selection of effective policies and technologies, the project will benefit the region, particularly its rural population. International organizations such as UNICEF, WHO, Mercy Corps International and local NGOs, such as the Association for Maternal and Child Health, the International Institute for Central Asian Biodiversity, Ashkabad Ecological Group "Catena", Dashxaus Ecological Club, Ekolog, and Green Salvation, working on related projects will also benefit from the information generated by the project. The inclusion of Central Asian NGOs will enhance participation in local and national decision making.

The policy recommendations and modeling tool generated by the project will have an important impact through involvement of organizations and individuals active in policy decisions. The project proposes to reach: at least 270 farms; at least four ministries, including the Kazakh Ministry of Ecology and Biological Resources, Ministries of Agriculture in Kazakhstan and Uzbekistan, and the Ministry of Health in Turkmenistan; at least two agricultural industries, including KazAgProm and the American Sheep Industry Association; at least four international NGOs, including ISAR, Mercy Corps International, WHO, and UNICEF; and at least three Central Asian NGOs, including the Association for Maternal and Child Health, the International Institute for Central Asian Biodiversity, and the National Association of Farmers.

BENEFITS TO THE U.S.

From a scientific point of view, information on the desert rangelands of Central Asia will be relevant to similar areas of the United States. Deserts in Central Asia and the Great Basin areas of the United States have many similarities both in terms of their ecology and their use, mainly for livestock grazing (Loomis 1989). The existing network of carbon balance measurements in U.S. rangelands will be significantly enhanced by parallel measurements in Central Asia and vice versa. From an economic point of view, Central Asia (particularly Kazakhstan) is one of the most rapidly developing U.S. export markets. U.S. investments in agribusiness in the region are rapidly growing. Producers and associations from the U.S can both contribute to and significantly profit from Central Asian experiences and expertise in the promotion and management of livestock production.

Table 12: Livestock Development and Rangeland Conservation, Goals and Objectives Matrix

Project Goal: *To design and promote dissemination of low-cost livestock production systems, and agricultural policy instruments for the long-term improvement of rural family welfare in an ecologically sustainable way.*

Objectives	Research Outputs	Developmental Impacts	G/AFS Indicators	AID Strategic Objectives Intermediate Results
1. Implementation of productive and sustainable livestock systems based on a clear understanding of ecological and economic conditions and their variability in space and time.	1. Updating information and methods for applied rangeland management, and increased local capacity through joint projects. 2. Testing of a novel paradigm for development research in which traditional systems and practices are adapted to new economic and environmental conditions.	1. Increased animal production and productivity at the individual enterprise and herder level by more efficient and sustainable use of rangelands, forages and crop byproducts. 2. Reduced incidence of iron deficiencies among rural women and children, and increased economic viability of private, former collective and former state farms.	2.1b Increased food production by region/country. 2.2c Improved nutritional status in developing countries	2.1 Sustainable technologies and policies that enhance food availability developed and adopted. 2.2 Policies and technologies that improve food access and agribusiness opportunities developed and adopted.
2. Use of a GIS tool to select and demonstrate impacts of different agricultural policy instruments on rangeland-based livestock production, adoption of recommended systems, and nutritional welfare of the rural population.	1. Integration of current information on basic natural and technological resources in an open system that enables continuation of research cycle by regional scientists. 2. Unique model and dataset to document the role of properly manage rangelands in the sequestration of greenhouse gases.	1. Rational planning and adoption of strategic agricultural and environmental policy to promote recommended livestock systems will be achieved by using the model's predictions. 2. More efficient allocation of government resources for rural development at the country, and local levels.	2.4d Data collection, analyses and presentation standards established. 2.4e Number of donors using the resources to the system and benefiting from the results.	2.4 An information system established to enhance decision making for the agricultural sector developed and adopted.

Table 13: Livestock Development and Rangeland Conservation, Team Composition Matrix

Team Member Name	Affiliation	Role/Discipline	Nationality/Residence
Breuer, Abigail Graduate Student	Agronomy and Range Science University of California, Davis	Animal production and feeding systems/Agronomy and Economics	American/USA
Carpenter, Mary Graduate Student	International Agricultural Development University of California, Davis	Survey and Assessment/Human Nutrition and Development	American/USA
Gilmanov, Tagir Professor	Biology/Microbiology South Dakota State University Brookings, SD	Mathematical modeling/Systems Ecology	American/USA
Grivetti, Louis E. Professor	Nutrition University of California, Davis	Survey and Assessment/Geography and Nutrition	American/USA
Howitt, Richard Professor	Agricultural and Resource Economics University of California, Davis	Economics Modeling	British/USA
Jarvis, Lovell S. Professor	Agricultural Economics University of California, Davis	Advisor/Economics of Livestock Development	American/USA
Johnson, Douglas A. Ph.D.	Forage and Range Research Laboratory Utah State University, Logan UT	Primary production/Plant Physiology	American/USA
Kerven, Carol K. Ph.D.	Overseas Development Institute Portland House, London, UK	Advisor/Central Asian Livestock Systems	British/USA
Laca, Emilio A. Assistant Professor	Agronomy and Range Science University of California, Davis	Principal Investigator/Rangeland Ecology	Uruguay/USA
Plant, Richard E. Professor	Agronomy and Range Science University of California, Davis	GIS Expert/Agronomy	American/USA
Saliendra, Nicanor Z. Research Associate	Forage and Range Research Laboratory Utah State University, Logan UT	CO2 exchange/Physiological Ecology	Filipino/USA
Abdraimov, Seyfulla Deputy Director	Karakul Sheep Husbandry Institute, Shimkent, Kazakhstan	Director of Institute; maps and other data	Kazakstan/Kazakhstan
Alimayev, Ilya Senior Research	Institute of Forage and Rangelands, Almaty, Kazakhstan	Range Management	Kazakhstan/Kazakhstan
Andrusevitch, Vitaly Director	SPPC, Kazakh Hydrogeological Complex, Almaty, Kazakhstan	Hydrogeology, distribution of water wells for livestock	Kazakhstan/Kazakhstan
Aripov, Uktam Director	Karakul Sheep Research Institute, Samarkand, Uzbekistan	Animal Production	Uzbekistan/Uzbekistan
Asanov, Kasym Director	Kazakh Research Institute of Feed and Pasture, Almaty, Kazakhstan	Forage production, rangeland management	Kazakhstan/Kazakhstan
Gintzburger, Gustave Program Leader	Pasture Forage and Livestock Program, ICARDA, Aleppo, Syria	Coordination with ICARDA/Pasture, Forage and Livestock	French/Syria

Team Member Name	Affiliation	Role/Discipline	Nationality/Residence
Grishenko, Valentina	Institute of Space Research, Almaty, Kazakhstan	Remote sensing specialist	Kazakhstan/Kazakhstan
Hojakov, Olvyakuli, Director	Institute of Animal Breeding and Veterinary Ashgabat City, Turkmenistan	Animal Production, Turkmenistan representative	Turkmenistan/Turkmenistan
Khusanov, Rasulmat, Director	Institute for Market Reforms in Agricultural Sector, Ministry of Agriculture, Uzbekistan	Economics and Policy Studies	Uzbekistan/Uzbekistan
Kurochkina, Lidiya, Ya., Professor	Institute of Ecology and Sustainable Development, Almaty, Kazakhstan	Expert in Central Asian Rangelands/Botanist	Kazakhstan/Kazakhstan
Lebed, Lubov V., Head of Forecast	Kazakh Institute for Hydormeteorological Research, Almaty, Kazakhstan	Weather and Climate	Kazakhstan/Kazakhstan
Nasyrov, Mukhtar, Associate Professor	Samarkand State University Samarkand, Uzbekistan	CO2, flux measurements, Forage production	Uzbekistan/Uzbekistan
Nordblom, Thomas L., Ph.D.	Pasture Forage and Livestock Program, ICARDA, Aleppo, Syria	Trends in livestock and feeds/Agricultural Economist	American/Syria
Ombaev, Abdirachman, Director	Karakul Sheep Husbandry Institute Shimkent, Kazakhstan	Karakul Production	Kazakhstan/Kazakhstan
Podolskiy, Lev I., Director	State Scientific Production Center of Land Resources, Almaty, Kazakhstan	Land tenure; ground surveys of vegetation and soils, economist	Kazakhstan/Kazakhstan
Shabanova, Ludmila V., Director	Institute of Ecology and Sustainable Development, Almaty, Kazakhstan	Director of Host Institute; mapping/Ecologist	Kazakhstan/Kazakhstan
Sidorenko, Olga Head of Laboratory	Institute of Plant Physiology, Genetics and Bioengineering, Almaty, Kazakhstan	Carbon flux, primary production	Kazakhstan/Kazakhstan
Suleimenov, Mekhlis Liaison Officer Central Asia	ICARDA Highlands, Regional Program Ankara, Turkey	Pasture agronomy, rangeland improvement	Kazakhstan/Kazakhstan
Thomsom, Euan F. Ph.D.	Pasture Forage and Livestock Program, ICARDA, Aleppo, Syria	Animal production and nutrition	British/Syria
Turbacheva, Tamara Head of Geobotany Science	State Scientific Production Center of Land Resources, Almaty, Kazakhstan	Geobotanist, collection of ground data and mapping	Kazakhstan/Kazakhstan
Zakarin, Edige Deputy, Director, Professor	Institute of Space Research Almaty, Kazakhstan	Remote sensing, NDVI, GIS	Kazakhstan/Kazakhstan
Zhambakin, Zhapar Director General	National Federation of Private Farmers of Kazakhstan, KazAgro Co-op, Almaty, Kazakhstan	Contact with private farmers, dissemination, advisor on rangeland technology	Kazakhstan/Kazakhstan

LATIN AMERICA PROGRAM

NATURAL RESOURCE CONSERVATION AND RURAL DEVELOPMENT

During the period from 1980-1990, countries in Latin America experienced serious social and economic dislocation and rapid deterioration of the environment. Large foreign debts, hyperinflation, and lack of economic growth were characteristic of the period. The effects of macro-economic adjustments to reduce market fluctuations and public deficits were harsh. Measures taken to re-gain stability resulted in a decrease in the production of staple foods, widespread unemployment, and a reduction in social services (Vaccaro 1995). As much as forty percent of the population of Latin America still lives below the poverty line (Byrne 1997). While aggregated statistics indicate that average consumption of meat and milk has remained constant, it has recently been documented in Venezuela that the figures mask "a serious deterioration in diet quality of the poorest families" (Vaccaro 1995).

Consumption of meat and milk has been traditionally important in the Latin America diet, with cattle contributing nearly half the meat and almost all of the milk produced. While increase in the amount of land under food crops has not been significant (CIAT 1993, cited in Vaccaro 1995), in the 1980s Latin America had the highest rate of deforestation in the world (Serrao 1994, cited in Vaccaro 1995). Fifty percent of the pastures in tropical Latin America are estimated to be in a severe state of degradation (Serrao and Toledo 1990, cited in Vaccaro 1995). While in the NAFTA era the region is beginning to develop economically, economic development is outpacing concerns for sustainability. National economies are racing toward a rapid high but, without attention to maintaining the environmental integrity and biodiversity of the region, they face an inevitable fall and greater regional instability. Sustainable development is a critical issue for the region, as well as for the global community.

Due to limited funding and the need to maintain a critical mass of researchers in the two regions of highest priority, the Small Ruminant/Global Livestock CRSP (SR/GL-CRSP) has only one project in Latin America at this time. Nevertheless, the importance of maintaining a foothold in the Latin America region is underscored by the compelling need for development of sustainable livestock production systems, the poverty of rural populations, the extent of environmental degradation, and the substantial promise of the project being funded. With strong support from the regional panel who evaluated Latin America proposals, the University of Wisconsin-Madison (UW-Madison) project will focus on natural resource conservation and rural development. Like all SR/GL-CRSP projects, the UW-Madison project is regional in scope, involving extensive work in three countries (Bolivia, Ecuador, and Mexico).

Agricultural Sustainability in Forested Mountain Areas

The Latin America project concentrates on the interface between agricultural and forested ecosystems in mountainous regions that run throughout the region. This interface exists within nearly every country, providing an "internal frontier" between important watershed source areas and rapidly expanding clearing for logging and agriculture, a frontier as an area open for colonization by peoples forced to leave resource-poor regions (Thiesenhusen 1991), and a frontier of exploration of the unique rich biological diversity rapidly disappearing in the face of uncontrolled exploitation (Gentry 1991, Thurow 1991, Zimmerer 1992). Unlike many lowland forests, montane forested ecosystems in the tropics are subject to natural disturbance in direct relation to the scope of human activities. The UW project rests on the hypothesis that sustainable land-use practices can be devised for such a high-diversity/disturbance system.

Livestock-Environment Interactions

The Latin America team will investigate the relationship of livestock as a resource interacting with the vegetation and soil types of the region, including croplands, pastures, and the various types of natural vegetation. They will examine the interaction of different types of livestock on these land cover types. The consequences of these interactions will be analyzed in terms of 1) nutrition and production of livestock; 2) ecosystem services; and 3) ecological sustainability. Critical evaluation of livestock impacts on ecosystem services and sustainability will consider alternatives provided by local biodiversity. Biodiversity will be included as an explicit component of the problem model with the dual objectives of determining indicators of health for natural ecosystems that may be impacted by livestock activities, and evaluating corresponding resource potentials of components of local ecosystems that may supplement or be alternatives to livestock. These objectives clearly define elements on which the quality and sustainability of life for local small landholders in the water shed depend.

Involvement of Local Communities

The UW-Madison project incorporates a question of scale: ecological scales large enough to maintain local biodiversity and ecosystems functions and at a human scale small enough to conceive of effective local planning. Project planners have targeted the ecological scale at the level of microwatersheds and the human scale at the size of small rural communities. Ecosystem integrity and human welfare are seen as physically and conceptually inseparable. To the extent that ecosystem integrity is being lost, the basis for local economic development will be reduced, as well as alternative options and future opportunities for production. At the same time, maintenance of the ecosystem can not be achieved without local communities' taking responsibility for the ecosystem's healthy management. That the two go hand-in-hand is the essence of the project's problematic theme.

> "More animals, animal products, or income from integrated animal agriculture is not the same as development. Animals may well be a stimulus to generate development, but in itself livestock production cannot be the primary goal of development or the only measure of its success. Development is often defined in material terms; but as several writers in this field suggest, this is not an adequate definition. It neglects the human component. Human development is a participatory process that leads to self-determination, self-confidence, mutual cooperation, and a better quality of life. Its goal is holistic transformation."
>
> Aaker, J. 1994. "Livestock for a small earth: The role of animals in a just and sustainable world." Seven Locks Press, Washington D.C.

The process upon which the project is based explicitly involves and incorporates the people of rural communities. Recognizing that communities are not homogenous, the project seeks dialogue with a broad selection of groups. Since this program seeks to work with those people who are most in need, however, the principal beneficiary groups will be small-producers, land-poor families, women, and ethnic minorities. The strategy for reaching farmers in local communities is linkage with local conservation and development oriented NGOs. Regional coordination will be effected through researcher-to-NGO, site-to-site, and community-to-community relations. Future phases of the project will involve linking "upwards and outwards," through networking with government agencies, private interests and other NGOs.

Global Comparisons of Nutritional Interventions

The quality-of-life objective of the rural development component of the project includes attention to improved diets and provision of adequate human nutrition. The ability of animal source foods (ASF) to meet human nutritional needs, especially those of women and children, is being examined across the CRSP in three regions. A controlled intervention is being conducted in East Africa to determine the benefits of consumption of ASF, and human nutrition is an integral part of other projects in East Africa and Central Asia. CRSP projects are being developed collaboratively to share baseline data and to maximize the comparative potential of intra- and inter-regional studies. The linking of increased animal production and the improved physical and cognitive development of rural populations is a major thematic of SR/GL-CRSP research and development efforts.

Building on Regional Resources

Partners in the Latin America project bring a wide range of methodologies and experiences to the table. The Ecuador team has worked extensively with autodiagnostics, a method for the participatory involvement of local communities used by the SANREM CRSP. Three participating NGOs in Ecuador previously worked on the SANREM CRSP. The Bolivian team includes participation of the Interdisciplinary Center for Community Studies (CIEC), which has expertise in preparation and use of environmental education

materials. All sites have GIS experience but will be additionally supported by the U.S. Forest Service. The project has been designed to draw on the strengths of each partner to complement the strengths of others.

The project has also been set up to address land use and natural resource policy issues because partners are directly responsible for determining and applying policy near and within the reserves. In Mexico, IMECBIO works closely with the Secretaria del Medio Ambiente y Recursos Naturales y Pesca (SEMARNAP) in the administration of the Biosphere Reserve and serves as technical advisor in the planning and operation of the reserve. In Ecuador, FUNAN has a Convenio de Cooperacion with INEFAN (Direccion Nacional de Areas Protegidas y Vida Silvestre) for the management and administration of the Antisana Reserve. And in Bolivia, PROMETA has an administrative agreement with the Bolivian government for the management of the Tariquia Reserve. NGO partners have expressed their intention to use the project as a "pilot" program whose results will be applied to other protected areas under their jurisdiction.

Latin America Regional Workshop

A regional workshop was sponsored by the Small Ruminant CRSP, in collaboration with the Inter-American Institute for Cooperation on Agriculture (IICA), on April 15-18, 1996, in San José, Costa Rica (see workshop agenda, appendix D). The purpose of the workshop was to identify and prioritize research problems, which would establish the scope and definition of regional activities in the renewal period. Nine countries of Latin America

Latin America Regional Livestock Assessment Workshop

Ranking by Workshop Participants

1. Livestock Production Systems for Ecosystems.
2. Adjusting Livestock Production Systems to Environmental Potential and Limitations.
3. Animal Source Products Key to Child Development.
4. Improvement of Small Scale Agro-Processing of Livestock Products.
5. Adjusting Improved Technologies to Resource Product Farmers.
6. Impact of Macro-Economic and Trade Policy.
7. Empowerment of Producers.
8. Livestock Product Market Intelligence.
9. Evaluation, Protection and Equitable Rational Use of Wildlife in Livestock Production Systems.

were represented at the workshop: Belize, Guatemala, Mexico, Honduras, Costa Rica, Peru, Bolivia, Ecuador, and Trinidad. Other participants included representatives from NGOs, NARS, IARCs, the Food and Agriculture Organization (FAO) of the United Nations, local universities and the private sector.

The workshop included 1) country presentations, describing livestock production systems and policies governing land use in each country represented; 2) resource presentations, with information on human nutrition, wildlife/livestock interactions, policy and institutions, etc; and 3) research priority setting exercises. Priority setting workgroups were organized around the following themes: Human Nutrition, Livestock/Environment and Economic Growth. The workshop ended with a ranking by participants of livestock research priorities.

The Fielding of Assessment Teams and the Selection of Research Proposals

Problem models defined at the San José Workshop served as the basis for a Request for Proposals (RFP). The RFP issued by the Small Ruminant CRSP Management Entity in June 1996 called for the formation of assessment teams to conduct in-region investigations of specific work over a period of nine months. Through an iterative process of research problem refinement and extensive region-wide team building, assessment teams developed full proposals to submit in a second competition. One of the four funded Latin America assessment teams was selected to continue at the full proposal level.

Representative regional and U.S. team members of the successful project then participated in an Orientation and Regional Coordination Workshop held at UC Davis on October 23-25, 1997. The aim of this meeting was to coordinate efforts between teams, to provide for regional administration, and to collaborate in formulating the global and regional plans for the CRSP renewal. The Latin America plan is broad-based and involves the extensive participation of NGOs and local communities. Involvement by the people of local communities is crucial because 1) they have important knowledge of the ecosystem in which they live and work, and can describe their production systems and uses of the ecosystem; and 2) their appropriation of the project increases the achievement rate of project objectives during the duration of the project and the continuance of project goals afterwards.

Latin America Regional Livestock Assessment Workshop Participants
San José, Costa Rica 15 - 18 April 1997

Carlos Aquino
IICA
Costa Rica

Marcelino Avila
Ministry of Agriculture
& Fisheries
Belize

Hector Ballesteros
SANREM
Ecuador

Jorge Benavides
CATIE
Costa Rica

Larry Boone
IICA
Costa Rica

Juan Carlos
Chirgwin,FAO
Italy

Montague Demment
SR-CRSP
USA

Gustavo Enriquez
IICA
Costa Rica

Gerardo Escudero
IICA
Costa Rica

Enrique Flores
Universidad Nacional Agraria
Peru

Everado Gonzalez-Padilla
INIFAP
Mexico

Luis Iniguez
RERUMEN
Bolivia

Alejandra Jimenez
Asociacion Costarricense de
Criadores de Cabras
Costa Rica

Susan Johnson
SR-CRSP
USA

Michael McCoy
Universidad Nacional Heredia
Costa Rica

Miguel Mejía
DICTA
Honduras

Charlotte Neumann
University California,
Los Angeles, USA

Samsundar Parasram
CARDI
Trinidad

Carlos Pomareda
SIDE
Costa Rica

Sergio Ruano
IICA
Guatemala

Manuel Ruiz
IICA
Costa Rica

Arnoldo Ruiz
IICA
Costa Rica

Clara Solís
IICA
Costa Rica

Richard Taylor
EARTH
Costa Rica

LIVESTOCK-NATURAL RESOURCE INTERFACES AT THE INTERNAL FRONTIER

Principal Investigator: **Dr. Timothy Moermond, University of Wisconsin – Madison**

PROJECT GOAL: To develop and promote sustainable management of livestock and natural resources by communities of small landholders that maintains the high biodiversity of mountainous forested areas of Latin America.

OBJECTIVE 1: Identify existing and alternative practices of land use and livestock production that can be adopted by communities to produce sustainable rural development.

OBJECTIVE 2: Using a participatory community process to establish a system of long-term community planning for sustainable natural resource use and livestock production within forested watersheds.

The overall goal of this project is to work with local communities in forested mountainous areas in the design and development of a livestock production program for improving people's income and diet, in a manner that is sustainable for the production structure at the family level and the community-level and sustainable for the environment (forest, soils, indigenous flora & fauna) at the level of the watershed and the region. Livestock will be used as the primary target to integrate multiple approaches aimed at solving these problems. The project will proceed through the following steps: 1) To study the present and potential role of livestock in the livelihood of rural families and communities; 2) To enhance local, community-based planning for the use and management of livestock and for the sustainable use of land and natural resources at the scale of the community's watershed; 3) To work with rural families and communities in the development of sustainable livestock and natural resources management alternatives.

PROBLEM MODEL

The majority of livestock in Latin American countries is not found in forested areas (although many are in formerly forested areas), and the majority of remaining forest area does not regularly harbor livestock. Nevertheless, at virtually every forest:farm interface livestock are present and part of the problem and process of land degradation. Livestock are often directly associated with modification and/or clearing of natural vegetation as a result of grazing activities or needs. It is hypothesized, however, that appropriate management of carefully selected livestock can be ecologically sustainable and can improve the livelihood of the communities in these sensitive regions.

The link between livestock production and deforestation has been well documented (Williams 1986, Leonard 1987); however, there is a notable lack of knowledge concerning the impact of cattle grazing in forested areas (in a recent global review of the impact of grazing on natural vegetation by Milchunas and Lauenroth, 1993, none of the 103 sites examined was in montane tropical forest). Not only has there been little study of livestock grazing in tropical montane forested systems; there have been fewer investigating the integration of livestock production and wildlife cropping in those systems (Barnes et al. 1991, Severson and Urness 1994).

The project is addressing major problems in the mid-elevation mountain and foothill regions of Latin America: deforestation, serious changes in the water regime, loss of biodiversity and biological resources, and deterioration of the ability of rural peoples to sustain their livelihood. By focusing on the mountain regions, which tend to have more marginal grazing than the lowlands, our focus will be on a relatively homogeneous group of small-scale producers, often working within mixed farming systems. The project is community-based and the process of planning, implementation and evaluation explicitly

> "Non-governmental organizations are playing an increasingly important role in reaching farmers, particularly in developing nation.... Although relatively limited in terms of technical resources and scientific rigor, NGOs, with their emphasis on field-based approaches, serve as increasingly critical links between farmers and scientists. They can also play useful roles in shaping policy and the research agenda."
>
> National Research Council, 1991.

incorporates the participation of the people of these communities. While recognizing and soliciting a spectrum of viewpoints within these communities, the project seeks to work with those who are most in need—small-producers, land-poor families, women, and ethnic minorities—as principal beneficiary groups.

Research sites have been selected using the following criteria: 1) regions in which livestock are an important element; 2) mountainous watersheds with an interface between forested ecosystems and agriculture; 3) regions with problems of deforestation, degradation of soils, and poverty; and 4) regions occupied primarily by small landholders. In looking for suitable areas for target studies, it became clear from in-country contacts and collaborators that there were many areas that fit these criteria and that the problems in these areas were legion, poorly studied, and rapidly increasing in magnitude. The problems include: 1) deterioration of water sources in the areas surrounding these mountainous forested ecosystems, 2) rapid loss of irreplaceable biological resources, and 3) degradation of the production potential of these regions, thereby reducing the productive capacity of countries with an increasing problem of landless, resource-poor peoples.

Approach to the Sustainable Integration of Livestock and the Environment

The project's approach to the integration of livestock and the environment is to focus on a critical region (as defined above) and then study how livestock can be incorporated into the environment in a manner which is ecologically sustainable and which can contribute to the improvement of the livelihood of local residents. In-country collaborators are convinced that this integrated, community planning approach is highly relevant to the needs of the local peoples and has a high potential to benefit local communities.

The approach has been developed and refined through the application of four "elements": 1) a wide variety of relevant disciplines have been included, 2) a wide range of different experiences have been included (NGO and University experiences, theory and practical application, research and action), 3) the entire effort has been oriented toward a common goal, and 4) an integrating process was developed to incorporate and orient specific objectives and individual approaches towards this overall goal. The process (see Figure 23) was developed to allow an adaptive approach to the planning of the work as well as the long-term planning by the community. As such, the "integrated process" has become both a guide and one of the goals of the project.

Figure 23: Integrated Process for Community Planning

Work Areas

To accomplish this approach, the project is integrating four areas of work which encompass different scales of focus and which incorporate different techniques and methodologies: community organization and participation, livestock and land use, landscape analysis, and education. These work areas were defined to direct attention to different types and scales of methods and perspectives which need to be brought to bear on the common objectives of the problem model. It is important to the approach to emphasize that the four areas of work have been tightly integrated.

Project Goals

The project work will be organized around four principal goals. These goals span all of the project's work areas and form an overlapping and interactive set. It is assumed that in each goal community members will participate in all stages of the work, assuming an ever increasing share of the project through time. Sustainable livestock production and natural resource management are intended to be central to every goal. Biodiversity is a key component of sustainability and underlies the more explicit goals. The watershed is the scale of the application of these goals.

Goal 1: Identify the potentials and limitations within the community for sustainable management of natural resources and livestock, and improvement of quality of life.

The community and the project team will collect information on the population, the livestock, and the landscape using (1) participatory appraisal methods (e.g., community workshops, focus group meetings), (2) other scientific methods (e.g., structured interviews, case studies, land cover surveys, biological inventories), and (3) secondary sources (e.g., published and unpublished documents, databases, maps).

Goal 2: Evaluate current practices of livestock and natural resource management and experiment with alternatives.

The second goal is to evaluate current practices and to design a program of alternative practices for sustainable natural resource management at the community level with the identified stakeholders. This will be implemented by the community and the project team based on the information from the autodiagnostic process and building on the participatory process developed during this appraisal. Communication among community members and between the community and project team is crucial and should have priority in the methodology.

The long-term process for achieving this goal begins towards the end of the first year and continues throughout the life of the project. It includes 1) evaluation of current management practices, 2) identification and selection of alternative management practices, 3)

> "Traditional systems reflect more experimentation than meets the eye, often including combinations of celestial study, rotational patterns, species diversity, storage methods, inclusion of natural sources of fertility, and terrace building for soil control. Intervention in the form of NARS and scientific research have often neglected to recognize the forces that have held such civilizations together for centuries."
>
> Salas, M. 1994. "The technicians only believe in science and cannot read the sky: The cultural dimensions of knowledge conflict in the Andes."

experimentation with these alternative practices, 4) evaluation with regard to the viability of these alternatives, 5) promotion and diffusion within the community of the viable alternatives, and 6) adoption of these alternatives among producers. This process will be carried out through workshops and field visits with community and participants and project team members, technical assistance from the project team, and close collaboration between community and project team during the design, experimentation, and evaluation stages.

Goal 3: Generate a participatory process for planning, implementing, and monitoring current and alternative practices.

The third goal is closely related to the second in that it provides on-going monitoring of both traditional and alternative livestock and natural resource management practices (e.g., information regarding level of adoption, impact on stakeholders and ecosystem, level of community participation, etc.) and prepares the ground for the fourth objective (preparation of a community management plan). Monitoring is to be done by the community itself, with assistance from the project team (e.g., in the selection of indicators and criteria, in development of the monitoring program—ensuring full involvement by different stakeholders— and in analysis of results).

Goal 4: Establish a long-term, on-going, community planning process for natural resource and livestock management.

Elaboration of a community plan for long-term natural resource management will begin at the beginning of the fourth year of the project, once there is a strong participatory process and planning behavior developed in the community, and both project team and community members have concrete knowledge regarding natural resource management (both traditional and alternative) with a focus on livestock production in their community and the watershed area. The goal is to develop with the community an integrated and adaptive management plan that will guide them in managing their resources not only during the project but, more importantly, once the project has ended.

GEOGRAPHIC SCOPE

The project will address problems of the "internal frontiers" of three countries in Latin America: Mexico, Ecuador, and Bolivia. Within this agriculture-forest interface that runs

throughout Latin America, research sites have been selected in areas which constitute "buffer zones" of ecological reserves. In Mexico, research sites are in the official buffer zone of the Sierra de Manantlán Biosphere Reserve. In Ecuador, the project's sites are in the colonized corridor between a complex of three reserves: the Antisana and Cayambe-Coca Ecological Reserves and the Sumaco Napo-Galeras National Park. In Tarija, Bolivia, the work sites are just north of the imperiled Tariquía Ecological Nature Reserve. Although livestock are not typically the reason for initial human colonization of these forested areas and may not always constitute the cause of deforestation and degradation of the watershed, livestock are important elements of the problem and the potential solution within these regions.

The value of the regions which the selected sites represent has been recognized as many-fold: 1) they are very high in biodiversity (Bibby et al. 1992) with very high numbers of endemics—species with small geographic distributions unique to the regions—the area surrounding the site in Ecuador has been characterized as the richest area on earth (Felsa and Rahbek in press), 2) their watersheds are critical sources of water for densely settled surrounding areas (Churchill et al. 1995), 3) they are sources of valuable non-timber forest products and have a high potential for the discovery of new products (Zimmerer 1992), and 4) they are perceived as new sites for colonization by peoples leaving resource-poor areas. The residents and new colonists in these areas have hopes of finding a higher quality of life in these regions than appears available elsewhere. The challenge is to incorporate these people and their livestock into the regions in ways which can offer them a reasonable quality of life and which can sustain and be sustained by the natural ecosystems of these watersheds.

RESEARCH TEAM

The team began with an interdisciplinary core group from UW-Madison which has been further strengthened and linked with six external collaborators and advisors at four other institutions in the U.S. and U.K. providing the following expertise:

- range land ecology and experimental design (Langstroth, UW-Madison; Menke, UC-Davis)
- forest grazing methodology (Hester, MLURI, Aberdeen, U.K.)
- livestock foraging and nutrition (Wattiaux, UW-Madison)
- modeling of livestock foraging (Pastor and Moen, UM-Duluth)
- livestock production and genetics (Rutledge, UW-Madison)
- livestock diseases (Yuill, UW-Madison)
- land use and soil dynamics (McSweeney and Cooperband, UW-Madison)
- carbon balance methods (Kelley, Colorado State)
- agricultural econometrics (Zepeda, FAO UW-Madison)
- land tenure issues (Lastarria, UW-Madison)
- gender issues (Zepeda, FAO, UW-Madison)
- agricultural extension, education (Wattiaux, UW-Madison)
- vegetation regeneration dynamics (Moermond and Langstroth, UW-Madison)

- foraging ecology, pollination and seed dispersal (Moermond and Bleiweiss, UW-Madison)
- biodiversity and conservation biology (Moermond and Bleiweiss, UW-Madison)
- bioacoustics (Fristrup, Cornell Laboratory of Ornithology)
- biostatistics (Nordheim, UW-Madison)

Latin American Collaboration Institutions:

In Mexico, collaborators come from the Manantlan Institute of Ecology and Conservation of Biological Diversity (IMECBIO) of the University of Guadalajara, an internationally recognized multidisciplinary research group dedicated to the conservation and development of the Sierra de Manantlan Biosphere Reserve.

- livestock systems, community development (Louette)
- agronomy (Carranza, Louette)
- botany, livestock forage (Sánchez, Pineda, Cuevas)
- vegetation dynamics, ecology (Jardel, Sánchez, Pineda)
- wildlife dynamics, population dynamics, radio-telemetry (Iñiguez)
- land use, GIS (Jardel, Iñiguez)
- watersheds and soil dynamics (Martinez, Dario)
- environmental education (Garcia)

In Ecuador, collaborators are drawn from four NGOs: Heifer Project International, Center for Conservation Data (CDC), Terranueva (TE), and the Antisana Foundation (FUNAN), three of whom have previous experience working together successfully on the SANREM-CRSP.

- livestock systems, animal health (Ballesteros, HPI)
- socio-economics, community diagnostics (Larrea, HPI; Ordoñez, TE)
- agronomy, agroecology (Castillo, TE; Castillo, FUNAN; Chancusig, HPI)
- land use, GIS, geography (Guevara, Almeida, CDC)
- plant ecology, vegetation dynamics (Josse, Penafiel, CDC)
- biodiversity, resource management (Josse, Campos, CDC; Mosquera, FUNAN)

In Bolivia, collaborators include three NGOs (PROMETA, CER-DET, and CIEC), a government agency (ZONISIG), a university group (CLAS-UMSS), coordinated by a social development group (SEAD).

- land tenure issues (Baracatt, PROMETA: Castro, CER-DET)
- land use, GIS (Ruis, ZONISIG; Beek, CLAS-UMSS)
- community organization (Cabero, SEAD, Chavez, PROMETA; Montano, Turner, CER- DET)
- livestock/forestry systems, agronomy (Vacaflores, PROMETA)

- forestry, forest resources (Eraso, CER-DET, Baldivieso, PROMETA; Espinoza, (ZONISIG)
- environmental education, extension (Roth, Jun, CIEC; Thomson, CER-DET)
- ecology (Thomson, CER-DET)

The collaborators mobilized by IMECBIO, the NGOs, and the other groups bring to the project valuable expertise, local experience, and commitment to conservation and rural development. At all three sites, the team has strength in cartography, remote sensing, and GIS, community organization and autodiagnostic experience, and a variety of experience and expertise for the management of natural resources.

TRAINING PLAN

Training will occur on multiple levels and will be linked with the overall education strategy.

Host country university students: At each site, 10% of the budget will be used for grants to facilitate participation of students from universities within the country. Students will be supported to complete thesis work on well-focused studies designed to contribute directly to project objectives.

U.S. university students: A minimum of five graduate students and one postdoctoral student from the UW-Madison are expected to participate in this project each year.

Research workshops/exchanges: Workshops at each site and annual multi-country workshops rotated among the three countries are planned to enhance the exchange of ideas, experience, and findings among researchers.

Local training and workshops: Workshops will also be planned for local farmers and other focus resident groups for education purposes. In each community there will be training in multiple aspects of the research and planning activities (e.g., monitoring and evaluation techniques, GIS use and interpretation, cattle embryo transfer, pasture management).

Development of education materials: The Interdisciplinary Center for Community Studies (CIEC) in Bolivia will provide expertise, guidance, and coordination for the preparation and application of environmental education materials for four main target groups in all three sites.

WOMEN AND GENDER COMPONENT

Gender issues are critical to the understanding of current natural resource use and production patterns in the watershed and will need to be carefully considered in developing

potential sustainable alternatives to land use and natural resource management by the local residents in the context of their families and communities.

For example, in the autodiagnostics and interviews, one line of inquiry will be to determine the economic purpose, benefits, and costs of livestock production in the community for different households (e.g., smallholders, landless, part-time vs. full-time farm families) and persons (e.g., men vs. women, across ethnic groups, age groups). Specific data to be collected include income generated by livestock production, the recipients of the income, use of livestock as a form of capital accumulation or risk management, the decision making process, the importance of autoconsumption of livestock, other economic uses of livestock (traction, speculation, etc.) and the beneficiaries, who pays the economic costs, and who provides unpaid labor and other non-monetarized costs. The role and welfare of women will be considered explicitly in data collection and analysis and in subsequent planning.

ANTICIPATED IMPACT

The success of the project will be evaluated at regular intervals by researchers and community members to allow modification and revision of experiments and activities with the communities. Throughout the project, indicators of sustainability and quality of life will be developed and monitored. These indicators will be chosen to correspond to the objectives of the project and to units representing different critical elements and scales of the problem model. For each unit (including different elements within the unit, for example, different types or breeds of livestock in the unit "Livestock"), attributes which satisfy criteria for useful indicators and can easily be monitored and clearly interpreted by local farmers and other community members will be determined. The monitoring of such indicators is not only useful for the critical evaluation of the project's activities, but is an essential component of the long-term planning process by the community itself.

BENEFITS TO U.S.

For U.S. collaborators, the project will mean gaining new perspectives, learning from experience and knowledge of host country collaborators. For the U.S., benefits will be derived from increased stability and productive capacity within host countries as sources of materials and as markets, from increased democratization in the region, and conservation of biodiversity and biological resources. "Farmer to farmer" exchanges will allow U.S. farmers to have first hand views of the development of the sustainable livestock practices and the development of the watershed scale integrated community planning process.

Table 14: Livestock-Natural Resource Interfaces, Goals and Objectives Matrix

Project Goal: *To develop and promote sustainable management of livestock and natural resources by communities of small landholders that maintains the high biodiversity of mountainous forested areas of Latin America.*

Objective	Research Outputs	Developmental Impacts	G/AFS Indicators	AID Strategic Objectives Intermediate Results
1. Identify existing and alternative practices of land use and livestock production that can be adopted by communities to produce sustainable rural development.	1. A database of natural resource use and livestock management practice ad alternatives developed and evaluated to determine the sustainability of natural resource and land use options within forested ecosystems.	1. Improved information base to inform the selection and promotion of sustainable natural resource use, livestock management and land use practices.	2.4d Data collection, analyses and presentation standards established.	2.4 An information system established to enhance decision making for the agricultural sector developed and adopted.
	2. GIS mapping system developed to evaluate scenarios of land use and management options for sustainable agricultural production, conservation of biodiversity and maintenance of watershed integrity.	2. Application of a powerful tool to visualize scenarios and the effective implementation of resource and biodiversity conservation and rural development.	2.3b Improvements in land use patterns in selected countries.	2.3 Technologies, policies and practices that enhance the long-term conservation of natural resources developed and adopted.
		3. Improved conservation of biodiversity, forest resources, and critical watershed services for host countries.	2.3a Reduction in water pollution and sedimentation of watersheds in selected countries.	
2. Using a participatory community process to establish a system of long-term community planning for sustainable natural resource use and livestock production within forested watersheds.	1. A suite of indicators of sustainability and monitoring system developed that will be incorporated into community-based landscape planning.	1. Establish information system with regular monitoring of indicators and an accepted community based system to improve the decision making capacity of farmers and land use managers to improve management of watershed and ecosystem services.	2.4c Draft indicator framework developed	2.4 An information system established to enhance decision making for the agricultural sector developed and adopted.
	2. Develop a community-based participatory monitoring and planning process using the indicators of sustainability and the GIS mapping system for effective, adaptive management of land use.	2. Increased stability and improved quality of life of rural communities established by the planning and management process while maintaining resource base and long-term options for host country development.	2.1b Increased food production by region/country	2.1 Sustainable technologies and policies that enhance food availability.

Table 15: Livestock-Natural Resource Interfaces, Team Composition Matrix

Team Member Name	Affiliation	Role/Discipline	Nationality/Residence
I. Ecuadorian team members			
Almeida, Pablo	Centro de Datos para la Conservacion (CDC), Quito, Ecuador	Geographer/GIS specialist. Cartography, GIS.	Ecuadorian/Ecuador
Ballesteros, Hector	Heifer Project International (HPI), Quito, Ecuador	Coordinator	Ecuadorian/Ecuador
Campos, Felipe	CDC, Quito, Ecuador	Zoologist, Taxonomist	Ecuadorian/Ecuador
Castillo, Marco	Terranueva, Quito, Ecuador	Agronomist	Ecuadorian/Ecuador
Castillo, Mauricio	FUNAN, Quito, Ecuador	Agronomist	Ecuadorian/Ecuador
Chancusig, Edwin	HPI, Quito, Ecuador	Agroecologist/Technical Assistant	Ecuadorian/Ecuador
Guevara, Marcelo	CDC, Quito, Ecuador	Geographer	Ecuadorian/Ecuador
Josse, Carmen	CDC, Quito, Ecuador	Plant ecology	Ecuadorian/Ecuador
Larrea, Fernanrdo	HPI, Quito, Ecuador	Anthropologist	Ecuadorian/Ecuador
Mosquera, Gustavo	FUNAN, Quito, Ecuador	Technical Director, Biologist	EcuadorianEcuador
Ordonez, Martha	Terranueva, Quito, Ecuador	Sociologist	Ecuadorian/Ecuador
Penafiel, Marcia	CDC, Quito, Ecuador	Botanist	Ecuadorian/Ecuador
II. Bolivian team members			
Baldivieso, Javier	Proteccion del Medio Ambiente Tarija (PROMETA), Tarija, Bolivia	Forester	Bolivian/Bolivia
Baracatt, Gabriel	PROMETA, Tarija, Bolivia	Lawyer	Bolivian/Bolivia
Beek, Martin MSc	Centro de Levantamientos Aeroespaciales y Aplicaciones SIG para el Desarrollo Sostenible de los Recursos Naturales (CLAS), Universidad Mayor San Simon (UMSS), Cochabamba, Bolivia	GIS Specialist	Dutch/Bolivia
Cabero, Javier	Servicios de Apoyo al Desarrollo (SEAD), La Paz, Bolivia	Psychologist	Bolivian/Bolivia
Castro, Miguel	Centro de Estudios Regionales para el Desarrollo de Tarija (CER-DET), Tarija, Bolivia	Lawyer	Bolivian/Bolivia
Chavez, Freddy	PROMETA, Tarija, Bolivia	Social Psychologist	Bolivian/Bolivia
Erazo, Orlando	CER-DET, Tarija, Bolivia	Forester	Bolivian/Bolivia

Team Member Name	Affiliation	Role/Discipline	Nationality/Residence
Espinoza, Linder	Proyecto Zonificacion Agro-ecologica y Establecimiento de una Base de Datos y Red de Sistema de Informacion Geographica en Bolivia(ZONISIG), Tarija, Bolivia	Forester	Bolivian/Bolivia
Jung, Jorge Eduardo Director, Psychologist	Centro Interdisciplinario de Estudios Comunitarios (CIEC), La Paz, Bolivia	Environmental Education	Bolivian/Bolivia
Montano, Blanca	CER-DET, Tarija, Bolivia	Psychologist	Bolivian/Bolivia
Penaloza, Eliana	CER-DET, Tarija, Bolivia	Administrator	Bolivian/Bolivia
Roth, Erick	CIEC, La Paz, Bolivia	Environmental Education	Bolivian/Bolivia
Ruiz, Jorge	ZONISIG, Tarija, Bolivia	Administrator, GIS Specialist	Bolivian/Bolivia
Thomson, Sandra	CER-DET, Tarija, Bolivia	Ecologist, Environmental education	Canadian/Bolivia
Turner, Andrew,	CER-DET, Tarija, Bolivia	Anthropologist	American/Bolivia
Vacaflores, Carlos	PROMETA, Tarija, Bolivia	Agronomist, Research Coordinator -Tarija	Bolivian/Bolivia
Valenzuela, Carlos	CLAS, UMSS, Cochabamba, Bolivia	GIS Specialist	Bolivian/Bolivia
III. Mexican team members			
Carranza, Arturo	IMECBIO, Universidad de Guadalajara, MEX.	Agronomist	Mexican
Carranza, Mario	IMECBIO, Universidad de Guadalajara, MEX.	Agronomist	Mexican
Cuevas, Ramon	IMECBIO, Universidad de Guadalajara, MEX.	Botanist	Mexican
Dario, Ruben	IMECBIO, Universidad de Guadalajara, MEX.	Soil Scientist	Mexican
Garcia, Salvador	IMECBIO, Universidad de Guadalajara, MEX.	Biologist	Mexican
Iniguez, Luis	IMECBIO, Universidad de Guadalajara, MEX.	Zoologist	Mexican
Jardel, Enrique	IMECBIO, Universidad de Guadalajara, MEX.	Ecologist	Mexican
Louette, Dominique	IMECBIO, Universidad de Guadalajara, MEX.	Agronomist	French
Martinez, Luis Manuel	IMECBIO, Universidad de Guadalajara, MEX.	Soil scientist	Mexican
Pineda, Maria del Rosario	IMECBIO, Universidad de Guadalajara, MEX.	Ecologist	Mexican
Sanchez, Lazaro	IMECBIO, Universidad de Guadalajara, MEX.	Botanist. Co-coordinator.	Mexican

Team Member Name	Affiliation	Role/Discipline	Nationality/Residence
IV. U.S. team members			
Bleisweiss, Robert	University of Wisconsin-Madison Department of Zoology	Zoologist	American
Cooperband, Leslie	University of Wisconsin-Madison Professor - Department of Soil Science Director, School of Natural Resources	Soil scientist	American
Kelley, Gene	Colorado State University, Fort Collins Professor of Soil Science Department of Soil and Crop Sciences	Soil scientist	American
Langstroth, Robert	Wisconsin Division of Safety and Buildings Madison, WI	Geographer/Botanist. Environmental Analysis and Review Specialist	American
Lastarria, Susana	University of Wisconsin-Madison Land Tenure Center	Land Tenure Specialist	Peruvian
McSweeney, Kevin	University of Wisconsin-Madison Professor-Department of Soil Science Director, School of Natural Resources	Soil scientist	American
Menke, John	University of California-Davis Department of Agronomy and Range Science	Range ecologist	American
Moermond, Timothy	University of Wisconsin-Madison Professor, Department of Zoology Chair, Conservation Biology Sustainable Development Program	Principal Investigator, Zoologist	American
Moen, Ronald	University of Minnesota-Duluth Professor of Biology Natural Resources Research Institute, Duluth MN	Wildlife ecologist	American
Nordheim, Richard	University of Wisconsin-Madison Department of Forestry and Statistics	Statistician	American
Pastor, John	University of Minnesota-Duluth Professor of Biology Resources Research Institute, Duluth, MN	Range ecologist	American
Rutledge, Jack	University of Wisconsin-Madison Department of Animal Science	Animal Scientist	American
Wattiaux, Michel	University of Wisconsin-Madison Department of Animal Science	Animal Scientist	Belgian
Yuill, Thomas	University of Wisconsin-Madison Director, Institute for Environmental Studies	Animal Scientist/Wildlife Ecologist	American
Zepeda, Lydia	Food and Agriculture Organization Rome, Italy	Economist	American

NEW INITIATIVES

RUSSIAN FEDERATION/UKRAINE

In 1997 USAID commissioned a trip to the Russian Federation to determine the feasibility of a U.S.-Russia Partnership Program. Between August 31 and September 18, 1997, a four-person team visited the Ministry of Agriculture and Food (MOAF) and other institutions in Moscow, institutions in five oblasts (provinces), and selected agricultural businesses (See Appendix I). The team recommended establishing an interdisciplinary and inter-institutional program focused on agricultural diversification including soil, plant and animal components. The initial target of the program would be the revival of the animal industry in Russia and Ukraine.

Development Problem

The dissolution of the former Soviet Union (FSU) in 1991 was followed by significant economic dislocation, as institutions designed for a centralized command economy were ill-suited to the demands of an international market. Among the Newly Independent States (NIS), the Russian Federation and Ukraine (along with Kazakhstan in Central Asia) were among the largest food producers (OECD 1996). However, since 1991, agriculture has suffered substantial declines in production (e.g., in 1996 beef production in Russia had dropped 40% from 1990 levels, USDA FAS 1996). These macro-economic trends translated into deepening rural poverty, large scale failures in agricultural businesses (OECD 1996), reduction in levels of human nutrition (especially in protein and vitamins, UNDP 1997), lower levels of per capita milk and meat consumption (Economist 1997), drastically reduced human life expectancy (USDA FAS 1997) and a spread of the perception that the benefits of a market economy reside solely in Moscow (Economist 1997).

Within the agricultural sector no component has been hit harder, yet holds more investment potential, than the livestock sector. The sector has lost 60% of its contribution to the GDP (gross domestic product), the largest of any economic sector (BISNIS 1997). Herd sizes, although maintained at unproductively high levels in the pre-1990 era, have been reduced by as much as 40%. A revitalized livestock industry would have substantial impact on the status of rural populations, both in economic and nutritional terms. Livestock production has potential to integrate animal and crop agriculture to bring a set of value-added products to rural communities. With economic growth, rural populations would have the buying power to consume more animal products. Greater consumption of animal products would improve diet quality and increase demand, further contributing to economic growth. Growth in the livestock sector would also encourage capital-intensive improvements in animal production, with concomitant opportunities for U.S. trade and investment.

Integrated Crop-Livestock Systems

The production logic of a centralized command economy has led to a lack of diversification at the oblast and local levels. Agricultural diversification, especially the integration of animal production with the cultivation of feed and food crops, would produce both short-term and long-term benefits for the region. For the short-term, increased availability of animal source foods would help to alleviate the rising incidence of anemia and other micronutrient deficiencies, especially in rural areas. Small livestock are a valuable

A joint statement was signed in February 1997 by Russian Federation Minister of Health, Tatyana Dmitrieva, and U.S. Secretary of the Department of Health and Human Services, Donna Shalala. The statement embodies an agreement to work together to eliminate micronutrient malnutrition.

resource for enhancing the micronutrient nutritional values of rural diets (Combs et al. 1996). For the long term, the carefully managed introduction and monitoring of livestock production in crop systems would help alleviate environmental stresses leading to land degradation and loss of biodiversity. Environmentally sound livestock production would contribute significantly to development approaches aimed at sustainable improvements in agriculture.

Since 1992, clinic physicians in the Russian Federation have been reporting an increase in the numbers of women and children affected by anemia and other micronutrient deficiencies. According to Dr. Glen Maberly, Director of the Program Against Micronutrient Malnutrition (PAMM) , all regions of the NIS have been affected by iron deficiency. It is the leading cause of maternal death and affects the cognitive development of children. Iron deficiency also results in fatigue, a decline in the productive capacity of workers of up to 40%, and a decrease in the ability of those affected to fight infection (Common Health 1997). The increased incidence of micronutrient deficiencies parallels the decrease in production of animals and animal products throughout the region. Available research suggests that by integrating crop and livestock production in smallholder systems, micronutrients from outputs can be maximized in a way that is both profitable and environmentally sustainable.

The large percentage of crop land taken out of production since 1991 is presumed to be marginal lands previously under pressure from pre-1991 policies promoting "gross production at all costs." The conversion of such lands to production of appropriate forages could rejuvenate the land, while providing a valuable resource for animal production. Animals contribute to nutrient cycling by re-fertilizing the land through daily excretions; at the same time, in the process of grazing animals convert humanly inedible plants to an edible form (dairy products and meat). Animals can also contribute to agricultural intensification by grazing on crop by-products, which constitutes a cost-effective and chemical-free

mechanism for waste removal. The development of integrated crop and livestock systems has potential to provide environmental benefits, with broad-based implications for sustainability and long-term economic growth.

Re-Orientation of Institutions

Analysis of the Russian agricultural sector by United Nations Food and Agriculture Organization (International Conference and Programme for Plant Genetic Resources 1994) indicates that low productivity is due to "weak connections between agricultural research and its practical implementation." A recent article in the Economist (1997) identifies the lack of linkages between basic and applied science, on one hand, and the connection of science with product development and marketing, on the other, as a major threat to the future existence of Russian science. In the American agriculture, the land-grant university system has been remarkably successful in connecting basic science with implementation. While the precise mechanism to achieve this connection may vary with culture, the principle that science (both basic and applied), teaching and technology transfer should be linked in a developmental pipeline is fundamental to both agricultural and economic development. In Russia and Ukraine today, where institutions of science and education are underfunded, the barriers between institutions severely constrain the ability to use science for the betterment of agriculture and, with a few exceptions, deteriorating funding is strengthening these barriers.

> "The breakup of the Soviet Union gives us the luxury of redirecting national resources spent containing communism to pressing domestic needs and to redirect our foreign assistance away from expenditures against communism to investments in democracy."
>
> Spero, J. E. 1993. "Economic diplomacy: Key to domestic prosperity."

CRSP programs have been successful as institution building instruments because they have a development problem at the center of every collaboration. The focus on problems gives meaning and rationale to the team building process, roles to the individual participants and direction to collaborative activities. Around this problem solving process, issues of training, institutional support, interdisciplinary interaction and priority setting are a natural component of operations. The problem solving environment provides a natural context for developing inter-institutional cooperation, developing new thinking about agricultural research, and improving technology transfer. There is a critical need in the Russia and Ukraine for a model that demonstrates the value of institutional linkages both to institutes themselves and the public they serve.

"Managing" the Rural Transition

Economic trends in the Russian Federation in the 1990s has driven large numbers of people into poverty. Poverty in the Soviet era was estimated at 10-15% of the population.

Families with large numbers of children, families without a wage earner, or pensioners living by themselves constituted the majority of the poor. Current estimates of the number of people living below the poverty line are as much as 90% (only 10% of the population have incomes meeting the official subsistence income of 1.4 million rubles per month). Coupled with this trend has been an increase in various forms of economic inequality and a rise in disparities between urban and rural dwellers (UNDP 1997). The rural citizens of Russia are the most conservative, the least served by the market economy, and the most dependent on agriculture for their quality of life. Their needs should be addressed directly through projects that have an immediate impact on agriculture. The consequence of ignoring the needs of farmers could be a costly one for the United States.

Objectives:

1) identify from a subset of the Promoting Russian Agriculture through Regional Investment (PRARI) initiative oblasts those that have the will to enact reforms critical to the development of strong livestock and agricultural sectors.
2) conduct market analysis of the livestock sector (a food system from soils to market) to determine the major constraints on profitability.
3) develop policy, management and technological solutions to the major constraints in the food system.
4) identify Russian institutional and private sector partners to address constraints, engage in meaningful institutional restructuring and management training to cope with market economies.

Administration of the program would fall under the umbrella of the Small Ruminant/ Global Livestock CRSP (SR/GL-CRSP). Obvious partners with our CRSP institutions in the project are the University of Maryland and Texas A&M, both with long affiliations in Russia and strong agricultural programs. Coordination between the Central Asia, Mongolia and Russia/Ukraine programs would be informative and the comparative advantages of such coordination would be enhanced by similar work in other regions of CRSP activity (East Africa and Latin America). The collaborative strengths of the CRSP framework and the methodologies of U.S. land-grant institutions would facilitate the creation of institutional linkages—at the oblast, national and international levels—needed to orient agriculture to a market-oriented economy. The potential for such a program is heightened by the existence in both Russia and Ukraine of a highly trained cadre of science professionals. Development of market-oriented institutions in Russia and Ukraine would create the opportunity to integrate development assistance with U.S. trade and investment policies.

The program will change inter-institutional relationships and connects basic science with marketable products in the agricultural sector. Livestock production is an all encompassing agricultural activity, combining the critical components of agriculture that should be represented in a broad-based program. Since feed production is a critical deficient aspect of animal production in Russia (USDA FAS 1996, BISNIS 1997), a strong focus on

crop production and its integration with animal production will be a critical link in the collaborations. This broad focus also provides the maximal opportunity for American investment.

The program will be problem oriented. One of the reasons for failed partnership programs worldwide has been that lack of focus. CRSP programs have been successful as institution building instruments because they have a development problem at the center of every collaboration. The focus on problems gives meaning and rationale to the team building process, roles to the individual participants and direction to collaborative activities. Around this problem solving process, issues of training, institutional support, interdisciplinary interaction and priority setting are a natural component of operations. The problem solving environment provides a natural context for developing inter-institutional cooperation, conducting reorganization, learning new management techniques, improving technology transfer and developing new thinking about agricultural research. In sum it is a natural framework to make major institutional changes.

The program will serve as a model whose success will fuel its own adoption. There is a critical need in the agricultural sector for a model that demonstrates the value of institutional linkages both to the institutes themselves and the public they can serve. If some portion of the vast and well trained scientific capacity of Russia is to survive and be productive, a new model must be developed that achieves the support of government and the rural public (Economist 1997).

While we advocate a relatively small program ($500K/year) some larger issues need to be stated:

Russia has a huge production capacity, largely unrealized, for grains and animals. The major reason for the short fall is inefficient production and a myriad of reasons underlie this symptom. However, if corrected Russian production will play a major role in the global food equation.

The way to change a system is to introduce a new one that by comparison will hasten the demise of the old. Some would advocate withholding assistance for the sector because they believe assistance will only extend the life of the old, unreformed system. We advocate investing in a time tested approach: use the CRSP problem model focus to extend the land grant concept of integration of research, teaching, extension, management and marketing. We will work with the innovators whose businesses and institutions provide models of success in the new market economy (i.e., the PRARI concept). Our program will link these successes to demonstrate how collaboration is synergistic. As value of these linkages becomes known, they will adopted.

The rural citizens of Russia are both the most conservative, the least served by the market economy and the most dependent on agriculture for their quality of life. Because

they represent a contingent that could have a major impact on the direction of Russia's future, their needs should be addressed directly through projects that have an immediate impact on agriculture. The expense of ignoring the needs of this population could be high for the United States.

MONGOLIA

Background

Mongolia is a land rich in range resources. A country approximately the size of Nebraska, South and North Dakota, Montana, Wyoming and Colorado combined, has a population of 2.3 million people with half being rural and/or pastoralists. Home to 25 species of mammals, Mongolian steppe is one of the world's last temperate grasslands with an abundance of rare and threatened species. The eastern steppe is dominated by about 1.8 million Mongolia gazelle (Procapra gutturosa) which undertake large scale migrations similar to the wildebeest migrations in the Serengeti.

The impact of transition from Soviet rule on agriculture has been dramatic. Cereal harvests have fallen 70 percent since 1990. The livestock sector, which is 88 percent of gross agricultural production, has been hit by multiple problems. Fodder production is down, credit unavailable, infrastructure, such as wells, decaying, and marketing systems are inadequate (FAO GIEWS 1997). The overall effect has been a dramatic fall in nutritional standards for the country, highlighted by a "growing population of vulnerable, low income people who have been experiencing a dramatic fall in nutritional standards" (FAO GIEWS 1997). Presently 25% of the children are classified as "chronically malnourished." The response to the increasingly unfavorable terms of trade in livestock has been to increase animal numbers per unit area.

The traditional organization of land in Mongolia was in corridors allowing north-south migration that provided a deferred grazing system with season pastures along a latitudinal gradient. Over time, and particularly during colonial rule, the land became subdivided into a patchwork of administrative units that hindered north-south movement. The advantages of this movement were: the ability to use the natural sequence of plant growth on the north-south axis, the access to trading partners, Russia in the north and China in the south, and the large land areas allowed pastoralist to take advantage of the habitat variability for optimal land use and grazing. The push by the Soviets to increase grain production, as in Central Asia, encouraged the plowing of the marginal crop land for cereal production. These lands while marginal for crops were among the most productive pastures. Much like the pastoralists in Africa, changes in population and land use are a major constraint impinging on their production systems.

Program

Develop appropriate grazing systems to improve livestock production, increase the efficiency of land use, and conserve natural resources and biodiversity.

Pasture land and the forage crop produced on pasture land is the natural resource base for the extensive livestock production system. Likewise, the extensive pastoral production system is the dominant livestock production system and a major sub-sector in agriculture. Considerable information about Mongolian pastures and livestock are collected annually as statistics. Other information on pastures and pasture use has been developed by the research institutes and ministerial departments. This information, while informative, does not provide information of the type or depth needed to develop realistic and timely guidelines for monitoring and managing pasture land and animal use, both wild and domestic. Given the importance of Mongolian pastoral resources to Mongolian society and economy, and considering the current debate over acceptable uses and the level of use that is sustainable, institutions involved in agriculture and environmental policy formulation need better access to accurate and realistic data about pasture capabilities and attributes. This is also true of provincial and district governments which have direct responsibility for implementing national level policies and regulating use of pastoral resources. This type of information is especially critical in developing optimal pasture management plans at local levels and provides the rationale for developing a pasture management system.

To achieve this capability, the SR/GL-CRSP will combine previous efforts in Mongolia by Oregon State University (Dr. Dennis Sheehy) with the current CRSP projects in Central Asia and East Africa that are developing spatial data bases and modeling grazing systems. The UC Davis project is constructing GIS databases to address the better management of degraded steppe in Kazakhstan. The CSU project is modeling wildlife and livestock interactions and the model will be adapted, with data collected in Mongolia, to steppe conditions to improve conservation efforts as well as grazing productivity.

Improve the quality of rural life by providing new mechanism to cope changing economic and social environments.

On former state farms in the central cropping region and elsewhere, conversion of pasture land to cereal grain production has substantially reduced not only the amount of pasture land available for livestock forage but has also increased substantially the amount of land subject to soil erosion from wind and water. Concentration of livestock is also occurring in these areas as herders seek access to markets, further increasing livestock demand for forage and fodder and, in some areas, contributing to degradation of pasture. As with African pastoralists the response to constraints on the livestock sector has been to increase animals. This response will inevitably lead to degradation of the land, deepening rural poverty, large losses in revenue for the pastoralists in boom and bust cycles, a lack of capital in rural communities to develop infrastructure and pronounced migration to urban centers that place

major demands on support services. The project will propose to increase access to information about markets and credit, diversify assets and income, and increase access to external resources.

The program is planned for a five year time frame with an initial project development phase of six months to insure appropriate collaboration, quality of science and focus.

INDONESIA

Recent economic turmoil has wreaked havoc on the Indonesian poultry industry, an industry that supplies nearly all protein requirements for Indonesia's population of more than 200 million (Morgan 1998). Prior to the current crisis, the poultry industry, with a growth rate of 15%, was the fastest growing livestock sector in Indonesia. In 1997, poultry meat made up 58% of the total meat production (Hartono and Alam 1997). Since the crisis, however, nearly 70% of the breeding farms have closed (Ministry of Agriculture 1998). Industry leaders are predicting little or no growth for 1998 due to oversupply, drought and less consumer purchasing power.

The poultry industry faces problems of high dependency on imported feedstuffs, vaccines, medications and mineral supplements. Breeding stock, including all grand parent stock (GPS), most parent stock (PS) and occasionally final stock (FS) are also imported (Bauer 1997). El Niño induced drought has increased the reliance on imported feed and currency devaluation and unavailability of bank letters of credit have closed off imported feed supplies. The depreciation of the Rupiah has doubled production costs in the last six months. With essentially no domestic feed stuff production, and no knowledge of alternate rations, breeder farmers have slaughtered most breeding stock, fertile eggs, and millions of chicks. Nearly all small producers have liquidated their stock and only a few of the four major integrators have breeding stock (Morgan 1998).

On February 24, 1998, a 16-member delegation of the US-ASEAN Business Council's Food and Agriculture Working Group concluded a nine-day trade mission to examine Indonesia's poultry sector (see Appendix J for draft trip report). Delegates met with government, poultry industry and feed mill representatives to assess the impact of the financial crisis and issues of market access. The review found severe weaknesses in technology and human resource development for the industry.

Firm after firm, farmers and processors and retailers, pointed to the lack of technology in Indonesia has undermined the capacity of the poultry industry to produce feed and a safe supply of poultry products for Indonesian consumers. Poultry scientists at Indonesia's pre-eminent agricultural university, Institut Pertaninan Bogor, flatly stated there is no indigenous source of technology in Indonesia, and there is no relationship whatsoever between the university and poultry industry. Furthermore, the leadership of all four integrated poultry

firms visited, critically relied on top and middle managers from outside Indonesia — chiefly the Netherlands, India, Singapore, Thailand and Australia.

The US-ASEAN trade mission resulted in a set of recommendations to assist recovery of the poultry industry and increase product availability to consumers in Indonesia. The Small Ruminant/Global Livestock CRSP in response to the crisis situation proposes to implement preliminary research and training for the poultry industry as recommended by the US-ASEAN trade mission. At least four areas for technology development and adaptation are needed: indigenous feed supply, elimination of mycotoxin and aflatoxin in feeds and food products, refrigerated storage and distribution, and technologies for tropical intensive poultry production (alternative rations, disease prevention, other practices). Highest priority is the development of alternative rations from domestic feed supplies and the elimination of toxins in feed.

Managerial issues that must be addressed included the collection, analysis, distribution and use of poultry market information; and modes of partnership between small scale broiler producers and large integrated firms.

Immediately the Small Ruminant/Global Livestock CRSP will address the issue of alternate feed supply and feed safety through technology assessment to be undertaken in cooperation with the US-ASEAN Business Council from April through September, 1998. Degree training of two Indonesian poultry scientists will be initiated through the sponsorship of US-ASEAN firms and SR/GL-CRSP universities. Pilot, short-term technical and managerial training will be conducted by the firms and universities, in the priority areas, at the end of the initial 6-month period. Pending USAID Mission support, the Small Ruminant/Global Livestock CRSP will incorporate a substantial research/training effort for the Indonesian poultry industry, over the succeeding five years, on poultry feeds, nutrition, feed and food safety, and market information.

WORLD BANK/SR/GL-CRSP INTERN POSITION

The SR/GL-CRSP would second a Specialist to work in the Agricultural Research and Extension Group (ESDAR) at the World Bank. The assignment would be to further common development objectives of both the USAID/CRSP and ESDAR, namely: analysis of global research system development, development of research linkages and collaborative research activities, and coordination of technology system development activities and donor assistance to developing country NARSs. In the case of the Livestock CRSP Specialist, work would focus on livestock research-related activities. An academic would fill the position on sabbatical leave from their university.

The focus of the position would be to promote increased partnerships and international collaboration on research and technology systems, reinforcing development of a global

agricultural research system (one of the main goals of ESDAR). The Specialist would work collaboratively with the ESDAR Group and the World Bank Rural Sector Family's AKIS (Agricultural Knowledge and Information System) Thematic Group.

Potential areas of activity related to ESDAR Core Program interests are listed below. These would all to some extent involve collaborative work with ESDAR and Bank staff and others:

- Impact assessment systems and performance monitoring systems for research programs. Emphasis may be on monitoring performance and impact of livestock research. Establishment of monitoring systems for the Livestock CRSP could be an option. Collaboration with international programs on impact assessment would be expected.
- Support to development of programs of regional agricultural research associations. Central Asia may be a priority, though other regions could be equally well considered.
- Developing biotechnology capacities of NARSs. This may involve assessments of needs and potentials in the area of livestock-related biotechnologies. It may also involve working out models for support for capacity development or accessing such capacity in advanced research institutions. It may also involve reviewing and documenting best practice for such capacity development and utilization.
- Identifying and documenting best practice approaches to development of university capacities in developing countries, including both research-extension capacities and teaching programs to meet future manpower needs.
- Identifying and documenting experience and best practice with establishment and operation of autonomous and semi-autonomous research organizations. Would involve work with Bank Task Managers and others to identify key opportunities and issues for autonomous research system operations.
- As part of a larger ESDAR study, analyze options and issues involved in conserving livestock genetic resources.
- Evaluation and identification of best practice for operation of competitive research grant programs and competitive procurement of research services. Would involve review of programs in developed countries, in developed countries for international research, and in developing countries.
- Assist ESDAR team in developing livestock aspects of an Electronic Global Forum for Agricultural Research.
- Identification, evaluation and documentation of best practice for privatization of animal health services and veterinary services.

The CRSP Livestock Specialist's involvement in the Bank's Rural Sector activities would be dependent on needs and opportunities to support on-going programs. This may involve analytical work, research, or participation in country project operations. It is expected that most involvement would be in the context of the multi-donor Livestock-Environment Initiative.

The Livestock-Environment Initiative (LEI) would include: policy support (training, policy studies, technology design) to guide decision making on livestock sector investments; an electronic "virtual livestock-environment center" to share experience with research on livestock-environment interactions; and a series of pilot field activities to integrate better planning of livestock/environment issues in development programs. The CRSP Livestock Specialist would be involved in research and information collection on one or more of the following issues:

- integration of livestock and wildlife production in communal grazing areas;
- conservation of domestic animal diversity;
- optimal nutrient recycling under conditions of extreme land pressure;
- area-wide integration and zoning of industrial livestock production systems; and
- livestock and deforestation of tropical rainforests.

Information on the above five areas is to be collected, analyzed, and tested in pilot programs and then fed into the electronic network and introduced into design of Bank development projects. The Specialist would have opportunity to work on Bank project designs to mainstream livestock-environment issues.

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PROGRAMMATIC PRIORITIES AND BUDGETARY SCENARIOS

The challenge for the SR/GL-CRSP and USAID is to find, on limited funding, an appropriate balance in the allocation of funds between sufficient concentration of resources to produce quality projects on one hand and ample diversity of regional presence to have a global program on the other. Three budget scenarios are presented below with the following explanation of priorities.

The first scenario (**Budget A requests $2.5M FY 1999**) represents a minimal program. Based on the priorities and criteria of the USAID/G/AFS, activity in three regions was considered the minimal level for achieving a global program. The regions were selected in the priority setting process (by dual consultation with the PAC and USAID/G/AFS and regional bureau representatives) and their ranking is reflected in the number of projects we have funded in the regions. Consideration was given to the relative needs of the region, USAID priorities and the quality of the projects judged across regions. The strong emphasis on East Africa reflects the substantial needs of the region, the strength of the projects submitted for the region, the remarkable complementary of the projects and synergistic potential of the resulting regional program. The East Africa program that emerged from the four projects is an example of the additive potential that can be achieved with a reasonable focus of resources with a region. The resources directed to Central Asia are minimal but represent a new direction for G/AFS and are the only Central Asia projects in the G/AFS portfolio.

Under Budget A, we have allocated to each project the bare minimum level that the PAC considers necessary to keep the projects viable, but with serious concern about the adequacy of resources for each project. The Latin American region was judged lowest in need; USAID also gave Latin America lowest priority as a region; and USAID priority, and in general the Latin American proposals did not compete well with those of other regions. The Latin American project that ranked highest in the review process, including the regional review, was partially funded by reducing allocations to the other six projects. The project is receiving substantial support from the University of Wisconsin and attempting to raise funds from other sources. At the funding level of $2.5M this project is in a precarious position.

The second scenario (**Budget B $4.06M FY1999**) we request (in order of priority) adequate funding for all projects, full funding for the Latin American project, funds to have fully developed global integration between projects, a new project in Mongolia, an intern at

the World Bank, and a new Indonesia poultry project. The emphasis on full funding for existing projects reflects the PAC's concern with the low levels of project funding in Budget Scenario A and the importance of having at least one full project in a third region to maintain a "global" program. Global integration requires the full development of the major themes of the program, such as livestock/environment, human nutrition and economic growth, between the projects. The concept is to improve the development process by identifying common constraints and processes, use comparison between countries and regions to deepen understanding of these issues and develop underlining principles in the thematic foci that can be generalized to a global level.

Mongolia represents a unique and complementary perspective for our Central Asia Program. Because the Mongolian steppe is not nearly as degraded as the rest of Central Asia, it provides a target for our rehabilitation work in Kazakstan, Uzbekistan and Turkmenistan. Its rich biodiversity in large mammals and dominant livestock economy make it a valuable comparison for our East African projects. The economy of Mongolia is largely a rural one, dominated by livestock production and whose transition and recovery will undoubtedly be linked strongly with the health of the livestock sector.

The CRSPs have had a presence at the World Bank over the past two years supported by G/AFS. Connections with the World Bank are a way to improve communication between the Agency and the World Bank, participate in the planning activities for development in selected regions and develop closer relationships between US universities, USAID/G/AFS and the World Bank. The goal is to help establish a Central Asia agricultural research network, increase funding opportunities for the CRSPs through better linkages to donors, and to assist in the development of Word Bank projects in livestock. The position would be in ESDAR under Dr. Michele Petit, supported by our budget request, funds from G/AFS, the World Bank and US universities.

The Indonesian project will be a follow up to ongoing work on the poultry industry. A mission by the US-ASEAN Business Council, which included a SR/GL-CRSP participant, identified a number of critical constraints faced by the poultry sector (a source of the majority of animal protein in the country). A follow up market study is being conducted this summer to assess the potential for delivering chilled products to consumers. If feasible the new project would lead the way for a major recovery of this sector and involve substantial participation of US-ASEAN companies.

Budget Scenario C is a request for **$5.0M** for FY 1999. The SR/GL CRSP requests an additional $850K for a Russia project. The project design is based on the fact-finding mission of the GCC sponsored by G/AFS and SR/GL-CRSP in the summer of 1997. While the project has received strong support within the Global Bureau some Mission concerns about the future of the Agency's role in Russia have delayed funding and implementation.

Small Ruminant/Global Livestock CRSP

Requested Budgets

Plan A

Summary - By Projects

Amounts Expressed in Thousands

Region/Program Category Project Title	1998/99 Amount	1999/00 Amount	2000/01 Amount	2001/02 Amount	2002/03 Amount	TOTALS Amount
Central Asia						
Impact of Economic Reform on Livestock	$ 300	$ 315	$ 330	$ 347	$ 363	$ 1,654
Range Conservation	$ 300	$ 315	$ 330	$ 347	$ 363	$ 1,654
Subtotal Central Asia	$ 600	$ 630	$ 660	$ 693	$ 726	$ 3,309
East Africa						
Drought Early Warning System	$ 300	$ 315	$ 330	$ 347	$ 363	$ 1,654
Wildlife-Livestock Interaction	$ 300	$ 315	$ 330	$ 347	$ 363	$ 1,654
Livestock Asset Diversification	$ 300	$ 315	$ 330	$ 347	$ 363	$ 1,654
Role of Animal Products in Child Dev.	$ 300	$ 315	$ 330	$ 347	$ 363	$ 1,654
Subtotal East Africa	$ 1,200	$ 1,260	$ 1,320	$ 1,386	$ 1,452	$ 6,618
Latin America						
Livestock-Natural Resource Interface	$ 100	$ 105	$ 110	$ 115	$ 120	$ 549
Management Entity	$ 350	$ 368	$ 386	$ 405	$ 424	$ 1,933
Research Support	$ 250	$ 263	$ 275	$ 289	$ 303	$ 1,380
TOTAL USAID FUNDS REQUESTED	$ 2,500	$ 2,626	$ 2,751	$ 2,888	$ 3,025	$ 13,790

Small Ruminant/Global Livestock CRSP

Budgets

Plan A

Summary-All Projects by Line Item

Line Items	1998/99 Amount	1999/00 Amount	2000/01 Amount	2001/02 Amount	2002/03 Amount	**TOTALS** Amount
Salaries and Benefits	$ 300,000	$ 315,000	$ 330,750	$ 347,287	$ 364,062	$1,657,099
Supplies and Services	$ 342,830	$ 359,222	$ 378,394	$ 397,208	$ 417,067	$ 1,894,721
Equipment	$ 250,000	$ 269,000	$ 276,100	$ 173,000	$ 175,000	$ 1,143,100
Travel						
Domestic	$ 300,000	$ 315,000	$ 330,750	$ 347,807	$ 365,190	$ 1,658,747
International	$ 475,000	$ 498,750	$ 523,688	$ 549,000	$ 576,450	$ 2,622,888
Subtotal Travel	$ 775,000	$ 813,750	$ 854,438	$ 896,807	$ 941,640	$ 4,281,635
Training	$375,000	$ 389,000	$ 408,450	$ 522,045	$ 548,146	$ 2,242,641
Subtotal Direct Costs	$ 2,042,830	$ 2,145,972	$ 2,248,132	$ 2,336,347	$ 2,445,916	$11,219,197
Indirect costs	$ 457,170	$ 480,028	$ 502,868	$ 551,653	$ 579,084	$ 2,570,804
TOTALS	$ 2,500,000	$ 2,626,000	$ 2,751,000	$ 2,888,000	$ 3,025,000	$13,790,000

Small Ruminant/Global Livestock CRSP
Plan A
Requested Budgets

Management Entity & Research Support

Line Items	1998/99 Amount	1999/00 Amount	2000/01 Amount	2001/02 Amount	2002/03 Amount	TOTALS Amount
Salaries and Benefits	$ 240,120	$ 262,055	$ 278,857	$ 288,000	$ 304,475	$ 1,373,507
Supplies and Services	$ 55,000	$ 56,500	$ 58,195	$ 69,775	$ 71,868	$ 311,338
Equipment	$ 10,000	$ 5,000	$ 5,000	$ 5,000	$ 7,500	$ 32,500
Travel						
Domestic	$ 20,000	$ 20,600	$ 21,218	$ 21,855	$ 22,510	$ 106,183
International	$ 40,000	$ 41,200	$ 42,436	$ 43,709	$ 45,020	$ 212,365
Subtotal Travel	$ 60,000	$ 61,800	$ 63,654	$ 65,564	$ 67,531	$ 318,548
Program Advisory Panel	$ 20,000	$ 20,600	$ 21,218	$ 21,855	$ 22,510	$ 106,183
Technical Committee	$ 25,000	$ 25,750	$ 26,523	$ 27,318	$ 28,138	$ 132,728
External Evaluation Panel	$ 25,000	$ 25,750	$ 26,523	$ 27,318	$ 28,138	$ 132,728
Conferences and Workshops	$ 45,000	$ 46,350	$ 47,741	$ 49,173	$ 50,648	$ 238,911
Subtotal Direct Costs	$ 480,120	$ 503,805	$ 527,710	$ 554,002	$ 580,807	$ 2,646,444
Indirect costs	$ 119,880	$ 127,195	$ 133,291	$ 139,998	$ 146,192	$ 666,556
TOTALS	$ 600,000	$ 631,000	$ 661,000	$ 694,000	$ 727,000	$ 3,313,000

Financial Support for Small Ruminant/Global Livestock CRSP
Plan A
Projections For the Period 1998-2003

Year	USAID Contribution	Institution Matching	Regional Contribution	Leveraged Funding	Totals
1998/99	$ 2,500,000.00	$ 625,000.00	$ 375,000.00	$ 934,299.00	$ 4,434,299.00
1999/00	$ 2,626,000.00	$ 656,500.00	$ 393,900.00	$ 934,299.00	$ 4,610,699.00
2000/01	$ 2,751,000.00	$ 687,750.00	$ 412,650.00	$ 844,875.00	$ 4,696,275.00
2001/02	$ 2,888,000.00	$ 722,000.00	$ 433,200.00	$ 894,875.00	$ 4,938,075.00
2002/03	$ 3,025,000.00	$ 756,250.00	$ 453,750.00	$ 925,275.00	$ 5,160,275.00
TOTALS	$ 13,790,000.00	$ 3,447,500.00	$ 2,068,500.00	$ 4,533,623.00	$ 23,839,623.00

Small Ruminant/Global Livestock CRSP

Requested Budgets

Plan B

Summary - By Projects

Amounts Expressed in Thousands

Region/Program Category Project Title	Priority for New Funds	1998/99 Amount	1999/00 Amount	2000/01 Amount	2001/02 Amount	2002/03 Amount	TOTALS Amount
Central Asia							
Impact of Economic Reform on Livestock		$ 400	$ 412	424	$ 436	$ 449.00	$ 2,121
Range Conservation		$ 400	$ 412	424	$ 436	$ 449	$ 2,121
Subtotal Central Asia		$ 800	$ 824	$ 848	$ 872	$ 898	$ 4,242
East Africa							
Drought Early Warning System		$ 375	$ 386	$ 398	$ 410	$ 422	$ 1,991
Wildlife-Livestock Interaction		$ 375	$ 386	$ 398	$ 410	$ 422	$ 1,991
Livestock Asset Diversification		$ 375	$ 386	$ 398	$ 410	$ 422	$ 1,991
Role of Animal Products in Child Dev.		$ 375	$ 386	$ 398	$ 410	$ 422	$ 1,991
Subtotal East Africa		$ 1,500	$ 1,544	$ 1,592	$ 1,640	$ 1,688	$ 7,964
Latin America	1						
Livestock-Natural Resource Interface		$ 350	$ 360	$ 378	$ 397	$ 416	$ 1,901
Global Integration	2	$ 100	103	$ 106	$ 109	$ 112	$ 530
Mongolia	3	$ 500	$ 515	$ 530	$ 546	$ 562	$ 2,653
World Bank Intern	4	$ 56	58	$ 59	$ 61	$ 63	$ 297
Indonesia Poulty Project	5	$ 100	$ 103	$ 106	$ 109	$ 112	$ 530
Management Entity		$ 400	412	$ 424	$ 437	$ 450	$ 2,123
Research Support		$ 250	263	$ 275	$ 289	$ 303	$ 1,380
TOTAL USAID FUNDS REQUESTED		$ 4,056	$ 4,182	$ 4,319	$ 4,460	$ 4,604	$ 21,621

Small Ruminant/Global Livestock CRSP

Budgets

Plan B

Summary-All Projects By Line Item

Line Items	1998/99 Amount	1999/00 Amount	2000/01 Amount	2001/02 Amount	2002/03 Amount	TOTALS Amount
Salaries and Benefits	$ 453,068	$ 466,871	$ 484,382	$ 498,513	$ 513,468	$2,416,302
Supplies and Services	$ 600,000	$ 626,200	$ 644,986	$ 685,383	$ 705,872	$ 3,262,441
Equipment	$ 375,000	$ 386,250	$ 386,316	$ 397,505	$ 409,421	$ 1,954,492
Travel						
Domestic	$ 420,000	$ 433,350	$446,350.00	$ 460,540	$ 474,356	$ 2,234,596
International	$ 760,000	$ 763,000	$ 785,890	$ 809,463	$ 841,954	$ 3,960,307
Subtotal Travel	$ 1,180,000	$ 1,196,350	$ 1,232,240	$ 1,270,003	$ 1,316,310	$ 6,194,903
Training	$700,000	$ 721,000	$ 772,005	$ 783,149	$ 806,643	$ 3,782,797
Subtotal Direct Costs	$ 3,308,068	$ 3,396,671	$ 3,519,929	$ 3,634,553	$ 3,751,715	$17,610,936
Indirect costs	$ 747,932	$ 785,329	$ 799,071	$ 825,447	$ 852,285	$ 4,010,065
TOTALS	$ 4,056,000	$ 4,182,000	$ 4,319,000	$ 4,460,000	$ 4,604,000	$21,621,000

Small Ruminant/Global Livestock CRSP
Plan B
Requested Budgets

Management Entity & Research Support

Line Items	1998/99 Amount	1999/00 Amount	2000/01 Amount	2001/02 Amount	2002/03 Amount	TOTALS Amount
Salaries and Benefits	$ 259,960	$ 272,155	$ 285,112	$296,145	$ 312,000	$1,425,372
Supplies and Services	$ 55,000	$ 60,063	$ 61,000	$ 61,290	$ 62,550	$ 299,903
Equipment	$ 10,000	$ 6,000	$ 5,000	$ 10,000	$ 7,500	$ 38,500
Travel						
Domestic	$ 20,000	$ 20,600	$ 21,218	$ 21,855	$ 22,510	$ 106,183
International	$ 45,000	$ 46,350	$ 47,741	$ 49,173	$ 50,648	$ 238,911
Subtotal Travel	$ 65,000	$ 66,950	$ 68,959	$ 71,027	$ 73,158	$ 345,094
Program Advisory Panel	$ 20,000	$ 20,600	$ 21,218	$ 21,855	$ 22,510	$ 106,183
Technical Committee	$ 25,000	$ 25,750	$ 26,523	$ 27,318	$ 28,138	$ 132,728
External Evaluation Panel	$ 35,000	$ 36,050	$ 37,132	$ 38,245	$ 39,393	$ 185,820
Conferences and Workshops	$ 50,000	$ 51,500	$ 53,045	$ 54,636	$ 56,275	$ 265,457
Subtotal Direct Costs	$ 519,960	$ 539,068	$ 557,988	$580,517	$ 601,524	$ 2,799,056
Indirect costs	$ 130,040	$ 135,932	$ 141,013	$145,483	$ 151,476	$ 703,944
TOTALS	$ 650,000	$ 675,000	$ 699,000	$726,000	$ 753,000	$ 3,503,000

Financial Support for Small Ruminant/Global Livestock CRSP
Plan B
Projections For the Period 1998-2003

Year	USAID Contribution	Institution Matching	Regional Contribution	Leveraged Funding	Totals
1998/99	$ 4,056,000.00	$ 1,014,000.00	$ 608,400.00	$ 934,299.00	$ 6,612,699.00
1999/00	$ 4,182,000.00	$ 1,045,500.00	$ 627,300.00	$ 934,299.00	$ 6,789,099.00
2000/01	$ 4,319,000.00	$ 1,079,750.00	$ 647,850.00	$ 844,875.00	$ 6,891,475.00
2001/02	$ 4,460,000.00	$ 1,115,000.00	$ 669,000.00	$ 894,875.00	$ 7,138,875.00
2002/03	$ 4,604,000.00	$ 1,151,000.00	$ 690,600.00	$ 925,275.00	$ 7,370,875.00
TOTALS	$ 21,621,000.00	$ 5,405,250.00	$ 3,243,150.00	$ 4,533,623.00	$ 34,803,023.00

Small Ruminant/Global Livestock CRSP

Requested Budgets
Plan C
Summary - By Projects
Amounts Expressed in Thousands

Region/Program Category Project Title	Priority for New Funds	1998/99 Amount	1999/00 Amount	2000/01 Amount	2001/02 Amount	2002/03 Amount	TOTALS Amount
Central Asia							
Impact of Economic Reform on Livestock		$ 400	$ 412	424	$ 436	$ 449.00	$ 2,121
Range Conservation		$ 400	$ 412	424	$ 436	$ 449	$ 2,121
Subtotal Central Asia		$ 800	$ 824	$ 848	$ 872	$ 898	$ 4,242
East Africa							
Drought Early Warning System		$ 375	$ 386	$ 398	$ 410	$ 422	$ 1,991
Wildlife-Livestock Interaction		$ 375	$ 386	$ 398	$ 410	$ 422	$ 1,991
Livestock Asset Diversification		$ 375	$ 386	$ 398	$ 410	$ 422	$ 1,991
Role of Animal Products in Child Dev.		$ 375	$ 386	$ 398	$ 410	$ 422	$ 1,991
Subtotal East Africa		$ 1,500	$ 1,544	$ 1,592	$ 1,640	$ 1,688	$ 7,964
Latin America	1						
Livestock-Natural Resource Interface		$ 350	$ 360	$ 378	$ 397	$ 416	$ 1,901
Global Integration	2	$ 150	155	$ 159	$ 164	$ 169	$ 796
Mongolia	3	$ 500	$ 515	$ 530	$ 546	$ 562	$ 2,653
World Bank Intern	4	$ 56	58	$ 59	$ 61	$ 63	$ 297
Indonesia Poulty Project	5	$ 100	$ 103	$ 106	$ 109	$ 112	$ 530
Russia Project	6	$ 850	$ 876	$ 902	$ 929	$ 957	$ 4,514
Management Entity		$ 425	438	$ 451	$ 437	$ 450	$ 2,201
Research Support		$ 270	284	$ 297	$ 312	$ 327	$ 1,491
TOTAL USAID FUNDS REQUESTED		$ 5,001	$ 5,156	$ 5,323	$ 5,467	$ 5,642	$ 26,589

Small Ruminant/Global Livestock CRSP

Budgets
Plan C
Summary-All Projects By Line Item

Line Items	1998/99 Amount	1999/2000 Amount	2000/01 Amount	2001/02 Amount	2002/03 Amount	TOTALS Amount
Salaries and Benefits	$ 661,754	$ 779,027	$ 782,422	$ 831,500	$ 856,242	$3,910,945
Supplies and Services	$ 752,382	$ 660,905	$ 680,000	$ 662,300	$ 716,707	$ 3,472,294
Equipment	$ 400,000	$ 412,000	$ 424,000	$ 436,711	$ 417,712	$ 2,090,423
Travel						
Domestic	$ 507,000	$ 522,210	$ 537,876	$ 554,013	$ 570,633	$ 2,691,732
International	$ 875,000	$ 901,250	$ 928,288	$ 956,136	$ 984,820	$ 4,645,494
Subtotal Travel	$ 1,382,000	$ 1,423,460	$ 1,466,164	$ 1,510,149	$ 1,555,453	$ 7,337,226
Training	$870,000	$ 898,000	$ 975,000	$ 1,004,250	$ 1,034,378	$ 4,781,628
Subtotal Direct Costs	$ 4,066,136	$ 4,173,392	$ 4,327,586	$ 4,444,910	$ 4,580,492	$21,592,515
Indirect costs	$ 934,865	$ 981,608	$ 995,414	$ 1,022,091	$ 1,061,509	$ 4,995,486
TOTALS	$ 5,001,000	$ 5,155,000	$ 5,323,000	$ 5,467,000	$ 5,642,000	$26,588,000

Small Ruminant/Global Livestock CRSP
Plan C
Requested Budgets

Management Entity & Research Support

Line Items	1998/99 Amount	1999/00 Amount	2000/01 Amount	2001/02 Amount	2002/03 Amount	TOTALS Amount
Salaries and Benefits	$ 269,693	$ 282,160	$ 294,510	$ 296,079	$ 312,600	$1,455,042
Supplies and Services	$ 55,000	$ 60,600	$ 62,418	$ 62,000	$ 63,860	$ 303,878
Equipment	$ 10,000	$ 6,000	$ 5,645	$ 10,000	$ 7,500	$ 39,145
Travel						
Domestic	$ 25,000	$ 25,750	$ 26,523	$ 27,318	$ 28,138	$ 132,728
International	$ 45,000	$ 46,350	$ 47,741	$ 49,173	$ 50,648	$ 238,911
Subtotal Travel	$ 70,000	$ 72,100	$ 74,263	$ 76,491	$ 78,786	$ 371,640
Program Advisory Panel	$ 25,000	$ 25,750	$ 26,523	$ 27,318	$ 28,138	$ 132,728
Technical Committee	$ 35,000	$ 36,050	$ 37,132	$ 37,132	$ 37,246	$ 182,560
External Evaluation Panel	$ 36,124	$ 37,208	$ 38,324	$ 31,474	$ 32,418	$ 175,548
Conferences and Workshops	$ 55,000	$ 56,650	$ 58,350	$ 58,350	$ 60,101	$ 288,450
Subtotal Direct Costs	$ 555,817	$ 576,518	$ 597,163	$ 598,844	$ 620,648	$2,948,990
Indirect costs	$ 139,183	$ 145,482	$ 150,836	$ 150,156	$ 156,352	$ 742,010
TOTALS	$ 695,000	$ 722,000	$ 748,000	$ 749,000	$ 777,000	$ 3,691,000

Financial Support for Small Ruminant/Global Livestock CRSP
Plan C
Projections For the Period 1998-2003

Year	USAID Contribution	Institution Matching	Regional Contribution	Leveraged Funding	Totals
1998/99	$ 5,001,000.00	$ 1,250,250.00	$ 750,150.00	$ 934,299.00	$ 7,935,699.00
1999/00	$ 5,155,000.00	$ 1,288,750.00	$ 773,250.00	$ 934,299.00	$ 8,151,299.00
2000/01	$ 5,323,000.00	$ 1,330,750.00	$ 798,450.00	$ 844,875.00	$ 8,297,075.00
2001/02	$ 5,467,000.00	$ 1,366,750.00	$ 820,050.00	$ 894,875.00	$ 8,548,675.00
2002/03	$ 5,642,000.00	$ 1,410,500.00	$ 846,300.00	$ 925,275.00	$ 8,824,075.00
TOTALS	$ 26,588,000.00	$ 6,647,000.00	$ 3,988,200.00	$ 4,533,623.00	$ 41,756,823.00

Small Ruminant/Global Livestock CRSP
USAID Grant No. DAN-1328-G-0046-00
Approved Program Budgets

Institutions	Disciplines	Year 12 90/91	Year 13 91/92	Year 14 92/93	Year 15 93/94	Year 16 94/95	Year 17 95/96	Year 18 96/97	Year 19 97/98	Total
Univ. of Calif., Davis	Genetics	$281,246.00	$233,000.00	$185,000.00	$223,167.00	$49,876.00	$50,000.00	$0.00	$0.00	$1,022,289.00
Univ. of Calif., Davis	Agric. Econ.	$0.00	$0.00	$0.00	$0.00	$0.00	$18,661.00	$0.00	$0.00	$18,661.00
Univ of Calif., Davis	Range Mgmt.	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$135,817.00	$350,000.00	$485,817.00
Univ. of Calif., Davis	Nutrition	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$99,878.00	$0.00	$99,878.00
UCLA	Nutrition	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$106,687.00	$325,000.00	$431,687.00
Colorado State	Animal Health	$201,570.00	$175,000.00	$137,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$513,570.00
Colorado State	Ecology	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$117,678.00	$325,000.00	$442,678.00
Cornell University	Animal Nutr.	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$92,891.00	$0.00	$92,891.00
Univ. of Missouri	Sociology	$313,500.00	$202,442.00	$210,000.00	$266,780.00	$132,324.00	$179,530.00	$85,000.00	$0.00	$1,389,576.00
Montana State Univ.	Breeding	$113,025.00	$106,412.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$219,437.00
N. Carolina State Univ.	Nutrition	$295,000.00	$227,000.00	$195,000.00	$352,100.00	$104,548.00	$60,000.00	$0.00	$0.00	$1,233,648.00
Texas A&M Univ.	Breeding	$210,659.00	$140,000.00	$129,000.00	$167,000.00	$79,135.00	$166,525.00	$85,000.00	$0.00	$977,319.00
Texas A&M Univ.	Drought GIS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$130,930.00	$325,000.00	$455,930.00
Texas A&M Univ.	Info Systems	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$138,543.00	$0.00	$138,543.00
Texas Tech. Univ.	Range-Nutritio	$180,000.00	$115,000.00	$118,000.00	$170,000.00	$0.00	$0.00	$0.00	$0.00	$583,000.00
Utah State Univ.	Range-Ecology	$120,000.00	$115,000.00	$115,000.00	$165,870.00	$114,804.00	$39,000.00	$110,973.00	$325,000.00	$1,105,647.00
Washington State Univ.	Health	$160,000.00	$175,000.00	$146,000.00	$304,327.00	$204,435.00	$196,000.00	$88,000.00	$0 00	$1,273,762.00
Winrock Int'l.	Dairy Mgmt.	$200,000.00	$150,000.00	$107,000.00	$82,500.00	$42,014.00	$138,000.00	$85,000.00	$0.00	$804,514.00
Winrock Int'l.	Economics	$255,000.00	$202,558.00	$177,000.00	$205,000.00	$128,125.00	$228,600.00	$21,690.00	$0.00	$1,217,973.00
Univ. of Wisconsin	Networking	$0.00	$0.00	$40,000.00	$55,000.00	$0.00	$0.00	$0.00	$0.00	$95,000.00
Univ. of Wisconsin	Socio-Econ	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$141,247.00	$350,000.00	$491,247.00
Univ. of Wisconsin	Natural Res.	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$104,655.00	$100,000.00	$204,655.00
Univ. of Kentucky	Anthropology	$0.00	$0.00	$0.00	$0.00	$0.00	$23,669.00	$0.00	$0.00	$23,669.00
	Subtotal	$2,330,000.00	$1,841,412.00	$1,559,000.00	$1,991,744.00	$855,261.00	$1,099,985.00	$ 1,543,989.00	$ 2,100,000.00	$13,321,391.00
Management Entity*		$600,000.00	$610,000.00	$610,000.00	$524,275.00	$311,813.00	$600,294.00	$ 442,030.00	$ 530,458.00	$4,228,870.00
Program Enhancement Funds		$0.00	$43,588.00	$40,000.00	$15,000.00	$71,479.41	$56,021.00	$ 441,199.00	$ 148,655.00	$815,942.41
Host Countries		$310,000.00	$305,000.00	$206,500.00	$41,620.00	$106,293.00	$15,273.00	$ 20,000.00	$ -	$1,004,686.00
Linkages/workshops		$65,000.00	$0.00	$70,000.00	$0.00	$0.00	$0.00	$62,750.00	$25,100.00	$222,850.00
Impact Assessment		$0.00	$0.00	$0.00	$3,133.00	$0.00	$0.00	$0.00	$0.00	$3,133.00
Networks		$0.00	$0.00	$14,700.00	$0.00	$0.00	$0.00	$0.00	$0.00	$14,700.00
Funds for Student Training		$0.00	$0.00	$0.00	$20,000.00	$874.00	$0.00	$0.00	$0.00	$20,874.00
New Site/Activity/Grant Renewal		$0.00	$0.00	$459,800.00	$19,000.00	$75,000.00	$266,389.00	$ 30,000.00	$ 110,550.00	$960,739.00
	Subtotal	$975,000.00	$958,588.00	$1,401,000.00	$623,028.00	$565,459.41	$937,977.00	$ 995,979.00	$ 814,763.00	$7,271,794.41
Small Grants						$12,540.00	$40,160.00	$ 15,000.00	$ 50,000.00	$117,700.00
Publications						$6,089.00	$8,770.00	$ 19,795 00	$ 12,550 00	$47,204.00
	Subtotal					$18,629.00	$48,930.00	$ 34,795 00	$ 62,550 00	$164,904.00
	TOTAL	$3,305,000.00	$2,800,000.00	$2,960,000.00	$2,614,772.00	$1,439,349.41	$2,086,892.00	$ 2,574,763.00	$ 2,977,313.00	$20,758,089.41

** Allocation for ME includes funding for External Evaluation Panel, Board Meetings, Technical Committee, and other meetings.*

BUDGET

Small Ruminant/Global Livestock CRSP
USAID Grant No. DAN-1328-G-0046-00
Expenditures by Program

Institutions	Disciplines	Year 12 90/91	Year 13 91/92	Year 14 92/93	Year 15 93/94	Year 16 94/95	YEAR 17 95/96	YEAR 18 96/97	Total
Univ. of Ca., Davis	Genetics	$331,324.81	$321,288.16	$253,754.00	$178,367.45	$49,738.66	$18,257.07	$0.00	$1,152,730.15
Univ. of Ca., Davis	Agric. Econ	$0.00	$0.00	$0.00	$0.00	$0.00	$18,411.18	$0.00	$18,411.18
Univ. of Ca., Davis	Range Mgmt							$109,386.64	$109,386.64
Univ. of Ca., Davis	Nutrition							$95,731.82	$95,731.82
UCLA	Nutrition							$106,687.00	$106,687.00
Colorado State	Animal Hlth	$179,497.99	$195,474.36	$137,000.00	$0.00	$0.00	$0.00	$0.00	$511,972.35
Colorado State	Natl Res. Mgm							$109,981.82	$109,981.82
Univ. of Missouri	Sociology	$201,575.76	$353,614.61	$345,687.42	$217,925.32	$132,324.00	$179,530.00	$85,000.00	$1,515,657.11
Montana St Univ	Breeding	$110,568.80	$105,196.99	$0.00	$0.00	$0.00	$0.00	$0.00	$215,765.79
Cornell University	Land Use							$63,052.10	$63,052.10
N. Carolina St Univ	Nutrition	$383,672.90	$337,642.00	$303,258.17	$305,833.06	$104,548.00	$0.00	$0.00	$1,434,954.13
Texas A&M Univ.	Breeding	$141,524.58	$194,460.00	$165,750.00	$150,321.83	$79,135.00	$166,525.00	$84,789.38	$982,505.79
Texas A&M Univ.	Info Sys							$129,475.39	$129,475.39
Texas A&M Univ.	GIS							$130,855.25	$130,855.25
Texas Tech. Univ.	Range-Nutr	$84,122.34	$191,010.28	$168,446.05	$132,179.41	$0.00	$0.00	$0.00	$575,758.08
Utah State Univ.	Range-Eco	$91,342.42	$133,195.00	$142,270.00	$165,870.00	$100,327.93	$39,000.00	$9,191.86	$681,197.21
Utah State Univ.	Risk Mgmt.							$90,290.84	$90,290.84
Wash St Univ.	Health	$160,000.00	$175,000.00	$146,000.00	$197,061.34	$204,073.64	$193,974.87	$87,999.48	$1,164,109.33
Winrock Int'l.	Dairy Mgmt.	$233,000.00	$186,690.00	$126,318.17	$78,290.76	$42,014.00	$115,979.19	$77,939.42	$860,231.54
Winrock Int'l.	Economics	$212,325.07	$246,906.00	$187,000.00	$173,095.25	$128,125.00	$225,587.19	$21,690.00	$1,194,728.51
Univ. of Wisc	Networkg	$0.00	$0.00	$28,779.79	$13,829.53	$0.00	$0.00	$0.00	$42,609.32
Univ. of Wisc	Socio-Econ							$154,669.04	$154,669.04
Univ. of Wisc	Natl Resource							$104,638.20	$104,638.20
Univ. of Kent	Anthro	$0.00	$0.00	$0.00	$0.00	$0.00	$23,659.34	$0.00	$23,659.34
	Subtotal	$2,128,954.67	$2,440,477.40	$2,004,263.60	$1,612,773.95	$840,286.23	$980,923.84	$1,461,378.24	$11,469,057.93
HOST COUNTRIES **									
Indonesia		$0.00	$0.00	$7,099.00	$0.00	$81,464.25	$0.00	$0.00	$88,563.25
Kenya		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20,000.00	$20,000.00
Morocco		$14,609.18	$10,756.76	$0.00	$0.00	$0.00	$0.00	$0.00	$25,365.94
Bolivia		$42,656.96	$147,330.90	$46,241.74	$34,656.64	$93,290.74	$15,192.28	$0.00	$379,369.26
	Subtotal	$57,266.14	$158,087.66	$53,340.74	$34,656.64	$174,754.99	$15,192.28	$20,000.00	$513,298.45
Management Entity	***	$439,035.03	$498,501.98	$658,193.61	$422,137.36	$297,538.46	$512,194.45	$444,921.82	$3,272,522.71
Small Grants		$0.00	$0.00	$0.00	$0.00	$0.00	$38,423.91	$0.00	$38,423.91
	Subtotal	$439,035.03	$498,501.98	$658,193.61	$422,137.36	$297,538.46	$550,618.36	$444,921.82	$3,310,946.62
	TOTAL	$2,625,255.84	$3,097,067.04	$2,715,797.95	$2,069,567.95	$1,312,579.68	$1,546,734.48	$1,926,300.06	$15,293,303.00

** Most Host Country Expenses are reflected in the expenditures for the participating U.S. institutions.
*** Expenditure for ME includes expenses for EEP, Board Meetings, Technical Committee and other meetings.

Small Ruminant/Global Livestock CRSP
USAID Grant No. DAN-1328-G0046-00
Matching Contributions from U.S. Institutions

Institution	Disciplines	Year 12 90/91	Year 13 91/92	Year 14 92/93	Year 15 93/94	Year 16 94/95	Year 17 95/96	Year 18 96/97	Total
Univ. of Calif, Davis	Genetics	$118,292.08	$122,877.02	$103,056.00	$92,682.00	$36,282.00	$18,951.36	$0.00	$492,140.46
Univ. of Calif, Davis	Agric. Econ.	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Univ. of Calif, Davis	Nutrition	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$40,000.00	$40,000.00
Univ. of Calif., Davis	Range Conservation	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25,000.00	$25,000.00
UCLA	Nutrition	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$37,701.00	$37,701.00
Colorado State	Animal Health	$53,333.04	$87,499.62	$41,861.38	$0.00	$0.00	$0.00	$0.00	$182,694.04
Colorado State	Nat'l Resource	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$37,151.56	$37,151.56
Cornell University	Land Use	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$216,176.00	$216,176.00
Univ. of Missouri	Sociology	$66,184.42	$81,894.67	$121,900.45	$91,115.58	$33,601.39	$51,541.90	$36,739.05	$482,977.46
Montana State Univ	Breeding	$60,734.04	$52,668.00	$0.00	$0.00	$0.00	$0.00	$0.00	$113,402.04
No Carolina St Univ	Nutrition	$64,731.14	$55,975.10	$53,631.00	$55,192.79	$20,331.83	$0.00	$0.00	$249,861.86
Texas A&M Univ	Breeding	$46,289.63	$53,757.88	$63,822.49	$63,704.89	$25,303.42	$46,172.71	$20,151.32	$319,202.34
Texas A&M Univ	Info Systems	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$33,042.00	$33,042.00
Texas A&M Univ	GIS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$32,000.00	$32,000.00
Texas Tech. Univ	Range-Nutrition	$51,422.63	$68,212.94	$49,900.38	$45,924.26	$0.00	$0.00	$0.00	$215,460.21
Utah State Univ	Range Ecology	$46,379.09	$84,756.83	$52,639.90	$54,737.10	$73,152.99	$9,750.00	$3,584.83	$325,000.74
Utah State Univ	Range Risk Mgmt	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$14,673.05	$14,673.05
Wash St Univ	Health	$53,333.00	$81,373.76	$48,180.00	$120,470.61	$85,296.23	$117,106.12	$25,412.76	$531,172.48
Winrock Int'l.	Economics	$75,406.90	$83,273.79	$102,045.27	$92,258.89	$71,268.24	$65,431.43	$19,992.60	$509,677.12
Winrock Int'l.	Dairy Mgmt.	$68,022.61	$56,749.01	$26,262.35	$47,138.48	$26,750.68	$33,149.03	$41,036.81	$299,108.97
Univ. of Wisc.	Natl Resource	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$130,816.77	$130,816.77
Univ. of Wisc.	Socio-Econ.	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$190,996.48	$190,996.48
Univ of Wisc	Networking	$0.00	$0.00	$0.00	$11,795.61	$0.00	$0.00	$0.00	$11,795.61
Univ of Kentucky	Anthropology	$0.00	$0.00	$0.00	$0.00	$0.00	$4,715.00	$0.00	$4,715.00
	TOTAL	**$704,126.58**	**$829,038.62**	**$663,299.22**	**$675,020.21**	**$371,986.78**	**$346,817.55**	**$904,474.23**	**$4,494,765.19**
	Percentage	32.21%	31.90%	32.24%	32.62%	28.34%	22%	47%	29%

Small Ruminant/Global Livestock CRSP
USAID Grant No. DAN-1328-G-0046-00
Summary of Host Country Contributions

Host Country	Year 12 90/91	Year 13 91/92	Year 14 92/93	Year 15 93/94	Year 16 94/95	Year 17 95/96	Year 18 96/97	Total
Bolivia	$809.00	$164,787.00	$81,230.00	$117,013.48	$125,764.12	$0.00	$0.00	$489,603.60
Indonesia	$1,428,400.00	$3,691,400.00	$4,692,840.00	$5,004,400.00	$4,999,800.00	$5,012,500.00	$0.00	$24,829,340.00
Kenya	$218,771.00	$216,284.00	$127,919.00	$56,489.00	$254,718.00	$280,995.00	$308,565.00	$1,463,741.00
Morocco	$1,044,000.00	$826,000.00	$811,000.00	$0.00	$0.00	$0.00	$0.00	$2,681,000.00
Peru	$6,845.00	$6,500.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13,345.00
TOTAL	**$2,698,825.00**	**$4,904,971.00**	**$5,712,989.00**	**$5,177,902.48**	**$5,380,282.12**	**$5,293,495.00**	**$308,565.00**	**$29,477,029.60**
Non-CRSP Support	$46,615.00	$120,962.00	$166,259.00	$340,472.00	$84,301.00	$0.00	$8,200.00	$766,809.00
TOTAL	**$2,745,440.00**	**$5,025,933.00**	**$5,879,248.00**	**$5,518,374.48**	**$5,464,583.12**	**$5,293,495.00**	**$316,765**	**$30,243,838.60**

Financial Support for Small Ruminant/Global Livestock CRSP

For the Period 1990-1998

Year	USAID Contribution	Institution Matching	Host Country Contribution	Totals
1990/91	$ 1,794,880.00	$ 704,129.00	$ 2,745,440.00	$ 5,244,449.00
1991/92	$ 3,360,000.00	$ 829,039.00	$ 5,025,933.00	$ 9,214,972.00
1992/93	$ 2,960,000.00	$ 663,299.00	$ 5,879,248.00	$ 9,502,547.00
1993/94	$ 2,700,000.00	$ 675,020.00	$ 5,518,374.00	$ 8,893,394.00
1994/95	$ 900,000.00	$ 371,987.00	$ 5,464,583.00	$ 6,736,570.00
1995/96	$ 2,200,000.00	$ 346,818.00	$ 5,293,495.00	$ 7,840,313.00
1996/97	$ 2,036,300.00	$ 904,474.00	$ 308,565.00	$ 3,249,339.00
1997/98	$ 2,390,000.00	In-process	In-process	$ 2,390,000.00
TOTALS	$ 18,341,180.00	$ 4,494,766.00	$ 30,235,638.00	$ 53,071,584.00

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GLOSSARY

AARNET	Animal Agriculture Research Network
AFRNET	African Feed Resources Network
AID	Agency for International Development, Washington DC, USA
ALRMP	Arid Lands Resource Management Project, World Bank
AMREF	African Medical Research and Education Foundation
ANP	Applied Nutrition Program
AP	Advisory Panel
APEX	Agricultural Policy Environment Extender
ASAL	Arid and Semi-Arid Lands, Netherlands
ASARECA	Assoc. for Strengthening Agricultural Research in East & Central Africa
ASEAN	Association of Southeast Asian Nations
ASF	Animal source foods
AT	Assessment Teams
AWF	African Wildlife Foundation
BASIS CRSP	Broadening Access and Strengthening Input Market Systems Collaborative Research Support Program
BEST	Belize Enterprise for Sustained Technology
BRD-USGS	Biological Resource Division, U.S. Government Service
CARDI	Caribbean Agricultural Research and Development Institute
CATIE	Centro Agronomico Tropical de Investigacion y Ensenaza
CBE	Commercial Bank of Ethiopia
CDC	Center for Conservation Data
CGIAR	Consultative Group on International Agricultural Research
CIAT	Centro Internacional de Agricultura Tropical
CIEC	Centro Interdisciplinario de Estudios Comunitarios (Center for Interdisciplinary Community Studies), Bolivia

CRIAS	Coordinating Research Institute for Animal Science, Indonesia
CRSP	Collaborative Research Support Program
CSU	Colorado State University
DPG	Dual-purpose goat
DPIRP	Drought Preparedness Intervention and Recovery Program
EARO	Ethiopian Agricultural Research Organization
ECF	East Coast Fever
EEP	External Evaluation Panel
EHNRI	Ethiopian Health and Nutrition Research Institute
EML	Explore Mara Ltd.
ESDAR	Agriculture Research and Extension Group, World Bank
EU	Egerton University
EU-TACIS	European Union, Technical Assistance to the Commonwealth of Independent States
FAO	Food and Agriculture Organization, United Nations
FEWS	Famine Early Warning System
FICAH	Food Industry Crusade Against Hunger
FSU	Former Soviet Union
FUNAN	Fundacíon Antinsana, Ecuador
GATT	General Agreement on Tariffs and Trade
GCC	Gore/Chernomyrdin Commission
GDP	Gross Domestic Product
GHA	Greater Horn of Africa
GIEWS	Global Information and Early Warning Systems
GIS	Geographic Information System
GLCI	Grazing Lands Conservation Initiative
GO	Government organization
GPM	Global Problem Model
GTZ	Deutsche Gesellschaft für Technishe Zusammenarbeit (German Agency

	for Technical Cooperation)
GTZ-MDP	GTZ/Marsabit Development Project
HBCU	Historically Black Colleges and Universities
HPI	Heifer Project International
IAR	Institute of Agricultural Research
IARC	International Agricultural Research Center
ICARDA	International Centre for Agricultural Research in the Dry Areas
ICRAF	International Center for Research in Agroforestry
ICRW	International Center for Research on Women
IDM-MoA	Livestock Development and Marketing Department, Ministry of Agriculture, Kenya
IDRC	International Development Research Centre, Canada
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IGAD	Intergovernmental Agency for Development
IICA	Inter-American Institute for Cooperation on Agriculture
ILCA	International Livestock Center for Africa
ILRI	International Livestock Research Institute
IMAS	Integrated Modeling and Assessment System
IMECBIO	Manantlan Institute of Ecology and Conservation of Biological Diversity
INEFAN	Direccion Nacional de Areas Protegidas y Vida Silvestre
IPB	Bogor Agricultural University, Indonesia
IRA	Institute for Resource Assessment
ISNAR	International Service for National Agricultural Research
ISRN	Indonesian Small Ruminant Network
KARI	Kenya Agricultural Research Institute
KDHS	Kazakhstan Demographic and Health Survey
KDPG	Kenya dual-purpose goat

KEVEVAPI	Kenya Veterinarian Vaccine Production Institute
KRTISB	Kazakh Research and Technological Institute for Sheep Breeding
KWS	Kenya Wildlife Service
LAC	Latin American Countries
LTC	Land Tenure Center
MALDM	Ministry of Agriculture, Livestock Development and Marketing
MCF	Malignant catarrhal fever
ME	Management Entity
MOAF	Ministry of Agriculture and Food
MOU	Memoranda of understanding
NAFTA	North American Free Trade Agreement
NARO	National Agricultural Research Organization
NARS	National Agricultural Research System
NCAA	Ngorongoro Conservation Area Authority
NCRSP	Nutrition CRSP
NDVI	Normalized Difference Vegetation Indices
NGO	Non-governmental organization
NIRS	Near Infrared Reflectance Spectroscopy
NIS	Newly Independent States
NPS	National Park Service
NRCS	Natural Resource Conservation Service
OBAD	Oromia Bureau of Agricultural Development
ODI	Overseas Development Institute
OECD	Organization for Economic Co-operation and Development
OFPEP	On-farm Productivity Enhancement Program
OHLA	Ololepo Hills Landowners Association
OPC	Ovine pulmonary carcinoma
OPP	Outreach Pilot Project
ORP	Outreach Research Project

PAC	Program Administrative Council
PAMM	Program Against Micronutrient Malnutrition
PD	Program Director
PDU-MoA	Pastoral Development Unit, Ministry of Agriculture
PENHA	Pastoral and Environmental Network for the Horn of Africa
PHYGROW	Plant/Hydrology/Yield/Growth Simulation Model
PI	Principal Investigator
PRARI	Promoting Russian AgricultureThrough Regional Investment
PVO	Public Volunteer Organization
REDSO	Regional Economic Development Support Office, USAID-Nairobi
RERUMEN	Latin American Network of the Small Ruminant CRSP
RFP	Request for Proposals
RRA	Rapid Rural Appraisal
SAIS	Sociadad Agriocol Interes Social
SALTLICK	Semi Arid Lands Training and Livestock Improvement Centres of Kenya
SAM	Structured Analysis Methodology
SCT	Spatial Characterization Tool
SEMARNAP	Secretaria del Medio Ambiente y Recursos Naturales y Pesca
SORDU	Southern Rangelands Development Unit
SPA	Sheep pulmonary adenomatosis
SR/GL-CRSP	Small Ruminant/Global Livestock CRSP
SR-CRSP	Small Ruminant CRSP
SSA	Sub-Saharan Africa
SWRI	Serengeti Wildlife Research Institute
TAES	Texas Agricultural Experiment Station
TAMUS	Texas A&M University System
TANPA	Tanzania National Parks
TC	Technical Committee

TE	Terranueva
TMA	Tanzania Ministry of Agriculture
TT	Technology transfer
UAAS	Uzbekistan Academy of Agricultural Sciences
UCD	University of California, Davis
UCLA	University of California, Los Angeles
UCLAS	University College of Lands and Architectural Studies, University of Dar es Salaam
UDZ	Zoology Department, University of Dar es Salaam
UK	University of Kentucky
UMTWA	Uganda Ministry of Tourism, Wildlife and Antiquities
UN	United Nations
UNAE	University of Nairobi, Department of Agricultural Economics
UNB	University of Nairobi, Department of Botany
UNEP	United Nations Environment Programme
UNESCO	United Nations Educations, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
USACP	USA and Canad Program (Heifer Project International)
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USU	Utah State University
UWI	University of West Indies
UW-Madison	University of Wisconsin-Madison
VOCA	Volunteers in Overseas Cooperative Assistance
WANA	West Asia and North Africa
WC	Williams College
WI	Winrock International
WRI	World Research Institute
WOCCU	World Council of Credit Unions

SUMMARY OF FACTS

Project Title: Small Ruminant/Global Livestock Collaborative Research Support Program

Grant No: DAN-1328-G-00-0046-00

Grantee: University of California, Davis

Program Director: Montague W. Demment

USAID Funding Obligated through 9/30/97: $18,341,180

USAID Funding Authorized through 9/30/98: $19,400,000

Expenditures reported thru 9/3/97: $15,293,303

Funds committed to 9/30/98: $3,054,073

Total U.S. Institutions' matching contribution under this grant:
$4,494,765.19 (29% of reported expenditures)

Total host countries' contribution through 9/30/97:
$30,235,639 (198% of USAID funds expended)

Current U.S. institutions holding primary subgrants:
Colorado State University
Texas A&M University
University of California, Los Angeles
University of California, Davis
University of Wisconsin-Madison
Utah State University

U.S. institutions affiliated with primary subgrantees:
University of Colorado
University of Illinois
University of Kentucky
University of Minnesota
Oregon State University
Pennsylvania State University
South Dakota State University
Williams College
Winrock International

Collaborating International Agricultural Research Centers (IARCs):

International Livestock Research Institute (ILRI)
International Center for Agricultural Research in Dry Areas (ICARDA)
International Center Food Policy Research Institute (IFPRI)
International Service for National Agricultural Research (ISNAR)

Collaborating regional organizations:

Central Asia: Association of Central Asia Livestock Research Academies (ACALRA)
East Africa: Association for Strengthening Agricultural Research in Eastern Africa (ASARECA)
Latin America: Institute for Inter-American Cooperation in Agriculture (IICA)

Cooperating Non-Governmental Organizations (NGOs):

CARE
FARM Africa
Heifer Project International
CONDESAN
Overseas Development Institute (ODI)
Volunteer in Overseas Cooperative Assistance (VOCA)
Save the Children

Private sector cooperation:

American Breeders Service
Land O'Lakes
World Council of Credit Unions
Commercial Bank of Ethiopia

Foreign collaborators:

Central Asia:
Institute of Ecology and Sustainable Development
Karakul Sheep Husbandry Institute (Kazakhstan)
Institute of Forage and Rangelands (Kazakhstan)
Kazakh Hydrogeological Complex
Institute of Space Research (Kazakhstan)
Institute of Animal Breeding and Veterinary Medicine (Kazakhstan)
Ministry of Agriculture (Uzbekistan)
Kazakh Institute for Hydrometeorological Research
Samarkand State University (Uzbekistan)
State Scientific Production Center of Land Resources (Kazakhstan)
Institute of Plant Physiology, Genetics and Bioengineering (Kazakhstan)
Kazakh Institute of Oriental Studies
Kazakh Institute of Feeds and Pastures
Kazakh Center for Sheep Selection and Genetics (KCSSG)
Kazakh Federation of Private Farmers

Latin America:
Centro de Datos para la Conservacion (CDC) (Ecuador)
Terranueva (Ecuador)
Fundacíon Antisana (FUNAN) (Ecuador)
Proteccion del Medio Ambiente Tarija (PROMETA) (Bolivia)
Centro Interdisciplinario de Estudios Comunitarios (CIEC) (Bolivia)
Centro de Levantamientos Aeroespaciales y Aplicaciones SIG para el Desarrollo Sostenible de los Recursos Naturales (CLAS), Universidad Mayor San Simon (UMSS) (Bolivia)
Servicios de Apoyo al Desarrollo (SEAD) (Bolivia)
Centro de Estudios Regionales para el Desarrollo de Tarija (CER-DET) (Bolivia)
Proyecto Zonificacion Agro-ecologica y Establecimiento de una Base de Datos y Red de Sistema de Informacion Geographica en Bolivia (ZONISIG)
Manantlan Institute of Ecology and Conservation of Biological Diversity (IMECBIO), University of Guadalajara (Mexico)

East Africa:
Kenya Agricultural Research Instiute (KARI)
Makerere University (Uganda)
University of Nairobi (Kenya)
Egerton University (Kenya)
University of Asmara (Eritrea)
Mekelle University (Ethiopia)
Ministry of Agriculture (Kenya)
Namulonge Research Institute (Uganda)
Sokoine University (Tanzania)
Institute of Agricultural Research (Ethiopia)
Mpawapwa Livestock Research Institute (Tanzania)
Uganda Ministry of Tourism, Wildlife and Antiquities
Inuyaat e-Maa (Maasai Patoralist Group) (Tanzania)
Serere Research Station (Uganda)
Africa Wildlife Foundation (Kenya)
Bush Homes of East Africa (Kenya)
University of Dar es Salaam (Tanzania)
Ministry of Agriculture and Cooperatives (Tanzania)
National Agricultural Research Organization (NARO) (Kenya)
Ethiopian Health and Nutrition Research Institute
Alemaya University of Agriculture (Ethiopia)
Ministry of Health (Kenya)

Other Organizations:
MacCaulay Land Use Institute (United Kingdom)
International Fund for Agricultural Development (IFAD)
Russian Institute for Oriental Studies
Russian Institute for Ethnography and Anthropology

Collaborating CRSPs:
BASIS

Program Administrative Council:

Edwin Price, Chair, Texas A&M University, Asst. Vice Chancellor for International Agriculture
Jerrold Dodd, North Dakota State University, Chair, Department of Animal and Range Science
Penelope Nestel, Johns Hopkins University, Human Nutrition Division, Department of International Health
Jane Shey, Livestock Agriculture Consultant
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Michel Simeon, World Bank
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External Evaluation Panel:

Nancy Conklin-Brittain, Harvard University, Animal Nutritionist
L.J. (Kelvin) Koong, Oregon State University, Animal Scientist
David Sammons, Purdue University, Agronomist
Susan Thompson, Dartmouth University, Sociologist

Research Teams:

East Africa

D. Layne Coppock, Leader, Utah State University: Diversification of Livestock Assets in East Africa
Michael Coughenour, Leader, Colorado State University: Integrated Management and Assessment for Balancing Food Security, Conservation and Ecosystem Integrity in East Africa.
Paul Dyke, Leader, Texas A&M University, Blackland Research Center: Early Warning System for Monitoring Nutrition and Health of Livestock and the Food Security of Humans in East Africa
Charlotte Neumann, Leader, University of California, Los Angeles: Role of Animal Source Foods to Improve Diet Quality and Growth and Cognitive Development in East African Children

Latin America

Timothy Moermond, Leader, Univiversity of Wisconsin-Madison: Livestock-Natural Resource Interfaces at the Internal Frontier

Central Asia

Emilio Laca, Leader, University of California, Davis: Integrated Tools for Livestock Development and Rangeland Conservation in Central Asia

Kenneth H. Shapiro, Leader, University of Wisconsin-Madison: Impact of Decollectivization in Central Asia

Participating countries:

Central Asia-- Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan
East Africa-- Eritrea, Ethiopia, Kenya, Tanzania, Uganda
Latin America--Bolivia, Ecuador, Mexico

Proposed new countries: Russian Federation, Ukraine, Indonesia and Mongolia.

SR-CRSP ACHIEVEMENTS 1978-1997

The SR-CRSP was instituted in 1978 with research in five countries (Brazil, Peru, Morocco, Indonesia, and Kenya). Two countries were graduated from the program: Brazil in 1987 and Morocco in 1993. In 1991, due to political unrest, work in Peru was shifted to Bolivia and was continued until 1996. Research in Indonesia was also terminated in 1996, while involvement in Kenya has proceeded as the program expands to a regional focus. The accomplishments listed below provide an outline of what the SR-CRSP has achieved in the countries where it was operational from 1978-1997.

BOLIVIA (1991 – 1996)

In September 1991, political instability caused the transfer of SR-CRSP fieldwork from Peru to Bolivia. Work focused on strengthening national research capacity through collaboration with the Bolivian Technological Institute for Agriculture (IBTA). The program aimed to train local scientists, to investigate socio-economic issues, to encourage the use of multidisciplinary methods, to provide guidance for on-farm research, and to develop research facilities. The SR-CRSP ended its stay in 1996 due to severe budget reductions and changing priorities resulting from a major reorganization of IBTA.

Feed and Nutrition

Identification of constraining conditions on farmland. Research has demonstrated that quantity and quality of native forage species related to livestock production are affected by: high altitude, limited rainfall conditions with prolonged periods of drought, high radiation and irradiation losses, fragile soils susceptible to erosion, and large short-term temperature variations.

Land use and forage map. A land use and vegetation map was produced for San Jose Llanga from on-ground surveys, aerial photos and satellite imagery analysis. This quantitative characterization of the area's natural resource base provides a powerful tool with which to overcome constraints to feed supply. Use of this information will enhance production of camelids, sheep, and cattle in the Andean Highlands.

Socioeconomic Analysis

Assessment of resource use. An assessment of access to primary means of production (land, labor and animals) has guided research in gender specific analyses of production strategies.

Information management system established for socioeconomic data. A unifying data management system for all economic and sociological data has been established to ensure that the data is analyzed to its fullest potential.

Small ruminant commercialization on the altiplano. It was revealed that commercial channels for small ruminant products occur at three different levels: at the village market level, milk is the most important product, along with sheep hides and some cheese; at the provincial market level, live animals and sheep hides are sold; and at the export market level, sheep hides predominate.

A social and environmental history. The environmental, demographic and institutional history of San Jose Llanga and surrounding areas has been reconstructed to identify significant episodes of socioeconomic and ecological change and their impacts on resource management.

Training and Institution Building

Formal training. Twenty-eight students from five Bolivian universities conducted their senior research theses for B.S. degrees, and several of these students are prospects for M.S. training in the U.S. Three U.S. students did part, or all, of the research for their degrees in Bolivia.

Nutrition laboratory established. With leadership and direction from SR-CRSP scientists, a functional nutrition lab at the Patacamaya research station was established, utilizing unused equipment

Strengthening Bolivian scientists' on-farm research capabilities. The on-farm research approach of the SR-CRSP agropastoral project and its base in an indigenous community fostered a greater willingness on the part of Bolivian researchers to include farmers in setting research agendas.

BRAZIL (1979 –1987), GRADUATED

Work in Brazil focused on research that produced new technologies and management practices for hair sheep and goats raised under semi-arid conditions in one of the poorest regions of the world. In 1987, the SR-CRSP was phased out when USAID declared Brazil a graduate country.

Feed and Nutrition

Meat production from goats and hair sheep. Sheep were found to be better meat producers than goats except under complete browsing conditions. Goats appeared to produce milk more efficiently than cattle where browsing (*caatinga*) was the primary feed source.

Sustainable production. It was demonstrated that the use of *caatinga* forest in the Sertáo region of northeast Brazil could be an economically effective and sustainable enterprise for both animal and wood production.

Importance of native tree and shrub species as forage. Research established the potential importance of coppice in the year-round forage balance for sheep and goats and introduced the possibility of "coppice management" as a new principle in small ruminant production systems worldwide.

Forage production and goat nutrition enhanced through vegetal manipulation. Thinning of tree canopies in Brazil's semi-arid forest regions caused up to 600% increase in herbaceous vegetation on the ground.

Major nutritional constraints for small ruminants. It was found that the major nutritional constraint in Brazil was digestible energy from mid-September through December. This problem was partially resolved by careful timing of tree cutting, which promoted the growth of new coppice shoots from the stump.

Animal Health

Identified the immune response to the caseous lymphadenitis bacterium, which infects sheep and goats worldwide. A test measuring the immune response of goats was developed and then used to evaluate an experimental vaccine.

Socioeconomic Analysis

Goats as a "living bank account." It was learned that farmers in northern Brazil used goats mainly as living bank accounts. Goats provide economic stability since they are likely to survive droughts, require little in maintenance costs, and have a value which does not depreciate with inflation.

Training and Institution Building

Laboratory building. In some cases, up to 20-25% of basic laboratory equipment was funded through the SR-CRSP partnership,

Formal training. Fifteen Brazilian and American graduate students were trained either in Brazil or in the U.S., utilizing data generated through CRSP work.

Information Dissemination

International conferences. In April 1986 at the CNPC over forty presentations were given by both Brazilian and American scientists. In March 1987, CNPC/CRSP results and recommendations were presented in 18 papers and 68 abstracts at the IV International Conference on Goats involving 651 specialists from 45 countries.

Publications. New technologies and management practices were developed and transferred to producers through papers published either in Brazil or in the U.S., in English as well as Portuguese. These include 2 books, 30 chapters, 13 Masters theses, 15 Ph.D. dissertations, 79 scientific papers, 18 short courses, 95 abstracts, and 85 technical communications.

On-farm technology trials. Studies tested improved small ruminant technologies using regular research field hearings in which farmers participated jointly in selecting the technologies they were to receive.

INDONESIA (1980 – 1996)

Research in Indonesia focused on three areas: feed resource management, genetics and breeding, and socioeconomic analysis. The feed resources component evaluated forage resources, grazing systems, feed requirements, and feed supplementation. Genetic research concentrated on increasing the prolificacy of goats and production of improved hair breeds of goats. Economic analysis focused on integrated production systems, animal heath and grazing management, and marketing and trade. In 1995, when funding for the CRSP in Indonesia ended, CRSP activities were transferred to national and regional institutions.

Feed and Nutrition

Feeding technologies to overcome nutritional constraints. While feed offered to animals was generally adequate, supplementation with cassava leaves, tree legumes, and concentrate supplements increased growth by 50-100 grams/head/day.

Computerized database. A database containing the composition of the feedstuffs utilized in all of the nutrition feeding studies in three West Java locations was established. The database is being maintained at the Research Institute for Animal Production (RIAP), Bogor.

Protein and energy requirements of growing sheep and goats. Information on protein and energy requirements for animals less than 20 kg weight has been estimated and published for use in Indonesia. Nutrient requirements and productivity responses of

pregnant and lactating ewes/does to dietary treatment on strategic supplementation of prolific sheep have also been determined.

Species evaluation of forage trees. A collaborative effort among several institutes was undertaken to evaluate forage tree species.

Animal Breeding

Prolificacy gene identified. A major gene ($fecJ^F$) was identified as highly prolific and a strain of Javanese Thin Tail sheep was developed. Sheep average 2.8 lambs per litter, nearly double the average in West Java.

Development of Sei Putih Hair Sheep. The Sei Putih Hair Sheep breed (50 percent Sumatra, 25 Percent St. Croix, and 25 percent Barbados Blackbelly) was developed and adapted for grazing under tropical tree crops. This breed has superior genetic potential for resistance or tolerance to internal parasites. Sei Putih lambs are 47% heavier than Sumatra lambs at weaning; in addition, productivity per unit weight of ewe and productivity per unit metabolic weight of ewe were 13 and 20% higher than for Sumatra ewes, respectively.

Sumatra sheep raised under rubber plantations. Lambing and weaning data show that Sumatra sheep possess exceptional potential for accelerated lambing in rubber plantations systems in humid tropical conditions. Sumatra sheep achieved 1.82 lambings per production year and weaned 2.2 lambs per year weighing 21 kg per 22 kg ewe.

A new strain of productive hair sheep for the hot humid tropics. A productive strain of hair sheep with superior genetic potential for resistance or tolerance to internal parasites was developed. This breed is well adapted to the climate and feed resources of the humid and sub-humid tropics and to a variety of management systems.

Animal Health

Parasitic constraints to sheep production in plantations. Gastro-intestinal worms and pancreatic fluke were identified as the most serious constraints to sheep production in rubber plantations. Anthelmentic drugs have demonstrated large economical benefits in controlling the parasites.

Socioeconomic Analysis

Sheep grazing in rubber plantations. The development of sustainable and economically workable techniques for integrating sheep grazing with rubber plantations can help reduce environmental contamination from herbicides, saving approximately US $51 million per year. Small farmers raising sheep have an average of 33% higher profit and return for labor. Furthermore, approximately 10 sheep can control weeds in one hectare of rubber plantation, reducing the labor needed for weeding by 18-31%.

Sheep grazing in oil palm plantations. Hair sheep have been integrated into oil palm plantations following the rubber plantation model, with the same benefits.

Economics of feed supplementation. Small amounts of cheap feed supplements provided over the critical lambing period were found to have more economic benefits than general supplementation. Feed supplements yielded a 40% increase in productivity and a more than 200% gain in net benefit.

Government investment in sheep production. Using advice and technology from the SR-CRSP, Indonesian government plantations started investing in sheep production units as part of their mandated 5% expenditures on social development.

Role of women. While the importance of small ruminants among farmers is clearly exemplified by the central role of male heads of household in making most major management decisions, women play a critical role in the farm management.

Women's breeding group. Four women's groups with 30 members per group were established by the SR-CRSP. Each group owns and manages 36 sheep and is responsible for passing along two female lambs to other members of the group over a three-year period.

Training and Institution Building

Formal training. A total of 37 Indonesian students have received degrees through support from SR- CRSP funds.

Network development. The SR-CRSP was instrumental in the formation of the Indonesian Small Ruminant Network (ISRN) and the Small Ruminant Network for Asia. The network is now supported by the International Development Research Center (IDRC).

Institutional development. The activities of the SR-CRSP have been integrated into the Indonesian Central Research Institute for Animal Sciences (CRIAS), with former CRSP trainees involved in its administration and research.

Information Dissemination

Publications. The SR-CRSP has published more than 140 papers in Indonesian and international journals.

Sheep and goat production handbook. Using pictures and limited text, the SR-CRSP published a handbook for farmers and extension personnel in Indonesian, Sudanese, Javanese, and English language editions.

Development of technology packages. Two technology packages have been tested and adopted in order to establish a dialogue with groups of farmers for the development of appropriate small ruminant management and technologies. These improvements have increased farmers' incomes from small ruminants.

Outreach programs. A successful outreach pilot program (OPP) and an outreach research program (ORP) were established for smallholders. On-farm testing of the SR-CRSP Sheep Techpack by the OPP demonstrated the potential to increase yields by 50% over traditional methods. In the ORP in North Sumatra growth rates of pre-weaned sheep averaged 78 g/d; pre-weaned mortality was relatively low at 8%; and lambing was only 217 days on average.

International workshops. Three international workshops have been supported by the SR-CRSP in collaboration with international donor agencies and host countries.

Small grants program. The small grants program provided ten grants in 1991 and nine in 1993 for Indonesian scientists in locations other than West Java and North Sumatra to undertake research in sheep and goat production.

The Indonesian Small Ruminant Network (ISRN). Created in 1989, ISRN has published an inventory of human resources and centers involved in production, has established a literature database, has supported national workshops, and has published a biannual newsletter.

KENYA (1980 – PRESENT)

A key focus of the work in Kenya has been the institutionalizing of multidisciplinary research and on-farm trials in applied agricultural research. The CRSP has also helped establish social science and economic programs at the Kenya Agriculture Research Institute (KARI). These programs have produced wide-reaching training.

Feed and Nutrition

Feed Resources. Methods have been established for development and preservation of suitable feed resources for small ruminant livestock under smallholder management in Kenya. These methods include screening and determination of production and utilization potentials of forage crops.

Nutritional and management improvements. Nutrition and management have been improved through: palatability ranking and nutritional analysis of forage, quantification of feed resources throughout the year, development of appropriate nursing regimens, and refinement of tethering management techniques.

Animal Breeding

The development of the Kenya Dual Purpose Goat (KDPG). To meet the requirements of small- scale farm families, a dual-purpose goat has been developed, which is composed of equal proportions of two local and two exotic dairy breeds. The new breed possesses acceptable milk yield, a fast growth rate, and high fertility, and is highly adaptive to various agro-ecological zones. The KDPG and improved forage production practices have resulted in a 66% increase in food yield for smallholder families.

Animal Health

Development of reagents for detecting contagious caprine pleuropneumonia (CCCP), heartwater, and anaplasmosis. Development of these highly specific and sensitive diagnostic reagents allows for the unequivocal identification and characterization of highly infectious agents of small ruminants worldwide.

Identification and control of caprine arthritis encephalitis viral infection in Kenya, Peru, and other parts of the world. It was determined that viral transmission of this disease occurs through colostrum and milk, and methods were developed to prevent its spread. These controls are important to the U.S., where about 80% of dairy goats are affected. The control of this disease represents a US $20,000,000 savings for goat producers worldwide.

Vaccine development for CCCP. A new vaccine has been developed for CCCP and has been shown effective in on-farm trials. This vaccine has the potential to prevent an average of 82 annual local outbreaks involving an estimated 300,000 goats in Kenya alone.

Development of Rift Valley Fever vaccine. In collaboration with ILRAD, a vaccine against Rift Valley fever was developed and tested on animals in a controlled environment.

Socioeconomic Analysis

A baseline survey conducted to identify the role of the goat in farming systems of western Kenya. Survey results indicate that farmers are familiar with the goat, but that it is neither a preferred source of meat (as compared with sheep) nor a conspicuous source of milk. Market studies suggest that as the cow is slowly phased out, alternative sources of milk, such as the KDPG, will be acceptable and welcome.

An historical study of the character of agrarian social structure and national political economy. The agricultural sector has not been able to retain labor in the region.

Due to historical out-migration of males, women farmers have become a major focus of SR-CRSP research and should be targeted for future research and extension.

Study of dietary patterns. A study of farm families participating in the KDPG program highlighted the specific role that milk plays in human nutrition. Findings revealed that for all households surveyed, milk was the major source of dietary protein. For example, in the Hamisi cluster, milk was found to be the only source of animal protein consumed on 50% of survey days based on 24-hour dietary recall. Many households were found to purchase Kenya Creameries Cooperative milk to meet these needs. The demonstrated importance of milk underscored the KDPG's potential for improving nutrition in rural communities.

Evaluation studies of KDPG viability and supporting production package in western Kenya. Findings indicate that acceptance of KDPG technology is most likely in areas where intensification of agriculture is already underway or likely to occur.

Economic analysis of forage production. A study of forage production enabled development of strategies for KDPG production in smallholder farm situations.

Development of linear programming models to evaluate economic feasibility of KDPG technologies and to assess its impacts on existing farming systems. In regard to smallholder farmers in western Kenya, economic analysis determined the most profitable food-forage associations. Credit facilities were determined to be necessary to make the KDPG enterprise profitable.

Training and Institution Building

Formal training. Thirty-seven people have earned degrees through Small Ruminant CRSP work.

Internships. The SR-CRSP has hosted seven undergraduate students as interns.

Information Dissemination

Over 50,000 people have been directly exposed to the KDPG technology package. KDPG research has occurred on 150 smallholder farms and the management package has been displayed at many local agricultural shows.

Publications. The Small Ruminant CRSP has published over 450 papers in regional and international journals.

MOROCCO (1980 – 1993), GRADUATED

The research generated by the SR-CRSP in Morocco addressed nutrition, genetics, and range management. Genetic efforts were focused on crossbreeding to improve prolificacy. Nutrition and range management work consisted of the assessment and utilization of resources. The CRSP was phased out in 1993 when work was considered mature.

Animal Breeding

Sheep prolificacy. It was demonstrated that the Moroccan D'Man breed of sheep transmits its high prolificacy additively to first cross and backcross progeny.

Cross breeding program established. The program started in 1982 and crossbreeding began in 1988 for the development of a synthetic breed of 50% D'Man and 50% Sardi breeds.

Identification of nutritional myopathy among sheep. It was determined that nutritional myopathy results from a dietary deficiency in selenium. Methods for correcting the deficiency previously developed in the U.S. were tested and found effective in Morocco.

Training and Institution Building

Establishment of a sheep station. A 265-hectare farm was established in the central part of Morocco in the Tadla area. This farm simulates both intensive irrigated mixed crop-livestock and extensive dryland systems. Housing pens for more than 1,000 sheep, individual pens for nutrition and physiology studies, and a laboratory for reproductive physiology have been added.

Improved facilities. The research facilities at the ENA experimental farm in Meknes and the range research station at Timahdit (Middle Atlas) were improved, and several pieces of equipment were purchased through the CRSP.

Formal training. Between 1981 and 1992, 12 faculty members completed their doctoral theses, 54 students earned their M.S. or DVM degrees, and earned 34 B.S. degrees. At least 10% of students were from North African and sub-Saharan countries. Former CRSP trainees have been hired by extension services, professional associations, and research institutions.

Information Dissemination

Publicly available information on Moroccan small ruminants. Data generated by the CRSP in Morocco has been published in 111 articles in national and international scientific journals.

Extending research. The program in Morocco maintained close relationships with extension units and government agencies at the national and regional levels. Joint meetings were organized to share research results. Seminars and demonstrations were organized in the Tadla and Middle Atlas areas.

Technology package for Mediterranean climate sheep production. The SR-CRSP in Morocco produced a technology package publication that can be used by extension agents and advanced farmers. This document has been extensively distributed throughout Morocco and in North Africa, the Middle East, and sub-Saharan zones with similar conditions.

PERU (1980 – 1990)

Extensive work in Peru focused on the improvement of sheep and camelid production. The result of this collaborative effort was enhancement of animal production through improvement in animal breeding and nutrition. Related social and economic mechanisms were also analyzed. Work in Peru was shifted to Bolivia in 1991 due to political unrest.

Feed and Nutrition

Characterized grazing on Peru's highland ranges. The competitive and interactive grazing behavior of sheep, alpaca, and llamas on Peruvian highland ranges was characterized. Research showed that rotational grazing systems are important in the recovery of land and vegetation and that cultivated forages can boost animal production by 15 to 20%.

Agro-edaphologic maps. Scientists devised a practical method for elaborating agro-edaphologic maps that permit differentiation of range sites according to suitability for grazing.

Native forage species identified. The effect of climatic patterns on growth cycle and nutritive value of principal native grasses was established. Predominant plant associations were characterized using cover, biomass production, and nutritive quality as criteria.

Stocking rates calculated. Appropriate range site stocking rates were established according to range condition and animal species.

Range land improvement. Procedures for the improvement and recuperation of rangeland, from various adverse environmental conditions, have been introduced. Through these procedures, it is possible to improve initial stocking of 0.5 sheep units/ha/year on overgrazed range to four or five sheep units/ha/year.

Agricultural plots and soil fertility in peasant communities. The introduction of nitrogen fixing legumes at the beginning of the fallow period shortens the period and provides additional forage for livestock.

Animal Breeding

Established improvement efforts for 80% of the sheep population in smallholder hands. The SR-CRSP helped shift the focus of breeding efforts away from the large commercial enterprises towards the remaining 80% of sheep held by smallholders.

Characterization of the productivity of existing sheep breeds. The Junín and Corriedale breed have been characterized in productive and reproductive terms at two sites in the Central Sierra.

Breeding at the Sociadad Agricol Interes Social (SAIS) Tupac Amaru. The introduction of the Targhee-Finn rams did not contribute to improvement of Junín sheep production, indicating it would be more efficient to exploit the pure Jardín sheep.

Small ruminant production improvements in the Southern Sierra. Researchers found that the Criollo sheep in the highlands exhibited better reproductive characteristics (i.e. an early age of reproduction and fertility) and better carcass yields at 18 months than the improved breeds of the zone.

Genetic characterization of alpaca. The herd of the La Raya Experimental Center (in Puno) was used to generate a database for the development of studies in the area of genetic improvement.

Achievements in sheep reproduction. Researchers have characterized the presentation of estrus and ovulation in the Junín, Corriedale, and Criollo breeds under natural range conditions.

Feed availability and reproduction. Under irrigated pasture conditions at the IVITA Station in the Mantaro Valley, it was demonstrated that, with mixed pastures, three parturitions in two years may be obtained in the Junín, Criollo, and Corriedal breeds.

Achievements in alpaca reproduction. The reproductive cycles and behavior of alpacas were studied and documented. A system for management of males during breeding was developed, which increases the number of females bred and females exposed from 55% to 85%.

Animal Health

Identification of an ovine pulmonary carcinoma (OPC) virus-specific antigen. OPC is responsible for severe losses of adult sheep in Peru. Identification of the antigen will be useful in isolating the causative virus, in developing a serological test for carrier animals, and eventually in developing a vaccine.

Diagnosis and control of sheep pulmonary adenomatosis (SPA) and ovine progressive pneumonia (OPP). Clinical and pathological criteria have been established for diagnosis of sheep pulmonary adenomatosis (SPA) and ovine progressive pneumonia (OPP).

Reducing lamb mortality through improved preventative care. It was found that nearly 40% of lamb deaths associated with pneumonia were the result of improperly administered medication; thus, improved training and preventative care are appropriate.

Assays of medicinal plants for control of parasitic infections in sheep. Research has shown that medicinal plants help control parasitic infections, thus providing the small producer with an accessible treatment for some parasites.

Socioeconomic Analysis

Highland production system characterized. Detailed knowledge of production systems comprising small ruminants was acquired in associative enterprises and rural communities of the highland region and in small goat herds in the Northern Coast of Peru. It was found that 60% of family hand labor is expended on livestock; that women play a predominant role with livestock; and that institutional forms of credit and technical assistance do not yet serve the existing system of alpaca fiber production and marketing.

Benefits of supplementation. It was established that pasture-feeding supplementation during the last third of gestation in sheep and during growth and reproduction of female alpacas are economically advantageous practices.

Computer data analysis. Tools were developed for data processing by computer. From a simple herd model, programs have been prepared for the recording of quantitative and qualitative data that facilitates analysis.

Training and Institution Building

Formal training. A total of 84 Peruvian students earned degrees through the CRSP (17 Ph.D., 22 M.S., and 45 B.S.), with a total of 106 theses produced.

Peruvian graduate training program in animal production and health. The contributions of SR- CRSP funding, research capability, and training of Peruvian scientists were instrumental in the establishment of post-graduate programs in the Veterinarian Faculty at San Marcos and Puno Universities.

Information Dissemination

Publications. SR-CRSP work in Peru produced 62 journal articles, 170 technical reports, 9 books or book chapters, and 203 summaries. Support was provided for participation at 103 conferences.

The Andean Small Ruminant Science Network (RERUMEN). The SR-CRSP played a leading role in the establishment of RERUMEN, a small ruminant network for the Andean region. RERUMEN publishes a newsletter several times a year, with a distribution of over 500 professionals. In addition, it maintains databases of professionals in the area and of small ruminant issues.

BENEFITS TO THE UNITED STATES

Research has been beneficial to both host countries and the United States. Much of the two decades of SR-CRSP research has been applied domestically.

Feed and Nutrition

Llama production. Research on llama nutrition and feeding has benefited the United States as llama production increases.

Model development. Texas A&M has developed sheep and goat simulation models which are being applied to the U.S. In addition, scientists are trying to link these models to models of forage dynamics and diet selection.

Rangeland management. For over a decade, SR-CRSP-supported research on grazing systems in the semiarid regions has benefited the United States. The knowledge base generated has assisted ranchers in the U.S. to implement successful and sustainable grazing systems.

Animal Breeding

Hair sheep. Hair sheep developed by the SR-CRSP have been introduced into farming systems in the southeastern United States.

Animal Health

Disease control. Disease control measures in foreign countries reduce the likelihood that animal diseases will reach the United States.

Disease resistance. The work in Kenya to identify genetic resistance to the intestinal parasite *Haemochus contortus* can be applied to the United States with a cost savings of over $40 million a year.

Genetic resistance. A project at Texas A&M has been initiated to identify genetic markers that correlate to resistance to internal parasites in small ruminants.

Socioeconomic Analysis

Livestock production. The systems approach and research results in Bolivia have application to livestock production in the U.S. high plains inter-mountain states and have benefited a project funded by the Utah Agricultural Experiment Station. The Bolivian program has also developed forage seed markets for U.S. export.

Integrated production systems. SR-CRSP research provides U.S. agricultural producers with applicable models of sustainable production systems.

Computer simulations. The SR-CRSP has developed computer simulation models that enable U.S. sheep producers to evaluate the potential for leaner lamb production, which could increase profit by $3 to $6 per head.

TRANSITION AND RE-ENGINEERING

SCHEDULE OF EVENTS
MAY 1995-OCTOBER 1998

May 8-9, 1995	Synthesis Meeting, Arkansas
October 19-20, 1995	Advisory Panel Meeting, Washington, DC
January 1996	East Africa Workshop, Uganda
February 1996	Central Asia Workshop, Uzbekistan
April 1996	Latin America Workshop, Costa Rica
June 1996	Advisory Panel Meeting, Davis, California
July 1996	Call for Assessment Team (AT) Proposals
July 22, 1996	Bidder's Conference, Chicago
August 23, 1996	AT Proposals Due
Sept. 29-30, 1996	Advisory Panel Meeting, Chicago
October 1996	Assessment Team Award Announcements
March 1997	Five Month Progress Report
June 1997	Year-End Conference, Boston
July 1997	Full Proposal Due
September 1997	Advisory Panel Meeting, Santa Fe, New Mexico
September 1997	Full Project Award Announcements
October 1997	Orientation and Regional Coordination Workshop, Davis
February 1998	Renewal Proposal Due at USAID
April 1998	Formal Presentation at USAID
October 1998	Global Livestock CRSP Begins

REGIONAL WORKSHOPS -- EAST AFRICA LIVESTOCK ASSESSMENT
ENTEBBE, UGANDA
29 JANUARY - 1 FEBRUARY 1996
AGENDA

Monday, January 29, 1996

9:00 - 9:15	Registration	
9:15 - 9:30	Welcome	Dr. Mrema Executive Secretary ASARECA
9:30 - 10:30	Introduction	Dr. Demment Program Director SR-CRSP
10:30 - 10:45	*Break*	
	Country Presentations	
11:00 - 11:30	Ethiopia	Dr. Alemu, IAR Holeta
11:30 - 11:45	Discussion	
11:45 - 12:15	Kenya	Dr. Abate, KARI
12:15 - 12:30	Discussion	
12:30 - 1:30	*Lunch Break*	
1:30 - 2:00	Tanzania	Dr. Lugenja
2:00 - 2:15	Discussion	Asst. Comm. Livestock Res.
2:15 - 2:45	Madagascar	Dr. Rasambainarivo, ERZV
2:45 - 3:00	Discussion	
3:00 - 3:15	*Break*	
3:30 - 4:00	Uganda	Dr. Kiwuwa, Makerere Univ.
4:00 - 4:15		Discussion
4:15 - 4:45	Livestock Dev. Policy	Dr. Ebong, NAARI
4:45 - 5:00	Discussion	
6:00 - 7:00	Meeting of Thematic Group Leaders with Dr. Demment	

East Africa Regional Livestock Assessment Workshop Agenda (continued)

Tuesday, January 30, 1996

	Country Presentations (continued)	
9:00 - 9:30	Burundi	Dr. Maniramboni, ISABU
9:30 - 9:45		Discussion
	Resource Presentations	
9:45 - 10:30	Kenya CRSP	Dr. Semenye, SR-CRSP
10:30 - 10:45	*Break*	
11:00 - 11:30	NGO	Dr. Peacock, Farm Africa
11:30 - 11:45	Discussion	
11:45 - 12:15	Human Nutrition	Dr. Murphy
12:15 - 12:30	Discussion	University of California
12:30 - 1:30	*Lunch Break*	
1:30 - 2:00	Wildlife/Livestock	Dr. Infield
2:00 - 2:15	Discussion	African Wildlife Foundation
2:15 - 2:45	Wildlife/Disease	Dr. Mihok, ICIPE
2:45 - 3:00	Discussion	
3:00 - 3:15	*Break*	
3:30 - 4:00	Wildlife/Natural Res.	Dr. Githaiga
4:00 - 4:15	Discussion	Kenya Wildlife Services
4:15 - 4:45	Policy/Econ. Growth	Dr. Ngategize
4:45 - 5:00	Discussion	Uganda Coffee Dev. Auth.

East Africa Livestock Assessment Workshop Agenda (continued)

Wednesday, January 31, 1996

9:00 - 12:00	Thematic Workgroups	Group Leaders	
		Livestock/Environment	Infield/Githaiga
		Human Nutrition	Murphy/Semenye
		Economic Growth	Von Kaufmann/Ngategize
10:00 - 10:15	*Break*		
12:00 - 12:45	Full Group Discussion		
12:45 - 2:00	*Lunch Break*		
2:00 - 4:00	Thematic Workgroups Regional Integration and Prioritizing		
4:00 - 5:30	Reporting and Discussion		
6:30 - 8:30	***ASARECA Reception***	***Lake View Terrace***	

Thursday, February 1, 1996

9:00 - 10:00	**Thematic Groups** Revise and Finalize Report
10:00 - 11:30	Final Reporting and Regional Priority Setting
11:30 - 12:30	Meeting of ASARECA Country Participants

EAST AFRICA WORKSHOP: PROBLEM MODELS

PRIORITY TOPICS FOR RESEARCH IN HUMAN NUTRITION

Introduction: A high prevalence (40%) of childhood malnutrition exists in East Africa. Two types of malnutrition have been identified: (1) protein-energy malnutrition (PEM) resulting from inadequate quantities of food; (2) micronutrient malnutrition due to poor quality food (e.g., low intakes of iron, vitamin A, vitamin B12, zinc, and calcium). Children with PEM will usually have micronutrient deficiencies as well, although micronutrient deficiencies may exist without PEM.

Objective: To identify and evaluate practical methods to increase animal products in children's diets to alleviate malnutrition.

Hypothesis: Increasing animal products in children's diets will enhance child health and development.

Activities:
Review of literature and other available knowledge to clearly identify constraints and gaps in information regarding:
- •Nutritional status and dietary data
- •Policy, economic status, agricultural practices, etc.

Conduct surveys (PRAs, RRAs, etc.) for validation of existing information (if any) and establish the magnitude of the researchable nutrition problems
Characterize the nutritional content of typical diets
Develop the most appropriate intervention protocols:
- •Educational
- •Household animal production
- •Community access to animal products

Implement randomized controlled trials
Measure impact of the selected interventions (e.g., improvements in birth weight, growth, child survival, and cognitive development).

Outputs:
Comprehensive description of the nutritional status of the community.
A summary of the nutritional adequacy of typical diets in the community.
An evaluation of the impact of adding animal products to children's diets.
A handbook describing these methods and their possible application in other communities.

Relevance: The problems are universal in East and Central Africa.

Actors:
- Land grant universities in the US.
- Agricultural universities in East and Central Africa.

- NARS and Ministries of Health and Agriculture.
- NGOs such as International Center for Research on Women (ICRW), FARM Africa, Save the Children's Fund, Freedom from Hunger, Heifer Project International, CARE, OXFAM, Action Aid, Plan International.
- IARCs (ILRI, IFPRI)
- UNICEF
- Private sector (e.g., US Livestock and Meat Board, Land O' Lakes, meat packers).

Active Projects:
ICRW/FARM Africa dairy goat project in Ethiopia (contact: Charlotte Johnson-Welch at ICRW, Washington, DC).

Note: Consideration should be given to incorporation of human nutrition components into existing livestock research and development projects.

PRIORITY TOPICS FOR RESEARCH IN LIVESTOCK PRODUCTION, WILDLIFE INTERACTIONS AND ENVIRONMENTAL CONSERVATION

Introduction: Under this general research area two main areas of interest were examined:
Crop/livestock production systems
Livestock/wildlife production systems

Bearing in mind the interests of the Small Ruminant CRSP and the considerable research already carried out on crop/livestock production systems the group concentrated discussions on livestock/wildlife production systems and examined areas of research that would promote increased production whilst enhancing environmental conservation in rangeland. It is felt that though some of the ideas may have relevance to forest areas, their greater significance is for arid and semi-arid rangeland habitats.

Livestock/Wildlife Production Systems

The major topics identified were:
1. Establishing policies that would support a sustainable balance between food production and conservation of the environment.
2. Community based management strategies for protected areas.
3. Management strategies to integrate livestock and wildlife populations to maximize the production of rangeland ecosystems.
4. Problems in pastoralist production systems in response to periodic droughts.

(1) Policies and their importance for incorporating wildlife into the development of sustainable balances between food production and conservation of the environment.

Objective: To establish an appropriate and sustainable balance between food production and environmental conservation.

Research has shown that mixed species systems can result in higher production in both biomass terms and economic terms than single species systems. Current policies in the east African region do not, however, promote such systems and traditional and cultural dispositions and the conservatism common amongst farmers tend to result in concentration on single species production systems, or at best the use of two or three domestic animal varieties. The expectation that the control of livestock diseases (notably by the effective control of tsetse fly) will make large areas of rangeland currently unavailable to livestock and often important wildlife areas available for livestock production also presents the opportunity for the development of mixed livestock/wildlife production systems.

Hypothesis: Creation of a well researched policy environment will permit optimal balances between food production and environmental conservation on land made available by the control of livestock diseases.

Activities: The following areas of research were identified as necessary for validating the above hypothesis:

- Social sciences:
  Society and resource use
  Conflict resolution
  Resource sharing
  Traditional structures
  Forms of social organizations
  Needs and demands of rangeland communities
- Economics of production:
  Pricing and marketing
  Cost of production
- Range ecology:
  Conflicting uses
  Ecological monitoring
  Range and wildlife management (protection and use)
  Stocking rates in mixed species systems
- Ownership:
  Communal management vs. private management of land in terms of food production and conservation.
  Ownership of wildlife (private Vs state)
  Conflicting interests
- Development of wildlife industry:
  Relationship to tourism
  Processing of by-products
  Marketing
- Facilitation:

Extension
Producer associations
Tax environment
Conflict resolving current and future conflict between wildlife and other agricultural production systems.

Outputs: Lands likely to be opened up by eradication of diseases will be managed under optimum regimes balancing both environmental conservation and food production.

Relevance: The products of this research will apply to a great proportion of the rangelands in Africa.

Actors: Expertise is available to carry out these activities from; Land grant Universities, ILRI, Government agencies concerned with management of wildlife, and various NGOs. The following agencies are active in this type of research:

- UNEP
- WLTI
- NEMA (Uganda)

(2) Community based management strategies for protected areas.

Objective: To examine empirically the apparent advantages of a community based approach to protected area management in the pursuit of sustainable conservation areas.

The general acceptance of community based conservation as the correct approach to protected area management, largely replacing protectionist approaches, has come about largely in the absence of empirical evidence to demonstrate its facility. Despite the lack of real evidence, most western based conservation organizations, if not all African conservation authorities, now require that projects funded by them include activities to enable communities to participate in and benefit from protected area management. The complex nature of community based approaches to protected area management and the apparent failure of many of the pilot projects implemented around the continent, suggest the importance of a body of data to support the theoretical rationale for involving local communities in protected area management.

Hypothesis: Community based approaches to protected area management are more effective than traditional protectionist approaches.

Activities: The following areas of research were identified as necessary for validating the above hypothesis:

- Environmental monitoring
  - comparing environmental parameters both inside and outside PAs under different management regimes.

- Economic analysis
  - Respective costs of different management regimes, current expenditure and projections.
  - External pressure on protected areas and vice-versa - comparing the pressures exerted on the PAs to allow analysis of the degree of impact of management on the problem (land pressure, poaching pressure, natural resources, population pressure, etc.), and the degree of negative impact caused by the PA on local communities (e.g., crop damage, loss of livestock, loss of trad. resources, etc.)
- Sociological aspects
  - Attitudes of communities to the PA, roles of community structures in management, impact of management initiatives on social structures.
  - Economic impact on the community, comparison between the economic cost of the PA on the community with the value of benefits created under a community based approach.

Outputs: This research will provide data which can be used to better evaluate the benefits of adopting a community based approach to protected area management. The techniques involved will be viewed realistically, and applied in a practical and appropriate way, rather than as an act of faith or as an act of political correctness.

Relevance: The products of this research will apply to most countries within the region developing various forms of community based conservation initiatives.

Actors: Available expertise to undertake these activities are: International research organizations like ILRI, Land grant Universities, NGOs, and some governmental organizations. Agencies with active research projects related to this topic are:

- AWF
- WWF
- WCI
- IUCN
- FOC
- IFF
- CARE
- KWS
- ANGAP (MADAGASCAR)

(3) Management Of Mixed Livestock/Wildlife Populations To Maximize Efficiency Of Use Of Rangeland Resources.

Objective: To maximize efficiency in the use of ecosystems by stocking both livestock and wildlife in the rangelands.

Rangeland management theory and wild and domestic animal ecology research suggest that productivity in terms of biomass production will be increased by employing a multi-

species production system rather than a single species system. It is suggested that this will result from the ecological adaptations and niche separation demonstrated by the wide variety of large mammals and reflected to some extent in the different domestic animals. At a simplistic level it is clear that in woodland savannas, a mixture of grazers and browsers will make fuller use of the available natural forage resource than either grazers or browsers alone. Thus, keeping a mixture of browsers and grazers would allow higher stocking rates to be maintained, leading to higher production from a given area. Management of a mixed species production system, however, is more complex, and where this included wildlife, the required technical skills may not exist.

Hypothesis: Animal production can be improved by incorporating wildlife into the production system.

Activities: The following areas of research were identified as necessary for validating the above hypothesis:

- Ecology of domestic and wild herbivores
  water
  forage
  habitat
- Management in drought prone environments
- Economics (natural resources/production).
- Production technologies
  harvesting animals
  processing
  fencing
  disease management
  most appropriate management techniques
- Training
  extension workers, producers
- Biodiversity - livestock, wildlife and plants
- Habitat modification in relation to production systems
  production levels
  cultural perspectives
  ecological mechanisms
- Use of animals (domestic and wild) as environmental management tools.

Outputs: The output of this research will be the formulation of stocking densities that are optimal for the rangeland ecosystems when stocked with a mixture of wildlife and livestock. This will prevent environmental degradation and allow for the most economic and ecologically efficient use of the land.

Relevance: The products of this research will apply to most parts of African rangelands.

Actors: Expertise available to carry out these activities are NGOs like WCI, WWF, Government agencies and Land grant Universities. It was difficult to identify agencies active in these activities in this region.

(4) Production inefficiencies in pastoralist systems resulting from droughts.

Objective: To research mechanisms that will assist pastoralists to overcome limitations on their livestock production system resulting from inability to de-stock rapidly in response to droughts and re-stock following droughts.

Traditional pastoralist strategies of reducing risk in rangeland in highly variable rainfall areas depended on mobility, exploitation of habitat variability, distribution of animals over a social network, and large herd sizes. These strategies were highly adaptive and enable higher levels of production from the land than western based ranching models of production. Reduction in mobility and the available land has compromised these strategies in many circumstances. Retention of large herds in particular tends to result in dramatic collapses in livestock populations in response to drought, often with accompanying damage to the environment. Enabling pastoralists to reduce herd size in advance of droughts to avoid die-offs and thus loss of capital, and restock rapidly to exploit available forage resources following droughts should increase the productivity of the rangeland and provide significant social and environmental benefits.

Hypothesis: Mechanisms for connecting pastoralist to financial institutions to increase liquidity of livestock would be effective in enhancing production and environmental protection in arid and semi-arid rangeland system.

Activities: This topic relates closely to the topic presented by the animal production for economic development group to examine the problems of pastoralists' responses to droughts. The rationale presented here could be combined with their rationale.

Crop/Livestock Production Systems

The following topics were examined:

1. Reducing herd sizes through intensification will ameliorate environmental degradation.
2. Testing available technology packages that are efficient, environmentally efficient and economically viable.
3. Development of methodologies for transfer and adoption of technologies
4. Use of marginal lands within high intensity production systems.

(5) Appropriate mechanisms can be developed to connect pastoralist systems to the central national economies in ways that allow livestock capital to integrated into national and

local capital markets providing flexibility to deal with drought and minimize environmental degradation.
(Topic is similar to one identified by the economic development group.)

(6) Marginal lands within high intensity production systems.

Objective: To examine mechanisms for the sustainable use of marginal, ecologically fragile lands existing with high intensity production systems, currently subject to inappropriate and generally environmentally damaging production systems.

Many areas characterized by high population densities and high intensity crop/livestock production systems contain within them areas of marginal production potential, but which often play an important role in the provision of ecological services and are high in biodiversity. Examples would be steep forested or grassland slopes and seasonally inundated valleys or wetlands. Land pressure often forces farmers to exploit these marginal lands in inappropriate ways that are not sustainable and which may damage the production potential of the entire system, and certainly of the marginal lands. Land-uses for these marginal areas need to be developed which would contribute to the productivity of the farming system but which will be sustainable and support the retention of biodiversity.

Hypothesis: Sustainable management of marginal area resources can increase farming system production in the short term whilst retaining biodiversity.

Activities: The following areas of research were identified as necessary for validating the above hypothesis:

- Characterization of marginal lands within a high intensity production area selected for study.
- Examination of uses of marginal lands and economic analysis of their contribution to the production system.
- Impact of land use on habitat and biodiversity.
- Participatory development of alternative land uses for marginal areas that would increase production and reduce environmental damage.
- Economic and environmental impact analyses of identified alternative land uses.
- Specific examination of potential roles for wildlife within alternative land use systems (e.g. small antelopes for meat production, butterfly pupae production, honey production).

Outputs: Methodologies for examination of potential for marginal lands to contribute towards crop/livestock production systems.

Relevance: Highly relevant to highland areas in the region, especially Ethiopia, and to Uganda's extensive wetlands.

Actors: Potential collaborators: IUCN (Wetland Prog., Uganda), FARM Africa, NARs.

PRIORITY TOPICS FOR RESEARCH IN ANIMAL AGRICULTURE FOR ECONOMIC DEVELOPMENT

Introduction: Though no intellectual restriction was applied, selection of the major topics was done within the ASARECA identified priorities and with an eye to the exploiting the comparative advantages of the CRSP approach to collaborative research. There will be other priority topics, appropriate to other approaches to regional collaboration in agricultural research, that have not been identified in this exercise. This prioritization also assumes a commitment by regional national agricultural research institutions to collaboration with US Land Grant Universities and other institutions which will have to be validated by further consultation. The role of the CRSP in building capacity for achieving the research objectives will be assessed as a component of each selected project.

The major topics that were identified for research in animal agriculture for economic development (not in order of priority) were:

1. Ensuring the food security and development needs of resource poor households.
2. Improving the ability of pastoral people to cope with and recover from drought.
3. Establishing a enabling policy environment.
4. Matching livestock genotypes to ecological and economic environments.
5. Improving input and output markets.
6. Conserving forage and browse plant and livestock biodiversity.
7. Optimizing land use and natural resource conservation by integrating domestic and wild animal species.

(1) Ensuring the food security and development needs of resource poor households

Objective: To use livestock, especially small ruminants to enable resource poor households to cope with stress and enter the monetary economy. The priority target group will most likely be women in households that currently do not have livestock and little opportunity to acquire them as a hedge against poor harvests.

Hypothesis: Livestock are important in maintaining household security in times of stress, especially in resource poor households.

Activities: The following activities have been identified as necessary for validating the above hypothesis:

- identifying appropriate target groups that are typical of a broad cross section of people in East Africa. This will be preceded by establishing criteria for identifying such groups;
- establishing human nutrition profiles partly as criteria for identification and as baselines for assessing progress in achieving food security;
- identifying appropriate interventions;
- developing appropriate means for resource people to access credit e.g., through women peer groups; and
- extension techniques in human nutrition.

Outputs: The output of this research will be viable approaches for improving the welfare and food security of the poorest communities in rural areas and enabling them to enter the market economy.

Relevance: The products of this research will apply to significant numbers of people in all East African countries.

Actors: The following agencies are active in this type of research and development:

- FARM-Africa
- Save the Children Fund
- CARE International
- International Center for Research on Women (with FARM-Africa)
- Ethiopian Health and Nutrition Research Institute
- UNICEF

(2) Improving the ability of pastoral people to cope with and recover from drought

Objective: To improve the chances of livestock people being able to withstand catastrophes and sustain their production systems and welfare under changing ecological, social and economic circumstances.

Hypothesis: By better matching of traditional coping mechanisms with appropriate policy and technical options, pastoral systems will be more sustainable and better able to accommodate change.

Activities: The following activities have been identified as necessary for validating the above hypothesis:

- identification of central and local government, and traditional authorities which affect the behavior of pastoral systems and elucidation of their roles;
- identification, description and evaluation of pastoral coping mechanisms;
- assessing extent, and consequences, of changing terms of trade between pastoral societies and providers of food grains and other essential goods and services. And studying food sources, quality of market information and state of infrastructure of trade in livestock and foodstuffs;
- identification of available technologies for amelioration of the effect of drought, especially water and feed options;
- analyses of options open for pastoral mobility and likely trends;
- design and implementation of a pastoral famine early warning system for East African countries that will complement the FEWS in place for grain crops. This will involve the identification of locationally-strategic partners in research, extension and NGO communities and provision of means for them to be trained in famine early warning and enabling them to conduct trials on coping mechanisms suggested by the pastoral communities amongst whom they work; and
- depending on resources, this may be linked to the design and validation of

appropriate herd health procedures to control diseases that exacerbate the deleterious effects of droughts.

Outputs: An early warning system that will constitute a vital component of effective relief to development assistance and which will ameliorate the effect of future drought and disease catastrophes.

Relevance: The products of this research will apply to significant numbers of people in all East African countries, especially those with large pastoral communities.

Actors: The following agencies are active in this type of research and development:

- FARM-Africa's northern Kenya camel production improvement project
- Save the Children Fund
- CARE
- OXFAM
- IGADD
- CARE International
- ILRI associated Livestock research networks; CARNET, SRNET and AFRNET
- World Bank
- USAID
- IDRC
- FAO

(3) Establishing an enabling policy environment

Objective: To provide government with the necessary information and analysis of options with which to formulate policies that will stimulate change and progress in animal agriculture for the benefit of smallholders, pastoralists and consumers of livestock products; milk, meat, fiber, hides, manure and draught power.

Hypothesis: The creation of an optimal policy environment will facilitate change and encourage economic growth.

Activities: The following activities have been identified as necessary for validating the above hypothesis:

- identifying of the agencies and communities involved in developing animal agriculture including state and NGO extension agencies, NARS and farmers' organizations;
- analyzing land tenure and resource use arrangements;
- identifying and logging meta data, i.e., what data exists on the particular topic, where it is, how much there is, its quality, its format and accessibility;
- analyzing the likely effect of different pricing policies for inputs and outputs; and
- studying the marketing arrangements and the role of government through regulation and the actions of parastatal marketing agencies and the degree of competition in the market place.

Outputs: Enabling policy options for consideration by government advisors and decision makers.

Relevance: The products of this research will apply to significant numbers of people in all East African countries.

Actors: The following agencies are active in this type of research and development:

- World Bank
- European Union
- Bilateral donors
- ILRI and IFPRI

(4) Matching livestock genotypes to ecological and economic environments

Objective: To provide the extension services concerned with animal agriculture with appropriate information on which to base advice to farmers on the use of indigenous resources rather than depending on exotic germplasm and foreign technologies that may not be well adapted to their less than ideal marketing and ecological circumstances.

Hypothesis: Matching animal genotypes to prevailing ecological and economic circumstances will maximize human welfare, farm profitability and the sustainability of smallholder farming systems.

Activities: The following activities have been identified as necessary for validating the above hypothesis:

- analysis of feeding and other production factors affected by the ecology and prevailing farming systems. This will inter alia included identification of appropriate crop residue, forage, browse and agro-industrial bi-products available for feeding to livestock. This will include determining the potential for utilization of novel feeds;
- analysis of the strength of demand for livestock products, the marketing systems including the provision of market information, the state of the infrastructure and central and local government policies and regulations that restrict freedom of trade;
- identification and epidemiology of the important endemic livestock diseases, diagnostic tools and capabilities and efficacy and delivery systems for of disease control measures;
- identification, characterization and assessment of the production potential and productivity traits such as disease and stress tolerance capability of available local and exotic livestock genotypes and their crosses; and
- modeling of key systems to take account of the above factors.

Outputs: Systems of smallholder production that despite less than maximum output are both more profitable and more sustainable than high input systems dependent on exotic germplasm.

Relevance: The products of this research will apply to significant numbers of people in all East African countries.

Actors: The following agencies are active in this type of research and development:

- ITAG
- Heifer Project International
- FARM-Africa
- VETAID
- ILRI, ICIPE, ICRAF

(5) Improving input and output markets

Objective: To provide decision makers with information they need to remove market imperfections that will reduce the prices of inputs and costs of sales and make animal products available to a wider cross section of urban consumers, especially the more disadvantaged families.

Hypothesis: that, present marketing arrangements constrain adoption of innovations and response to consumer demand; and

that, improvements can be made to processing and delivery systems to make foods of animal origin accessible to the poorer urban consumers.

Activities: The following activities have been identified as necessary for validating the above hypothesis:

- analysis of the demand for animal products;
- assess the need for credit and devise appropriate way of providing credit that will make inputs available in the rural areas. This should included inventory finance for wholesalers and rural retailers as well as for producers;
- the supply and maintenance of animal-drawn implements in rural areas including the capacity of commercial suppliers and local artisans
- assess the seasonal availability of animal feedstuffs;
- analysis of the supply of veterinary drugs and services and the role of government and the private sector in this;
- analysis of alternative processing and delivery systems that will reach the less well off communities with appropriate healthful products; and
- analysis of the effect of alternative pricing and import and export policies on the supply of inputs for animal agriculture and the demand for locally produced animal products.

Outputs: This research will provide suggestions for improved input and output marketing arrangements that will reduce the risks and increase the returns to investment in animal agriculture.

Relevance: The products of this research will apply to significant numbers of people in all East African countries.
Actors: The following agencies are active in this type of research and development:

- FARM-Africa
- ITAG
- Private sector

(6) Conserving forage and browse plant and livestock biodiversity

Objective: To ensure that the invaluable diversity of domestic livestock breeds and forage varieties are conserved for sustaining and improving future production systems

Hypothesis: that, varieties of forage and fodder plants and breeds of domestic livestock with valuable properties are threatened and that in situ conservation technologies and policies can be devised and implemented

Activities: The following activities have been identified as necessary for validating the above hypothesis:

- characterize and phenotype indigenous forage and browse plants, and plants with medicinal veterinary uses that may be threatened due to expanding cultivation, overgrazing or other causes;
- characterize and phenotype indigenous livestock breeds that may be threatened by neglect, crossbreeding or other causes;
- determine population abundance and assess the extent and urgency of the threats to vulnerable population;
- identify important production and stress tolerance traits in threatened germplasm;
- determine appropriate conservation programs for selected plants in genebanks and in situ conservation schemes that can elicit community interest and participation; and
- devise and implement appropriate in-situ conservation schemes for threatened livestock breeds that can be profitable managed by communities that have traditional kept the breeds selected for conservation

Outputs: Invaluable plant varieties and livestock breeds preserved for the benefit of future communities world-wide.

Relevance: The products of this research will apply to significant numbers of people in all East African Countries and around the world.

Actors: The following agencies are active in this type of research and development:
- FAO
- ILRI

- ICRAF
- Signatories to the Agenda 21 convention on biodiversity including the USA
- UNEP

(7) Optimizing land use and natural resource conservation by integrating domestic and wild animal species

Objective: To ensure that the opportunity is not lost to conserve biodiversity and improve sustainable use of natural resources through ignorance of the benefits and technology for integrating wildlife into commercial land use systems.

Hypothesis: In certain circumstance wildlife can contribute to the sustainability and profitability of farming systems.

Activities: The following activities have been identified as necessary for validating the above hypothesis:

- conduct a desk study of the grazing and watering behavior of wildlife species with potential for commercial exploitation in mixed land-use systems;
- determine if there are ways of incorporating grazing and watering requirements into the prevailing land tenure and resource use systems where they might have commercial potential;
- determine the technology and husbandry required for rearing wildlife for efficient reproduction and profitably achieving appropriate size and ages for the desired end uses such as slaughter for meat, sport hunting and green hunting;
- determining the institutional constraints such as ownership law and market regulations that may constrain exploitation of wildlife and their products; and
- determine disease factors that may affect livestock species on the farms and ranches on; which the animals are kept and neighboring properties.

Outputs: Technical and policy recommendations for increasing the opportunities for rural producers to benefit from the humane exploitation of wildlife.

Relevance: The products of this research will apply to significant numbers of people in all East African countries.

Actors: The following agencies are active in this type of research and development:

- Private enterprise
- African Wildlife Foundation
- FARM-Africa

REGIONAL WORKSHOPS -- CENTRAL ASIA ANIMAL PRODUCTS ASSESSMENT
TASHKENT, UZBEKISTAN
27 FEBRUARY - 1 MARCH 1996
AGENDA

Tuesday, February 27, 1996

9:00 - 9:45	Opening Session Dr. Usmanov, Uzbekistan Academy of Science Dr. Gintzburger, ICARDA Dr. Beniwal, ICARDA	
9:45 - 10:45	Introduction Dr. Demment, Small Ruminant CRSP	
10:45 - 11:00	*Break*	
	Country Presentations	
11:00 - 11:40	Kirgistan	
11:40 - 12:00	Discussion	
12:00 - 12:40	Khazakhstan	Dr. Abduraimov
12:40 - 13:00	Discussion	
13:00 - 14:00 Lunch		
	Country Presentations (continued)	
14:00 - 14:40	Turkmenistan	Dr. Khodzjakov
14:40 - 15:00	Discussion	Academy of Ag. Sciences
15:00 - 15:40	Tadjikistan	Dr. Eschonov
15:40 - 16:00	Discussion	Agricultural Institute
16:00 - 16:30	*Break*	
16:30 - 17:10	Uzbekistan	Dr. Nasirov
17:10 - 17:30	Discussion	Inst. of Animal Husbandry

Central Asian Animal Products Regional Assessment Workshop Agenda (continued)

Wednesday, February 28, 1996

Resource Presentations

9:00 - 10:00	Carol Kerven and Roy Behnke, Overseas Development Institute "Impacts of Decollectivisation on Rangelands and Livestock Marketing in Central Asia"
10:00 - 10:30	Discussion
10:30 - 11:00	*Break*
11:00 - 12:00	Thomas L. Nordblom, ICARDA "Food and Feed Prospects for the 2020 in Central Asian Republics"
12:00 - 12:30	Discussion
12:30 - 13:30 Lunch	

Resource Presentations (continued)

13:30 - 14:30	Tagir Gilmanov, San Diego State University "Some ecological problems of the rangelands of Central Asia and suggested role of mathematical modelling and optimization in their management"
14:30 - 15:00	Discussion
15:00 - 15:30	*Break*
15:30 - 16:30	Tjaart Schillhorn van Veen " New challenges for the livestock sector in central Asia; overcoming legacies, and adapting to new policies, technologies, markets and farmers."
16:30 - 17:00	Discussion

19:00 - 21:30 Workshop Reception

Central Asian Animal Products Regional Assessment Workshop Agenda (continued)

Thursday, February 29, 1996

9:00 - 12:00	Thematic Workgroups Environmental Issues Public Policy and Land Tenure Economic Growth	Group Leaders Gilmanov/Gintzberger Kerven/Abduraimov Schillhorn/Khodzjakov
10:00 - 10:30	*Break*	
12:00 - 12:45	Full Group Discussion	
12:45 - 14:00 Lunch		
14:00 - 16:00	Thematic Workgroups Regional Integration and Prioritizing	
16:00 - 17:30	Reporting and Discussion (Full Group)	

Friday, March 1, 1996

9:00 - 10:00	**Thematic Groups** Revison and Finalize Report
10:00 - 10:30	*Break*
10:30 - 12:00	Final Reporting and Regional Priority Setting
12:00 - 13:00	Meeting of Central Asia Country Participants
13:00 - 14:00 Lunch	
14:00 - 14:30	Concluding Session Dr. Usmanov, UAAS Dr. Gintzburger, ICARDA Dr. Demment, SR-CRSP Dr. Beniwal, ICARDA

CENTRAL ASIA WORKSHOP: PROBLEM MODELS

PRIORITY TOPICS FOR RESEARCH IN POLICY AND ECONOMIC DEVELOPMENT

Introduction: Population growth is rapid in the Central Asian republics: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. Compared with a total of 54 M people in 1990, the region will be the home of a projected 92 M by the year 2025 (World Bank, 1993).

Permanent pastures (rangelands) account for the largest share of the land surface in the region, totaling about 260 million hectares (FAO, 1995). This is comparable with the total area of 272 million hectares of steppe land (100 - 400 mm rainfall) in all of West Asia and North Africa. Irrigated farming in Central Asia covers some 9.4 million hectares and is a major source of feed in the form of crop residues and by-products.

Livestock inventory statistics (FAO, 1995) can be aggregated into Livestock Units (LU = 500 kg bovine at maintenance). Small ruminants are prominent in all five republics. The aggregate number of Livestock Units of Central Asia in the early nineties was about 25 million, compared with about 21 million in the late seventies. Increases in the intervening years and recent sharp reductions in livestock inventories since the collapse of the Soviet Union are hidden in this comparison, however.

There are many points where human capital (including policies and institutions) need strengthening in Central Asia: rangeland tenure and private farm-level development need attention; where pastoralists and farmers are insecure tenants, they cannot be expected to take a long-run view of sustaining the natural resources they use. Large economic gains appear feasible also through devolving property rights and decision taking from state bodies to individual farmers or well organized small groups. These questions deserve strategic research support.

Nine research titles on policy and economic development of livestock production in Central Asia are proposed here. The proposals are defined in two main lines.

The first line is evaluation of the current situation and a 'stock-taking' of the emerging dynamics of livestock production in the region: lessons from decollectivization, household livestock management, the institutional environment and the balances of livestock, feed and food resources (past and future).

The second line of proposals are for optimization of future development paths: adapting livestock production to the new economic conditions, recapitalization of livestock farms, restructuring of livestock support services, and provision of social support services to livestock producers.

A. EMERGING DYNAMICS (positive analysis: 'taking stock')

(1) Decollectivization: What Must Be Learned And Preserved

Objectives:

1. To summarize lessons from experiences in decollectivization of livestock operations in various countries in and beyond central Asia, showing the conditions and consequences of the various options for different farm structures and production systems.
2. To identify the 'public goods' aspects of collective and public livestock organizations that may be lost in privatization; of particular interest is preservation of high quality genetic stock (both animal and plant).

Hypothesis: Radical privatization may cause the loss of irreplaceable genetic material and important public services, as well as causing unnecessary losses and human suffering. Lessons can be learned from a study of various decollectivization processes, and their contexts and consequences, both within and outside the Central Asian Republics. A summary and analysis of these experiences will enable the most important lessons to be taken into account in any new decollectivization.

Activities:

- Review of literature on decollectivization of livestock and land, particularly rangeland;
- Case studies of contrasting examples of decollectivization in the five Central Asian Republics by survey of experiences in privatization of farms and farm services in general, and livestock farms and services in particular. Special attention will be given to organizational aspects, social aspects and preservation of valuable genetic stock and other production factors;
- Cross-case analysis of decollectivization experiences based on key attributes, contexts and consequences, to draw out the most important lessons;

Outputs: Publication of a report in Russian and English by-mid 1998.

Relevance: There is great concern and confusion regarding the privatization process, This study aims to provide information to policy makers, farm leaders and the general public regarding experiences and options in the process of decollectivization.

Actors: The studies will be designed by multidisciplinary teams of livestock scientists, social scientists and pasture/forage specialists, with advice and participation of international scientists.

(2) Studies Of Household-Level Changes In Livestock Management

Objectives:

1. To rapidly obtain information on the changes on private and collective farms during the transition period.
2. To develop methods for continuous monitoring of livestock development

Hypotheses: The previous farm data collection systems are breaking down, as they depended on state and collective farm reporting. There is great need for solid information on what is happening in the sector, as governments should base their decisions on sound data. Therefore, there is good reason to initiate an immediate program of participative rapid rural appraisals, and use this experience to develop a large-scale farm data collection system.

Activities: Design and carry out a set of participative appraisals. Use the experience and the findings to develop long-term monitoring system. There will be a series of short, informal studies of different types of livestock-owing communities and families. A representative sample will include different ecological zones in each participating country. Standard Participative Rural Appraisal (PRA) techniques will be used, and training on these techniques will be provided to the design and data collection teams. At a later stage these studies will form the basis for designing large-scale statistical surveys, to monitor changes at the household level.

Outputs: Analyses of livestock management practices in different ecological zones. Description and analysis of management strategies currently employed by different kinds of livestock producers.

Relevance: Such data, not currently available, are essential for informed government planning and design of livestock improvement projects.

Actors: The studies will be designed by multidisciplinary teams of livestock scientists, social scientists and pasture/forage specialists, with advice and participation of international scientists. The field data collection and participative studies will be carried out by junior scientists working together with regional and district specialists. Rural producers will participate in the studies.

(3) Analyses Of The Institutional Environment For Livestock Development

Objectives:

1. To identify the main policy instruments which assist or hinder development in the livestock sector.
2. To understand and strengthen the institutional links between research and policy-making.

Hypothesis: The governments of Central Asia have a number of mechanisms which can be applied to influence the direction of livestock development in the process of transition. Such mechanisms include:

- subsidies on inputs(water, veterinary drugs, fodder, etc).
- tariffs on livestock product exports.
- protection of domestic livestock processing industries.
- trading regulation on livestock products.
- domestic pricing policies on livestock products.
- state and private investment for infrastructure related to the livestock sector.

Activities: An examination of each country's laws and regulation which directly or indirectly effect livestock production and marketing. Comparisons will be drawn with other countries where similar ecological and economic conditions prevail.

Outputs: Recommendations for changes in national laws and policies which promote the livestock sector. Presentation of various options for development of the sector, drawing out economic, social and environmental costs and benefits of each option.

Actors: An international team of policy analysts, with expertise in both intensive and extensive livestock sectors, working together with senior Central Asian scientists in pasture and livestock and with senior economic policy advisors in the national governments.

(4) Feed And Animal Resource Balances In Central Asia: Past Present And Future, To The Year 2025

Objectives:

1. To provide a picture of past and present balances of livestock inventories and feed resources, including rangelands, crop residues and forage crops, and feed grains and other concentrates.
2. To provide a picture of food production balances, and the role of livestock products in human diets in the region.
3. To project the effects of human population growth to the year 2025 on feed and food demand in the Central Asian republics.

Hypothesis: Heterogeneous natural resource bases among the five Central Asian republics lead to differentiation in crop/livestock/range systems, differences in food production for the growing human populations. An assessment of these relationships will help in focusing research and development support.

Activities:

- Study the development over time (early '70s, late '80s and early '90s) of country-by-country inventories of feed resources from cropland, rangelands and agro-industrial by-products in Central Asia;

- Study the development of livestock numbers, country-by-country, for the same periods;
- Study the production of all foods and their relationships with livestock production;
- Study the balances of feed, livestock and food for past, present and future periods (to 2025) in light of past and projected human population growths.

Outputs: A report in Russian and English by mid-1998.

Relevance: This study is needed to show livestock production in perspective with the natural resource bases and human populations of the Central Asian republics, enabling objective assessments of the relative importance of the different elements of agricultural production in the planning and focusing of livestock research and development.

Actors: This work would be lead by ICARDA but can only be completed satisfactorily with the direct participation of experts on the feed and food situations in each of the Central Asian republics.

B. OPTIMIZATION (normative analysis: how to go in the future)

(5) Adaptation Of Livestock Production To New Economic Conditions

Objective: To elaborate suitable methods for constrained optimization of individual farm management (size, enterprise mixes, market focus), illustrated with case studies under contrasting conditions; in support of privatization ('firmerization') of livestock production that is more efficient, equitable and environmentally sustainable than centralized production.

Hypothesis: Each particular physical environment, location with respect to markets (for livestock inputs and outputs), and each farm household (labor and capital and risk preference) condition may have a different optimal farm plan; therefore, farmers need a choice of visible options to choose among... not blanket recommendations.

Activities:

- Elaboration and illustration of multiple goal optimization methods, using contrasting case studies of livestock farmers;
- Development and illustration of methods for calculating comparative advantages;
- To identify examples and best principles of farmers' organizations (for input supply, credit, marketing);
- Development and illustration of methods for on-farm trials, to test and demonstrate animal health, nutrition, reproductive and financial management by small farmers.

Outputs: Training of NARS staff of Centra Asia and joint publications in Russian and English on:

- multiple goal optimization methods, using contrasting case studies of livestock farmers;

- methods for calculating comparative advantages with respect to local, regional and world markets;
- best principles of farmers' organizations (for input supply, credit, marketing);
- methods for on-farm trials, to test and demonstrate animal health, nutrition, reproductive and financial management by small farmers.

Relevance: Guidelines for small private farmers is lacking and very much needed. The research outputs here, will provide part of the basis for developing location-specific extension material for farmers.

Actors: An international team of agricultural economists, with expertise in both intensive and extensive livestock sectors, working together with senior Central Asian scientists in pasture and livestock and with senior economic policy advisors in the national governments.

(6) Recapitalization Of Livestock Farmers

Objectives: To find practical options for the recapitalization of livestock farms, and related services.

Hypothesis: The financing of new small farms with livestock enterprises is a crucial area of need which, if not ameliorated, could retard rural development in Central Asia.

Activities:
Studies of practical options for provision of credit to small farmers

Outputs: Guidelines for practical steps in recapitalization of livestock farms in Central Asia, published I Russian and English by mid-1998.

Relevance: Credit for long-term financing of capital equipment, facilities and livestock, as well as shorter term credit for purchase of key inputs, is often lacking and is a reason for underemployment of land, labor and management resources for livestock production in Central Asia.

Actors: An international team of agricultural economists, with expertise in both intensive and extensive livestock sectors, working together with senior Central Asian scientists in pasture and livestock and with senior economic policy advisors in the national governments.

(7) Best Practices In The Restructuring Of Livestock-Support Services

Objective: To study various options and develop policy recommendations and best practices for the restructuring of livestock farm support services, including animal health services, input supply, small and large scale processing and marketing of livestock products.

Hypotheses: With decollectivization, a lack of support services to livestock production is hindering development of the sector.

Activities: An appraisal of the 'public good' and market prospects for provision of livestock support services will be carried out in Central Asia. Practical options will be explored and the missing elements for bringing these into operation will be identified.

Outputs: An analysis of practical options for development of economically viable livestock support services, published in Russian and English by mid 1998.

Relevance: Support services provide the bridge between subsistence and market oriented livestock production, lowering transaction costs and increasing efficiency of resource use.

Actors: An international team of agricultural economists, with expertise in both intensive and extensive livestock sectors, working together with senior Central Asian scientists in pasture and livestock and with senior economic policy advisors in the national governments.

(8) Methods To Alleviate The Negative Impacts Of Transition By Provision Of Social Services To Livestock Producers

Objectives: To determine the most cost-effective way of providing essential social services to remote shepherding families in the extensive livestock areas.

Hypothesis: Decollectivization has caused a breakdown in the provision of both social as well as technical services to families in the livestock sector. Such services include health, sanitation, schooling, water, power, public records and security. These services were provided through the state to large collectives, but as some Central Asian republics move towards privatization, these services are not being maintained. As yet, these services have not been replaced. One result is that families, especially in remote grazing areas, may abandon livestock-keeping, and migrate to town in search of alternative employment. Another result is a decline in animal production. Both results are negative, at least in the short term.

Activities: Review the experiences of other countries in providing cost-effective social services to low-density populations of mobile livestock-keepers. Evaluate whether producers in Central Asia could afford to pay for these services, and at what level of payment. Identify possible sources of social service provision in the private sector, and what would be required for these to be activated (e.g. financial credit and training). Examine the possibility of encouraging producer associations which could receive and international assistance in providing services to their members.

Outputs: Recommendations on how to improve social and to the livestock sector. The roles of the state, regional administration, producer associations and the private sector to be specified. Identification of the needs for credit and personnel to implement the recommendations.

Actors: An international specialist in participative rural development (working with producer associations), an international economist with experience in costing social services, national economists and regional planners from the Central Asian republics, and livestock producers.

(9) Options For Rangeland Tenure Under Decollectivization

Objectives:

1. Review the current laws and practices in each participating Central Asian republic, regarding access rights for livestock and their owners on different types of rangelands.
2. Identify and assess the options for rangeland use as decollectivization proceeds in each country. This will include comparison with other countries.

Hypothesis: Some current systems of livestock husbandry are no longer economically viable with the reduction of state support for fodder. Other systems are also thought to be environmentally damaging causing soil degradation and loss of biodiversity due to overuse of pastures especially those nearer to settlements. As the large-scale collectives are broken up, new patterns of rangeland use are being adopted by newly-privatized livestock owners. Which methods of rangeland use should be encouraged by the state is not at present clear. Further field research and comparative analysis is required.

Activities: Carry out empirical studies of rangeland uses being adopted by different types of livestock producers undergoing decollectivization. Studies are to be carried out in various agro-ecological and climatic zones. Each use is to be assessed in terms of economic returns, social impacts, sustainability and environmental consequences. New concepts and methods of semi-arid rangeland assessment developed in Europe, Australia, North America and South Africa will be applied in these assessments.

Outputs: Recommendations on the options for rangeland regulation, access and management which can be considered by national and regional administrations, and groups of livestock producers. The recommendations will be accompanied by estimates of costs and benefits for each option.

Actors: International biological and social scientists with an understanding of new models of rangeland ecology, to work together with senior pasture and livestock specialists in Central Asia in designing a set of field studies. There studies to be carried out by junior scientists in participation with regional and district officials, with the participation of livestock producers.

International organizations with relevant experience and/or interest in Central Asian livestock and rangelands

Pasture, Forage and Livestock Program,
International Center for Agricultural Research in the Dry Areas (ICARDA)
P.O. Box 5466 Aleppo, SYRIA
Contacts: Dr Gustave Gintzburger, Leader and Rangeland Ecologist
Dr Thomas L. Nordblom, Agricultural Economist
Dr Euan F. Thomson, Livestock Scientist
Dr Scott Christiansen, Pasture Ecologist
Tel:(963-21) 213477 Fax:(963-21) 213490 e-mail: icarda@cgnet.com

MacArthur Project for Environmental and Cultural Conservation in Inner Asia
University of Cambridge,
8 Sylvester Road
Cambridge, UK
Contact: Dr. David Sneath, Tel. +44-1223-300586 Fax. +44-1223-300589

Macaulay Land Use Research Institute
Craigiebuckler
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Scotland, UK
Contact: Dr. J. Milne, Director, Animals and Grazing Ecology Division
Tel: +44-1224-318611 Fax: +44-1224-311556

Social and Economic Development Division
Scott Polar Research Institute
University of Cambridge
Lensfield Rd,
Cambridge CB2 1ER, UK
Contact: Dr. Piers Vitebsky (bi-lingual Russian-English)
Tel: +44-1223-336540 Fax: +44-1223-336549

Institute of Terrestrial Ecology
Monks Wood
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Huntingdon
Cambridgeshire PE17 2LS, UK
Contact: Dr. Lloyd Anderson, Deputy Director, Tel: +44-1487-773381
Fax: +44-1487-773590

Post-Soviet States in Transition
Sidney Sussex College
Cambridge CB2 3HU
Contact: Dr: Annette Bohr, (Uzbekistan)
Tel: +44-1223-330838 Fax: +44-1223-338884

Robin Mearns (geographer, research on pastoral systems in Kyrgyzstan)
Research Fellow
Institute for Development Studies
Sussex University
Falmer, Sussex
Tel: +44-12373-678774

USA-based
Dr. Nicolas Kulibaba (expert in livestock marketing from pastoral areas)
Abt Associates Inc.,
Hampden Square, Suite 600
4800 Montgomery Lane
Bethesda, MD 20814
Tel: (USA) 301-913-0669 Fax: 301-652-3839

Institute for Development Anthropology (expertise on extensive pastoral livestock systems)
Binghamton, NY

Contact: Dr. Micheal Horowitz, Tel: Fax: 607-773-8993
E-mail: mhorowi@bingsuns.cc.binghamton.edu

Dr. Chuluun Togtohyn (range ecologist from Mongolia, Russian-speaker)
Natural resource Ecology Laboratory
Colorado State University
Fort Collins, Colorado 80523 USA

Fax: (USA) 303-491-1965 E-mail: chuluun@nrel.colostate.edu

PRIORITY TOPICS FOR RESEARCH IN LIVESTOCK AND ENVIRONMENT

(1) Development Of Sustainable Rangeland Management Systems Suited To The Changing Economic And Private Environment

Objectives: The arid regions of Central Asia have a wide variety of climatic and rangeland types and effective technologies to preserve these rangelands should be based on sound ecological principals.

During the period of transition to a market economy, pasture management and water supply systems as well as economic and social conditions are changing. This may result in a need to alter the structure of farming systems. Research is therefore urgently needed which takes these factors into account to design alternative farming and pastoral systems.

Activities:

- Studying and evaluation of ecological (climate, soil, plants) conditions in different regions of Central Asia.
- Studying of water availability on the rangelands; a. artesian wells, b. wells for stock water supplies, c. water delivery, d. domestic water.
- Optional regimes of usage and different types of property (private farmers, cooperatives, collective and state farms, farmers associations, etc.)
  - Moderate use with rangeland rotation system
  - Intensive use with rangeland rotation system
  - Transhumant system.
- Solving the problem of determining the optimal balance and intensive and extensive sheep production.

Outputs:

- Advantages of different and appropriate rangelands management system demonstrated.
- A 10% improvement in rangeland and animal production compared to present grazing systems.
- Appropriate range management systems identified.
- Improved quality of pasture forage in terms of botanical composition, including the introduction of forage crops.
- Recommended extensive sheep husbandry practices for different economic and ecological environments.

Actors:

- Kazak Research Institute of Karakul Sheep Breeding
- Uzbek Research Institute of Karakul Sheep Breeding
- Turkmen Research Institute of Animal Husbandry and Veterinary Studies
- Turkmen Institute of Deserts
- Kirgiz Research Institute of Forage and Pasture
- Tadjik Institute of Animal Husbandry

(2) Strategies To Reduce Desertification And Develop Vegetation Improvement Of Degraded Rangelands

Objectives: Anthropogenic influences may have a marked effect on arid lands and in the new economic environment rangelands and pastures may have lost their self-regulating capacities. The extreme desert conditions of Central Asia demand appropriate methods for effectively using the limited pasture resources without disturbing the ecosystem.

There is a need to design new pasture-based systems that will tolerate more intensive use without degradation under the difficult ecological conditions. Rainfed pastures can provide cheaper feed without the associated risk of secondary salinity. Previous experiments have shown that sown pastures of appropriate species under rainfed conditions can yield several times more than native pastures.

Activities:

- Studies and collection missions to areas of Central Asia, to collect seeds of potentially productive and useful forage species and to evaluate and multiply them for further use in various ecological zones.
- Studies of the capabilities and adaptation of new forage species, introduction of nurseries and creation of germplasm banks of forage crops.
- Developing technologies for forage crop production in Central Asia.
- Producing higher yielding cultivars of forage crops.
- Developing methods to combat desertification.

Outputs:

- Germplasm collections of forage crop and range species established. (This material will provide the basis to improve forage production in the region and other similar ecosystems of the world.)
- Optimal seeding and cultivation techniques developed for range species.

Actors:

- Kazak Research Institute of Karakul Sheep Breeding
- Uzbek Research Institute of Karakul Sheep Breeding
- Uzbek Institute of Forestry
- Complex Institute of Regional Problems of Samarkand (Branch of Uzbek Academy of Sciences)
- Botany Institute (Uzbek Academy of Sciences)
- Kirgiz Scientific-Production Association of Forage, Pastures and Range Improvement
- Turkmen Institute of Deserts
- Turkmen Research Institute of Animal Husbandry and Veterinary Studies

(3) Cattle Production Systems

Objectives: During the transition period to a market economy there are different forms of farming- state farms, collective farms, joint-stock company farms and small private farming. The production and processing of livestock products, breeding, reproduction and feeding systems which were developed for large state livestock complexes may no longer be appropriate for use on small private farms and emerging systems. Thus, it is important to develop new technologies suitable for these new farming systems.

Activities:
- Conduct surveys to describe and analyze the present production systems and to identify constraints to milk and meat production.
- Describe and analyze the production characteristics of local breeds and develop appropriate breeding programs.
- Adapt the systems of production and processing of meat and milk to the new conditions.
- Evaluate the conditions, technology and potential improvement of animal husbandry (barn, shelter, etc...).
- Evaluate and adapt established methods of feeding to provide a mechanism for optimal feed use and optimal production.
- Assess the impact of farm ownership on farm mechanization.

Outputs:
- Production systems appropriate to the new economic environment.
- Prioritized list of constraints arising from the systems analysis.
- A standardized regional feed rationing system suitable for the new intensive production systems.
- More efficient food production systems.
- Recommendations about farm ownership policy appropriate to the new economic environment.
- Suitable forage production and utilization systems.

Actors:
- Uzbek Research Institute of Animal Husbandry
- Kazak Research Institute of Animal Husbandry
- Tadjik Research Institute of Animal Husbandry
- Kirgiz Research Institute of Animal Husbandry
- Turkmen Research Institute of Animal Husbandry and Veterinary Studies

(4) Small Ruminant Production Systems

Objectives: Sheep production is one important branch of the livestock industry in the Central Asian countries. Breeding of Karakul sheep is an important agricultural sector, with an annual production of about 300,000 tonnes of milk which is used to produce *brinza* cheese.

This sector also produces 3-4 million units of rennet, 800-850 tonnes of fermented products such as yoghurt, and 3-3.5 million Karakul pelts. During the last 5-6 years sheep wool and meat production decreased by 15-25% and the quality of Karakul pelts deteriorated. The changing farming environment requires the development of new diversified systems of small ruminant production.

Activities:

- Make a local, regional and global survey to identify markets for the products of small ruminant production systems,
- Identify and describe the comparative advantages of different production systems and animal breeds (Karakul, etc..) (to enable effective competition in these markets).
- Develop the technology (what technology) to support the above.
- Conduct selection studies to produce Karakul fleeces or pelts of different colours which meet current market demands.
- Generate technologies (management systems?) to increase meat, milk, fat and fleece productivity.
- Conduct studies to enable qualitative and quantitative improvement of raw wool.
- Evaluate, and if necessary increase, fertility and disease resistance of sheep.

Outputs:

- A list of potential markets for small ruminant products.
- A list of the comparative advantages of local products.
- Effective sheep and goat production systems suited to the local ecological conditions and new forms of ownership.
- Recommended allocation of sheep and goats breeds to different new systems.
- Increased quality of Karakul fleeces with regional colour variations adapted to international market conditions.
- Improved technologies for producing (processing?) wool, meat, fat.
- Better fertility and disease resistance in small ruminants.

Actors:

- Uzbek Research Institute of Animal Husbandry
- Uzbek Research Institute of Karakul Sheep Breeding
- Tashkent Agrarian University
- Kazak Research Institute of Sheep Breeding
- Kazak Research Institute of Karakul Sheep Breeding
- Turkmen Agricultural Institute
- Turkmen Research Institute of Animal Husbandry and Veterinary Studies
- Tadjik Research Institute of Animal Husbandry
- Kirgiz Research Institute of Animal Husbandry

(5) Development Of Methods To Characterize And Monitor Rangeland Condition Using Remote Sensing, Gis And Modeling

Objectives: The changing economic environment, growing population pressure and the associated threat of over-grazing and cropping are putting the rangelands of Central Asia under threat. The large areas and diversity of the rangelands in the region creates an opportunity to use remote sensing to characterize and monitor the changes in the local management systems and land use. It is therefore necessary to develop and to use these methodologies for estimating the condition of the rangelands and to predict their productivity using satellite imagery and aerial photography. This will be combined in geographic information system (GIS) that integrate climate, soil, vegetation data and land use from different regions.

Zoning of arid pastures using aerial photography and satellite imagery are the most advanced techniques for determining the productivity and degradation of rangelands. Mapping the productivity of pastures in arid areas is a step towards developing rational systems of management which should decrease the rate of degradation and desertification process.

Activities:

- Collection of climate, soil and vegetation characteristics of representative rangeland types.
- Collection and analysis of representative satellite images covering cropping and rangeland zones of the Central Asian Republics at five years intervals.
- Development and adaptation of deciphering methods for remote sensing information on rangelands.
- Construction of models and algorithms to estimate moisture stress and above ground biomass of range and croplands using remote sensing data and related information collected on representative polygons.
- Development of remote sensing methods to estimate the spread and degree of desertification and soil degradation (including variation of humus content) on rangelands.
- Developing a regional rangeland GIS to integrate soil, vegetation and climate data and to estimate rangeland conditions and the productivity.

Outputs:

- Methods of deciphering remote sensing information on rangelands.
- Models relating pasture biomass and productivity to spectral vegetation indices and relevant environmental parameters.
- Construction of electronic and hardcopy maps of phytomass productivity and desertification of rangelands.
- Characterization of longterm trends of land use and desertification.

Actors:

- Kazak research Institute of Karakul Breeding

- Turkmen Institute of Deserts
- Institute of Space Exploration (Kazak Academy of Sciences)

(6) Conservation And Evaluation Of Locally Adapted Species Of Animals Of Central Asia

Objectives: Central Asia is the centre of origin of many animal breeds which are well adapted to the local climatic, pastoral and feed conditions. These breeds include the *shviuezebuvidny* cattle population, the *Altauzskaya* and *Bushuevskaya* breeds of cattle, the *Karakulskaya, Saradjinskaya, Alayskaya, Gissarskaya* and other breeds of sheep and the *Arvana* breed of camel. Introduced (exotic) breeds are potentially more productive than these indigenous breeds although clearly less adapted to local conditions. For this reason it is necessary to design new management systems for local breeds and to increase productivity by studying their genetics and feed requirements.

Activities:
- Characterize and evaluate local breeds of farm animals.
- Determine their role in new livestock systems.
- Assess the size and structure of the local breeds and races and their regional distribution.
- Develop (and test) effective genetic methods to improve the productivity of cattle.
- Study the useful biological specificity of meat breeds (adaptation to native vegetation, forage and disease environment).
- Develop recommendations for the improvement of elite races (populations).

Outputs:
- Better *in situ* conservation of local breeds (races, populations) of farm animals.
- Elite (nucleus) flocks created (which conserve and improve farm animals under various environments for the benefit of private and government farms).
- Better genotypes from nucleus flocks distributed to improve productivity of local flocks.

Actors:
- Uzbek Research Institute of Animal Husbandry
- Uzbek Research Institute of Karakul Sheep Breeding
- Kazak Research Institute of Karakul Sheep Breeding
- Kirgiz Research Institute of Animal Husbandry
- Turkmen Research Institute of Animal Husbandry and Veterinary Studies
- Tadjik Research Institute of Animal Husbandry
- Kazak Research Institute of Animal Husbandry

(7) Emerging Animal Health Problems In The Changing Economic Environment

Objectives: Intensification of livestock production systems requires reliable protection against infectious, invasive(?) and non-infectious diseases and the privatization of state

farms is resulting in many small private farms with flocks of 30-100 small ruminants. This is leading to a change in the prevalence of different diseases, particularly a reduction in the number of infectious diseases (Salmonellosis, Pasteurellosis, Colibacteriosis) and an increase in some non-infectious diseases such as helminth parasites. It is important to understand the reasons for this change to enable better prediction possible epizootics and better planning of control measures. Furthermore, the need to develop new veterinary services to serve the small private farms is evident due to the increasing importance of this sector.

The domestic production and supply of veterinary medicines made from local materials (microbial preparations, feed additives, macro- and micro-elements) is one of the main challenges facing the livestock industry. Another is the need to study zoonoses (Brucellosis, Echinococcosis??) and the development of prophylactic control measures.

Activities:

- Study the epizootiology of infectious, non-infectious and invasive diseases affecting animals kept under new management conditions.
- Study the seasonal prevalence of diseases, including zoonoses, determine the mechanisms which spread them and the economic losses they cause.
- Study the effectiveness of new and improved veterinary preparations, including those made from local strains of pathogens, raw materials and phyto-preparations.
- Develop effective health control programs and veterinary services suited to the conditions of management on small private farms.

Outputs:

- a better understanding of the epizootiology of diseases of animals kept under new management systems, the seasonal prevalence of different diseases including zoonoses, the factors causing the spread of the diseases, and the economic costs of the disease.
- effective veterinary preparations, including those made from local strains of pathogens, raw materials and phyto-preparations.
- effective health programs and veterinary services appropriate for the new conditions of management on small farms.

Actors:

- Uzbek Research Institute of Veterinary Studies
- Turkmen Research Institute of Animal Husbandry and Veterinary Studies
- Kazak Research Institute of Animal Husbandry and Veterinary Studies
- Tadjik Research Institute of Veterinary Studies
- Kirgiz Research Institute of Veterinary Studies
- Samarkand Agricultural Institute

(8) Processing, Quality Control And Marketing Of Livestock Products

Objectives: It is important to increase sheep production and improve the quality of processing and product conservation in all regions of Central Asia. Privatization of farms is also important. For these reasons the processing of sheep products - meat, wool and karakul pelts - is an important question in the emerging farming systems. It is therefore necessary to carry out research to create new processing and preservation technologies which are adapted to these new farming systems.

Activities:
- Assess technologies for processing and storing of livestock products while taking into consideration the different forms of ownership and regional ecological conditions.
- Define basic parameters for defining ecologically safe and clean livestock products.

Outputs:
- Constraints to the processing and storing livestock products.
- Quality standards for the main livestock products.
- Appropriate technologies for processing of livestock products adapted to new the conditions of ownership and regional specificity.

Actors:
- Uzbek Research Institute of Animal Husbandry
- Uzbek Agrarian University
- Uzbek Research Institute of Karakul Production
- Kazak Research Institute of Karakul Production
- Kirgiz Research Institute of Animal Husbandry
- Uzbek Research Institute of Veterinary Studies
- Turkmen Research Institute of Animal Husbandry and Veterinary Studies

9) Intensification And Optimization Of Fodder Crop Production On Irrigated Land

Objectives: Rational use of irrigated lands to produce fodder in the Central Asian Republics has considerable importance. Indeed, with appropriate use of water and soil resources, two-to-three crops can be harvested each year to provide livestock with different kinds of fodders. Research is needed to study ways to produce high yielding and nutritious fodder crops that use suitable management systems and make optimal use of the limited water resources.

Activities:
- Determine the contribution and the optimal proportion of different irrigated crops in the rotations of Central Asia.

- Establish the most effective combination of main, replicate(?) and intermediate irrigated fodder crops which achieve the highest output.
- Determine the different agroecological zones where highly productive and early maturing varieties of irrigated fodder crops can be grown in the main crop rotations, replicates(?) and intermediate planting???

Outputs:
- Irrigated fodder crops in rotations which augment productivity and production levels.
- High yielding and early maturing varieties of irrigated fodder crops for the different regions of Central Asia.

Actors:
- Uzbek Research Institute of Animal Husbandry
- Kazak Research Institute of Karakul Production
- Turkmen Institute of Agriculture
- Kirgiz Scientific-Production Association of Forage, Pastures and Range Improvement
- Kirgiz Research Institute of Agriculture
- Kazak Research Institute of Forage and Pastures
- Uzbek Research Institute of Cotton Production
- Agrofirm "ERKIN"

REGIONAL WORKSHOPS -- LATIN AMERICA LIVESTOCK ASSESSMENT
SAN JOSÉ, COSTA RICA
15 - 18 APRIL 1996
AGENDA

Monday, April 15, 1996

Moderator: Dr. Manuel Ruiz

9:00 - 9:15	Registration	
9:15 - 9:30	Welcome	Dr. Aquino Director General, IICA
9:30 - 10:30	Introduction	Dr. Demment Program Director SR-CRSP
10:30 - 10:45	*Break*	
	Country Presentations	
11:00 - 11:30	Peru	Dr. Enrique Flores
11:30 - 11:45	Discussion	Univ. Nacional Agraria
11:45 - 12:15	Bolivia	Dr. Luis Iniguez
12:15 - 12:30	Discussion	RERUMEN
12:30 - 1:30	*Lunch Break*	

Moderator: Dr. E. Gonzalez-Padilla

1:30 - 2:00	Honduras	Dr. Miguel Mejia
2:00 - 2:15	Discussion	DICTA
2:15 - 2:45	Guatemala	Dr. Sergio Ruano, IICA
2:45 - 3:00	Discussion	
3:00 - 3:15	*Break*	
3:30 - 4:00	Ecuador	Dr. Ballesteros
4:00 - 4:15	Discussion	SANREM
4:15 - 4:45	Costa Rica	Dr. Richard Taylor
4:45 - 5:00	Discussion	EARTH
5:30 - 6:30	Meeting of Thematic Group Leaders with Dr. Demment	

Latin America Regional Livestock Assessment Workshop Agenda (continued)

Tuesday, April 16, 1996

Country Presentations (continued)

Moderator: Dr. Enrique Flores

9:00 - 9:30	Caribbean	Dr. Parasram, CARDI
9:30 - 9:45	Discussion	
9:45 - 10:30	Belize	Dr. Marcelino Avila
10:30 - 10:45	Discussion	Ministry of Ag. & Fisheries
10:45 - 11:00	*Break*	
11:00 - 11:30	Mexico	Dr. Gonzalez-Padilla
11:30 - 11:45	Discussion	INIFAP

Resource Presentations

11:45 - 12:15	Human Nutrition	Dr. Charlotte Neumann
12:15 - 12:30	Disucussion	
12:30 - 1:30	*Lunch Break*	

Moderator: Dr. S. Parasram

1:30 - 2:00	Policy/Economic Growth	Dr. Carlos Pomareda
2:00 - 2:15	Discussion	
2:15 - 2:45	Livestock/Environment	Dr. Michael McCoy
2:45 - 3:00	Discussion	Univ. Nacional Heredia
3:00 - 3:15	*Break*	
3:30 - 4:00	Livestock Prod. Systems	Dr. Juan Carlos Chirgwin
4:00 - 4:15	Discussion	FAO
4:15 - 5:00	Thematic Workgroups	Group Leaders
	Livestock/Environment	Flores/McCoy
	Human Nutrition	Ballesteros/Neumann
	Economic Growth	Avila/Pomareda
5:00 - 5:30	Full Group Discussion	

Latin America Regional Livestock Assessment Workshop Agenda (continued)

Wednesday, April 17, 1996

9:00 - 12:00	Thematic Workgroups	Group Leaders
	Livestock/Environment	McCoy/Flores
	Human Nutrition	Neumann/Ballesteros
	Economic Growth	Pomareda/Avila
10:00 - 10:15	*Break*	
12:00 - 12:30	Full Group Discussion	
12:30 - 1:30	*Lunch Break*	
1:30 - 4:00	Thematic Workgroups Regional Integration and Prioritizing	
4:00 - 5:30	Reporting and Discussion	
7:00 - 9:00	***IICA Reception***	

Thursday, April 18, 1996

9:00 - 10:00	**Thematic Groups** Revision and Finalize Report
10:00 - 12:30	Final Reporting and Regional Priority Setting
12:30 - 1:30	Lunch Break

LATIN AMERICA WORKSHOP: PROBLEM MODELS

PRIORITY RESEARCH TOPICS ON ECONOMIC GROWTH/POLICY

(1) Livestock Production Systems For Ecoregions

Introduction: There continues to be a large population of rural low-resource farmers in all countries of the LAC. These persons have a) little income, b) few employment opportunities, c) have a diet low in protein and nutrients especially those from animal origin and hence are prone to major nutritional deficiencies and generally have problems of food security. Yet there exist low-resource production and marketing systems of animal production of various species which feed well on shrubs and other forest trees under intensive/semi-intensive systems of production which are environmentally friendly.

Objective: To identify, characterize, adapt, test and validate these animal systems and transfer them to these low-resource farmers.

Hypothesis: If low-resource farmers work with these systems, help adapt them and demonstrate them to other farmers, there would be a high adoption rate that will generate employment, increase income, improve nutrition and food security.

Activities:

- Identification of target groups and their agro-socio-economic characterization using a sondeo approach to establish baselines and determine needs, constraints and opportunities.
- Identify, analyse and characterize the named technologies and understand the reasons for their successful performance.
- Adapt, test, validate and transfer such technologies into other interested areas in similar ecoregions and groups of farmers.
- Develop information packages and recommendations and continue to provide technical backstopping.
- Monitor and evaluate farmers' adoption, adaptation and performance under their conditions and their criteria.
- Upgrade capacity of the clients through relevant training.

Outputs:

- Tested, adapted and validated production and marketing livestock systems successfully developed.
- Systems transferred to wider groups of farmers and being uitlized by farmers to achieve their objectives and to train other farmers.
- Farmers trained on technology management, adaptation and evaluation.
- Farmers having gainful employment and cash income, and having animal products in the daily diets of their family.
- Information packages, recommendations and training materials for technology transfer and use by other groups.

Regional relevance: Low-resource farmers constitute a significant population of most LAC countries and face the same problems of food security, employment, icome and nutrition.

Actors:
- Land grant universities in USA
- CATIE in Costa Rica
- National and subnational R&D organizations
- Institutes in LAC, e.g. CARDI, CFNI in the Caribbean
- Farmers' Associations in the LAC
- NGOs

Active Projects:
- EDF funded goat project in the Caribbean
- EDF funded feed and feeding systems in the Caribbean
- CATIE goat project

(2) Impact of Macro-Economic and Trade Globalization

Introduction: LAC is endowed with a productive resource base for livestock production superior to that of the other major regions of the developing world. Furthermore, the LAC region provides an expanding market for livestock products which can be attractive for highly productive regions, i.e. Oceania, and also for the livestock commodity surpluses from the developed countries. Accordingly, it is critical to understand the effects and trends induced by these economic changes in order to direct the structural adjustments to effectively exploit the created opportunties and mitigate the negative impacts of globalized trade.

Objective: To determine the potential short and long term impact and trends of the economic globalization policies and the downsizing of the public sector on the livestock industry, rural development and natural resources under under different scenarios.

Hypothesis: According to economic and trade trends during the last 2 decades, present macro-economic and trade liberalization changes will bring about substantial repercussions on livestock product flows within and among countries, the actors involved in livestock production and trade, technology demand, labor employment, input markets, natural resources and the institutional modalities for providing support services (i.e. research and extension), to the livestock industry.

Activities:
- Review previous research results in each country to define the specific objectives and final methodology for the regional analysis.
- Constitute a multi-national and multi-disciplinary team to conduct the proposed research.

- Compare and contrast the predicted impacts with what has been occurring in the region as a whole and specifically within some countries leading in international trade liberalization and others lagging behind in such process.
- Study the impact trends and implications for other regions of the world which are potential competitors or clients of LAC countries with respect to the major livestock commodities.
- Evaluate in selected countries and in the LAC region as a whole the impact of economic globalization policies, public sector downsizing, privatization of selected livestock-related services.
- Interview key informants involved in the production-to-consumption chain of the major livestock commodities.
- Identify market niches for livestock products, even though of small size, which can be supplied advantageously by LAC countries.
- Construct short and long-term scenarios considering market forces and potential government adjustment policies to determine the expected impact on employment, producer incomes, natural resource use, and production systems with major advantages.

Outputs:

- Analysis of impact and trends associated with the globalization, privatization and public sector downsizing processes on the livestock industry, the participating actors and resource use.
- Empririically supported results and recommendations for public and private sector decision-making in LAC countries, regional fora and regional organizations.

Regional relevance: Intra-regional free trade decisions, the integration of most LAC countries into the World Trade Organization and the economic and social importance of the livestock industry make it imperative to render the highest priority of this project for all countries of the LAC region and indeed for the rest of the world.

Actors:

- USA Universities, e.g. UC-Davis
- Education and research institutions in LAC
- Multi-national organizations in LAC: IICA, CEPAL and SELA
- Producer organizations, processors, marketers of LAC countries.
- Ministries of Agriculture of LAC.

(3) Livestock Product Market Intelligence and Development

Introduction: Instigated by a) the mounting negative national balance of payments and the weakening value of national currencies and b) economic stabilization and structural adjustment pressures, many LAC countries have taken the "fast track" approach to liberalizing their economy, adopting policies which lead to:

- Greater trade globalization,

- Stimulation of increased private sector participation
- Increased reliance on market forces to drive and regulate economic activity.

In the context of this new environment, a market-led approach must be applied to develop the livestock industry, hence enabling the sector to make notable a contribution to economic growth with equity. Most LAC countries lack an adequate information system and service for domestic and international livestock markets.

Objective: To provide producers, processors, marketers, policy makers, researchers and developers with timely market intelligence, to promote access to national and international livestock product markets, and to enable/facilitate effective competition in the livestock industry in representative countries of LAC.

Hypothesis: Poor market intelligence and poor delivery of relevant market information on livestock products (including niche ethnic markets) constrain the development and adoption of technological innovations for production and processing, development of appropriate effective marketing policies , and the generation of greater household income and foreign exchange from the livestock industry.

Activities:

- Analysis of quality, pricing, health, stratification and relevant conditions in local, national and international markets for major and promising livestock products.
- Diagnosis of the existing market policies, intelligence, information delivery systems and technical capacity in each country.
- Analysis and implementation of proposed interventions to address identified constraints and piorities in 2 above.
- Design and communication of market information packages to the specific target audiences (producers, processors, researchers, developers, policy makers) through appropriate media.
- Monitoring and evaluation of the utilization and impact of market information on production, research and extension programs and income generation.
- Training of local personnel in market intelligence, information delivery, M&E, etc.

Outputs: This research project will produce:

- Periodic market information bulletins, news releases and training manuals tailored to the targetted groups.
- Improved systems and human capacity for market intelligence, delivery, M&E.
- Increased production, productivity and income for producers, processors and forex from the livestock industry.
- Tested research methodologies for livestock market intelligence and delivery, etc.
- Publications for national and international audiences.

Regional relevance: Many countries (i.e. Mexico, Trinidad & Tobago, Costa Rica, Honduras and Belize) have established market-led approaches and will benefit directly from the results of this research.

Actors/Collaborators:

- International/Regional: IICA, IFPRI, ILRI, CARDI, CATIE and the Caribbean Export Development Agency.
- Universities: UC-Davis, UNAM, UCR, UWI
- NARs: Ministries of Agric and Livestock, Research and extension departments
- NGOs: Chamber of Commerce, Development-oriented agencies, Extension and credit groups.
- Organizations: Livestock producers organizations, etc.
- Media: radio stations, TV stations, newpapers
- Funding: CRSP, Governments, IDB, IFAD, country-USAID

Active Projects:

- IICA?, IFPRI?, ILRI?, CARDI?, CATIE?
- Mexico
- T&T
- Costa Rica
- Honduras
- Belize: Marketing Intelligence Service (Contact: Mr Jose Castellanos or Dr M. Avila, MAF, Belmopan, Tel: 501-2-22242, Fax 22409)

(4) Empowerment of Producers

Introduction: The vast majority of livestock producers are small farmers with mixed farming systems in which decision making responsibilities on resource allocation, technology adoption, product utilization, and access to technical information are spread out and dynamic among various members of the household and community organizations. Improving their farming and livestock systems requires clear strategies and methods for empowerment and effective participation of the real decision makers in the research and development efforts.

Objective: To determine intra- and inter-household decision making processes and evaluate cost effective methods to empower them in order to increase livestock production and productivity.

Hypothesis: Empowering resource-limited livestock producers producers, i.e. participation of the real decision makers in livestock research, extension and support services, will lead to higher rates of technological adoption and substantial gains in livestock productivity, hence on enhancing household food security and nutrition, gainful employment and the sustainable development of the livestock industry.

Activities:

- Characterize the principal livestock production systems (e.g. cattle, dairy, pig, small ruminants, homeyard, honey bees systems) to determine the roles, knowledge, perspectives, priorities and decision making power of household

members.
- Determination of the labor requirements and contribution and access, distribution of benefits from livestock production enterprises and activities, and social indicators, according to intra- and inter-household gender and age classes.
- Development and/or adaptation of appropriate participatory methods to involve the relevant household decision makers and beneficiaries in strategic activities, e.g.: selection and evaluation of technological innovations (e.g. agroforestry, dual purpose cattle, household value adding activities), setting priorities for research and extension, and livestock system management (i.e. resource allocation, choice of technologies, product utilization and marketing strategies).
- Training of change agents, service support agents and researchers in participatory methods to empower producers.
- Monitoring and evaluation of impacts of participatory approaches on technology adoption, livestock production, household nutrition, labor productivity, and natural resource conservation.

Outputs: This research project will produce:
- Improved human capacity for participatory research and development in the public and privates sectors.
- Increased livestock technology adoption and production, household income, employment and quality of natural resources.
- Tested research methodologies and training manuals on participatory approaches and methods for resource limited households.
- Publications for national and international audiences.

Relevance: Many countries (i.e. Mexico, Trinidad & Tobago, Costa Rica, Honduras and Belize) will benefit directly from the results of this research.

Actors:
- International/Regional: CIAT, CARDI, CATIE.
- Universities: UC-Davis, UACH, UADY, UWI
- NARs: Ministries of Agric and Livestock, Research and extension departments, Comision Nacional Caprina de Costa Rica.
- NGOs: Development-oriented agencies, Extension and credit groups.
- Organizations: Livestock producers organizations, etc.

Active Projects:
- Asociacion Costarricence Creadores de Cabras, (Contact person: Ing. Alejandra Jimenez Salas, Apartado 141-2250, San Jose Costa Rica, Tel: 506-279-6314 Fax: 506-279-6519.
- Belize Enterprise for Sustained Technology (BEST), (Contact: Ms Bridgitte Cullerton, Director, Belmopan, Tel: 501-2-22242, Fax 22409)
- Sheep and Goat Project, EDF Funded, Jamaica and Guyana (Dr S Parasram, Director of Research, CARDI, Trinidad and Tobago.

PRIORITY RESEARCH TOPICS ON LIVESTOCK/ENVIRONMENT

(1) Improvement Of Small Scale Agro-Processing Of Livestock Products

Introduction: Rural poverty has been associated with over exploitation and degradation of natural resources. Income generation at the farm level is often limited by inappropriate timing of sales and poor quality presentation of primary livestock products; encouragement of on-farm and village level processing operations could generate a significant increase in farm revenues.

Actual agroindustrial processing has concentrated in large scale units located at urban and peri-urban areas, often times associated with high risk of pollution and wide spread squalor among the labor force.

Objectives: To increase farm revenue while improving product quality and insuring better employment opportunities at the small farm level.

To reduce natural resource degradation through increased farm revenue and offer alternative decentralized small rural processing that would reduce the negative environmental impact of modern agroindustries in large cities.

Hypothesis: Increased farm income obtained through processing of primary livestock products will improve the living standard of small farmers through added value to their produce, creation of employment opportunities and increased hygene and quality levels offered to consumers; while reducing risks of over exploitation of natural resources. Better rural employment opportunities will reduce social degradation caused by emigration to cities.

Numerous decentralized processing units of small size will reduce large or significant pollution caused by agroindustries in large cities.

Activities:

- Determination of products to be processed and their end-products.
- Identification and preliminary assessment of processing technologies and marketing schemes.
- Research and validation of new processing technologies such as cheese making, toffee (cajeta), sausages, dry-salted meat, shearing and fleece classification, dehairing, spinning and weaving, raw-hide tanning, leather handicrafts, etc.
- Training of producers, processors and family members.
- Marketing research.
- People's organization.
- Supply contracts between consumers and producers (input-output).

Outputs:
- Appropriate, environmentally friendly processing technologies applicable at the small farm/village level, being used.
- Marketing schemes in place.
- Trained families and professionals.
- Increased farm revenues and higher/better nutritional intake.
- Increased job opportunities and reduced rural emigration.
- Utilization of processing by-products at village and on-farm level.
- Improved quality and sanitary standards of livestock products offered to consumers.
- Training material and technical reports.
- Reduced city pollution levels caused by large agroindustries.

Relevance: Particularly important for small farmers located in distant areas (difficult access) throughout the LAC Region.

Actors:
- INCAP, EARTH, ECAG, ZAMORANO, CITA (ucr)
- CIPAV, IMCA, DSEC
- FAO, IICA

(2) Adjusting Improved Technologies To Resource-Poor Farmers

Introduction: Many efforts have been made to develop improved tecnologies, which in many cases have resulted in interventions with proven capacity to increase productivity of production systems. Unfortunately, resource-poor farmers, due to specific constrains, have not been able to access the benefits of these technologies. Nevertheless, these tecnologies have the potential to assist these farmers if adequate adjustments are made.

Objective: To identify available improved technologies and adjust them to the circumstances of resource-poor farmers.

Hypothesis: Improved technologies capable of improving productivity that are available, but which require adjustment and validation under the specific conditions of resource-poor farmers.

Activities:
- Definition of pertinent indicators related to productivity, sustainability, equity and empowerment.
- Identification (inventory) and preliminary assessment of available technologies.
- Definition of validation method.
- Confirmation of preliminary assessment with farmer's participation.

- Implementation at farm level. Monitoring and evaluation.
- Analysis and definition of technology transfer (TT) approach.
- Implementation of TT. Monitoring and evaluation.

Outputs:
- A validated TT methodology
- Validated tecnologies
- Trained farmers and professionals
- Sets of indicators
- Support system for T.T. in place
- Training material and technical reports

Relevance: Particularly on the Pacific Slopes of Mexico and the Central America Isthmus, the Andean Highlands, the flooded savahannas of the Orinoco and Amazon Basin and the Caribbean Islands.

Actors:
- INIFAP, ICTA, BELIZE, ZAMORANO, DICTA, MAG-Nic, EARTH, ECAG, UCR, IDIAP, ICA, INIA, LA MOLINA, IVITA, IBTA
- CIPAV, IMCA, DESEC
- IICA, CATIE, CIAT, ILRI, ICRAF, FAO, CARDI

(3) Evaluation, protection and equitable rational use of wildlife in livestock production systems.

Introduction: A lack of knowledge exists among rural ranchers on how to carry out sustainable harvests of wildlife. There is also a lack of knowledge concerning the positive and negative interactions between livestock and wildlife. The rural community, many times, fails to perceive economic benefits from wildlife because of this lack of knowledge, and many wildlife species fail to receive protection from the rural community because of this lack of economic value.

Objective: To identify and determine the degree of ecological and economical compatibility between wildlife and livestock and to design potential methods that permit the rational management and/or sustainable harvest of wildlife in association with livestock, by the rural community.

Hypothesis: A rational management/use of wildlife will contribute to the conservation of these species and their habitats, since the rural community will receive a direct economic benefit from such species.

Activities:
- Literature review and other sources of information to identify actual cases and other new potential uses and/or interactions.
- Characterize actual relations (positive and negative) between wildlife & livestock.

- Evaluate the success and effectiveness of actual projects in the region.
- Evaluate environmental-, social- and economic impact of actual projects in the region.
- Design new models of rational use of wildlife associated with livestock.
- Propose research to fill existing voids in information.
- Training of extensionists and ranchers
- Implementation of models in selected sites.
- Periodic evaluation and monitoring.

Outputs:

- An analytical description of actual systems and their capacity to improve life conditions of the rural community.
- The proposition of rational and economic management systems for wildlife in livestock operations.
- Research results publications.
- Political recommendations for improved management and conservation of wildlife.

Relevance: Central America, Caribbean Basin, Ecuador, Peru, Chile, Bolivia, Argentina

Actors:

- Land grant universities-USA
- Agricultural and natural resource universities of the Caribbean Basin and Andean region (PRMVS-UNA, Costa Rica, CATIE, EARTH, La Molina, Peru, Cordoba, Argentina, etc.
- Ministries of Agriculture, Environment, Natural Resources, CONACS, RAMSAR, USFWS
- ONG's, DESCO, CEDEP, Nature Conservancy, WWF
- Small Producers and Peasant Communities of the Andean region, community organizations or associations,
- Private sector: (e.g. Textile Industry of Japan, Italy, Peru, England, Andean Mining Companies, Alpaca International Association)
- FAD (International Fund for Agricultural Development), InterAmerican Foundation,

Active Projects:

- Soil Conservation and water management project (IFAD)
- Vicuna Management and Conservation Project
- Cattle projects of MINAE-UNA-Ramsar-FAO, Costa Rica
- Duck egg production-harvest, El Jocotal, El Salvador

(4) Adjusting livestock production systems to environmental potentials and limitations

Introduction: Traditional livestock production is based on practices that in appearance are

detrimental to the environment (e.g. deforestation, overgrazing and grazing on slopes) if management is not controlled. This has been reflected in poor and insufficient technical and financial support as well as in poor levels of productivity. In contrast it is also known that livestock production, relative to intensive agriculture, is more stable in particular under extreme environmental conditions. The social and economic role of livestock over all Latin American countries, the rate utilization of natural resources and the needs of a growing demand of animal products, requires new approaches and new technologies leading to sustainable production and resource management to achieve improvements not only in family income and farmer's well being but also in environmental stability.

Objective: To develop and adjust livestock production technologies in order to achieve sustainable and rational use of natural resources and the environment.

Hypothesis: Livestock can be productive and compatible with rational use and management of natural resources and the environment.

Activities:

- Assessment and development of alternatives to alleviate seasonal effects on livestock production, due to variations in quality and quantity of available forage resources.
- Assessment of indigenous livestock and forage genetic resources.
- Adjustment and development of agroforestry (silvopastoral) technologies as a means for rational and sustainable use of natural resources and the environment.
- Development of appropriate animal production technologies for fragile slope areas and tropical savannas.
- Organization and management of livestock production activities (health, reproduction, nutrition, grazing and infrastructure) in accordance to requirements of new developed technological approaches.
- Monitoring of the impact on water, soil and vegetation caused by livestock production practices.

Outputs:

- Sustainable alternatives of livestock production to improve productivity and family income on the basis of a rational use and management of natural resources and the environment.
- Increased knowledge, awareness and policy recommendations on the interaction of livestock and environment.

Relevance: Improvement of farmer's income and well being on the basis of rational utilization of in- place available resources.

Actors:

- Small and medium-scale farmers

- Private enterprises
- Foundations and NGO's
- National and international research centers (CATIE, EARTH, Universidad Nacional de Costa Rica, CIAT/Bolivia, Universidad Cochabamba/Bolivia, RERUMEN, IBTA/Bolivia y Universidad Central del Ecuador, INIAP/Ecuador, Universidad Catolica/Ecuador

PRIORITY TOPIC FOR HUMAN NUTRITION

Animal Source Products: A Key Issue For Child Growth And Cognitive Development.

Objective: To introduce or increase intake of animal source products into poor rural household diets, it especially of young children and women, in a sustainable way compatible with natural resources, the socio-economic realities and cultural values.

Hypothesis: Low intake of animal source products result in a poor quality diet (low micronutrients content), which in turn, affects reproductive outcome and physical growth, and mental development of children.

Issues:
- The activities will be related to the following three main issues:
- How to increase or introduce animal sources.
- How to ensure a steady household supply over time of the animal source products through proper preservation and processing.
- How to ensure household consumption of animal source products for dietary improvement, without excluding market opportunities.

Activities:
- To increase or introduce animal sources.
    a) Ethnographic studies in a regional basis:
    -Availability
    -Management
    -Utilization
    -Consumption
    -Acceptability of potential animal source foods

    b) Baseline studies (in planned intervention area and control area):
    -Household socio-economic status
    -Nutritional value of typical diet
    -Nutritional status of community

    c) Qualitative evaluation of the promising animal sources, alone and in combination with non animal foods (nutrient content analyses)

- To ensure a steady household supply over time of animal source products through proper preservation and processing.
  - -Ethnographic studies (current and past practices) on food preservation and processing.
  - -Improvement of current methods and/or development and introduction of new methods.
  - -Post-processing nutrient content evaluation.

- To ensure household consumption of animal source products for dietary improvement without excluding market opportunities.
  - -Education/information through formal and informal activities about value of animal source foods.
  - -Development of mechanisms to overcome negative attitudes and beliefs toward diet improvement with animal sources.
  - -Participatory "hands on" household preparation, recipe design and test consumption of improved or new dishes.
  - -Periodic follow up of acceptability and continuation of dietary improvement.

- Controlled study of impact (outcome evaluation). In both, control and study areas:

  Independent variables
  -Diet pattern and food consumption and nutrient intake for macro and micro nutrients of family member

  Dependant variables
  -Growth (anthropometry) and nutritional status of family members (children, women)
  -Cognitive function, motor and mental for infants and preschoolers, cognitive function and school performance in school children.
  -Household evaluation (baseline vs. post intervention)
  - Micro-environment analysis
  - Household food intake
  (all of above will be carried out on two occassions at least three months apart)

  Intervening variables
  -socio-economic status
  -illness
  -genetic/familial factors
  -micro-environment, etc

  Household evaluation (baseline vrs. post intervention)
  -micro-economic analysis
  -household food intake

Relevance: Mexico - Central America, Andean Region

Actors:

- Central America and Mexico Region
  - Instituto Mexicano de Nutricion. (Mexico)
  - Instituto de Nutricion para Centro America y Panama (INCAP). Guatemala.
  - University of California
  - ICAITI, Guatamala (meat and milk production)
- Andean Region
  - Instituto de Investigacion Nutricional (Lima, Peru)
  - Universidad Central, o Catolica, o San Francisco de Quito (Quito, Ecuador)
  - Univresidad Nacional de Cochabamba (Bolivia)
  - University of California
  - Cornell University
  - Carribean Region
  - Carribean Food and Nutrition Institute
  - University of the West Indies
- NGO's
- Women's Groups

ASSESSMENT TEAMS

EAST AFRICA:

1) Diversification of Livestock Assets for Pastoral Risk Management and Regional Development in East Africa

Lead Principal Investigator: Dr. Layne Coppock, Utah State University, Dept. Rangeland Resources, Logan UT 84322-52. Phone: 801-7987-1262 EMAIL: lcoppock@cc.usu.edu FAX: 801-797-3796

We have already invested several years developing an initial problem model and on-going research that fits SR-CRSP guidelines for Animal Production Systems for Pastoralists in East Africa. The basic tenet of our model is that by facilitating access of pastoralists to alternative, non-pastoral investment complementary to livestock, we can set in motion an effective systems-level, policy-oriented intervention that would diversify household assets, mitigate poverty, improve food security, reduce environmental degradation and contribute to regional economic growth. Alternative investment options to be mixed with livestock could include land accounts and various land, urban, and commodity schemes. Our proposed Assessment Team (AT) has 10 members from four institutions providing expertise in research and extension (Utah State University, University of Kentucky, the International Livestock Research Institute (ILRI) and CARE-International). Eight team members have extensive African experience. We envision three U.S.-based meetings to provide an iterative process for team building and evaluation of the problem model; the process will also benefit from new empirical data from Ethiopia. We seek to merge and expand relevant work in Ethiopia and northern Kenya into a truly regional project. In between U.S. meetings we propose a month-long field tour of priority research sites in Kenya (Kajioado Maasiland, Samburu, Baringo, Turkana) and Eritrea (Afar) to complement our existing work; these new sites offer analytical gradients in terms of climate, land use, economic development, and cultural norms.

2) An Integrated Management and Policy System for Conserving Biodiversity in Spatially Extensive Pastoral Ecosystems of East Africa - Assessment Team Formation

Lead Principal Investigator: Dr. Michael Coughenour, Colorado State University, Natural Resource Ecology Lab, Fort Collins, CA 80523. Phone: 970-491-5572 EMAIL: mikec@nrel.colostate.edu FAX: 970-491-1965

An international team will be formed to develop a system to assess livestock-environment interactions and conserve biodiversity in extensive pastoral ecosystems of East Africa. The Assessment system will integrate computer modeling, geographic information

systems, remote sensing, and field studies to improve prospects for developing productive pastoral systems which also conserve biodiversity, wildlife, and ecosystem services. The system will enable alternative policy and management strategies to be objectively explored, debated, implemented, and reassessed. Stakeholder involvement will be elicited from the outset. Regional level analyses for East Africa will eventually be conducted using GIS, modeling, networking, and cross-site comparisons. Two workshops will be held in Kenya and Tanzania to develop the assessment approach and to identify appropriate assessment team members. The interdisciplinary team will be comprised of U.S. and East African scientists, managers, and other stakeholders. Several model implementation sites will be identified, including the Ngorongoro-Serengeti-Loliondo area in Tanzania.

3) An Early Warning System for Monitoring Nutrition and Health of Livestock and the Food Security of Humans in Eastern Africa

Lead Principal Investigator: Dr. Paul T. Dyke, Texas A&M University, Blackland Research Center, 808 E. Blackland, Temple, TX 76502. Phone: 817-770-6612 EMAIL: dyke@brcsun0.tamu.edu FAX: 817-770-6561

Providing food security for East Africans continues to be a policy problem with the ever-threatening droughts, population pressures, and dependence on limited resources such as land and capital. This project addresses the establishment and operation of an early warning system to monitor the nutrition and health of livestock and, in turn, the impacts on food security in Eastern Africa. The research plan integrates animal nutritional profiling through infrared reflectance spectroscopic monitoring of animal feces with spatially referenced climate, resources, livestock and human demographics, economics, and classifications of grazing systems. Alternative grazing systems will be simulated with advanced computer models to predict probabilities of nutritional deficiencies due to drought. Climate models will be used to enhance the early warning of droughts.

4) Role of Animal Source Foods to Improve Diet Quality and Growth and Cognitive Development in East African Children

Lead Principal Investigator: Dr. Charlotte Neumann, University of California, Los Angeles, School of Public Health, P.O. Box 951772, Los Angeles, CA 90095. Phone: 310-825-2051 EMAIL: cneumann@ucla.edu FAX: 310-794-1805

Diets low in energy and of poor quality among poor rural children in East Africa are widespread. Little or no intake of animal source foods with low concentrations of micronutrients and fat, and high rates of parasitism and infection, contribute to the problems of stunting and poor cognitive development. An assessment is planned to

further define the above problem and its determinants and construct a Problem Model which will form the basis for a full project for a long-term research-cum-intervention program. A multidisciplinary Assessment Team comprised of East African and U.S. scientists from the disciplines of Animal Science, Human Nutrition, Agricultural Economics, Child Development, Maternal and Child Health, Behavioral Science, and NGO experts in Community Development will carry out the assessment in a problem-oriented mode. The assessment team will collect background information about the problem through a literature review, field visits, rapid field assessments and focus groups. Using the background information, the team will refine the Problem Model. Substantial input about the problem and possible solutions will be sought from all levels: community, district, regional and national. The Problem Model will serve as the conceptual framework for designing the project for a long-term research and interventions phase. There will be collaboration between the University of California team (UCLA and UC Davis) with East African universities, NGOs, and regional organization in the assessment and research/intervention phase.

CENTRAL ASIA:

1) GIS modeling tools for international donors and local policy makers to understand and predict regional trends of rangeland production in Central Asia

Lead Principal Investigator: Dr. Emilio Laca, University of California, Davis, Dept. of Agronomy & Range Science, Davis, CA 95616. Phone: 916-752-4083 EMAIL: ealaca@ucdavis.edu FAX: 916-752-4361

Historically, animal production systems in Central Asian republics have been characterized by nomadic pastoralism, with large-scale movements of humans and herds to match the seasonal cycles of rangeland production. In recent times, the systems have been subject to changes due to
collectivization and subsequent decollectivization. The pressures of a new political and economic organization, plus the growing human population, have led to increased stocking densities and degradation of rangelands, as well as to expectations of lack of feed and forages for livestock. We hypothesize that the region already has a considerable amount of information on the ecology of rangelands, animal and human populations, and propose to assess the need for and feasibility of a regional geographical-information-system (GIS) model, including soils, climate, vegetation, animal and human layers. Our assessment approach is to promote full cooperation from multiple regional and international institutions, to enable local capacity, and to integrate information, from basic primary production processes to social impacts, by means of a truly multidisciplinary team. Regional cooperation will be coordinated in a workshop in Almaty, where a pilot GIS will be created. This GIS will have predictive capabilities and should be instrumental for international donors and regional decision-makers to identify and prevent major imbalances in the rangeland-livestock-human systems.

2) Central Asia: The Impacts of Decollectivization

Lead Principal Investigator: Dr. Kenneth Shapiro, University of Wisconsin, Madison, International Agricultural Programs, Madison, WI, 53706-1562. Phone: 608-262-1271 EMAIL: kenneth.shapiro@ccmail.adp.wisc.edu FAX: 608-262-8852

The five Central Asian countries are seeking new systems of agricultural organization after 70 years under a command economy. The proposed assessment takes two approaches toward facilitating that process. One uses Deming's iterative planning/ learning cycle combined with PRA to help design research strategies to analyze emerging models of reform and devise new ones. The second builds a regional network that can work with policy makers and farmers to develop new forms of agricultural organization, and then to monitor, evaluate and modify them as these countries grow and change.

The University of Wisconsin team includes expertise in economic analysis, sociopolitical analysis, agricultural production systems, and agricultural statistical systems. Collaborating institutions include American Breeders Service and Land O' Lakes, the SANREM CRSP and (possibly) the BASIS CRSP, and several institutions in the region.

Three field visits will be made to: visit more and less successful examples of reform of state and collective farms; observe cropping systems, grazing pressure, etc.; meet with farmers, local experts, and local and national policy makers; appraise input and output markets and relevant infrastructure; meet with statistical units to review data and survey programs.

The following type questions will guide the work: (2) which farm-level change models are functioning best and worse (and why?) in terms of carrying capacity, incomes, efficiency, land use and environmental impact: (2) What barriers hamper development of new forms of organization, e.g., input and output markets (including land markets), infrastructure, land and water resources, social services, national policies and laws, supply and price controls, local leadership, kin-based associations, etc.? How, and with what temporal sequencing, might these be overcome or turned to a positive outcome? (3) what farming system elements (e.g., which crop rotations, crop-livestock interactions, grazing strategies, etc.) are most appropriate for different change models?

LATIN AMERICA:

1) Land Use and Nutrient Management Decision Making in Latin America Agrosilvopastoral Systems

Lead Principal Investigator: Dr. Robert W. Blake, Cornell University, Dept. of Animal Science, 131 Morrison Hall, Ithaca, NY, 14853. Phone: 607-255-2858 EMAIL: rwb5@cornell.edu FAX: 607-255-9829

This project's goal - better husbandry of agrosilvopastoral, or farming, system nutrients to sustain family, community and environmental well-being will be achieved by an international research team through interdisciplinary and interinstitutional collaboration. Results having international and domestic policy relevance are expected to emerge from this work which will actively evaluate interrelationships between farming systems, social welfare, family nutrition and health, and development policy. The project will be carried out in two ecoregions, Peru and Honduras, to take into account contextual specificity and to provide the project with a comparative perspective. Three main themes define the project: 1) agrosilvopastoral (ASP) system management, including soil nutrient assessment, animal nutrition management, optimization and decision support, and evaluation of related household and community behaviors; 2) policy effects on ASP system sustainability; 3) economic evaluation of policy effects on households and communities; 4) evaluation of diets and health, considering especially the roles of animal origin foods and agromedicinal crops. Our eleven member Assessment Team (AT) encompasses the range of disciplines, institutional affiliations and ecosystem regions required for effective management of the project. The AT will coordinate the collaborative efforts of those involved in the project, the formation of Working Groups (WG), the evaluation of WG research plans and results, and the dissemination of results. The project will undergo external review by a committee of experts from various international development agencies.

2) Assessment of the importance of animal products for the nutrition of young children in the Andean region: team building and identification of appropriate animal products

Lead Principal Investigator: Dr. Kenneth H. Brown, University of California, Davis, Dept. of Nutrition, 3150 Meyer Hall, Davis, CA 95616. Phone: 916-752-1992 EMAIL: khbrown@ucdavis.edu FAX: 916-752-3406

To ascertain the specific roles of animal products in children's nutrition and functional performance, we plan to conduct future controlled, community trials of nutritional supplementation of young children from 6-15 months of age with different animal products, plant foods, or isolated micronutrients. Before initiating these trials we will collect background information in 1) the range of animal products currently produced in the region and fed to young children, 2.) the constraints to greater production of these products, 3) factors limiting their consumption by young children, and 4) ways of promoting greater consumption of these products by high risk groups. During the first year of this proposed multi-year effort, a team will be assembled to conduct preliminary research and prepare for subsequent research and outreach activities. The goals of the first phase of collaborative activities are 1) establish an assessment team composed of US and Andean nutritionists, economists, animal scientists, and food scientists with interest in working on interdisciplinary problem-oriented research, 2) convene two workshops in Peru to review existing data and develop a future research plan, 3) collect additional data,

both from secondary sources and interviews with "consumers" to further develop the program model and prepare the phase-two research project, and 4) establish contacts with local decision makers, consumers, and possible sources of future funding.

3) Livestock-Natural Resource Interfaces at the Internal Frontier

Lead Principal Investigator: Dr. Tim Moermond, University of Wisconsin, Madison, International Agricultural Programs, Madison, WI 53706-1562. Phone: 608-262-1271 EMAIL: kenneth.shapiro@cmail.adp.wisc.edu FAX: 608-262-8852

The slopes of the inter-Andean valleys, and their Central American extensions, are a critical, but under-studied zone. Management of livestock, wildlife and other natural resources can have a major impact for many people. These slopes harbor vast biodiversity, diverse populations of small producers, and are the gatekeepers of sustainability for extensive areas downstream.

Our project brings together an experienced team to develop a participatory model for understanding and seeking solutions to the resource balance at the "internal frontier" of farm and forest. We will focus on the role of livestock and wildlife/forest resource in the livelihood of small-scale farmers.

During the assessment phase, we will draw on our extensive contacts in the region to build a network of research collaborators, and identify three pilot study sites. Eight key questions will drive our iterative refinement of the problem model, working both locally with communities and individual producers, and at a workshop with the regional network. Researchers from a similar study in Mexico will share their experiences at this workshop.

Output from the local assessment and the workshop will be a robust understanding of the problem model and a plan for a participatory process, applicable at each study site. This will define livestock/natural resource management issues, and identify solutions and means to implement them to assure future sustainability of livestock production on the mountain slopes of the region. As we learn through implementation at the study sites, we will further develop our approach to serve other areas of the continent.

4) Livestock Information Network Development for the Americas

Lead Principal Investigator: Dr. Gary Williams, Texas A&M University, Dept. of Agricultural Economics, Texas Ag. Research Car., College Station, TX 77843-2124. Phone: 409-845-5911 EMAIL: gwwilliams@tamu.edu FAX: 409-845-6378

Livestock Information Network Development for the Americas (LINDA) is a comprehensive program of research, training and resource generation to promote an

enabling environment: policy recommendations and access to marketing systems. Enabling systems necessarily impact nutrition, environment, etc. Accordingly, LINDA will impact all Latin America SR-CRSP priorities, e.g. (1) human nutrition, (2) animal production systems for resource poor farmers, (3) environment and wildlife, and (4) enabling environment; with lead focus on the last. The Assessment Team comprises two groups: (I) to build a market information/policy system; (II) to conduct research in other three priority areas, plus animal health, extension systems, and product development. Group II will inform I, and together they will iteratively refine LINDA. Main results are a regional livestock news and analysis service reporting prices, production, trade, animal health, human nutrition, environmental technologies, wildlife interactions, etc.; jobs and trained personnel in enabling systems; policy capacity; and new funds for livestock research and information.

ASSESSMENT TEAM ORIENTATION AGENDA
DAVIS, CALIFORNIA
23 - 24 NOVEMBER 1996

November 23, 1996

9:00 - 9:30	Introduction and Welcome *Dr. Montague Demment*
9:30 - 10:30	Small Ruminant CRSP: an Overview *Dr. Montague Demment* • Past CRSP Activities • CRSP Model, Pros & Cons • Reengineering the CRSP • Assessment Team Iterative Process • CRSP Administrative Structures
10:30 - 11:15	Regional Group Meetings
11:15 - 11:30	Coffee Break
11:30 - 12:30	Working with USAID *Mr. Jim Scott* • Budgets • AID Regulations: Travel, Purchasing, Inventory • Expenditure Reports • Reports
12:30 - 1:30	Lunch (*Alumni Center)*
1:30 - 3:30	Assessment Team Presentations *Assessment Team Lead PIs* 10 minute summary of each Assessment Team project
3;30 - 4:30	Working in the Region: Regional Presentations • Recap of the SR-CRSP Regional Workshops • Potential Collaborators and Resources
6:00 - 7:00	Reception (*Lobby of the Alumni Center*)
7:00 - 9:00	Dinner (*AGR Room of Alumni Center)*

Assessment Team Orientation Agenda (continued)

November 24, 1996

9:00 - 9:15	Overview of day's activities *Dr. Gary Goodpaster and Beth Greenwood, J.D.*
9:15 - 9:30	Lecturette: Negotiation Dynamics
9:30 - 10:00	Conflict Resolution: *Sally Swansong* Negotiation Exercise
10:00 - 10:45	Negotiation and Conflict Resolution Discussion: Problem solving models
10:45 - 11:30	Groupwork and Group Dynamics: *The Committee* Fishbowl exercise in group or team problem solving
12:00 - 1:00	Lunch *(Alumni Center)*
1:00 - 2:30	Teamwork Develop instrument to facilitate and insure team success
2:30 - 3:15	Discussion
3:15 - 4:15	Questions & Closing Comments *Dr. Montague Demment*

SR/GL-CRSP YEAR-END CONFERENCE AGENDA

TUFTS UNIVERSITY

JUNE 27-30, 1997

Friday, June 27, 1997

12:00 - 2:00	Registration - *South Hall*
1:00 - 2:00	**Lunch**
	Administrative Review Meeting Presentations - *Pearson Hall*
2:00 - 3:00	Welcome and SR/GL-CRSP Evolution Dr. Montague Demment
3:00 - 4:00	SR/Global Livestock CRSP in Context Dr. Gordon Campbell
	The Assessment Team Process Dr. Kenneth Shapiro
	SR/GL-CRSP Relevance to U.S. Ms. Jane Shey
	SR/GL-CRSP and the University of California Dr. Robert Shelton, UC Vice Provost for Research
4:30 - 4:45	**Break**
5:00 - 6:00	Regional Perspectives of SR/GL-CRSP Dr. Don Brown, ASARECA Representative Dr. Manuel Ruiz, IICA-RISPAL Dr. Mekhlis Souleimenov, ICARDA
	Benefits of CRSP Training Ms. Lita Buttolph and Dr. Robert Shavulimo
6:00 - 7:00	Advisory Panel Meeting - *Campus Center* Conference Procedures Feedback Guidelines
6:00 - 7:00	Administrative Review Meeting - *Campus Center*
7:00 - 9:00	Registration - *South Hall*

SR/GL-CRSP YEAR-END CONFERENCE AGENDA (continued)

Saturday, June 28, 1997

7:30 - 8:00	Registration - *Pearson Hall (#55 on map)*
8:00 - 12:00	General Meeting - *Pearson Hall* Overview of Conference Presentation Process Public Presentation of Assessment Team Progress
12:00 - 1:00	**Lunch Break**
	Latin America Assessment Team Presentations - *Pearson Hall*
1:00 - 1:45	*"Land Use and Nutrient Management Decision Making in Latin America Agrosilvopastoral Systems"* Principal Investigator: Dr. Blake
2:00 - 2:45	*"Assessment of the Importance of Animal Products for the Nutrition of Young Children in the Andean Region: Team Building and Identification of Appropriate Animal Products"* Principal Investigator: Dr. Brown
3:00 - 3:30	**Break**
3:30 - 4:15	*"Livestock-Natural Resource Interfaces at the Internal Frontier"* Principal Investigator: Dr. Moermond
4:30 - 5:15	*"Livestock Information Network Development"* Principal Investigator: Dr. Williams
5:30-6:30	External Evaluation Panel Meeting - *Campus Center* Latin America Teams
7:00 - 7:30	**Reception - Mugar Hall** *Courtesy of Tufts University*
7:30 - 10:00	**Dinner - Mugar Hall, Faculty Dining Room** *Courtesy of University of California*

SR/GL-CRSP YEAR-END CONFERENCE AGENDA (continued)

Sunday, June 29, 1997

East Africa Assessment Team Presentations: *Pearson Hall*

8:00 - 8:45	*"Diversification of Livestock Assets for Pastoral Risk Management and Regional Development in East Africa"* Principal Investigator: Dr. Coppock
9:00 - 9:45	*"An Integrated Management and Policy System for Conserving Biodiversity in Spatially Extensive Pastoral Ecosystems"* Principal Investigator: Dr. Coughenour
10:00 - 10:30	**Break**
10:30 - 12:30	General Meeting: *Pearson Hall* Question and Answer: Full Proposal Criteria Full Proposal Guidelines SR/GL-CRSP Five-year Proposal Timeline Assessment Team Process: Feedback & Discussion
12:30 - 1:30	**Lunch Break**
1:30 - 2:15	*"An Early Warning System for Monitoring Nutrition and Health of Livestock and the Food Security of Humans"* Principal Investigator: Dr. Dyke
2:30 - 3:15	*"Role of Animal Source Foods to Improve Diet Quality and Growth and Cognitive Development in East African Children"*
3:30 - 4:00	**Break**
4:00 - 4:45	*"Regionalization of the Kenya Dual Purpose Goat"* Principal Investigator: Dr. Valdivia
5:00 - 6:00	External Evaluation Panel Meeting: *Campus Center* East Africa Teams
6:00 - 8:00	Administrative Review Meeting (as needed)

SR/GL-CRSP YEAR-END CONFERENCE AGENDA (continued)

Monday, June 30, 1997

Central Asia Assessment Team Presentations: *Pearson Hall*

8:00 - 8:45	*"GIS Modeling Tools for International Donors and Local Policy Makers to Understand and Predict Regional Trends of Rangeland Production in Central Asia"* Principal Investigator: Dr. Laca
9:00 - 9:45	*"The Impacts of Decollectivization"* Principal Investigator: Dr. Shapiro
10:00 - 10:15	**Break**
10:15 - 10:45	External Evaluation Meeting - *Campus Center* Central Asia Teams
10:30 - 12:00	Advisory Panel Meeting : Wrap-up - *Campus Center*
10:30 - 12:00	Administrative Review Meeting (as needed)
12:00 - 12:30	**Lunch**
12:030 - 2:00	Administrative Review Meeting - *Campus Center*

ADMINISTRATIVE MANAGEMENT REVIEW

SMALL RUMINANT

COLLABORATIVE RESEARCH SUPPORT PROGRAM

Prepared for:

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

Prepared by:

Charles Sloger
Raymond J. Miller, Team Leader
Joyce M. Turk, Facilitator (USAID)

July 1997

Grant No. DAN-1328-G-00-0046-00

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ACKNOWLEDGMENTS

The Administrative Management Review Team thanks all who assisted in carrying out the review.

The team is indebted to University of California-Davis CRSP officials: Dr. Montague W. Demment, Director; Mr. James W. Scott, Assistant Director; and Ms. Susan L. Johnson, Program Coordinator, of the Small Ruminant (CRSP) Management Entity for the well planned and executed conference and for supplying all of the material requested.

The team is also indebted to all of the SR-CRSP Principal Investigators and collaborators who participated in and attended the conference for their willingness to meet, answer questions, and in general make themselves available to the team.

The team thanks both the External Evaluation Panel and the Advisory Panel for their cooperation, openness, and response to all requests and suggestions.

The team also thanks Dr. Tracy Atwood, Division Chief, Food, Land, and Policy Division, Office of Agriculture and Food Security, USAID, for his support, counsel, and insights regarding USAID CRSP programs and for arranging the appointment of the team.

The team appreciated the support of the US Department of Agriculture (FAS/ICD/DRD), especially Mr. Robin Comfort, for arranging for the services of the team and provision of logistical support.

Finally, the team thanks Dr. Joyce Turk, USAID Small Ruminant Project Manager, for her support in making arrangements for the review, in supplying documents and information, and arranging printing of the report.

SMALL RUMINANT CRSP ADMINISTRATIVE MANAGEMENT REVIEW

EXECUTIVE SUMMARY

The Small Ruminant CRSP is in its 18th year. The CRSP is in the final stages of re-engineering and the revised project should be approved in 1998. This CRSP has a number of accomplishments and will have some sustainable programs.

Even though the University of California-Davis has been the Management Entity since the inception of this CRSP, there has been uneven leadership by the Management Entity, Board of Directors, and Technical Committee. The CRSP at one time was identified to be terminated. After reinstatement it was suggested that this CRSP re-engineer itself. The re-engineering is in its final stages and a strong, focused project will likely result. The process used in the re-engineering has been well thought out and is accomplishing its objectives.

The team makes recommendations by categories as follows:

SR-CRSP Transition and Implementation of Re-engineering Philosophy

Utility of the Advisory Panel vis-à-vis Functionality of Traditional Advisory Entities (ME, BOD, TC, and EEP).

1. That the AP be continued but its name may no longer be appropriate

2. That a detailed policy and procedures manual be developed.

3. That a mechanism be developed and implemented that involves the PIs in a meaningful role in the CRSP on issues of programmatic focus.

The Value of the Assessment Teams and Regional Workshops

4. That the final project include regional plans, stating what their possible impact and results might be and how these would become a global plan.

5. That the final plan address, where appropriate, how policy issues will be considered at the local, state or national level. If policy action is needed, what are those policies and how should they be developed and what is required to implement them.

TRAINING AND INSTITUTIONAL DEVELOPMENT

6. That a training plan for the GL-CRSP be based on a needs assessment and that a system be developed to monitor the achievements of the training plan. If it is not meeting its goals corrective procedures need to be in place.

7. That a system be developed to determine where graduates of the program are employed and their responsibilities.

8. That when training results are compiled they be done in such a way that they relate to the plan and to specific countries or regions.

MANAGEMENT OF RESEARCH PROGRAM

Utility of Evaluations, Reviews, and Associated Processes.

9. That the projects be required to submit only one report each year.

Management by ME and Subgrantees.

10. That USAID streamline its procurement and contracting procedures.

11. That the procurement office not try to micro manage the GL-CRSP.

Dissemination of Research Results

12. That when publication output is compiled that the publications be categorized by type of publication, country, and project.

FINANCIAL

13. That the GL-CRSP pay for a full time fiscal officer.

14. That the ME be prepared to provide appropriate assistance in the proper handling of funds and processing vouchers in countries where they have little experience in such matters.

15. That the ME develop a written procedure for travel requests and approval according the new USAID guidelines.

SPECIAL INTERESTS

16. That a plan for involving women in the HCs and in training be developed and that HBCUs be involved in the projects of the GL-CRSP.

MANAGEMENT REVIEW

SMALL RUMINANT (SR) COLLABORATIVE RESEARCH SUPPORT PROGRAM (CRSP)

INTRODUCTION

Purpose

The purpose of this assignment was to carry out an administrative management review of the SR-CRSP in accordance with instructions from USAID as outlined in the Scope of Work, appendix 1. The Scope of Work covered both the management review and the External Evaluation Panel (EEP) review. After meeting with the EEP it was decided to prepare two separate reports and the scope of work was divided accordingly. The full scope of work is given in appendix 1. The Program Administration and Management, Buy-Ins, and Mission/IARC sections are covered in the management review.

Methods

The review team attended the SR/L-CRSP Year-End Conference held June 27-30 (appendix 2). This was cost effective for the team met with: some project scientists of the current projects, members of the SR-CRSP Management Entity (ME), the Advisory Panel (AP), the EEP, and as needed specific scientists to clarify particular issues (appendix 3). Dr. Robert Shelton, UC Vice Provost for Research explained UC-Davis's commitment to support the redesign of the SR CRSP. The team reviewed numerous CRSP documents, publications, EEP reports, and other appropriate information provided by the ME. The review team decided not to visit CRSP operations at any US campus or in any of the Host Countries (HC).

The review team also reviewed the transition phase of the SR-CRSP. The team evaluated the process that has been and is being used to revise the SR/L-CRSP and the procedures that are being developed for the CRSP when it is renewed.

The SR-CRSP

Pursuant to the Foreign Assistance Act of 1961 as amended in 1975, USAID implemented the Collaborative Research Support Program (CRSP). It was developed to utilize US Land Grant University and Federal resources to maximize development of agriculture in the US and agriculturally developing countries. The Small Ruminant - CRSP organized in 1978, initiated in 1980, was revised and awarded a new grant in 1985, extended in 1987, awarded a new grant in 1990 and extended in 1995 to 1998. In 1994, USAID identified the SR-CRSP as one of the CRSP's to be ended, this caused a substantial reduction in activity. In 1995, USAID extended the SR-CRSP with the suggestion to re-engineer itself. Currently the components of the 1990 extension that are still active are in their final phases and the re-engineered CRSP is nearing identification of its new components. The University of California-Davis has been the management entity since the inception of the SR-CRSP. Dr. Tag Demment has served as Director of the CRSP since 1994.

The SR-CRSP currently links US universities through Memoranda of Understanding (MOU) with collaborating host country agricultural institutions in Indonesia and Kenya. Collaboration with Bolivia ended in 1996. Current SR-CRSP linkages are as follows:

Activity	United States	INTERNATIONAL
KENYA		
Breeding a Dual Purpose Goat	Texas A & M	Kenya Ag. Res. Inst.(KARI) Univ. of Nairobi
Dual Purpose Goat Production Systems	Winrock Int.	KARI
Kenya Dual Purpose Goat: Sociological Analysis	Univ. MO, Columbia Texas A & M, WSU, Winrock Int.	KARI
Multi-Valent Virus Vectored Vaccine	WSU, CSU, Univ. MO	KARI
Soc. Analysis Small Ruminant Prod. Sys.	Univ. MO, WSU	KARI
INDONESIA		
Hair Sheep Prod. Sys.	UC, Davis, Winrock	Installation for Research & Assessment of Agr. Tech. (IP2TP)
Econ. Small Ruminant Prod. Systems	Winrock Int.	Central Res. Inst. Animal Sci.(CRIAS), RAINAT - Sungai Putih Res. & Ass. Install. Agr. Tech
Feed Resources	Texas Tech.	CRIAS, RAINAT
SMALL GRANTS		
Sustainable Agropastoral Systems	USU	Inst. boliviano de Tecnologia de Agropecuaria
Banking Livestock Capital	USU	Int. Livestock Res. Inst.
Eval. Rukwa Valley SR-CRSP	UC, Davis	
Eval. Impact World Meat Markets - Argentina & Uruguay	UC, Davis	
Prel. Ass. Disease Vectors	UC, Davis	
Modeling Pastoral Res.	Univ. Kentucky	

SR-CRSP Objectives:

I. Integration of Dual-Purpose Goats (DPG) into Kenyan Farming Systems.
- Improve productivity (milk, meat) of DPG.
- Continue evaluation of the technical and socioeconomic feasibility of research-based interventions.
- To develop 'techpacs' from the above on-farm evaluations.

II. Completion of research on Prolific Sheep

III. Hair Sheep Production Systems
- Develop and adapt hair sheep production systems to the needs of smallholders in the humid and sub-humid tropics.

IV. Sustainable Agropastoral Systems on Marginal Lands
- Design management strategies for sustained small ruminant production in agropastoral systems of the developing world.

V. Women in Development

VI. Training and Professional Development

VII. Small Ruminant Science Network

Characteristics of the New Global Livestock-CRSP:

I. Reduce transaction costs

II. Diversify granting mechanisms

III. Effective assessment and problem resolution

IV. Diversify partnerships

V. Regionalization

VI. Customer oriented

A summary of the current SR-CRSP and the assessment teams is provided in appendix 4.

PROGRAM ADMINISTRATION AND MANAGEMENT

SR-CRSP TRANSITION AND IMPLEMENTATION OF RE-ENGINEERING PHILOSOPHY

The SR CRSP operated in a stable traditional manner until April 1994 when USAID announced that the CRSP would be terminated in 1995. The CRSP began a phase down of activities. Some overseas sites were closed, no new research trainees were started and support was only given to phase down priority research activities. At the end of 1994 the CRSP faced termination. The Principal Investigators were shocked and upset to suddenly have to cope with a phase down of research activities and selling off of research animals.

A transition phase began in early 1995 when USAID decided to maintain the SR-CRSP. USAID suggested that the ME consider re-engineering the CRSP along the lines of USAID's re-engineering exercise. This was an opportunity to make the CRSP a re-engineering lab. Dr. Demment has shown dynamic leadership in this redesign effort. The main reason for the redesign of the SR-CRSP stems primarily from USAID's intensive re-engineering effort at that time. Some key elements in USAID's re-engineering process were adopted by the CRSP.

The change has been good for the CRSP despite some hardship by some PIs who had worked hard to build a program over 15 years. Some people associated with the SR-CRSP were concerned that the BOD and TC had become too large and had vested interests to operate effectively. Members had an entitlement attitude toward the program. The time was right to revalidate research objectives and develop new research objectives based upon current problems at the farm level. The redesigned CRSP uses the problem model approach where the problem drives the research agenda.

According to Dr. Robert Shelton the actions of the UC-Davis Administration helped in the redesign of the CRSP. The selection of Dr. Demment to be the CRSP Director was a critical decision because he has stepped in to breathe new life into the CRSP and to provide leadership during the transition phase. The university provided on-campus space for the CRSP. Also the new CRSP will be well positioned to take advantage of a globalization initiative at UC-Davis campus. The university intends to be a more effective partner in the CRSP by providing financial and administrative support after the transition phase.

The transition phase has been a major undertaking for the CRSP. It is similar to a Planning Activity for initiation of a new CRSP with the additional elements of USAID's re-engineering concept. This has been a novel and dynamic approach to update a CRSP.

The redesign process started with a synthesis meeting at Winrock in May of 1995. According to the CRSP "We convened some of the best people in the field of livestock development from US universities, the CG system, NARS and the private sector to

develop a plan for the renewal of the SR-CRSP." After the meeting the ME prepared a concept paper entitled "Plan for Global Livestock CRSP" (appendix 5). The plan outlined how the SR CRSP will become the Global Livestock CRSP in 1998. The ME presented the plan to USAID for their comments and approval. Throughout the transition phase there has been constant communication between the ME and USAID to reach common understanding on key issues (appendix 6). USAID has been a part of the process from the beginning.

The ME abolished the Board of Directors and the Technical Committee, and created an Advisory Panel (AP) to assist and advise the ME. The panel has a broad representation from private sector, academia, IARCs, NGO, NARS, and USAID. The AP has done an excellent job playing a multi-purpose role as BOD, TC, and JCARD during the transition phase. To continue this role after the revised CRSP is formed may over extend the AP.

The re-engineering process has been effective in bringing about the following new characteristics:

-reduced ME transaction costs of staff and committees;
-increased diversity in granting mechanisms;
-more effective assessment and resolution of problems;
-increased diversity in kinds of partnerships;
-more customer orientation;
-a regionalization focus.

Utility of the Advisory Panel vis-à-vis Functionality of Traditional Advisory Entities (ME, BOD, TC, and EEP).

From discussions with various persons involved in the SR-CRSP some of the traditional advisory entities were not providing the guidance and actions needed to have a highly successful CRSP. There was a strong feeling among some of the current principal investigators (PI) that the management entity (ME) did not provide the needed guidance and overview. This apparently is no longer the case. Robert Shelton, when he was Vice Chancellor for Research at UC-Davis was very much involved in the SR-CRSP. This involvement is reflected in the appointment of Dr. Montague Demment. All indications are that UC-Davis is involved and wants the CRSP to be successful.

The Board of Directors (BOD) did not provide the guidance a BOD should and from all the team could learn was ineffective.

The External Evaluation Panel (EEP) was felt to be ineffectual by some of the PI's. The team found the recent EEP reports to be thorough and did identify problems and needs. If there was a problem it was probably the inability or unwillingness of the technical committee (TC) to take action based upon the EEP recommendations. There were strong

feelings as to the effectiveness of the TC, some felt it was ineffectual, some felt that it provided the avenue for PI involvement that makes CRSPs successful.

From everything the team could learn there was a need to reassess the SR-CRSP. The elimination of the old advisory structure was appropriate. The creation of the Advisory Panel (AP) appears to have been timely and has been effective. The AP has been a dedicated group who have spent a great deal of time helping shape and direct the re-engineering process. For the AP to continue to be effective a number of actions need to be considered.

One of the strengths of CRSPs has been the involvement and dedication of the scientists. It is important that the PIs know projects other than their own, have a meaningful input into priorities and needs, are involved in the development of the regional, global, training, and other overall plans. To do this some mechanism needs to be developed to have meaningful PI input. In our discussions with the director it was apparent that he is aware of the need and is considering mechanisms to meet the need. If a satisfactory system can be developed the AP can continue to provide overall guidance but the PIs will have a role in the process.

It is important that the AP not become overly involved in the details of managing the CRSP. As the re-engineered CRSP becomes operational there will be many details that need to be attended to. The AP needs to have developed a good policy and procedures manual. This should include such things as: the role and responsibilities of the AP, the term of appointment and replacement procedures for members of AP, process for subgrants with US and host country institutions, procedures and requirements for such things as travel and procurement, how and who will evaluate the director and the criteria to be used, how projects will be initiated and terminated, what approvals does AID require, etc. The director will need guidance and approval of various policies, help in dealing with problems, and should ask for recommendations and action, by the AP, on some decisions. What will be the role of the AP? The name may be inappropriate for its role in the revised CRSP.

So that all of the AP do not become overly involved in management details they may find subcommittees useful. For example a subcommittee on management could deal with appropriate issues, and make recommendations to the whole committee for its action.

It may be helpful in the development of the 'Policy and Procedures Manual' to get copies of the manuals from other CRSPs. Many if not all of the CRSPs will have manuals and much of the needed material has likely been developed and would need only minor modification.

Recommended:
1. That the AP be continued but its name may no longer be appropriate.

2. That a detailed policy and procedures manual be developed.

3. That a mechanism be developed and implemented that involves the PIs in a meaningful role in the CRSP on issues of programmatic focus.

The Value of the Assessment Teams and Regional Workshops

The review team was impressed with the process that has been established and followed in the re-engineering of the CRSP. Appendix 7 lists the workshops, meeting, and other activities that have or will take place. These activities have resulted in a great deal of planning and interaction that has come from both the bottom and top. In talking to PIs there was strong support for the process and what they had achieved. Many, if not all, of the PIs talked to said it would have been impossible to have developed the relationships with US collaborators, HC institutions, NGOs, producer and other consumer groups, international centers, and other groups if the up front funding and process had not been provided. USAID, ME, AP, the assessment teams, and all of the other participants in the process are to be commended. Several assessment teams indicated that they will use their plans to solicit funding elsewhere if they do not receive CRSP support.

The assessment teams, regional workshops, and planning activities are a good process and one that should be studied to see if all or parts of the process can and should be used by the other CRSPs. There are some issues that ME and AP need to address in the final stages of the assessment, awarding of projects, and development of final plans for the re-engineered GL-CRSP (Global Livestock-CRSP).

The GL-CRSP is to be regional and have a global dimension. To this end three areas of the world have been selected, those regions seem appropriate, but beyond that there are not obvious regional programs. It was stated that both the regional and global plans would emerge once the final projects are selected.

In addition policy thrusts were to be a part of projects where appropriate. What the policy implications might be and how policy would be affected or implemented was not stated in many of the presentations at the conference. These are all issues that need to be addressed in the final plan. There needs to be a regional plan with anticipated regional impacts and results, including how these activities come together as a global plan.

Recommended:
4. That the final project include regional plans, stating what their possible impact and results might be and how these would become a global plan.

5. That the final plan address, where appropriate, how policy issues will be considered at the local, state or national level. If policy action is needed, what are those policies and how should they be developed and what is required to implement them.

TRAINING AND INSTITUTIONAL DEVELOPMENT

The sustainability of a development project is in the trained and educated people that result from the project. The SR-CRSP did have a training plan that identified the number of people to be trained at the MS and PhD level by project area. From the data provided it is very difficult to determine if those goals have been met. The data is not compiled by country, project, or by grant period and no analysis was provided as to whether or not the training goals were being met. The plan identified that 19 MS and 12 PhD scientists were to be trained. As best the team could determine 11 MS and 15 PhD scientists were trained.

When the disruption caused by the termination and then reinstatement of the project is taken into account, this is seems to be a reasonable attainment.

To be most effective a training program should begin with an analysis of the current capabilities and base the training needs on the identified deficiencies. There is no indication that either the current project or the re-engineered project have developed such an assessment and resulting plan. The team believes this should be a high priority of the project and should be emphasized by AP and ME. In the same vane to have maximum impact on the HC the current scientists have to be involved and affected and the new trainees have to return to the HC and hopefully the HC institutions. No data was provided as to where the trainees were employed after graduation. It is realized that it is not financially feasible to develop an elaborate tracking system of graduates. But the projects should be able to provide at least initial employment information.

From the material presented and the documents read there is little doubt that the SR-CRSP has had an impact on the HCs and sustainability of the CRSP. This is particularly true for Kenya and Indonesia where there should be a continuing capability and development of the program areas.

There were not a large number of US students trained under the current project and it is unclear what the benefit to the SR-CRSP is of training students from other parts of the world. Never the less when the number of students trained is added to the faculty involvement the CRSP has had significant effect on the US institutions. It has broadened their understanding of global needs and opportunities, developed methods, models and techniques that are of direct benefit to the US. The training of students was an integral part of the other CRSP priorities. The CRSP did involve a large number of people in short term training. This training supported the priorities of the CRSP and contributes to the sustainability of the CRSP.

Recommended:

6. That a training plan for the GL-CRSP be based on a needs assessment and that a system be developed to monitor the achievements of the training plan. If it is not meeting its goals corrective procedures need to be in place.

7. That a system be developed to determine where graduates of the program are employed and their responsibilities.

8. That when training results are compiled they be done in such a way that they relate to the plan and to specific countries or regions.

MANAGEMENT OF RESEARCH PROGRAM

Utility of Evaluations, Reviews, and Associated Processes.

Since the current program is in its final stages and the utility of the committees was commented upon in the administration and management section, the following will deal mostly with the re-engineering aspects of the CRSP.

The review team was impressed with the thoroughness and dedication of the assessment teams and the accomplishments of the total GL-CRSP development process. The procedures have resulted in interaction and collaboration between scientists at different US institutions and between those US institutions and various institutes and organizations in the HCs. It has been both bottom up and top down planning and development. This should continue. The ME and AP will need to continue to provide guidance, encouragement, and recognition for continued progress and success. One problem many programs have encountered is getting the involvement and commitment of HC organizations. This seems to have been overcome by this CRSP.

All indications were that the ME considers recommendations very carefully and thoroughly. Input and advice is sought and then decisions are made and acted upon. From all the discussions we had the ME seems to be responsive. The decisions are not always popular, which often indicates they not only were difficult decisions but probably needed to be made. The team found all ME members to be responsive, helpful, and well informed.

Work plans and the implementing MOUs are very important. The work plans, should detail the plans for the next year and present the results of the past year upon which the plans are built. In the re-engineered project every effort should be made to have one report and plan each year. Not a report followed in some months by a work plan and budget request. These should all be in one document. From the PI's perspective, it saves time and effort. It should make sense to AID both time wise and for cost reduction.

Recommended:
9. That the projects be required to submit only one report each year.

Management by ME and Subgrantees.

The team did not detect or hear of any deficiencies in the management of either the ME or the subgrantees. Since we did not visit any of the sites or HCs some problems may not have been detected. But the US institutions did not fault the day-to-day management of the ME. The major problem and concern was of the timely and difficult process of travel approval. It seems that there was a lack of clarification between AID and ME. This is discussed in more detail in the financial section.

The other major complaint was how difficult and slow the procurement and contracting process is in AID. When AID processes are compared to other federal agencies, AID's processes seem to be slower and more cumbersome. In addition the contracts office seems to try to micromanage the project. AID should simplify their procedures.

Recommended:
10. That USAID streamline its procurement and contracting procedures.

11. That the procurement office not try to micromanage the GL-CRSP.

Relationships and Interactions

A key element of the redesign process has been the open competition. It has brought in new groups of people. The regional trips have improved the socio-economic dimensions of the proposals and has helped to promote a bottom up approach to solving problems. Two groups of researchers from the old SR-CRSP are actively competing for programs in the new CRSP. The competitive process has increased quality of proposals and choices for the CRSP. The ME has done an excellent job in running a transparent Request for Proposal (RFP) process. We did not hear any complaints from the PIs.

Another important element of the redesign process has been the high degree of interaction between researchers and representatives of the private sector, NGOs, PVOs, NARS, and other donors. All assessment teams have done an outstanding job in bringing in appropriate collaborators. The diversity of collaborators improves the prospects for socio-economic impact and policy reforms.

The SR-CRSP has had no buy-ins from USAID missions under the current grant. However, the CRSP has leveraged considerable resources from collaborating organizations in Kenya, Indonesia and Bolivia. The transfer of technology has been helped by numerous linkages with extension organizations. The assessment teams have contacted USAID missions, but so far missions have only offered moral support. At least

the teams seem to be doing a good job of building a rapport with the missions. This is important in the long run.

Dissemination of Research Results

It is difficult to provide a detailed evaluation of the research results of this CRSP because of the interruption of the project due to its termination, reinstatement and the request to re-engineer.

The team was provided a detailed report of publications from 1978 to 1993 and an update for 1996 and 1997. This material was difficult to analyze as it is an alphabetical listing. It is not categorized by type of publication or by project period. It does have a compilation of country publications by publication number, but this is difficult to use.

The publication of results follows traditional science reporting; peer journals, proceedings, and workshops. Some of the projects seem to have published a number of peer journal articles, others few. Overall the publication record of the current project appears to be limited and there is little evidence of a significant outreach activity, a coordinated effort to reach end users, or meaningful interaction across research sites.

In the re-engineering and assessment process these deficiencies are being dealt with. The proposals have developed linkages with end users, they have developed collaborations with organizations who will assist in technology transfer, and have begun to address how information should be developed, treated and used. If the AP and ME continue to pursue these needs the re-engineered project should be much stronger in all of the areas associated with result dissemination and use.

Recommended:
12. That when publication output is compiled that the publications be categorized by type of publication, country, and project.

Impact on End-Users, Host Country Partners, and US Agriculture

Even though the publication documentation does not clearly show a link to users and out-reach, two of the projects have made an impact on the HC and should be sustainable. These are the programs in Indonesia and Kenya. Some of the technology will also be used in the US, for example the vaccine or at least the technology of its development and modeling different ecosystems.

In the GL-CRSP procedures and relationships have already been developed within the HCs so there should be an impact and sustainability.

FINANCIAL

The financial operation of the project seems to be in good working order. We did not hear any complaints from PIs concerning their sub-grants. The ME is doing a good job of disseminating the sub-grants in a timely manner. According to the ME they are using funds without running up a large amount of unused funds. The ME has started a new policy of taking back unused funds from PIs for use on priority activities. This is intended to better meet CRSP goals and to keep the amount of unused funds to a minimum. The UC-Davis has established a new fiscal management system which should help the ME more quickly track expenses and process vouchers. The operational costs of the ME runs about 16 per cent of the total CRSP budget. The ME has taken steps to cut costs of their operation.

The ME has an experienced and competent financial person. We did see a problem in that the financial person is officially working only half time but in reality works full time. The project should be funding a full time fiscal position.

The financial management of the CRSP during the transition phase has been complicated by the sub-grants to the assessment teams. The teams have been under pressure to get to the field and to develop collaborative activities in a short period of time. In some instances, the Assessment Teams have encountered LDC institutions without modern financial management systems. In the re-engineered project the GL-CRSP is likely to be working with institutions, in at least one country, that will need assistance in handling financial details. The ME appears to have clear policies for handling funds and processing vouchers. They will need to be prepared to provide appropriate and possibly greater assistance to these institutions.

The travel approval process has not worked well for the ME and USAID for the past year. The large number of trips by assessments teams has caused concerns. This should not have occurred since USAID has issued new guidelines to ease travel clearance procedures by contractors.

The SR-CRSP indicated that the level of detail required by USAID for travel costs in their budget was excessive. This has been true in the past. The current USAID requirements are more flexible than the MEs interpretation. If the budget includes the number of trips, travelers, and dollars needed for the year the approval process is straight forward.

The SR-CRSP is currently answering an inquiry from USAID concerning unused funds. This is something for the CRSP and USAID to resolve.

Recommended:

13. That the GL-CRSP pay for a full time fiscal officer.

14. That the ME be prepared to provide appropriate assistance in the proper handling of funds and processing vouchers in countries where they have little experience in such matters.

15. That the ME develop a written procedure for travel requests and approval according the new USAID guidelines.

SPECIAL INTERESTS

During the assessment process there has not been as much apparent emphasis on the role of women in the HCs or in their training as is warranted. This should be addressed in the GL-CRSP. The HBCUs were only involved in a relatively small way in the current project. Hopefully there will be more involvement in the GL-CRSP.

Recommended:
16. That a plan for involving women in the HCs and in training be developed and that HBCUs be involved in the projects of the GL-CRSP.

ANCILLARY ISSUES

Mission/IARC

The CRSP has shown a willingness to support Mission projects and objectives. For example in Bolivia the USAID/Mission gave PL-480 funds to the CRSP and requested the CRSP to stay. In another case the USAID/Morocco wanted the CRSP to stay in the country, but the Moroccan HC institution was not interested in true collaborative research. In most cases a government wants its researchers to work with the CRSP, but the Mission has other interests. PIs in Kenya and Indonesia run the in-country CRSP program. The waning USAID Mission interest in agricultural research and the problems of rural agricultural production has worked against most of the CRSPs. It is difficult for a CRSP with a global mandate to attract Mission interest when Missions are focused on in-country economic growth and financial reforms in the private sector. This is an area where the CRSPs and the Office of Agriculture have to work together to gain greater USAID Mission interest.

The SR-CRSP is not structured in a way to provide, upon request, technical assistance and service to the Mission. The CRSPs operate under a Global Plan for collaboratively planned research by PIs in the US and overseas.

The working relationship between the SR-CRSP and ICARDA and ILRI is excellent. A member of ILRI is on the AP of the SR-CRSP.

APPENDICES

APPENDIX I
SCOPE OF WORK

ADMINISTRATIVE MANAGEMENT AND EEP REVIEW STATEMENT OF WORK SMALL RUMINANT/LIVESTOCK CRSP

The following are specific generic issues that should be considered by the Administrative Management and EEP team:

PROGRAM ADMINISTRATION AND MANAGEMENT

A. SR-CRSP Transition and Implementation of re-engineering philosophy
   1. Reasons for redesign — assess the need for reform
   2. Effectiveness of re-engineering process
      a. cost
      b. human resources
   3. Impact of redesign and transparency of opening up the CRSP at the management and technical levels
   4. Comment on conformance with AID's re-engineering objectives
   5. Utility of the Advisory Panel vis-à-vis functionality of traditional advisor entities
   6. Assess whether Assessment Team activities as part of the project design will produce regional impacts
   7. Value of regional workshops and links with regional host country organizations (ASARECA, IICA, and the NIS)

B. Training and Institutional Development
   1. Impact of long-term training
      a. on host country institutions
      b. on host country development
      c. on sustainability of CRSP research
   2. Training plans - development and management
   3. Benefits to U.S. institutions
   4. Relationship to other CRSP priorities

C. Management of Research Program
   1. Utility of evaluation and reviews
      a. procedures for promoting good research, strengthening host country partner participation, and promoting promise of development impacts
      b. responsiveness of ME to recommendations
      c. usefulness of contributions by traditional advisory entities (TC, BID, EEP) and US/HC PIs
      d. usefulness of workplans

2. Management by ME and subgrantees
    a. responsiveness to AID procurement regulations
    b. responsiveness to reporting requirements
    c. evidence of modifications to workplans and budgets when required
    d. progress toward reaching goals and objectives
3. Characterize relationship and degree of interaction with NGOs, PVOs, IARCs, other donors, and private sector
    a. level of collaboration
    b. OYB transfers, buy-ins, or other leveraged funding
    c. pro-activity of ME and subgrantees in establishing linkages and consequences of such linkages
    d. contributions to wider international research and development community
4. Dissemination of research results
    a. determine impact of new approaches developed by project for communication and outreach
    b. assess quality of publications by US and HC scientists
        i. publication in peer-reviewed journals and other publications
        ii. usefulness of summary reports to end-users
    c. mechanism for dissemination of technology transfer
    d. integration within and across research sites
    e. effectivity of participatory research process on promoting access to and exchange of research results
5. Impact on end-users, host country institutional partners, communities where research is being conducted, and U.S. agriculture
    a. evidence that host country programs will evolve and develop, ensuring sustainability of CRSP moves to new sites
    b. developmental relevance on a global basis and for specific host countries

D. Financial
1. Evaluate fiscal and operational management of project by:
    a. management entity
    b. subgrantees/PIs
    c. AID
2. Submission of financial reports and vouchers
    a. timeliness
    b. needed modifications
3. Institutional cost matching
4. Operational costs

E. Special Interests
1. Contributions of project in supporting participation by U.S. and host country women at the scientist, training and producer levels
2. Use of expertise at U.S. land-grant and HBCUs

PROGRAM OPERATIONS

A. Current Research Program
1. evaluate complementarity of current research program and proposed research with priorities of ASARECA
2. evaluate progress in response to last EEP report, particularly recommendations listed on pp. 28-30
3. describe any new research results
4. determine impact of research achievements on US and HC producers and/or consumers
5. note reasons for any personnel changes since last Administrative Management and External Evaluation Reviews
6. describe progress relative to objectives stated in workplans and to similar research worldwide
7. enumerate reasons for deviation from workplans
8. describe quality of research
9. comment on adequacy of funding
10. evaluate quality of subgrant management by subgrantee institutions
11. determine degree of collaboration between US and HC scientists
12. describe support of AID Mission
13. assess contributions of collaborating institution(s)
14. indicate evidence of HC institutionalization
15. assay balance between domestic and overseas activities with respect to program objectives
16. evaluate economic viability of continuing program in same geographic region

B. Recently Closed Programs (Bolivia and Indonesia)
1. describe reasons for closure
2. evaluate impact of closure on HC institutions and HC participators
3. evidence that project-initiated research is continuing after closure
4. evaluate adequacy of personnel trained by project in terms of institutionalization in NARS programs
5. assess results of research since project inception
6. assess bilateral and regional impact of project in HC and US on:
    a. livestock development
    b. economic growth
    c. human nutrition and health
    d. environment
7. potential for future regional collaborative research

ANCILLARY ISSUES

A. Gender

The original CRSP design does not hold the programs accountable for gender-specific

development. However, in the interest of developing a progressive program, the following information will be important.

1. Agency policy is to emphasize and support participation and substantive contributions of women in the development process. Have gender issues been taken into account during project design and implementation?
2. Has a gender component been incorporated into all appropriate projects? Should there be a more directed approach towards incorporation of women into the program? How and where?

B. Buy-Ins

1. Has the ME been proactive in seeking buy-ins? Have buy-ins influenced the program and/or is the program dependent on buy-ins?
2. What attributes of the buy-ins have or have not worked?

C. Cost Effectiveness

1. In what ways has the CRSP been cost effective? Is there a way to evaluate cost-benefits of the program and its impacts on research and training?
2. What success stories are there to support/dispute cost effectiveness?
3. What impact has this CRSP had on US agriculture? impacts in the past five years?

D. Mission/IARC

1. Has the CRSP supported Missions' projects and strategic objectives?
2. Should the CRSP become more involved in technical assistance and service to the Missions?
3. What is the working relationship between the SR-CRSP and the IARCS? How can this be enhanced?

E. Information Dissemination

Since extension work has not been designated as a CRSP-specific activity, the CRSPs are not held responsible for impact of their research results, and subsequent adoption of materials and procedures by farmers. However, this will be useful for design of future programs.

1. Are concise summary reports issued for users in the LDCs? Is there a procedure for summarizing, cataloging and distributing CRSP results?
2. Is there a plan for information and technology dissemination and implementation to users? Has there been an effect attributable to technology transfer? Is there any mechanism/procedure to measure this?
3. Have CRSP results been regularly published in refereed professional journals?

BACKGROUND MATERIAL FOR TEAM

The team will receive reports and briefing materials for use prior to and during its reviews. Documents to be made available through G/EG/AFS and/or the CRSP ME are as follows:

1. Current Grant document
2. Project descriptions - Assessment Team reports
3. Annual workplans and annual reports for the past three years
4. Budgets for each participating institution and each
5. External Evaluation Panel Reports for the past five years
6. Assessment Teams' trip reports
7. Global Plan
8. Five-year record of incremental funding amounts and dates funds received, and vouchers submitted to ME by subgrantees and vouchers submitted by the ME to USAID

FINAL REPORT

The Review Team's final written report which addresses the specific items in Section IV should be completed and submitted to AID by July 15, 1997. Two copies of the final report and a copy of the report on a Word Perfect formatted diskette should be submitted to the AID Project Manager, Food Policy Division, Office of Agriculture and Food Security, Global Bureau, Agency for International Development.

APPENDIX 2

SR/GL CRSP YEAR-END CONFERENCE AGENDA
Tufts University
June 27-30, 1997

Friday, June 27, 1997

12:00 - 2:00	Registration - *South Hall*
1:00 - 2:00	**Lunch**
	Administrative Review Meeting Presentations - *Pearson Hall*
2:00 - 3:00	Welcome and SR/GL-CRSP Evolution Dr. Montague Demment
3:00 - 4:00	SR/Global Livestock CRSP in Context Dr. Gordon Campbell
	The Assessment Team Process Dr. Kenneth Shapiro
	SR/GL-CRSP Relevance to U.S. Ms. Jane Shey
	SR/GL-CRSP and the University of California Dr. Robert Shelton, UC Vice Provost for Research
4:30 - 4:45	**Break**
5:00 - 6:00	Regional Perspectives of SR/GL-CRSP Dr. Don Brown, ASARECA Representative Dr. Manuel Ruiz, IICA-RISPAL Dr. Mekhlis Souleimenov, ICARDA
	Benefits of CRSP Training Ms. Lita Buttolph and Dr. Robert Shavulimo
6:00 - 7:00	Advisory Panel Meeting - *Campus Center* Conference Procedures Feedback Guidelines
6:00 - 7:00	Administrative Review Meeting - *Campus Center*
7:00 - 9:00	Registration - *South Hall*

SR/GL CRSP YEAR-END CONFERENCE AGENDA
Tufts University
June 27-30, 1997

Saturday, June 28, 1997

7:30 - 8:00	Registration - *Pearson Hall (#55 on map)*
8:00 - 12:00	General Meeting - *Pearson Hall* Overview of Conference Presentation Process Public Presentation of Assessment Team Progress
12:00 - 1:00	**Lunch Break**
	Latin America Assessment Team Presentations - *Pearson Hall*
1:00 - 1:45	*"Land Use and Nutrient Management Decision Making in Latin America Agrosilvopastoral Systems"* Principal Investigator: Dr. Blake
2:00 - 2:45	*"Assessment of the Importance of Animal Products for the Nutrition of Young Children in the Andean Region: Team Building and Identification of Appropriate Animal Products"* Principal Investigator: Dr. Brown
3:00 - 3:30	**Break**
3:30 - 4:15	*"Livestock-Natural Resource Interfaces at the Internal Frontier"* Principal Investigator: Dr. Moermond
4:30 - 5:15	*"Livestock Information Network Development"* Principal Investigator: Dr. Williams
5:30-6:30	External Evaluation Panel Meeting - *Campus Center* Latin America Teams
7:00 - 7:30	**Reception - Mugar Hall** *Courtesy of Tufts University*
7:30 - 10:00	**Dinner - Mugar Hall, Faculty Dining Room** *Courtesy of University of California*

SR/GL CRSP YEAR-END CONFERENCE AGENDA
Tufts University
June 27-30, 1997

Sunday, June 29, 1997

East Africa Assessment Team Presentations: *Pearson Hall*

8:00 - 8:45	*"Diversification of Livestock Assets for Pastoral Risk Management and Regional Development in East Africa"* Principal Investigator: Dr. Coppock
9:00 - 9:45	*"An Integrated Management and Policy System for Conserving Biodiversity in Spatially Extensive Pastoral Ecosystems"* Principal Investigator: Dr. Coughenour
10:00 - 10:30	**Break**
10:30 - 12:30	General Meeting: *Pearson Hall* Question and Answer: Full Proposal Criteria Full Proposal Guidelines SR/GL-CRSP Five-year Proposal Timeline Assessment Team Process: Feedback & Discussion
12:30 - 1:30	**Lunch Break**
1:30 - 2:15	*"An Early Warning System for Monitoring Nutrition and Health of Livestock and the Food Security of Humans"* Principal Investigator: Dr. Dyke
2:30 - 3:15	*"Role of Animal Source Foods to Improve Diet Quality and Growth and Cognitive Development in East African Children"*
3:30 - 4:00	**Break**
4:00 - 4:45	*"Regionalization of the Kenya Dual Purpose Goat"* Principal Investigator: Dr. Valdivia
5:00 - 6:00	External Evaluation Panel Meeting: *Campus Center* East Africa Teams
6:00 - 8:00	Administrative Review Meeting (as needed)

SR/GL CRSP YEAR-END CONFERENCE AGENDA
Tufts University
June 27-30, 1997

Monday, June 30, 1997

Central Asia Assessment Team Presentations: *Pearson Hall*

8:00 - 8:45	*"GIS Modeling Tools for International Donors and Local Policy Makers to Understand and Predict Regional Trends of Rangeland Production in Central Asia"* Principal Investigator: Dr. Laca
9:00 - 9:45	*"The Impacts of Decollectivization"* Principal Investigator: Dr. Shapiro
10:00 - 10:15	**Break**
10:15 - 10:45	External Evaluation Meeting - *Campus Center* Central Asia Teams
10:30 - 12:00	Advisory Panel Meeting : Wrap-up - *Campus Center*
10:30 - 12:00	Administrative Review Meeting (as needed)
12:00 - 12:30	**Lunch**
12:030 - 2:00	Administrative Review Meeting - *Campus Center*

APPENDIX 3

PERSONS CONTACTED

Meetings were held with the following persons.

External Evaluation Panel
Glen Vollmer, University of Nebraska-Lincoln (Chair), Economist
Nancy Conklin-Brittain, Harvard University, Animal Nutritionist
David Sammons, Purdue University, Agronomist
Susan Thompson, Dartmouth University, Sociologist

Advisory Panel
Gordon Campbell, Cornell University, Assoc. Dean, Veterinary Medicine
Jerrold Dodd, North Dakota State University, Chair Animal and Range Science Dept.
Jane Shey, Livestock Agriculture Consultant
Ahmed Sidahmed, International Fund for Agricultural Development
Michel Simeon, World Bank
Ralph von Kaufmann, International Livestock Research Institute

Current and Past Principal Investigators
D. Layne Coppock, Utah State University
Corinne Valdivia, University of Missouri-Columbia
Travis McGuire, Washington State University
James DeMartini, Colorado State University
Jere Gilles, University of Missouri-Columbia

Management Office
Montague Demment, Director
James Scott, Assistant Director
Susan Johnson, Office Coordinator

USAID
Tracy Atwood
Joyce Turk, Program Manager

APPENDIX 4

Small Ruminant CRSP Summary of Facts

Project Title: Small Ruminant Collaborative Research Support Program (SR CRSP)
Note: The title in the renewal period will be Global Livestock CRSP

Grant No: DAN-1328-G-00-0046-00

Grantee: University of California, Davis

Program Director: Montague W. Demment

USAID Funding Obligated through 5/14/97: $15,951,180

USAID Funding Authorized through 9/30/68: $19,400,000

Expenditures reported to date: $14,253,590 Funds committed to 9/30/97: $929,056

Total US Institutions' matching contribution under this grant: $4,242,552
(30% of reported expenditures)

Total Host Countries' Contribution through 9/30/96: $31,784,549
(199% of USAID funding)

Current US Institutions holding primary subgrants:

1. University of California, Davis
2. Colorado State University
3. Cornell University
4. UCLA
5. University of Missouri-Columbia
6. Texas A&M University
7. Utah State University
8. Washington State University
9. Winrock International Institute for Agricultural Development
10. University of Wisconsin, Madison

US Institutions affiliated with primary subgrantees:

1. Emory University
2. University of Colorado
3. University of Kentucky
4. Oklahoma State University Experiment Station

US Institutions that phased out during this grant period:

1. Montana State University - 1991
2. Texas Tech University - 1995
3. North Carolina State University - 1996

Collaborating International Agricultural Research Centers (IARC)s:

1. International Livestock Research Center (ILRI)
2. International Center for Agricultural Research in Dry Areas (ICARDA)
3. International Potato Center

Collaborating Regional Organizations:

1. Central Asia: Association of Central Asia Livestock Research Academies (ACALRA)s
2. East Africa: Association for Strengthening Agricultural Research in Eastern Africa (ASARECA)
3. Latin America: Institute for Inter-American Cooperation in Agriculture (IICA)

Cooperating NGOs:

1. CARE
2. Farm Africa
3. Heifer Project International
4. CONDESAN
5. Overseas Development Institute

Private Sector Cooperation:

1. American Breeders Service
2. Global Knowledge
3. Group Danone
4. Houston Livestock Association
5. Land O'Lakes

Foreign Collaborators:

1. Almaty Agricultural University
2. Kazakh Scientific Research Institute
3. Kazakh State University
4. Kazakh National Academy of Sciences
5. Institute of Ecology and Sustainable Development (Kazakhstan)
6. Kenya Agricultural Research Institute (KARI)
7. Universidad Nacional Agraria La Molina
8. Panamerican Agricultural School, Zamaro
9. Ministry of Agriculture and Fisheries, Belize
10. Children's Nutrition Research Center
11. Institute of Nutritional Research
12. Makerere University

13. University of Nairobi
14. Muhimbili University (Tanzania)
15. Uzbek Academy of Agricultural Sciences

Collaborating CRSPs:
1. SANREM
2. BASIS

Countries phased out during this grant period:
1. Morocco 1994 - the project matured to graduate status
2. Bolivia 1995 - research and operational difficulties
3. Indonesia 1996 - project was graduated at the request of USAID/I

Advisory Panel:
1. Edwin Price, Chair, Texas A&M University, Asst.Vice Chancellor for International Agriculture
2. Gordon Campbell, Cornell University, Associate.Dean, Veterinary Medicine
3. Jerrold Dodd, North Dakota State University, Chair, Animal and Range Science Dept.
4. Jane Shey, Livestock Agriculture Consultant
5. Ahmed Sidahmed, International Fund for Agricultural Development
6. Michel Simeon, World Bank
7. Ralph von Kauffman, International Livestock Research Institute

External Evaluation Panel:
1. Glen Vollmar, Chair, University of Nebraska, Lincoln, Economist
2. Nancy Conklin-Brittain, Harvard University, Animal Nutritionist
3. David Sammos, Purdue University, Agronomist
4. Susan Thompson, Dartmouth University, Sociologist

Assessment Teams:

Central Asia
1. Emilio Laca, Leader, UC Davis: GIS Modeling Tools for International Donors and Local Policy Makers to Understand and Predict Regional Trends of Rangeland Production in Central Asia
2. Kenneth H. Shapiro, Leader, U. of Wisc., Madison: Impact of Decollectivization in Central Asia

East Africa
1. D. Layne Coppock, Leader, Utah State U.: Diversification of Livestock Assets in East Africa
2. Michael Coughenour, Leader, Colorado State University: Integrated Management and Policy System for Conserving Biodiversity in Spatially Extensive Pastoral Ecosystems of East Africa

3. Paul Dyke, Leader, Texas A&M University: Early Warning System for Monitoring Nutrition and Health of Livestock and the Food Security of Humans in East Africa
4. Charlotte Neumann, Leader, UCLA: Role of Animal Source Foods to Improve Diet Quality and Growth and Cognitive Development in East African Children
5. Corinne Valdivia, Leader, University of Missouri-Columbia: Regionalizing the Kenya Dual Purpose Goat in East Africa

Latin America

1. Robert Blake, Leader, Cornell University: Land Use and Nutrient Management Decision Making in Latin America Agrosilvopastoral Systems
2. Kenneth Brown, Leader, UC Davis: Children in the Andean Region: Identification of Appropriate Animal Products
3. Tim Moermond, Leader, Univ. of Wisconsin-Madison: Livestock-Natural Resource Interfaces at the Internal Frontier
4. Gary Williams, Leader, Texas A&M University: Livestock Information Network Development for the Americas

Continuing Projects - Kenya

1. Economic Analysis of Small Ruminant Production and Marketing Systems
   Hendrick Knipscheer, Principal Investigator, Winrock International
2. Multivalent Virus Vectored Vaccines for Goats
   Travis McGuire, Principal Investigator, Washington State University
3. Breeding Dual Purpose Goats in Kenya
   Jeremy Taylor, Principal Investigator, Texas A&M University
4. Dual Purpose Goat Production Systems in Kenya
   Jim Yazman, Principal Investigator, Winrock Intenational
5. Sociological and Economic Analysis of Small Ruminant Production Systems
   Corinne Valdivia, Principal Investigator, University of Missouri-Columbia

APPENDIX 5

PLAN FOR GLOBAL LIVESTOCK CRSP

RATIONALE

Recognizing that we are working against the constraint of time, we have drafted a plan that will enable the Program to move forward on a timely basis. This plan allows the flexibility required to implement a high impact program responsive to the evolving needs of the principal stakeholders, i.e., host country participants, regional agencies/ organizations, collaborating entities (e.g., IARCs, NGOs, producers' groups, donor agencies/organizations, other CRSPs, etc.), USAID (both Missions and Washington) and the U.S. institutions.

It was clear from the discussions at the GL CRSP planning meetings held at Winrock International (Arkansas) in May 1995 that in order to have a successful Program, the planning process must be from the bottom up as well as from the top down. We plan a series of input levels from global to regional to national at at least two levels. There is bottom up input at the regional and national levels plus the field fact finding missions. The Advisory Panel will provide input at the global level and define regional geographical areas of focus as well as advise on the process for selecting and prioritizing researchable constraints. The Panel will not only assist and advise during the planning phase but will assume the role of the Technical Advisory Board during the tenure of the follow-on grant. The TAB will facilitate the integration with and complimentarity of other donor organizations thus attracting the dollars from other sources than USAID.

At the regional level, experts and senior host country personnel comprising regional bodies can provide top down input. USAID and other major donors provide input on regional programs and target objectives. Regional priorities can be presented for GL CRSP consideration by regional agencies/organizations and they can define CRSP oriented problems with realistic and achievable objectives. We envision regional workgroups headed by capable teamleaders who will facilitate communication and engender cooperation through collaborative research planning, budget development and project implementation.

Host countries input - Programmatic information and research interests through national organizations, collaborating entities as well as through regional organizations and USAID Missions as well as host country project definition teams.

Why the regional focus?

1. Many of the policy issues the CRSP is asked to address are regional in scale.
2. We are interested in issues with wider impact and application than a single country, e.g., trade issues, transhumanist matters, common currency exchanges and indefinite national borders, etc.

3. The emergence of regional organizations, e.g., ASARECA, CILS etc., and host countries' growing recognition of the advantages to be gained from regional affiliations and linkages in addressing development constraints.
4. Donor organizations are shifting to regional approach
5. A Regional outlook complements the current trend in USAID to consider issues on a regional basis.
6. We can maximize the impact of the dollars and research invested in the Program.

Proposal Summary

The proposal will be policy driven and built around a limited number (e.g., three) geographic regions with broad research themes to be carried out in geographic regions with differing ecozones. It will be less monolithic; it is designed to be responsive to bottom up as well as top down needs and interests. The Plan will be for a ten year period with a midpoint review after the close of the fifth year. Funding commitments (obligations) by USAID will be in three year increments; each increment will be committed one year prior to the expiration of current operating period, i.e., the second increment will be confirmed at the close of year 1 and third increment will be confirmed at the close of year 2, etc. Specific research projects/activities and countries as well as participating U.S. institutions will be selected throughout the life of the grant. The Program will be multidisciplinary including social as well as biological sciences. The disciplines and institutions will vary according to need throughout the life of the grant. The length of specific activities and projects will vary according to need as will the participating institutions. A small grants component will be an integral part of the Proposal thus enabling broader participation both in the U.S. and internationally. UC Davis, as the Management Entity, will oversee the administrative functions and guide the research.

Modus Operandi

Planning period-start up: A small Advisory Panel with relevant expertise and representing a mix of interests and perspectives on livestock production in the context of international development will assist the Program Director by:

1. Advising on geographic regions with interest in and need for assistance in livestock technology and research.
2. Helping to identify and articulate broad research themes.
3. Advising on defining procedures for soliciting and awarding project/ activities.
4. Review proposal drafts and concur on the final proposal to be submitted to AID.

On-going: The Director will issue calls for Project proposals based upon need and funds available. The need can be identified by a host country participant, result of a research

finding, a request by USAID/W, a request of the Technical Advisory Board or the result of an observation by a U.S. participant or an unsolicited proposal by a nonparticipating scientist from an eligible institution. The Director can issue a call to an individual researcher, an institution, an organization, another CRSP, IARC or advertise on a regional, national or international basis. All proposals over $75,000 will be reviewed by at least three objective peers with appropriate training and experience for the proposed project. Each project will submit an annual progress report or end-of-project report which will be combined into a Program Annual Report. All project proposals with a budget of $75,000 or more will be reviewed with the Board prior to final approval. Approved projects and activities will be funded for the life of the project/activity or in annual increments, whichever is shorter. All specific research projects/activities will be developed jointly with the participating foreign counterparts from the inception.

The U.S. participant will operate under a subgrant from the Management Entity. When deemed necessary or advantageous, Affiliation Agreements will be signed with regional organizations/agencies, e.g., ASARECA, CILS, etc. The foreign regional agency will advise the Program Director and the Technical Advisory Board on the research and training priorities in that geographic region; serve as liaison with specific countries and collaborating counterparts at operating sites; and facilitate negotiations of Memoranda of Understanding with host country collaborating entities.

Organizational Structure

The Global Livestock CRSP will be under the executive direction of the Program Director guided by a Technical Advisory Board, an Evaluation Panel and the USAID Program Manager. The Director will appoint Regional Team Leaders to coordinate, assist, and advise on regional issues and progress.

Technical Advisory Board (TAB)

The Technical Advisory Board will consist of five voting members and one ex-officio non-voting member, the USAID Program Manager. The five voting members represent diverse segments of the international research and development community, e.g., private producers' groups, NGO/PVOs, and administrators from a land-grant institution, e.g., Director of International Programs and other major donor agencies, e.g., World Bank. No one TAB member may serve more than three consecutive years. The TAB will advise the Director on technical proposals, program progress and budget management including suggesting coordination and integration with complementary donor projects.

Evaluation Panel

The Evaluation Panel will consist of five experts with relevant experience and training from institutions/organization that do not have Livestock CRSP subgrants or contracts. The Evaluation Panel will review the program at least every three years for technical progress and make recommendations to the Program Director.

Discussion

The transition from the current Small Ruminant grant into the follow-on Global Livestock will be bridged through an emphasis on transferring the appropriate SR CRSP technology in the regions chosen for the GL CRSP while detailed projects and activities are being formulated and well developed. Some of the elements of the SR CRSP have worked well; the long-term relationships between U.S. scientists and institutions with host country personnel and institutions/organizations is a notable one. We will draw upon these strengths as we work up project implementation plans. The new proposal will broaden our U.S. and foreign institutional base. The GL CRSP format will mitigate Principal Investigator burnout, facilitate participant competition and afford more opportunity for the junior scientists to get involved both at the U.S. and host country level. The GL CRSP design aims to eliminate any perceptions of an entitlement Program for subgrantees.

CRSP experience suggest institutional relationships, choices of and by both U.S. and host country, are as important to grant success as the subject matter. With this in mind, we have built into the design of the new Program, the capability to assess relationships of U.S. institutions with foreign counterparts and evaluate their ability to work together.

The new operating guidelines will require all P.I. vacancies to revert to the Director for reassignment for competitive bidding. The P.I. will be evaluated more often and the structure will promote more timely replacement of less productive P.I.s.

The small grants component will motivate young scientists with interest and creative ideas to become involved in international research and development early in their careers by providing opportunities for an entree into international research. The small grants component also combats the hazard of stagnation over the long term of the Program.

APPROACH TO DEVELOPING GLOBAL LIVESTOCK GRANT

October 1995 Convene the Advisory Panel

Objectives:
- Select and prioritize the target regions and identify potential foreign collaborators
- Recommend overall Program goals
- Establish process by which regional and national programs will be developed
- Define the beneficiaries (who are we trying to serve?)
- Select broad regional research themes to pursue
- Discuss grant design and structure
- Compile researchable constraints within broad themes and rank according to priority
- Compile informational needs for further decision, appoint ad hoc

	subcommittees or study teams and set target dates for follow-up Decide on workshops, meetings, exploratory visits that will assist in fleshing out the grant design and proposal along with suggested dates Inventory existing technology that can be readily transferred during the transition period while the new research projects/activities are being developed and proposed for subgrants Discuss how inputs and impacts assessment models for this plan will be characterized in this proposal Elicit from USAID exactly what must be included in the final submission for grant renewal, who is the audience in AID, is a Strategic Framework essential?
October 23-30	Summarize the discussions from the October 19 & 20 meeting (Frank Byrnes).
November	Consultations with Regional groups and interested parties in priority regions Workshops in promising sites using data and technology developed by SR
Late November	Convene the Advisory Panel to review drafts and discuss information gained since the initial meeting. Update the planning timeline and determine follow-up requirements.
January 1996	Final draft review by Advisory Panel
February 1996	Formal submission to USAID/W

APPENDIX 6

RE-ENGINEERING A CRSP

The Small Ruminant Livestock Collaborative Research Support Program (SR-Livestock CRSP) was challenged by USAID to re-engineer and redesign its program for a five-year grant extension. In addition, USAID strongly encouraged this livestock CRSP to become a policy project instead of a technology development entity.

Traditionally, global constraints defined by U.S. university researchers led to an RFP. Grants were awarded, teams formed and developed research workplans based on the preselected constraints to production.

Using Agency re-engineering guidelines, the CRSP set the following objectives for its design process. It would:

1) be customer oriented;
2) reduce transaction costs;
3) diversify its granting mechanism;
4) develop a more effective assessment of constraints;
5) diversify its partnerships; and
6) orient its research regionally instead of bilaterally

The Livestock CRSP asked:

*how are sound collaborative relationships built between/among IARCs and CRSPs, and

*how could this CRSP meet its six objectives in the re-engineering process?

To answer question one, the Livestock CRSP queried its principal investigators as well as a university/IARC liaison to the World Bank. In order to develop good collaboration, it would have to bring partners and collaborators together in the development phase, and not add them to the program post facto only to conduct research. This participator approach has been used throughout the planning and development of the CRSP redesign.

Reducing transaction costs required several innovative steps. To meet objectives two and five, the CRSP Management Entity condensed the functions of a number of advisory boards into one Advisory Panel composed of U.S. university, CRSP External Evaluation Panel, IARC, other donor, World Bank, NGO, private sector and USAID representatives. Each Panel representative is experienced in international private and public sector livestock development at the global, regional, smallholder, and commercial levels, thus bringing objectivity, current technical expertise, and a broad perspective to the re-engineered program.

From the outset, this Panel guided the CRSP Management Entity by identifying major topical and geographic areas of focus. The Advisory Panel defined three geographic

regions (LAC, AFR, and NIS) and three primary topical areas, each containing a policy element:

- the role of livestock in economic growth,
- the role of livestock in human nutrition, and
- the impact of livestock on the environment.

The Livestock CRSP adopted a customer-driven, regionally-oriented approach (objectives one and six). In the three geographic regions selected, the Livestock CRSP conducted workshops to solicit input solely from regional policymakers and scientists. Regional workshops also included representatives from NARCS, IARCs, and NGOs (meeting objective five) as well as the Livestock CRSP Management Entity and local AID representatives. These host country groups defined constraints for the region in a "problem model" format. These constraints (problem models) drove the formation of a proposal, not vice versa.

At the workshops, each problem model fit one of the three general areas of research (environment, human nutrition, economic growth) and was framed as a hypothesis. Participants prioritized the problem models in order of importance for the region (not for individual countries within the region). The problem models were reviewed by the Advisory Panel which suggested some amalgamation and priority setting among the short list. From the Advisory Panel's recommendations, an RFP for one-year grants was competitively bid by U.S. institutions. Winners of these grants are fielding Assessment Teams which will solidify regional relationships among scientists, producers, NARS; redefine problems models; and develop long-term proposals, thus engaging the customer at every step of the process (objectives one, four and five.)

The Management Entity has formed regional linkages with three important public sector groups: in the NIS, a newly developed scientific partnership among policymakers of the five "stans"; ASARECA in East Africa; and IICA in Latin America. Memoranda of Understanding have been written between the Livestock CRSP and each one of these entities, so that regional research and technology transfer is supported.

During FY97, prior Livestock CRSP research which had been conducted on a bilateral basis will be reviewed for regionalization impact and potential inclusion in the redesigned program. The Management Entity and the Advisory Panel also will be evaluating the performance of the Assessment Teams. In June 1997, the Assessment Teams will make presentations describing their research to AID and the Advisory Panel. Full proposals for a second and final cut will be due in July 1997 which the CRSP will incorporate into its extension proposal to AID.

APPENDIX 7

Schedule of Events
May 1995-October 1996

May 1995	Synthesis Meeting, Arkansas
October 1995	Advisory Panel Meeting, Washington, DC
January 1996	East Africa Workshop, Uganda
February 1996	Central Asia Workshop, Uzbekistan
April 1996	Latin America Workshop, Costa Rica
June 1996	Advisory Panel Meeting, Davis, California
July 1996	Call for Assessment Team Proposals
July 22, 1996	Bidder's Conference, Chicago
August 23, 1996	AT Proposals Due
Sept. 29-30, 1996	Advisory Panel Meeting, Chicagp
October 1996	Assessment Team Award Announcements

Schedule of Events
October 1996 - October 1998

October 1996	Assessment Team Award Announcements
March 1997	Five Month Progress Report
June 1997	Year-end Conference
July 1997	Full Proposal Due
September 1997	Advisory Panel Meeting
October 1997	Assessment Team Award Announcements
December 1997	Renewal Proposal Due at USAID
February 1998	Formal Presentation at USAID
October 1998	Global Livestock CRSP Begins

APPENDIX 8

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EXTERNAL EVALUATION PANEL REPORT

1996 - 1997

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INTRODUCTION

The last External Evaluation Panel (EEP) review report for the Small Ruminant Collaborative Research Support Program (SR-CRSP) was done during 1995. During this period, the EEP did an on-site review of the Kenya Project and a paper review of the Bolivia and Indonesia projects. This was the beginning of the transition of the SR-CRSP to the Global Livestock CRSP (GL-CRSP) and its realignment with the United States Agency for International Development (USAID) reengineering philosophy. The SR/GL-CRSP Advisory Panel was formed and discussions regarding SR-CRSP changes were discussed and future plans for the CRSP began to evolve. The SR/GL-CRSP Management Entity (ME), USAID/Washington based staff and the Assessment Teams (AT) showed enthusiasm and positive support for the extension of the SR/GL-CRSP program reorganized to include global, reengineered approaches.

The SR-CRSP EEP was reorganized in 1997. The members of the panel include David Sammons, Purdue University; Nancy Lou Conklin-Brittain, Harvard University; Susan J. Thompson, Dartmouth College and Glen Vollmar, University of Nebraska, who serves as EEP Chairperson.

The 1996-1997 EEP review was based on a paper review, EEP participation in the SR/GL-CRSP Year End Conference held at Tufts University, June 27-30, 1997, and research done by individual EEP members. The Management Entity provided ample background information, including reports and financial information for the EEP review. The 1996-97 period was a period of CRSP transition with Assessment Team activity and the generation of new proposed projects. The EEP met in Chicago, August 23-24, 1997, to finalize a draft of the EEP report.

The EEP evaluation and an Administrative Review were done concurrently. The EEP recognizes that there may be some duplication in its report and the Administrative Review report.

The EEP extends its thanks to Susan Johnson (ME staff) who provided the arrangements for the EEP to carry out its work and for putting the report into draft and final form. The EEP also appreciates the support of Joyce Turk (USAID), Montague Demment (ME), and Jim Scott (ME) for their support of the EEP review. The EEP also extends its appreciation to all of the participants in the SR/GL-CRSP Year End Conference who provided information that was most useful in the review process.

The EEP submits its evaluation report and recommendations in hopes that they will contribute to the CRSP during its transition to a new era of global livestock collaborative research.

PROGRAM ADMINISTRATION AND MANAGEMENT

TRANSITION AND REENGINEERING

The 1997 External Evaluation Panel has been asked to comment on SR/GL-CRSP transition and implementation of USAID's new reengineering philosophy. In order to conform to USAID's new post-cold-war focus, various changes have been made in how the SR-CRSP operates. In the past, most of USAID's traditional technical divisions have worked with very narrow focuses, sometimes referred to as "stovepipes," without sufficient regard for spillover effects among the various sectors. These stovepipes reinforced institutional isolation of sector specific Strategic Objectives within Missions, and very likely within global USAID projects like the CRSP programs. Changes such as decentralization and community-level strategic partnerships have been tried at a few, selected missions and have been shown to improve the effectiveness of USAID's work.

All of USAID's missions and projects, including the CRSPs, have been asked to step back and consider global perspectives and to stop focusing exclusively on narrowly defined and disconnected technical projects. While technical projects will always be necessary, they need to be part of a research network that considers "spillover effects" and the interconnectedness of all the necessary components of development in a country or region. The original SR-CRSP was narrowly focused, although it is important to point out that it published important and needed technical information, and would probably continue to do so if kept in its original format. However, the time has come for USAID to consider the broader picture of the status of the world and to develop coordinated global strategies. Under this new mandate, SR-CRSP, and presumably all of the CRSPs, need to broaden their approach to technical questions.

The SR-CRSP has substantially redesigned itself in response to USAID's reengineering objectives. There are two aspects to the redesign/reinvention of the SR-CRSP; one is its internal reorganization and the other is a response to USAID's reengineering mandate.

Response to USAID's Reengineering

USAID's new mission is described as emphasizing broad-based economic growth, environment, population and health, and democracy. As such, the original SR-CRSP format was too narrow. Based on the EEP Reports and SR-CRSP Annual Reports, the original SR-CRSP emphasis was more specifically on the small ruminants themselves (health, breeding, feeding) without much consideration of their role in the larger national or regional economy. In defense of the old system, small ruminant research needed that

kind of attention. Small ruminants were a neglected group of domesticated livestock. However, we are becoming increasingly aware of the importance of broadening research goals to include studying the impact of livestock on the environment and what is needed to design effective national/regional livestock policies. These are two of the major goals for the new SR/GL-CRSP, and have led to the proposed renaming of the SR-CRSP to the Global Livestock CRSP (GL-CRSP).

The following are goals appropriate to CRSPs that USAID has published as part of its reengineering strategy. These goals are also part of Vice President Al Gore's New Partnership Initiative (NPI):

Meeting customer needs and achieving results. SR/GL-CRSP, by holding workshops with resident scientists, NGOs, IARCS, NARS, local leaders, and the private sector in the countries where the CRSP plans to work, is determining the customer needs and targeting those needs in the proposal writing process;

Participation & teamwork. In the context of SR/GL-CRSP, this includes teamwork between US scientists and host country scientists, which has received heavy emphasis in the new design;

Enhance accountability. In the context of the SR/GL-CRSP, this includes the switch to making the individual Principal Investigators (PIs) accountable for the funds being granted, instead of doing so at the university level. This will be more thoroughly discussed later.

Some of the more detailed goals of NPI included in the SR/GL-CRSP are:

Local capacity building. In general, the SR/GL-CRSP emphasizes the inclusion of a training component in the grant proposals;

Strengthening the local enabling environment. This goal and the above are reflected in the way SR/GL-CRSP has reached out and diversified contact and participation of local organizations, IARCS, NGOs, NARS, etc.;

Fostering strategic partnering. This is reflected in the emphasis placed on obtaining matching funds. This makes it possible to leverage resources from other donors and local stakeholders, and to make sure activity will continue after USAID is gone, encouraging local ownership of programs and enhance developmental impact. The CRSP has always operated using matching funds.

SR/GL-CRSP Internal Reorganization

Part of the current redesign of SR/GL-CRSP provides more frequent opportunities to review projects and make changes if necessary. The previous system gave fairly long-term grants to universities, not individual researchers, without a mechanism to make changes as conveniently as this new system is designed to do. The new system also enhances accountability. Specifically, the new system awards grants to the individual PIs, making them individually responsible for the use of the funds and the results obtained. If the PIs change institutions, the money is not reassigned to someone at the original institution, who is perhaps less committed to the project. The funds either revert back to the ME or can go with the PI to his or her new institution. The funds are distributed in 3-year grants. If a project has accomplished its goals in three years, the

remaining funds become available for a new project with new researchers subject to the same selection process the original project went through. If, however, the project is long-term and is judged to be progressing satisfactorily, another three year allotment of funds can be awarded. This new system is more flexible and competitive, and seems likely to achieve the results desired by the newly reengineered USAID.

Another part of the current redesign of SR-CRSP is to include all ruminants, and, perhaps, swine and chickens: Global Livestock or GL-CRSP. The EEP applauds this expansion.

Refocused Goals

Starting in 1995 with the Synthesis meeting three major research themes have been chosen as the focus of SR/GL-CRSP:

- ***The role of animal products in nutrition & child development.***

This is the narrowest of the new goals, but highlights the very important and unique position of livestock in a community's and region's development. One complicating aspect to the narrowness of this goal is, unfortunately, reflected in the difficulties that the PIs have had in writing regional research projects, particularly given the limited funds available for SR/GL-CRSP projects. There are still some important points of contention in the literature regarding the contribution of animal products to micronutrient nutrition of children that need some specific manipulatory-type experiments to clarify. Two proposed projects address their research to clarification of animal product contributions. These are, however, very costly projects that are difficult to regionalize. Most of the other new projects addressing this research theme make use of general ecological survey-type techniques that are more applicable at a regional level. Nevertheless, it is important to consider giving these narrower nutrition projects consideration because of their potential regional application, although the projects themselves are not regional.

This research theme gives the results of the SR/GL-CRSP a domestic US as well as international impact. The livestock industry in the US and overseas needs to demonstrate its unique position in the human diet. It would be difficult to find a significant-sized population of children all in one convenient location in the US who are on a diet devoid of animal products. Consequently it would be very difficult for researchers to clearly demonstrate a need for animal products for optimal cognitive development in children in the US. In developing countries, however, there are substantial populations of children, even whole villages, who are not consuming significant amounts of animal products in their daily diet. It is both easier and more humane to add items to a child's diet rather than to subtract items from their diet. This allows researchers to clearly demonstrate what has been suggested in previous research, that animal products, especially meat, are critical for optimal child development. This has important implications on the diet of people in the US where vegetarian diets are increasingly popular.

- ***Livestock's impact on the environment.***

This research theme includes both production systems for poor farms and the natural systems-livestock interaction, that is, the production-conservation interface.

This goal is very adaptable to the regional focus of the GL-CRSP, as is seen by the research proposals, most of which are

essentially ecological survey-type projects. This goal also addresses head-on one of the most frequent criticisms of funding livestock production research on the part of environmentalists in developed countries. The importance of addressing this criticism cannot be over-emphasized. This goal is also tightly linked to the animal products and child development goal above - it is important to clearly demonstrate the true need for animal products in the diet of children for optimal cognitive development. Environmentalists and animal-rights activists in developed countries (including the USA) advocate the cessation of livestock farming, at home and overseas. For USAID (as well as USDA) to be able to justify continued support of livestock production research, it is necessary to provide data showing both the need for animal products in human diets and livestock management options that do not damage the environment.

This research theme also has a clear domestic impact. Developing methods for monitoring and alleviating livestock impact on the environment, and demonstrating that livestock production can occur without damaging the environment will have a beneficial effect in the US.

- ***The role of policy to enable economic development of the livestock sector.***

This SR/GL-CRSP research theme clearly addresses USAID's ultimate goal to assist a country or a region to be self-sufficient and to put in place a sustainable infrastructure to assure the country's or region's ability to stay self-sufficient. The development of predictive models are needed for policy-makers to design sustainable marketing systems, prevent famines, and improve the health and nutrition of all the people in a given region through the effective inclusion of livestock in the region's economy. This goal, and the research proposals addressing this issue, are clearly regionally focused.

Customer Orientation and Diversification of Participants

Overall, the reengineering of the SR/GL-CRSP has been well thought-out and directed. In addition to the technical aspects, the redesign has made good use of human resources from various perspectives. In particular, the redesigned SR/GL-CRSP improves the use of human resources involving the host country's personnel. In the past it appears that the SR-CRSP designed projects with relatively little input from the host country's scientists. Upon arrival in the country, a PI's first task was to convince the NARs to work on the project as it was already designed. Under reengineering, the AT process established extensive contacts and conducted workshops to obtain as much input from host country experts as possible. This should result in a better designed project, and one that addresses host country/region needs more directly. This kind of liaison is particularly important given that the CRSPs are among the only major USAID programs that are long-term and collaborative in nature.

At the Year End Conference the EEP had the opportunity to meet with the Assessment Team PIs, coPIs, and a few host country coPIs. There was general consensus that the nine month planning grant was extremely useful and important. In particular the AT members said that an assessment period was critical to establish contacts in new areas, especially Central Asia. The PIs felt this process allowed the host country participants to be invested in the project from the very beginning and that this was a more efficient way to develop proposal goals. They also felt that the

Advisory Panel's consolidated problem models helped focus the ATs but were still flexible. The step by step evaluation process permitted the production of better proposals. In the opinion of most of the PIs, their chances of finding alternative funding, if not funded by USAID, were improved by having done so much preliminary work.

One of SR/GL-CRSP specific goals is to increase its customer orientation and diversification of participants. Insofar as the host country coPIs represent the customer, some of their comments are as follows: host countries liked having had preliminary contact and participation in planning, whether or not a given project gets funded. Host country people appreciated the opportunity to describe their own research programs. They felt the workshops and meetings determined local needs more accurately. The workshops also resulted in host country coPIs who were better prepared to take the lead in country.

Most of the AT proposals also do an excellent job of diversifying the participants in their projects. In the host countries, Assessment Team PIs have gone beyond the traditional linkages with host NARs. In the US, collaborators are coming from a wider group of institutions, moving the GL-CRSP beyond the narrow "closed shop" of the SR-CRSP.

Cost Effective Redesign

In general, all of the CRSPs have been successful in leveraging USAID funds and, in the past, the SR-CRSP has more than matched the dollars contributed by USAID. The current SR/GL-CRSP has put much emphasis on the requirement of leveraging other funds in order to successfully obtain funding from USAID. In addition, SR/GL-CRSP is designed to make maximum use of already existing laboratories by host country scientists, which further reduces costs, rather than maintaining US personnel overseas or processing all lab work in the US.

The assessment team process has received praise from the participants, both US PIs and host country coPIs. By funding a nine month preliminary period, the projects that USAID is ultimately able to fund can begin immediately. The clear distinction between the assessment team phase and the final phase increases efficiency. The ATs knew they had nine months to collect preliminary information and data. This created a stronger research proposal and should eliminate lost time during project initiation. The increase in efficiency should be substantial.

The administrative framework of the SR-CRSP has also been changed. An Advisory Panel (AP) was formed initially to help with the reengineering of SR/GL-CRSP but will eventually function as an advisor to the ME in the selection of projects to be funded and the subsequent monitoring/re-evaluation of these projects. The Advisory Panel replaces the Board of Directors (BOD), Administrative Council (AC) and Technical Committee (TC). One of the general recommendations from the last EEP report (1994-1995) was the need for independent, third-party evaluations of research and that the resulting allocation of funds be consistent with the evaluation. The creation of the AP and the elimination of the BOD, AC and TC is a result of this recommendation and appears to be well warranted.

Comments

The Management Entity has been especially successful in the reengineering of the CRSP. If the final proposals are as strong as the presentations in June, the AP and ME will have some very difficult decisions to make. There exists a strong regional focus in the AT's preliminary work. The potential for funding multiple projects with different problem models in the same region is also a strength. The interaction between research teams has the potential of providing an important synthesis of findings within regions, a synthesis that has been missing in earlier SR-CRSP projects. The EEP does, however, have concerns about translating the regional focus into a true global research project.

There is also a stronger focus on action-oriented research in the AT proposals whose end-user is the residents of the regions. And, in most of the AT proposals, there are measurable outputs and potential impacts at the end of the funding cycle.

RECOMMENDATIONS

Overall the redesign of the SR/GL-CRSP is very complete. There are a few recommendations to improve some details that came up during small group meetings at the 1997 SR/GL-CRSP Year End Conference:

- ❑ The definition and role of the Advisory Panel and EEP needs to be clarified.

- ❑ The TC gave the opportunity for the PIs to get together and compare notes and discuss science. At the conference in Boston some mention was made of developing such a forum but with a different format than the former TC. The EEP supports this idea for the sake of globalization and to facilitate communications between all participants.

- ❑ Since cattle will be included in the GL-CRSP, care should be taken to monitor against a tendency to serve only large-scale livestock producers. By focusing on small ruminants in the past, the SR-CRSP was also ensuring that it would target the poorer, smaller farms. Including all livestock increases the flexibility of the GL-CRSP, which is definitely useful at a regional level. Nevertheless, care should be taken to preserve the original spirit of the SR-CRSP and not leave the small farms behind.

- ❑ For maximizing efficiency, the October fiscal year is awkward. For example, in Central Asia, this coincides with the beginning of winter. With the expansion of SR/GL-CRSP out of the tropics, an earlier fiscal year is more appropriate.

- ❑ The EEP notes that no process is in place to bring in new participants. Based on the success of the reengineering process used by the SR/GL-CRSP, the EEP recommends that this process be used in the future as a mechanism to bring in new regions and/or new problem models.

- ❑ The current redesign of SR/GL-CRSP presents a well rounded package of development, if all the projects were to be funded. As it stands, there is only enough funds for about five to be funded, meaning that each region will only have a part of the whole picture. SR/GL-CRSP has developed a complete, integrated package, and now the ideal scenario would be for USAID to fund the whole program so that a true global program can be realized.

TRAINING AND INSTITUTIONAL DEVELOPMENT

While it is recognized that the training component of the SR-CRSP was affected by the decrease in funding by USAID in the early 1990s and the complete cessation of funds in 1994/1995, the SR-CRSP has a relatively weak record in training during the last grant period, while institutional development has been better. A successful model for training was developed in Bolivia where undergraduate students at local universities were integrated with on-going research at the site. This enabled students, mostly from urban areas, to get direct practical experience with field research, participate in the daily activities of rural communities, and see first hand the local knowledge and skills of the community residents as well as the conditions under which rural peoples live and work. Indonesian and Kenyan students were also trained by the SR-CRSP. The Bolivia SR-CRSP also had a strong training component for US students—it linked with a Ph.D. student who had received a SSRC-Ford Foundation Pre-Dissertation Fellowship, as well as supporting the field research of a number of US students. In contrast, the Kenyan and Indonesian projects did not appear to support US students.

In the reengineered CRSP, there is an unspoken emphasis on training. Yet, training was not listed as a specific criteria in the materials sent to the PIs, and therefore is not addressed in detail in many of the annual reports presented at the conference. It is, nevertheless, something the ME, AP and USAID are emphasizing and should have been made clearer from the start to the ATs.

Formal training (outputs) needs to be re-evaluated and potential alternate host country training scenarios developed (impacts). As training has been operationalized in the past, formal training of US students has been limited to graduate student research culminating in an M.S. or Ph.D. degree. Formal training of host country students locally has also included bachelors degrees. Little attention has been directed at the training component that workshop attendance, even as an observer, provides or to shorter-term participation on research projects in the host country at all level of post-secondary education. Non-formal educational training activities targeted at farmers and other community residents are also essential components of a comprehensive training plan. In the host countries, training continues to occur both formally in the support of undergraduate, graduate and post-doctoral studies and at the local level with the training of producers, NGO and government personnel through short-courses, workshops, and demonstration farms.

Institutional development seems to have been successful in the Kenyan and Indonesian projects. The introduction of technologies to breed the Kenya Dual Purpose Goat (KDPG) will remain available to researchers at Kenya Agricultural Research Institute (KARI) and will enable the Institute to continue work in this area. That there has been a positive impact on the "sustainability of CRSP research" can be garnered from the 1994/95 fiscal year when funding for the CRSP was eliminated. KARI found funds internally to maintain the project's research. The fact that the KDPG is already being regionalized is another indication that this particular CRSP project is sustainable. In Indonesia, the cooperative agreement signed by the participants in the Indonesia-Malaysia-

Thailand Growth Triangle is an indication that the Indonesian SR-CRSP research is also sustainable.

The potential benefits to US institutions remains high. The access to research centers for the international training of US personnel and the ability to establish collaborative research are just two benefits. The benefits to students in US institutions have been low to non-existent. The fact that no US student was trained by the Kenyan SR-CRSP is unfortunate. Participation in a CRSP provides not only international research experience, but establishes new generations of international collaborators. Supporting a student as a research assistant on CRSP funds at the US institution is no substitute for actual international research experience. This might be one area where other funds could be secured through various matching fund initiatives to secure monies for student training. A much better record needs to be developed to show the impact of the presence of the CRSP on US campuses, regardless of where the funds originated. Such funds should be recognized as important examples of leveraging outside support.

RECOMMENDATIONS

- Increase the training component at both host country and US institutions. The training component should include both undergraduate and graduate training as well as short-term training of farmers, local citizens, technicians and others whose improved skills will contribute to the impact of the CRSP. Training programs are important contributors to sustainability. Less emphasis might be given to providing graduate students research support for their masters/Ph.D. and more emphasis given to providing shorter periods of international research experience. This international research experience could provide interested students with the preliminary data necessary to write a grant proposal.

- Training should not be narrowly defined as graduate degree education. Every effort should be made to include students in all aspects of the CRSP, e.g., as observers at workshops organized by the CRSP and, when appropriate, as instructors in short courses.

- Additional funding should be sought to provide international research experience for undergraduates and graduate students at US institutions. National Science Foundation's (NSF) Research Experience for Undergraduates program is just one potential source to be explored.

- The training experience in Bolivia should serve as a model for bringing students from local universities into the research process.

- The identification of host country personnel at collaborating institutions for training at US institutions as well as at host country collaborating institutes and universities should remain a high priority of the GL-CRSP.

MANAGEMENT OF THE RESEARCH PROGRAM

The SR-CRSP has gone through a difficult time due to budget reduction, uncertainties and program changes. The SR/GL-CRSP Management Entity has been tenacious in its request for an extension of grant funding and has worked enthusiastically to reengineer the SR-CRSP into a Global Livestock CRSP. The SR/GL-CRSP has responded to USAID procurement regulations and reporting requirements. The SR/GL-CRSP has adjusted work plans and budgets as needed.

The reduction in the USAID grant and uncertainties facing the SR-CRSP have had dramatic impacts on the program and the personnel involved. Personnel changes in the SR-CRSP activities in Bolivia and Indonesia are associated with the termination of activities in those two locales since the last review. Preparation for phase-out of the Kenya project with the launching of a new Global Livestock CRSP is in progress. The EEP believes the SR/GL-CRSP has shown a positive, reengineering response in developing a program with new and different collaborative projects and research priorities. The proposed Central Asia program is one example.

The documentation provided to the EEP does not permit an adequate evaluation of the quality of subgrant management by subgrantee institutions. We can only speculate, based on the research reported in the SR/GL-CRSP Annual Reports, that subgrantee institutions managed the limited funds available to them appropriately, and that this permitted work to go forward in accordance with plans insofar as resources allowed.

Interaction with NGOs, PVOs, IARCs, other Donors and the Private Sector

The interaction with NGOs, PVOs, IARCs and other donors appears to be strengthened in the new project proposals developed as a result of the AT process. Among the IARCs, ILRI is especially important to the collaborative research program of the SR/GL-CRSP. The working relationship between the SR/GL-CRSP and ILRI in Kenya is strong. Some of the project activity of the Kenya project engages US and ILRI scientists in a tripartite relationship with KARI. In addition, an ILRI scientist serves on the Advisory Panel of the SR/GL-CRSP. As part of the forward planning exercise for the new Global Livestock CRSP, an East Africa Livestock Assessment Workshop took place in late January 1996 in Entebbe, and scientists from ILRI participated in it. It is difficult to offer any guidance on how the relationship might be further enhanced in Kenya. However, given that ILRI does have a global mandate, it is certain that opportunities do exist for further working relationships to be established with this IARC in other parts of the world.

The reconnection and involvement with the private sector is an area that needs to be pursued as the SR/GL-CRSP moves into the new program phase. The CRSP has been active and looks to continue contributions to the global research and development community.

Impact on End-Users

There is evidence that programs will continue to evolve as the CRSP moves on. Paramount to this continuation is the training of scientists

and technicians to carry on the work. Also, host county governments and institutions must be convinced that the research is of high priority. The CRSP's work and relevance is important in countries where livestock systems are vital to the food supply, the economy and the social structure and are compatible with the environment.

US Impacts

There have been significant impacts in the US as a result of research conducted by the SR-CRSP. These impacts include preservation of genetic resources; utilization of small ruminant genetic diversity to create new breeds; promoting the generation of income in developing nations and therefore opening up possibilities for exports of US products; basic information in regard to livestock diseases and their control; development of biotechnology techniques; and integrated, environmentally compatible range production systems. The CRSP has also shown support for democratic processes, free market systems, and community organizations. The GL-CRSP needs from the start to give high priority to communication of benefits of the CRSP to the US livestock industry, environmentalists and others who have a stake in livestock production systems in the US. High priority issues facing the US livestock industry include the interface issues in livestock systems with people and the environment. CRSP project contributions to these issues are important to the US livestock industry, environmentalists, nutritionists and others including those concerned with future policy development.

Dissemination of Research Results

The SR/GL-CRSP has increased its informational impact by the use of the World Wide Web and Internet communications. There is a full range of written communications including journal articles, abstracts, newsletters, and popular publication articles which continue to make an important contribution to CRSP communications. Scientists' presentations and other media, including radio broadcast, also contribute to information dissemination. The quality of peer reviewed journal articles is excellent. More emphasis might be given to end-user needs as compared with sharing information within the scientific community. Kenya is an example where end-users including families, community groups and cooperatives of producers are involved. Also, KARI reports CRSP results and activities in its newsletters and other publications. The CRSP collaborates with extension and other technology transfer agencies and groups where they are available. The CRSP recognizes the need to get results to end-users in accurate and easily understandable form.

The annual budgets have publications as a line item for books (e.g. proceedings from conferences and workshops) that USAID helps to fund. The individual project financial reports do not have a line item for publications, particularly the cost of producing individual papers.

Although there is no extension component in the CRSPs, the individual projects have extended their work through Techpacs - for local end user impact; peer-reviewed journal articles - for domestic and international scientists; and proceedings - for host country scientists and fellow CRSP researchers and students.

RECOMMENDATIONS

- ❑ The EEP encourages the SR/GL-CRSP to continue forging new relationships with CIP, ICARDA, IFPRI, ISNAR and ICRAF as the reengineered CRSP emerges.

- ❑ In addition to in-country impact assessment, CRSP collaborative research impacts and assessment in regard to the US livestock industry should be given high priority. Small grants support might be considered. The people, environment and livestock systems interface is a suggested area of US and international concern for the livestock industry.

- ❑ The EEP recommends that information dissemination be made a priority and that this should be made a line item in the budget of individual projects.

- ❑ Since refereed publications are desirable, the EEP recommends that PIs publish results of their SR/GL-CRSP research in appropriate internationally recognized peer-reviewed journals.

- ❑ The publication of small, simple, and concise extension-style bulletins such as Techpacs (5-20 pages) is seen as very desirable by the EEP. Topical units should be in the local language and with simple photos and illustrations.

- ❑ All other means of information dissemination available should be fully exploited, including the World Wide Web, newsletters, radio, popular publications and peer-review journal articles.

FINANCIAL MANAGEMENT

Based on the information provided by the ME, the EEP finds the fiscal and operational management of the SR/GL-CRSP ME to be sound. The GL-CRSP will involve several new PIs who will need to be informed and given assistance regarding CRSP financial management procedures. Efforts should be made by the CRSP ME and USAID to keep transaction costs on projects as low as possible. The information provided to the EEP indicates that financial reports and vouchers are done in a timely manner and institutional cost matching equals or exceeds the required level. The ME strives to keep administrative costs as low as possible. Examples include utilizing low-cost air fares, scheduling weekend activities and conferences, and e-mail communication. The ME and support staff input has been at a minimum as a result of the CRSP's budget reduction, the transition to a reengineered CRSP, and the budget extension. The EEP believes that as the new grant is proposed and implemented, the amount of management input and the support staff available to the CRSP be reviewed and an increase seriously considered. A total of at least 1.75 full time equivalents (FTE) in the Director and Associate Director positions combined would be appropriate. The SR/GL-CRSP has lower management personnel and support staff input than the other CRSPs of comparable program scope and budget.

Cost Effectiveness

The EEP believes that the CRSP has been cost effective. The EEP recommends that priority be given to the allocation of CRSP resources for establishing benchmarks and impact analyses for each of the funded projects at the outset. An alternative would be to designate some CRSP small grants for these purposes. New projects offer the opportunity to establish benchmarks before the collaborative research starts.

RECOMMENDATIONS

- ❑ When the grant is extended, the amount of management input and support resources available in the ME office needs to be reassessed. It is recommended that there be at least 1.75 FTE in the Director and Associate Director positions and an appropriate level of support staff.
- ❑ The CRSP and USAID need to be concerned with PI collaborating scientists' motivation for participating in the CRSP. It is recommended that the PIs have representation in determining program direction and policy.
- ❑ Transaction costs in terms of reporting and program policies should be kept to a minimum.

PROGRAM OPERATIONS

This portion of the External Evaluation Panel report will focus on the current research program in Kenya, with a more general evaluation of the Indonesia and Bolivia programs. In the period since the last EEP evaluation (1994/95) the latter activities have been closed out, and much of the work reported in the most recent SR/GL-CRSP Annual Reports has been in a close-out context.

In general, the research conducted at all three prime sites has been organized around several common elements key to the enhancement of sheep and goat production: genetic improvement of animal species adapted to the region (except in Bolivia); improved production systems including a focus on range ecology, animal nutrition, and forage/grazing systems; and agro-sociological and economic studies of aspects of improved small ruminant production systems. The Kenya project has also focused to a significant extent on animal health management through the application of biotechnology to vaccine development. This organizational structure for the research program is logical and consistent with expectations for such a program.

In addition to the main research activities noted above, the 1996 SR-CRSP Annual Report summarizes the activities of a series of research activities supported under a "small grants" program. The six projects reported appear to be designed to: 1) fill important research gaps (range ecology and animal nutrition in camelid systems in Bolivia); 2) explore new research themes (modeling pastoral resource use, banking of livestock capital) and; 3) extend research activities into new geographic areas (Ethiopia, Tanzania). It is not entirely clear to the EEP how the small grant program was linked to the major research thrusts of the CRSP in the prime sites nor how the expenditure of these resources was justified when financial constraints appeared to be serious problems for the PIs in the prime sites.

RESEARCH PROGRAM

Under the close-out mode in Indonesia and Bolivia, and with possible phase-out of the current project in Kenya, reasonable progress has been made in the research activities under the SR-CRSP as outlined in the work plans. Deviations from the work plans developed by the PIs in each of the past two years are remarkably few, and are largely attributable to phase-out of the present SR/GL-CRSP and financial uncertainty. It is noteworthy that significant accomplishments can be catalogued in all research areas given the financial constraints that have plagued the SR-CRSP over the past two years.

New research results are reported in the 1996 SR-CRSP Annual Report as follows:

Kenya:

- researchers have demonstrated that genetic variation exists for resistance to *Haemonclus contortus* in the elite Kenya Dual Purpose Goat (KDPG) population that has been developed by the CRSP;
- research efforts have also demonstrated that *H. contortus* larvae have developed resistance to some of the commonly used drugs for treating infections due to this organism;
- the CRSP scientists have identified several new indigenous fodder species suitable for further study as source material for the improvement of small ruminant grazing regimes;
- socio-economic studies of the impact of the KDPG at the household level have determined that the introduction of this animal makes a relatively small contribution to household income in the lowlands and also in the highlands, but that it has made a sizable contribution (up to 20%) to income generation in households in coastal areas of Kenya largely as a result of its contributions to increases in milk production;
- technology adoption of the KDPG "package" is related to prior experience of the target farmers with goats, and is also related to the degree of face-to-face contact of farmers with the CRSP team;
- the vector used to induce a neutralizing antibody response to Rift Valley Fever virus is successful in mice;
- the government of Kenya, previously a principal provider of vaccines for protection of goats against major disease constraints, has introduced a cost recovery policy that has led to a significant decrease in vaccine use by smallholder producers, and this policy is linked to increased disease pressure and an increase in demand for these services;
- a majority of farmers in surveyed areas are still not aware of the availability of vaccines for use with goats.
- The commercial distribution of KDPG goats to farmers was increased.

Indonesia:

(This project has closed since the last EEP report, however some research results have been reported in the most recent SR/GL-CRSP Annual Report.)

- the integration of hair sheep into oil palm plantations has desirable benefits (low cost, environmentally friendly way to control weeds) as previously reported for a similar production system under rubber tree plantations;
- hypothesized improvements in feeding regimes that incorporate the use of concentrates, tofu by-products, rice bran and tree leaves in animal diets to augment forage crops have mixed benefits.

By and large, based on a paper review and limited conversation with CRSP PIs, the quality of the research accomplishments over the recent past appears to be quite good. It is particularly noteworthy that CRSP scientists have persisted with the research agenda for this CRSP despite a very uncertain fiscal environment, in some cases requiring funding support from alternative sources (including home institutions in some instances) to carry out the work. The EEP commends the PIs and their home institutions both in the United States and in the host countries for maintaining a research program under extraordinarily difficult circumstances.

The impact of the above-noted research achievements have been most notable in the

host countries, where they have provided technology to improve small ruminant production. In the case of vaccine research, the accomplishments have contributed to our understanding of basic biology associated with vaccine development and biotechnology applications to this arena. Beyond this, it is difficult to identify examples of specific impact of new research achievements on US producers and consumers.

There is relatively little material provided that enables the EEP to assess the balance between domestic and overseas research. In general, a reading of the material provided leaves the distinct impression that the research focus was primarily determined by host country needs and priorities. Most of the research findings reported, technology developed, and results implemented were done in and on behalf of the host country. Noteworthy among technology transferred to the United States from the SR-CRSP are: the introduction to the United States of a milk replacer technology for goat kids consisting of sweet potato vines and leaves; experience in interdisciplinary research and microenterprise development in the animal industry; better understanding of biotechnology applications to vaccine production and diagnostic tools for animal diseases; and an interest in evaluation of tropically adapted hair sheep in the southeastern United States.

Institutional Partners

The evidence for host country institutionalization of the research activities of the SR-CRSP (except in Kenya) is scanty at best in the material that has been supplied to the EEP for this review. Each of the projects lists numerous host country collaborators, but relatively little is said about their involvement in the ongoing research or the degree of their future commitment to the project activities in the absence of the CRSP. Likewise, in most cases multiple institutions are listed as collaborators, but again relatively little is said with regard to their institutional commitment to the programs. The institutional partners and evidence of program institutionalization that can be discerned by the EEP for each of the country programs are as follows:

Kenya: Institutional partners include several private sector groups who will be involved with breeding and multiplication of the KDPG; a role for KARI in regionalization of the CRSP to other parts of East Africa is mentioned; similarly MALDM has played a role in regionalization of the CRSP in East Africa; interaction with NGO partners including Heifer Project International and FARM-Africa are identified; and finally government involvement in vaccine production through KEVEVAPI and other government agencies is noted. The SR-CRSP provided considerable assistance and input in the establishment of biotechnology capabilities and expertise in the livestock sector in Kenya.

Indonesia: The close-out of this site created institutional hardships although the ME indicates that the research program was nearing maturity and that close-out was possible despite host country perspectives to the contrary. Capable returned trainees should permit research to continue from institutional bases with which the trainees are affiliated. Winrock International has provided some support during this phase-out period, and the information that the EEP has received indicates that collaborating institutions do exist which can maintain research initiated by the SR-CRSP. Few specifics, however, are provided, and the distinct impression is left that the CRSP activities have not been well institutionalized in Indonesia.

Bolivia: The CRSP PIs indicate in the final reports made available to the EEP that NGOs are maintaining some of the CRSP research, and that this research is probably going to continue. Students formerly associated with the CRSP have formed an NGO expressly for this purpose. In addition, the PIs indicate that host country co-investigators will probably be able to continue some of the research from platforms in the local university and/or private sector research bases. The EEP cannot assess whether or not research has actually continued.

Continuing SR-CRSP research in the prime sites (Bolivia and Kenya) which have been of importance to the CRSP in the past several years would probably be economically desirable given that so much has been accomplished in each location to date. More important, each locale has a trained cadre of scientists able to integrate effectively with the CRSP. Institutional partnerships have been identified and strengthened. Trust has been built. Collaborative working relationships have been established. Much of the preliminary "legwork" that it takes to launch a CRSP has already been done in each country. And, most important, there is much work that remains unfinished. Collaborating institutions play an important part in CRSP activities in all sites, and without their participation the CRSP could not easily function in the host countries. The EEP notes that several of the new project proposals include activities in Kenya and Bolivia.

Contributions of Collaborating Institutions and Host Country Scientists

The SR-CRSP Annual Report provides documentation on research progress and results as reported by the US PI in every case, but does not provide any substantial insight regarding host country scientist contributions. It is clear, however, that at least in Kenya (KARI) and Indonesia (RIAP, Bogor; RAINAT; CRIAS), scientists from collaborating institutions cooperated fully in the research activities respectively in those countries. The Bolivia program, however, appears to have been plagued by frequent turnover in key personnel within the cooperating host country institution (IBTA), thus limiting the effectiveness of collaborative research at this site.

By and large, the host country institutions listed above have been important contributors to the success of the SR-CRSP. Contributions have included scientists who have been seconded to the CRSP, office and laboratory space, provision of field research space, and assistance with administrative and bureaucratic issues. A country-by-country evaluation follows:

Kenya: The PIs report that KARI has been a fully engaged collaborating institution for the SR-CRSP. In some instances KARI has seconded scientists to the CRSP for specific program activities and in general has cooperated in the provision of office, laboratory, and field research space at center locations. The relationship appears to be grounded in trust and mutual respect.

Bolivia: IBTA provided research counterparts for the biological dimensions of the research in the country, but was not able to provide support for the social science activities early in the project life because of lack of human resources in relevant disciplines. PL480 funds eventually provided resources that permitted IBTA to hire an economist and a sociologist, but both positions were eliminated when the CRSP program closed. IBTA appears to have been a difficult institutional partner because of

instability of personnel, particularly those in senior positions.

Indonesia: The institutional partners in Indonesia were consistent contributors to the CRSP during its lifetime in that country. The relationship was strong, positive, and enduring, and, as a consequence, there was much unhappiness when the CRSP was forced to leave by USAID/Indonesia.

Kenya Projects

The Kenyan SR-CRSP appears, from the Annual Reports, work plans, and other materials provided to the EEP by the PIs, to be a research program of disparate parts. The economics (production systems) component has shifted to a regional diversification project. It appears that the collection of additional data on the economic impact of the KDPG has been shifted to the sociological component. Here there has been little visible activity. The quality of socio-economic research leaves much to be desired. Literature is reviewed, but there are few linkages made between the literature and the KDPG multiplication phase. For instance, does the KDPG study confirm reports in the literature that women are the primary producers of food crops, but men are the primary producers of cash (market) crops? Also, there is no linkage between the on-going research and earlier studies done by this component. As far back as the 1990 EEP Report, there was a recommendation that the data collected be analyzed and synthesized. This has yet to occur. If the CRSP is going to consider giving high priority to the regionalization of the KDPG, it should probably be through assistance to the entities who are currently carrying out the multiplication phase of the project. There is no pressing evidence to support the sociological or production systems (economics) components given their recent performance (1995 and 1996 Annual Reports). A comparison of the science and the publications of the Kenyan SR-CRSP sociological and economics components with the Indonesian SR-CRSP economics component and the Bolivian SR-CRSP sociological component gives some indication of the quality of research that can be produced by these components.

The funding inadequacies have constrained aspects of the Kenya project - notably multiplication of the KDPG herd, privatization of KDPG multiplication, regionalization activities, and vaccine development efforts. The collection of socio-economic data appears to have been successfully maintained under the funding structure in place at the time of the work. However, there has been little apparent effort to synthesize the data.

RECOMMENDATIONS

- ❑ The EEP recommends that future reports from the PIs be written to provide clear documentation of the collaborative activities of host country institutions and personnel, something that is of central importance to the CRSP research philosophy. At a minimum, the annual reports should be co-authored by all participants and due credit attributed to all authors.

- ❑ The CRSP scientists need to put more energy into institutionalization of the CRSP activities in the host countries/regions. A significant outcome of the CRSP should be the preparation of local scientists to continue the research activities as the CRSP pulls out of various locations (as, inevitably, it will). Joint strategic planning and joint research evaluation will make a large contribution to attaining this goal. It is important that local institutions be fully invested in the CRSP research activity right from the start.

- ❑ A larger emphasis needs to be placed on the impact of CRSP-generated technology on the US. This "reverse technology flow" (if it occurred) has not been well documented in the material that was reviewed by the EEP.

- ❑ The EEP recommends that some sort of presence be continued in Kenya and Bolivia, and that efforts be initiated to move back into Indonesia (for example with a small grant), if this is at all possible. Perhaps the Global Bureau at USAID/Washington or the cognizant REDSO office can be drawn into these discussions in an advocacy role.

- ❑ If regionalization of the Kenya Dual Purpose Goat remains a priority, small grants should be used to fund these activities.

FUTURE REGIONAL COLLABORATIVE RESEARCH

The EEP notes that the GL-CRSP is exploring the potential for further regional collaborative research in the Latin American region. The Altiplano ecozone which extends across parts of Bolivia and Peru, and possibly parts of Colombia, Ecuador and northern regions of Paraguay share similar ecosystem characteristics and probably similar problems with respect to livestock production. The possibility for regionalization of the work previously centered in Indonesia is problematic given that the USAID/Indonesia mission is not supportive of the CRSP and small ruminant production in other parts of this region is of less importance than it is in Indonesia. We do not view the potential for regionalization in this region to be a significant opportunity.

ASARECA

The SR/GL-CRSP philosophically ought to compliment the proposed research priorities of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) insofar as the SR/GL-CRSP's activities in that part of the world are concerned. The draft report of the ASARECA Working Group on Regional Priority Setting which was made available to the EEP is principally focused on the priority-setting process which was used by the working group during their session in Entebbe in April 1995. The priorities which are identified in that document are relatively generic and are largely built around a series of commodities. On that list of priorities, research on sheep and goats is ranked twelfth of nineteen. The criteria which were used to generate this list included those research efforts which contribute to food security and to social equity as well as those activities that improve agricultural efficiency and sustainability. By these measures, it appears to the EEP that the SR/GL-CRSP has done well in aligning its program with ASARECA priorities.

It would be of interest to the EEP to see the detailed ASARECA priority agenda for a closer comparison. However, it is our expectation that the ASARECA priorities will include research on production, animal protection, and genetic improvement - the very goals that have been set by the SR/GL-CRSP for its work in East Africa. In addition, the ASARECA research priorities also identify soil/water problems as fifth in priority on the list, soil fertility as sixth in priority, and socio-economics as sixteenth in priority. The SR/GL-CRSP addresses these issues as well in the work in East Africa in its production research and its socio-economic focus. Thus, the EEP concludes that the SR/GL-CRSP is well in tune with the research needs of the region as determined by indigenous scientists and as stated in the ASARECA document.

Global Program

There is no doubt that USAID's funding level is quite tight for getting a global CRSP under way. At the levels of funding requested by each of the AT proposals, it will be quite difficult to fund two projects in each region. Cutting back on the funding per project to fund more projects could be detrimental to individual projects. It is a Catch-22. It will be necessary for USAID to work with the ME to rethink what is meant by a global program.

Given the limits on funds, the currently envisioned GL-CRSP excludes too many regions to be considered global. There are, however, possibilities for a global program with very small increases in funds if global is conceptualized not as covering the major geographic areas, but as synthesizing similar problem models from different regions. There are at least two pairs of proposals that could begin contributing to a global program. Each pair covers at least two out of the three regions identified by the GL-CRSP. Each pair begins with a similar problem model, with each AT in the pair extending their research in different directions based on the particularities of the model in each region. This, in effect, means that similar research could be occurring in two regions during the same period. In order to globalize this research, an annual workshop of ATs working on similar problem models could be convened (maybe at the same time as the annual meeting of all funded projects) whose output would be a synthesis of the research findings to date for each project around issues of globalization of research results rather than regional specificity of research findings.

RECOMMENDATIONS

- ❑ USAID, AP and the ME need to specify what is meant by a global program given the limited funds available to the CRSP.
- ❑ Efforts should be made to "globalize" the funded CRSP projects within the budget constraints and, if possible, at least one pair of CRSP projects with similar problem models should be funded as part of the "globalization" program.
- ❑ The CRSP should be attentive to the process of forging a Global Program out of a series of country/regional programs. Cross-project interaction through US and host country PI conferences, etc. should contribute to this goal, and ought to be built into the budget and planning process of the ME. The AP and ME share the responsibility for ensuring that a Global Program is shaped from individual components.

RECENTLY CLOSED PROGRAMS

Funding shortfalls contributed to close-out of the Indonesia component of the CRSP, and were a significant factor in the decision to close-out the Bolivia project. Clearly, if funding had been adequate these components might not have closed as abruptly as they did - or at least not for financial reasons.

Bolivia: The Bolivia program was a relative newcomer to the CRSP programs. It was initiated in 1991 after closure of the Peru program site due to political disruptions in that country. The decision to move to Bolivia was made after consideration of several alternatives including sites in West Africa and Ecuador. Bolivia was selected principally because of strong USAID/Bolivia Mission support for it. Early in the CRSP's life in Bolivia the USAID Mission was instrumental in leveraging additional funds from PL480 sources for the CRSP.

From the outset, however, the Bolivia site required comparatively more attention than the Peru site. Part of the problem was related to frequent changes in leadership of IBTA, the collaborating institution in Bolivia. Each change in leadership at IBTA (three different directors in the period 1992 to 1994) brought requests for modified and/or new research agendas since there seemed to be little institutional memory for research priorities and prior agreements. There appear to have been problems also resulting from the World Bank program that brought the University of Wisconsin into the scene. The World Bank project apparently intruded in the efforts to build a working relationship between the CRSP and IBTA because it was focused on reorganization of IBTA. In addition, one of the PIs in the biological component of the CRSP decided to leave the project during this period. Then, in 1994, funding to the SR-CRSP was cut by USAID/Washington. All of these circumstances interfered with research productivity.

This series of events resulted in a decision by the SR-CRSP Board of Directors to close out the Bolivia program. A plan was developed to phase-out the program by September 1994 (later extended to September 1995) when the CRSP-supported Bolivian students in training would complete their studies. The entire research activity was closed except for some additional time which was allocated to the sociology project using small grants to complete research underway.

Despite the decision to close this project, the PIs reported that they were accomplishing quite a lot, and they did not agree with the decision to close the Bolivia program at that time, indicating to the EEP that close-out was premature. It was also reported to the EEP that the TC was not consulted in the close-out process nor did the ME make any attempt to contact the PIs as the decision was being made. In the end, it appears that the Bolivia program required more time, effort, and resources than were available.

Indonesia: The Indonesia project dated from 1980, early in the history of the SR-CRSP. The CRSP activity in Indonesia had been well supported by the USAID/Indonesia mission and was well integrated with the host country partner institution from its very earliest days. It had also made solid and enduring contributions to the small ruminant industry in

Indonesia. Multiple individuals were trained across an array of disciplines spanning the social and biological sciences.

By 1993, in the view of the ME, the Indonesia program was showing signs of maturation. Nevertheless, the Indonesian collaborators voiced a strong desire for the CRSP to remain. However, the USAID/Indonesia mission, in what apparently was a vindictive decision based on a personal dispute between senior mission officer(s) and Global Bureau USAID/ Washington forced the SR-CRSP to close down. The reason, reportedly, was that the CRSP research agenda did not fit with the strategic objectives of the mission. There was also a perception (unsubstantiated) that the presence of the SR-CRSP jeopardized funding to the mission's core programs, and that the CRSP increased the work load of the mission. The ME reports that the PIs met to develop a phase-out plan, and that by February 1995 the CRSP was essentially shut down in that country.

Impact and Sustainability

The information provided to the EEP does not indicate the impact that closure of these two sites had on the host country institutions with whom the CRSP had been working. Undoubtedly, there were effects that at a minimum were due to the loss of funds to support local personnel and research activity. It does appear that in both countries some research activity has been continued based on the presence of CRSP-trained individuals within cooperating institutions. In Bolivia, it is also reported that at least one NGO (started by CRSP trained students) has continued some of the CRSP work but that it has struggled with a lack of funds to sustain all that should be continued.

Bilateral impact of the SR-CRSP projects that have been closed-out has been limited due to the focus of the research activities on the constraints to small ruminant production in Bolivia and Indonesia, both of which have unique characteristics of local but not clearly bilateral significance.

Based on the material made available to the EEP, it is difficult to discern regional impact of either of the closed-out activities. To some extent, it is presumed that the Bolivia project inherited some of the important research results from the predecessor program in Peru, suggesting the probability that at least these two countries in the Latin American region have potential to benefit from the findings of the Bolivia project. Whether or not that actually has happened cannot be determined from the material we have seen.

Research Results

Research results since the inception of the Bolivia and Indonesia projects are many and varied. The EEP is impressed with both the quantity and the quality of the work that has been done, particularly given the financial hardships incurred by the CRSP in recent years. The principal research results of the two closed out projects are summarized as follows:

Bolivia: At close-out, the PIs arranged a "synthesis" workshop which was held in Bolivia in November 1995 that brought together the significant findings from the brief life of this component of the CRSP. This synthesis is now being drawn together for a publication that is expected late in 1997. This publication will be a lasting contribution to the knowledge-base of small ruminant production in the difficult Altiplano environment. The synthesis will present findings from both the

biological and the social scientists who contributed to the research over the six year span of the Bolivia program. The production synthesis will focus on range ecology, animal nutrition, and general problems associated with small ruminant management in the harsh and marginal conditions of the region. The social science synthesis will focus on food security issues associated with small ruminant systems, risk reduction and related management issues confronted by small farmers, and issues related to markets, trade, labor constraints, and technology change in an agropastoral setting on marginal lands.

Indonesia: The Indonesia project was nearer maturity than the Bolivia project at the time the USAID mission in Indonesia forced its closure. At that point, the project PIs had developed a composite sheep breeding population with greatly increased production potential for the humid tropics. The population is being expanded and multiplied, but there are reasons to be concerned about maintenance of this effort over the long-term in the absence of the CRSP. It is significant to note, however, that this part of the CRSP work in Indonesia has moved from government research stations to on-farm production schemes. In addition, the CRSP contributed to the existing knowledge-base with regard to grazing systems. Among the contributions in this regard are novel production systems integrating small ruminants into plantation tree systems (both rubber and oil palm plantations in which grazing provides an inexpensive, effective weed control opportunity) and research contributions to forage production, including nursery evaluations of potential new forage species, feeding evaluations of high producing tree legumes, and evaluation of high quality feeds (utilizing rice bran and tofu by-products). In addition, the CRSP has contributed to the plans of the Government of Indonesia involving the planned future expansion and development of oil palm plantations to new regions of Indonesia. The contribution of the CRSP has been to demonstrate the economic viability of integrating small ruminants into these plantation projects as the major income source for farmer participants.

USAID MISSIONS

USAID mission support has been variable across sites in this CRSP, and, in the case of the Indonesia program, is a significant factor in the close-out of the project in that country despite the reported wishes of host country institutions and scientists. The following section will provide a country-by-country assessment of mission support:

Kenya: PIs report that the USAID/Kenya mission has been supportive of the SR-CRSP, and that the objectives of the CRSP are consistent with mission goals. One PI reports that USAID/Kenya pleaded with USAID/ Washington for continued support of the CRSP when funding was cut off in 1994. Personnel turnover in the Kenya mission has not constrained continued support for the CRSP activity there.

Bolivia: PIs report that the USAID/Bolivia mission supported the SR-CRSP from the start and continued to be very supportive up to project termination. As evidence for this claim, the PIs point to the assistance provided to the CRSP in obtaining substantial PL480 funds to augment those provided by USAID for research activity. In addition, the USAID/ Bolivia mission wrote a letter of support encouraging the CRSP be maintained when the 1994 closure decision was made.

Indonesia: The ME reports (and PIs corroborate) that the USAID/Indonesia mission was completely unsupportive of the SR-CRSP during the past several years and essentially forced program closure there. Reportedly, Indonesian cooperators very much wanted the SR-CRSP to remain but the USAID/Indonesia mission forbade this because livestock agriculture was not part of the mission's strategic objectives. It has also been conveyed to the EEP that there was a perception on the part of USAID/Indonesia that the presence of the CRSP in the country might jeopardize mission funding and that the CRSP created an additional burden of work for the mission staff, perspectives that reportedly were never substantiated. The EEP, as well as the SR-CRSP PIs, lament the close-out of the Indonesia program because of the progress and the promise of the activities there.

Buy-ins

Buy-ins, i.e., the financial support by Missions of CRSP projects in the host country, have not been an important component of the SR-CRSP. There are no instances of formal buy-ins by the Missions using Basic Order Agreements. There have been only three instances of less formal buy-ins. In Bolivia and Peru, the Missions provided PL 480 funds ($450,000 over four years in Bolivia and $50,000 in Peru). The Kenyan Mission in early grant periods directed about $50,000 to the SR-CRSP.

The ME has been very proactive in seeking buy-ins from the Missions. The difficulty in securing the buy-ins has to do with the internal politics of USAID. There is currently no incentive for the Missions to support CRSPs.

The attribute of the buy-ins that has contributed to the low rate of participation by the Missions is that there is no apparent support by the USAID Mission Office in Washington of the Washington based programs. Funding of a CRSP has a very low priority at the Mission and there is no programmatic incentive to buy into the CRSP projects. Even with the current reengineering of the SR/GL-CRSP and its transformation into the GL-CRSP, it is unlikely that the Missions are going to buy-in to the projects. An early indication of this lack of interest is the Assessment Teams' mixed reception at the Missions.

RECOMMENDATIONS

- ❑ The ME and the PIs of GL-CRSP projects should continue to keep the Missions informed of their activities and actively seek buy-ins.

- ❑ Some way must be found for local USAID mission support to be much stronger than has been the case in some instances in the recent past. We recommend that the Global Bureau in Washington provide clear guidance to field missions with regard to the importance of the CRSPs to global programs as well as local mission programs. Perhaps some incentive structure can be attached to the inclusion of CRSP activities in the portfolio of local missions. The EEP finds it unacceptable to constrain CRSPs because of "turf battles" within the Agency or because of the personal whims of a mission director.

GENDER AND MINORITIES

There has been little involvement of women and minority persons in the US SR-CRSP activity and management as reflected in the ME, the PIs, and support staff. Dr. Corinne Valdivia has been an active PI and spokesperson for the CRSP and other women may be involved in the GL-CRSP depending on which projects are selected.
The SR-CRSP sociology component has been the most successful in contributing to the support of women in the host country at all levels. Other components within the SR-CRSP have been less successful with many programs indicating no support for women at the scientist, training or producer levels. There has been less success in supporting women from US institutions particularly at the scientist level. Only three of the programs list women as collaborating personnel. Of the six small grants awarded, only one went to a woman scientist.

There has been surprisingly little use of expertise at Historically Black Colleges and Universities (HBCUs), or host country universities. In the 1996 Annual Report, for instance, only one project listed a host country university faculty member as a collaborator and only three were listed in 1995. There has been no collaboration with faculty at HBCUs and the US land-grants indicate few contacts outside SR/GL-CRSP contracting departments.

RECOMMENDATIONS

- ❑ The involvement of women and US minorities needs continuous attention as the CRSP moves into the new phase.

- ❑ The low level participation of US women at the scientist and training levels needs to be addressed. It is important to have women PIs and coPIs from the US. The simple presence of women on a US team encourages host country professional women to participate more fully.

- ❑ There is a noted bias in the roles assigned to women in the SR-CRSP. Women scientists' participation should not be limited to the study of gender issues alone. It is important not to ghettoize the research of women scientists and women in training.

- ❑ A separate issue is the female customer, the simple presence of women in a position of authority doesn't necessarily ensure the participation of host country farmers' wives. These women will tell you that they understand that American women can do whatever they want to, but that they (the host country farmers' wives) do not believe that applies to them. Nevertheless, the presence of women on the research teams, especially from the host country, is more likely to uncover a more complete and correct picture of how livestock are managed and the livestock products consumed in a given region.

SMALL GRANTS

The small grants program should be continued under carefully defined guidelines, even if the funding for each grant is lower than current levels. These grants play an important role in introducing potential collaborators to the SR/GL-CRSP, expanding both the research activities and collaborators (women and HBCUs) of the SR/GL-CRSP projects funded, identifying young scientists, enabling additional globalization research activities, and closing out projects.

The small grant program has extended the research agenda of the SR/GL-CRSP in new disciplinary directions and into new geographic areas, but at a time in the life of the CRSP when justification for such extensions are not clear.

RECOMMENDATIONS

- ❑ The intent of the Small Grant component of the SR/GL-CRSP needs further clarification and justification.

EVALUATION AND REVIEW

The CRSP has evaluation and review processes in place for assessing the quality of research and the collaborative aspects of the research program. During the SR/GL-CRSP transition phase the EEP was not active and PI assessment meetings were not held resulting in a gap in the evaluation process. Work plans and MOU's have been useful in guiding the research process and in specifying responsibilities during the transaction. The traditional advisory groups, excluding the EEP, have been replaced by the Advisory Panel which along with the EEP is responsible for research progress and research quality evaluation. There is a need to clearly define the roles of the EEP and the Advisory Panel. The ME has responded to EEP recommendations to the extent that was feasible.

RESPONSE OF SR/GL-CRSP TO 1994/95 EEP REPORT

The EEP notes that the general recommendations made by the EEP in the 1994/95 Report have not been addressed completely in the past two years. However the reengineered SR/GL-CRSP has addressed most of these recommendations. The following list details our evaluation of the responsiveness of the CRSP to each of the general recommendations made in the 1994/95 EEP report:

1994/95 Recommendation: Overall, the EEP suggests that the CRSP research approach place greater focus on more specific research problems, with multi-disciplinary teams working in a collaborative manner. Social science elements must be integrated with biological sciences. This has not usually occurred - research has been conducted in parallel environments with minimal collaboration and cross fertilization between, and among, content areas. We believe the problem focus described above would help in moving toward greater integration.

The current, and soon to be terminated, research agenda continues to be fairly narrowly focused along disciplinary lines with relatively little collaboration across disciplinary boundaries. This is particularly true in the genetic and animal health areas which appear to operate essentially as independent entities within the larger CRSP effort. Notably, the socio-economic research appears in several instances to link fairly well with the discipline-specific research in terms of efforts to assess impact and evaluate effectiveness of the research generated technology. Nevertheless, the point made by the EEP in the 1994-1995 review is still valid: there needs to be more integration between the social science components of the research and the biological efforts right from the start of research planning.

The new assessment team/problem model approach used in the reengineered SR/GL-

CRSP has been quite effective in developing projects of both scientific quality and development relevance. The problem model approach with the regional workshops to identify and prioritize problem models let the regional institutes (IARCS, NARS, NGOs, host country universities) and others in the region know that the GL-CRSP was seeking their critical input seriously in the development of future research programs. First, the message sent out was that collaboration was not just a convenient word, but was truly occurring between the ME, USAID, and the regional research institutes. Second, when the assessment teams held their regional workshops with potential collaborators, they did not have to convince potential collaborators that these were important problems that needed to be addressed in the region. If there is another AT cycle, it will be important to hold regional meetings again to re-specify the problem models in the new region. These regional meetings would serve two purposes: 1) they would continue the regional collaboration between the ME and the regional institutes ensuring continued customer orientation; 2) they would provide an opportunity for the dissemination of funded AT projects' research findings and the incorporation of these findings in the re-specified problem models.

What became apparent when the EEP met with the ATs was that the ATs felt strongly enough about the scientific quality of their proposals that they would continue to seek funding if they were not among the recipients of GL-CRSP funds. Also, collaboration had begun. The ATs expected to continue working with their counterparts with or without GL-CRSP funding. The assessment team/problem model approach has already had an impressive impact, even before full project funding.

1994/95 Recommendation: It is important for the new CRSP to include a focus on the dual role of grazing animals: beyond providing food and an important quality element in the human diet, they also serve as a means to improve environmental quality. The latter role is less researched and areas such as weed and brush control, as well as solid waste management could be addressed. Such a focus would have important impacts in both the US and the host countries.

Increasingly, elements of the SR/GL-CRSP have turned their focus on the environmental aspects of small ruminant production, notably in the camelid research reported under one of the funded small grant projects in Bolivia which specifically addressed this issue. Also, the Indonesia studies that report on the weed control and grazing benefits from small ruminants "double cropped" in tree plantations have an environmental component. In addition, range ecology studies in Bolivia and the KDPG production Techpac have strong environmental elements. However, the new, reengineered SR/GL-CRSP has included the question of environmental quality as one of its primary areas of research. The EEP notes the inclusion of a strong environmental element in several of the AT proposals.

1994/95 Recommendation: The EEP recommends the inclusion of land tenure policy as an important area of research. Issues related to grazing on public lands are not limited to the US, with 61% of the world's land not actually tenured. It is essential that policy and decision-makers have greater understanding of both the issues at hand, and the social and biological impacts of decisions regarding "public" lands. The need for this information is particularly urgent in light of worldwide privatization trends.

There has been limited research conducted that addresses issues of land tenure and grazing on commonly-held land as part of the SR-CRSP as recommended by the 1994/95 EEP. Much of this work has focused on land tenure issues in Bolivia relative to migration and social structure. This is certainly an important social issue that is deserving of the attention of the socio-economic research teams and we urge that issues of this sort be more clearly addressed as principal constraints to improved livestock production systems in the reengineered CRSP. The EEP notes that the reengineered SR/GL-CRSP addresses questions of land tenure, particularly in Central Asia.

1994/95 Recommendation: There is little evidence that budgetary allocations in the SR-CRSP are linked in any way to research success, progress, or opportunities. It is important that the new CRSP have a system in place allowing for critical, independent (third-party) evaluation of research and correlated with the resulting allocation of funds.

The present EEP notes, as did the 1994/95 EEP, that the correlation between research success/progress does not consistently align with the expenditures on research. Part of this is specifically due to the fact that some types of research (for example, biotechnology applications to multivalent vaccine development) are more expensive to complete and slower in progress than certain production-oriented research and/or socio-economic research. However, we note that dollars expended are not necessarily a reliable guide for evaluation of anticipated research productivity and should not be used as a primary indicator of such (i.e., funds spent do not equal research productivity). The focus of evaluation should be on the measurable impact of the research completed, its contribution to science, and the degree to which it has been absorbed into the communities that are the intended beneficiaries. PIs should be held accountable in this regard. The SR-CRSP, through the sociological and agro-economic studies reported, has made a good faith attempt to do this in the face of a difficult funding environment.

1994/95 Recommendation: The EEP once again recommends that consideration be given to the global and US significance of research in arid lands. Because over 65% of the world's sheep and goats are kept in such an environment, it is essential that the SR-CRSP, when determining future projects, give the most serious consideration to work in arid lands, as well as to livestock and wildlife interaction.

The EEP concludes that the SR/GL-CRSP has focused increased attention on arid land research and the livestock/wildlife interaction (production/conservation interface). This latter focus is particularly prominent in some of the work funded under the small grants component of the CRSP. The EEP also notes that these factors are prominent among the AT proposals presently under consideration.

The 1994/95 EEP report also listed a series of strategic recommendations which have been reviewed by the current EEP in an attempt to gauge the response of the CRSP in the past two years. The EEP notes that the reengineered CRSP has responded to these recommendations as well.

1994/95 Recommendation: The somewhat inconsistent decisions of USAID regarding funding for the SR-CRSP, as well as other

CRSPs, has been enormously expensive and disruptive. The way these decisions have been made, and their communication and implementation, represent, at best, "poor-faith" bargaining on the part of USAID. In the view of the EEP, the disruptive and personal angst caused overseas by disruption of funding cannot be overemphasized. The scientists and staff of the SR-CRSP should be commended for keeping things going during a very difficult time. The EEP strongly feels any future program sustainability is dependent on the stability of funding.

The comment by the earlier EEP about the disruption caused by inconsistent funding decisions by USAID with respect to this and other CRSPs is still valid. Operating a research program under these financial conditions continues to be a source of enormous frustration to the CRSP scientists. We commend the PIs and their institutions for their commitment to the CRSP ideal and to the SR-CRSP research objectives and plans in the face of continuing erratic funding including a relatively lengthy shut down of the CRSP in 1994/95. The accomplishments of the CRSP under this financial environment are impressive and a sign of the value that the individual PIs attach to the work that they are doing. However, despite ingenuity of the PIs to find temporary funds, this is not the sign of a sustainable funding program. Under the reengineered CRSP the EEP hopes that USAID will manage CRSP resources such that these interruptions will not occur. A research program cannot be expected to operate under this type of funding environment.

1994/95 Recommendation: Strong consideration should be given to the importance of future research projects in relation to the needs of the US private sector. Every effort should be made to obtain input concerning the needs of the US private sector in future projects.

The EEP finds relatively little evidence of responsiveness of the SR-CRSP to the suggestion that the research agenda be more attentive to the needs of the US private sector. One possible explanation is the relatively little interest in goats and sheep by the U.S. livestock industry. The newly reengineered SR/GL-CRSP offers more to the US private sector with its human nutrition and environmental impact research. For example, building projects in the US are required to file an environmental impact statement and those statements are written by private consultants, hired by the builders. Any advancement in assessment techniques developed by the SR/GL-CRSP will be useful to these private consultants.

1994/95 Recommendation: Further, any future livestock CRSP must include a significant component of its program efforts in those ecoregions where transhumant and other extensive livestock production systems are predominant, and must address the issues of rangelands management, land tenure and other serious ecological concerns.

The 1994/95 EEP recommendations regarding future CRSP research directions are addressed in the Transition and Reengineering section of the EEP report.

1994/95 Recommendation: There are many possibilities for the SR-CRSP to cooperate with other CRSPs on cross-CRSP activities, especially as broader concepts of livestock research are incorporated into the program. The EEP encourages these activities.

The EEP notes with some concern that there appears to have been little effort to develop

cross-CRSP activities in the regions in which the SR-CRSP is operating. There would appear to be ample opportunities to work with the SANREM and Soil CRSPs in particular. The EEP continues to encourage these activities as does USAID. The EEP recognizes this is a priority in the reengineered CRSP.

1994/95 Recommendation: The EEP believes priority should be given to actual US and host country needs and values, as determined by the affected people and communities. This includes inputs by host country scientists, as well as local producers.

Research priorities should be determined by needs and values of both US and host country contributors as noted by the 1994/95 EEP. We believe that the reengineered CRSP process is attempting to do this better than has been the case in the past, and have offered our thoughts on this in another part of the EEP report.

Recommendations relative to host country site coordinators, composition of the SR-CRSP Board of Directors, host country representation on the TC and other administrative bodies, project regionalization, and other issues relative to theGL-CRSP which are stated in the 1994/95 EEP report will not be addressed at this point since they are addressed elsewhere in this report.

EXTERNAL EVALUATION PANEL

The attendance of the EEP at the Boston meetings was very useful. It provided the EEP with the opportunity to evaluate the on-going transformation of the SR/GL-CRSP. The EEP's evaluation schedule should be structured around the three-year funding period. For instance, during the first year of the GL-CRSP, the EEP would attend the Year End meeting of the funded projects. (NOTE: These end of year meetings should include as many of the collaborators as possible. The presence of the collaborators from Central Asia during the Boston meeting added a depth to the understanding of the AT's proposal.) The EEP could meet with each of the project teams during these meetings to identify project weaknesses that have surfaced during the year. After the second year's meeting, the EEP could do field visits. Some thought needs to be given to "field visits" given the regionalization of the projects.

From the EEP reports from previous years and the information the EEP was given on SR-CRSP projects, it seems that the EEP has been very good at identifying programmatic weaknesses. Many of the weaknesses have been addressed by the reengineering of the CRSP. For instance, EEPs have noted time and time again, the lack of integration of the biological components with the socio-economic components. Projects were funded in such a way that there was no incentive to integrate. Now, there is a single PI responsible for the multi-disciplinary integration of the project. There were also no repercussions during the five year grant period for not responding to EEP recommendations. For instance, the sociology component of the Kenya SR-CRSP stated in 1990 that one of their goals was to synthesize the previous ten years of sociological research by the project. There is no evidence that the synthesis occurred.

STRATEGIC RECOMMENDATIONS

GLOBAL PROGRAM

The current redesign of SR/GL-CRSP presents a well rounded package of development, if all the projects were to be funded. USAID, AP and the ME need to specify what is meant by a global program given the limited funds available to the CRSP. As it stands, there is only enough money for about five to be funded, meaning that each region will only have a patchwork of the whole picture. SR/GL-CRSP has developed a complete, integrated package, and now the ideal scenario would be for USAID to fund the whole program so that a true global program can be realized.

The SR/GL-CRSP should be attentive to the process of forging a Global Program out of a series of country/regional programs. At least one pair of CRSP projects with similar problem models should be funded as part of the "globalization" program. Cross-project interaction through PI conferences should contribute to this goal as well, and ought to be built into the budget and planning process of the ME. USAID, the AP and ME share the responsibility for ensuring that a Global Program is shaped from individual components.

MISSION/CRSP

The ME and the PIs of GL-CRSP projects should continue to keep the Missions informed of their activities and actively seek buy-ins.

Some way must be found for local USAID mission support to be much stronger than has been the case in some instances in the recent past. The EEP recommends that the Global Bureau in Washington provide clear guidance to field missions with regard to the importance of the CRSPs to global programs as well as local mission programs. Perhaps some incentive structure can be attached to the inclusion of CRSP activities in the portfolio of local missions. The EEP finds it unacceptable to constrain CRSPs because of "turf battles" within the Agency or because of the personal whims of a mission director.

INSTITUTIONAL PARTNERS, COLLABORATION AND CROSS-DISCIPLINARY TEAMS

The EEP encourages the SR/GL-CRSP to continue forging new relationships with CIP, ICARDA, IFPRI, ISNAR and ICRAF as the reengineered CRSP emerges.

The SR/GL-CRSP must continue to explore opportunities for InterCRSP linkages in line with USAID priorities. The EEP notes that there are opportunities for such ties with the SANREM and Soil CRSPs in particular, but potential links to other CRSPs also ought to be considered.

The TC gave the opportunity for the PIs to get together and compare notes and discuss science. At the conference at Tufts some mention was made of developing such a forum but with a different format than the former TC. The EEP supports this idea for the sake of globalization and to facilitate communications between participants.

The EEP recommends that future reports from the PIs be written to provide clear documentation of the collaborative activities of host country institutions and personnel, something that is of central importance to the CRSP research philosophy. At a minimum, the annual reports should be co-authored by all participants and due credit attributed to all authors.

The CRSP scientists need to put more energy into institutionalization of the CRSP activities in the host countries/regions. A significant outcome of the CRSP should be the preparation of local scientists to continue the research activities as the CRSP pulls out of various locations (as, inevitably, it will). Joint strategic planning and joint research evaluation will make a large contribution to attaining this goal. It is important that local institutions be fully invested in the CRSP research activity from the start.

RESEARCH AND SUSTAINABLE IMPACT

Since cattle will be included in the GL-CRSP, care should be taken to monitor against a tendency to serve only large-scale livestock producers. By focusing on small ruminants in the past, the SR-CRSP was also ensuring that it would target the poorer, smaller farms. Including all livestock increases the flexibility of the GL-CRSP, which is definitely useful at a regional level. Nevertheless, care should be taken to preserve the original spirit of the SR-CRSP and not leave the small farms behind.

In addition to in-country impact assessment, CRSP collaborative research impacts and assessment in regard to the US livestock industry should be given high priority. Small grants support might be considered. The people, environment and livestock systems interface is a suggested area of US and international concern for the livestock industry.

A larger emphasis needs to be placed on the impact of CRSP-generated technology on the US. This "reverse technology flow" (if it occurred) has not been well documented in the material that was reviewed by the EEP.

TRAINING

Increase the training component at both host country and US institutions. The training component should include both undergraduate and graduate training as well as short-term training of farmers, local citizens, technicians and others whose improved skills will contribute to the impact of the CRSP. Training programs are important contributors to sustainability. Less emphasis might be given to providing graduate students research support for their masters/Ph.D. and more emphasis given to providing shorter periods of international research experience. This international research experience could provide interested students with the preliminary data necessary to write a grant proposal.

Training should not be narrowly defined as graduate degree education. Every effort should be made to include students in all aspects of the CRSP, e.g., as observers at workshops organized by the CRSP and, when appropriate, as instructors in short courses.

Additional funding should be sought to provide international research experience for undergraduates and graduate students at US institutions. National Science Foundation's Research Experience for Undergraduates program is one potential source.

The training experience in Bolivia should serve as a model for bringing students from local universities into the research process.

The identification of host country personnel at collaborating institutions for training at US institutions as well as at host country collaborating institutes and universities should remain a high priority of the GL-CRSP.

INFORMATION DISSEMINATION

The EEP recommends that information dissemination be made a priority and that this should be made a line item in the budget of individual projects.

Since refereed publications are desirable, the EEP recommends that PIs publish results of their SR/GL-CRSP research in appropriate internationally recognized peer-reviewed journals.

The publication of small, simple, and concise extension-style bulletins such as Techpacs (5-20 pages) is seen as very desirable by the EEP. Topical units should be in the local language and with simple photos and illustrations.

All other means of information dissemination available should be fully exploited, including the World Wide Web, newsletters, radio, popular publications and peer-review journal articles.

GENDER AND MINORITIES

The involvement of women and US minorities needs continuous attention as the CRSP moves into the new phase.

The low level participation of US women at the scientist and training levels needs to be addressed. It is important to have women PIs and coPIs from the US. The simple presence of women on a US team encourages host country professional women to participate more fully in a project.

There is a noted bias in the roles assigned to women in the SR-CRSP. Women scientists' participation should not be limited to the study of gender issues alone. It is important not to ghettoize the research of women scientists and women in training.

A separate issue is the female customer, the simple presence of women in a position of authority doesn't necessarily ensure the participation of host country farmers' wives. These women will tell you that they understand that American women can do whatever they want to, but that they (the host country farmers' wives) do not believe that applies to them. Nevertheless, the presence of women on the research teams, especially from the host country, is more likely to uncover a more complete and correct picture of how livestock are managed and the livestock products consumed in a given region.

SMALL GRANTS

The intent of the Small Grant component of the SR/GL-CRSP needs further clarification and justification.

PROGRAM ADMINISTRATION AND MANAGEMENT

The EEP notes that no process is in place to bring in new participants. Based on the success of the reengineering process used by the SR/GL-CRSP, the EEP recommends that this process be used in the future as a mechanism to bring in new regions and/or new problem models.

If regionalization of the Kenya Dual Purpose Goat remains a GL-CRSP priority, small grants should be used to fund these activities.

The EEP recommends that some sort of presence be continued in Kenya and Bolivia, and that efforts be initiated to move back into Indonesia (for example with a small grant), if this is at all possible. Perhaps the Global Bureau at USAID/Washington or the cognizant REDSO office can be drawn into these discussions in an advocacy role.

When the grant is extended, the amount of management input and support resources available in the ME office needs to be reassessed. It is recommended that there be at least 1.75 FTE in the Director and Associate Director positions and an appropriate level of support staff.

The CRSP and USAID need to be concerned with PI collaborating scientists' motivation for participating in the CRSP. It is recommended that the PIs have representation in determining program direction and policy.

Transaction costs in terms of reporting and program policies should be kept to a minimum.

The definition and role of the Advisory Panel and the EEP needs to be clarified.

For maximizing efficiency, the October fiscal year is awkward. For example, in Central Asia, this coincides with the beginning of winter. With the expansion of SR/GL-CRSP out of the tropics, an earlier fiscal year is more appropriate.

APPENDIX

A: SCOPE OF WORK -- USAID

B: SCOPE OF WORK -- PROGRAM DIRECTOR

C: CRSP APPROVED BUDGET - YEAR 18

D: SR/GL-CRSP YEAR END CONFERENCE AGENDA

E: LIST OF MATERIALS PROVIDED FOR EEP REVIEW

F: GLOSSARY

SCOPE OF WORK - USAID
ADMINISTRATIVE MANAGEMENT AND EEP REVIEW
SMALL RUMINANT LIVESTOCK CRSP
JUNE 27-30, 1997

The following are specific generic issues that should be considered by the Administrative Management and EEP team:

PROGRAM ADMINISTRATION AND MANAGEMENT

A. SR-CRSP Transition and Implementation of re-engineering philosophy
   1. Reasons for redesign — assess the need for reform
   2. Effectiveness of re-engineering process
      a. cost
      b. human resources
   3. Impact of redesign and transparency of opening up the CRSP at the management and technical levels
   4. Comment on conformance with AID's re-engineering objectives
   5. Utility of the Advisory Panel vis-à-vis functionality of traditional advisory entities (ME, BOD, TC, and EEP)
   6. Assess whether Assessment Team activities as part of the project design will produce regional impacts
   7. Value of regional workshops and links with regional host country organizations (ASARECA, IICA, and the NIS)

B. Training and Institutional Development
   1. Impact of long-term training
      a. on host country institutions
      b. on host country development
      c. on sustainability of CRSP research
   2. Training plans — development and management
   3. Benefits to U.S. institutions
   4. Relationship to other CRSP priorities

C. Management of Research Program
   1. Utility of evaluations and reviews
      a. procedures for promoting good research, strengthening host country partner participation, and promoting promise of development impacts
      b. responsiveness of ME to recommendations
      c. usefulness of contributions by traditional advisory entities (TC, BOD, EEP) and US/HC PIs
      d. usefulness of workplans and MOUs
   2. Management by ME and subgrantees
      a. responsiveness to AID procurement and regulations
      b. responsiveness to reporting requirements
      c. evidence of modifications to workplans and budgets when required
      d. progress toward reaching goals an objectives
   3. Characterize relationship and degree of interaction with NGOs, PVOs, IARCs, other donors, and private sector
      a. level of collaboration
      b. CYB transfers, buy-ins, or other leveraged funding
      c. pro-activity of ME and subgrantees in establishing linkages and consequences of such linkages
      d. contributions to wider international research and development community
   4. Dissemination of research results
      a. determine impact of new approaches developed by project for communication and outreach
      b. assess quality of publications by US and HC scientists

i. publication in peer reviewed journals and other publications
ii. usefulness of summary reports and end-users
c. mechanism for dissemination of technology transfer
d. integration within and across research sites
e. effectivity of participatory research process on promoting access to and exchange of research results

5. Impact on end-users, host country institutional partners, communities where research is being conducted, and U.S. agriculture
   a. evidence that host country programs will evolve and develop assuring sustainability if CRSP moves to new sites
   b. Developmental relevance on a global basis and for specific host countries

D. Financial
1. Evaluate fiscal and operational management of project by:
   a. Management Entity
   b. Subgrantees/PIs
   c. AID
2. Submission of financial reports and vouchers
   a. timeliness
   b. needed modifications
3. Institutional cost matching
4. Operational costs

E. Special Interests
1. Contributions of project in supporting participation by U.S. and host country women at the scientist, training and producer levels.
2. Use of expertise and U.S. land-grants and HBCUs

PROGRAM OPERATIONS

A. Current Research Program
1. evaluate complementarity of current research program and proposed research with priorities of ASARECA
2. evaluate progress in response to last EEP report, particularly recommendations listed on pp. 28-30
3. describe any new research results
4. determine impact of research achievements on US and HC producers and/or consumers
5. note reasons for any personnel changes since last Administrative Management and External Evaluation Reviews
6. describe progress relative to objectives listed in workplans and to similar research worldwide
7. enumerate reasons for deviation from workplans
8. describe quality of research
9. comment on adequacy of funding
10. evaluate quality of subgrant management by subgrantee institutions
11. determine degree of collaborations between US and HC scientists
12. describe support of AID Mission
13. assess contributions of collaborating institution(s)
14. Indicate evidence of HC institutionalization
15. assay balance between domestic and overseas activities with respect to program objectives
16. evaluate economic viability of continuing program in same geographic region

B. Recently Closed Programs (Bolivia and Indonesia)
1. describe reasons for closure
2. evaluate impact of closure on HC institutions and HC participators
3. evidence that project-initiated research is continuing after closure
4. evaluate adequacy of personnel trained by project in terms of institutionalization in NARS programs
5. assess results of research since project inception

6. assess bilateral and regional impact of project in HC and US on:
   a. livestock development
   b. economic growth
   c. human nutrition and health
   d. environment
7. potential for future regional collaborative research

ANCILLARY ISSUES

A. Gender

The original CRSP design does not hold the programs accountable for gender-specific development. However, in the interest of developing a progressive program, the following information will be important:

1. Agency policy is to emphasize and support participation and substantive contributions of women in the development process. Have gender issues been taken into account during project design and implementation?
2. Has a gender component been incorporated into all appropriate projects? Should there be a more directed approach towards incorporation of women into the program? How and where?

B. Buy-Ins

1. Has the ME been proactive in seeking buy-ins? Have buy-ins influenced the program and/or is the program dependent on buy-ins?
2. What attributes of the buy-ins have or have not worked?

C. Cost-Effectiveness

1. In what ways has the CRSP been cost effective? Is there a way to evaluate cost-benefits of the program and its impacts of research and training?
2. What success stories are there to support/dispute cost effectiveness?
3. What impact has this CRSP had on US agriculture? Impacts in the past five years?

D. Mission/IARC

1. Has the CRSP supported Missions' projects and strategic objectives? What have been the impact/consequences of this support?
2. Should the CRSP become more involved in technical assistance and service to the Missions?
3. What is the working relationship between the SR-CRSP and the IARCS? How can this be enhanced?

E. Information Dissemination

Since extension work has not been designated as a CRSP-specific activity, the CRSPs are not held responsible for impact of their research results, and subsequent adoption of materials and procedures by farmers. However, this will be useful for design of future programs.

1. Are concise summary reports issued for users in the LDCs? Is there a procedure for summarizing, cataloging and distributing CRSP results?
2. Is there a plan for information and technology dissemination and implementation to users? Has there been an effect attributable to technology transfer? Is there any mechanism/procedure to measure this?
3. Have CRSP results been regularly and published in refereed professional journals?

SCOPE OF WORK: PROGRAM DIRECTOR

UNIVERSITY OF CALIFORNIA, DAVIS

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO • SANTA BARBARA • SANTA CRUZ

SMALL RUMINANT
COLLABORATIVE RESEARCH SUPPORT PROGRAM
(916) 752-1721
FAX: (916) 752-7523

DAVIS, CALIFORNIA 95616-8700

To: Glen Vollmar, Chair
External Evaluation Panel (EEP)

From: Montague Demment
Program Director

RE: Scope of Work - 1997

In addition to the USAID scope of work I would appreciate the EEP's evaluation of the following issues:

1. To this point in the renewal of the CRSP how effective has new process been? Specifically I would like the EEP's evaluation of the programic development with respect to USAID reengineering and some of the goals established at Winrock Mtgs (below):

    a) Regional focus.
    b) Customer oriented.
    c) Diversified participants (ie, IARCS, NARS, NGOs, private sector)
    d) Diversity of funding mechanisms. In this regard how much budget should be allocated to a small grants program?
    e) Increase outside (nonUSAID) funding.
    f) Domestic impact.

2. Are the funds adequate from USAID to meet their expectations for a global program that has high quality, adequate depth and level and rate of impact?

3. What is the role of training in the CRSP when USAID funding has been so unpredictable and USAID has deemphasized training as an activity? How can the concept of training be reconciled with USAIDs concept of impact (here I refer to their insistance on counting trained personel as outputs not impacts)?

4. What direction should the ME take on using funding for support of US PIs salary? Some CRSP allow it but set a limit (20%), while others do not allow it at all. Some universities clearly have a strategy to underfund their faculty with fractional FTE support and then expect that they must hustle for the rest. We are now in this situation with a number of our participants. I would frankly like to reduce or eliminate it. My view is that these CRSP funds are for overseas development not US scientists salaries. Others would argue that if we want out people to focus on such problems we must buy their time.

5. How effective has the assessment team/problem model approach been in developing projects of both scientific quality and development relevance.

6. How responsive has USAID been to its reengineering goal of reducing transaction costs? Are the reporting requirements excessive? Do the best scientist not participate because of these costs? How often should there be external reviews? How effective have past external reviews been in terms of identifing programatic weakness?

7. In Kenya is the multiplication program an effective development? Has the production systems project been active in the last year? What has been the quality of the sociology component in Kenya? Has it been productive? Are the science and the publications of this component of high quality? Should the CRSP give high priority to regionalization of the DPG?

8. Does the EEP view the concept of a 3 year subcontracts with open competition for renewal of existing projects as a positive process? Does the panel have suggestions as to how the process of renewal should occur? Should we invest in another AT phase as part of the third year to allow others to compete?

Small Ruminant CRSP

Director's Approved Budget
Year 18 - 1996/97

Subgrants	Principal Investigator	Region	Amount
Continuing Programs			
Texas A&M University	Jerry Taylor	Kenya	$85,000.00
University of Missouri-Columbia	Corinne Valdivia	Kenya	$85,000.00
Washington State University	Travis McGuire	Kenya	$88,000.00
Utah State University-Lita Buttolph	Layne Coppock	Latin America	$10,000.00
Winrock International-Publications	Henk Knipscheer	Indonesia	$21,690.00
Winrock International	Jim Yazman	Kenya	$85,000.00
Subtotal Continuing Programs			$374,690.00
Host Country Administration-Kenya			$20,000.00
New Programs			
Utah State University	Layne Coppock	East Africa	$100,973.00
University of Wisconsin	Kenneth H. Shapiro	Central Asia	$141,247.00
UC Davis	Emilio Laca	Central Asia	$135,817.00
Cornell University	Robert Blake	Latin America	$92,891.00
Texas A&M University	Gary Williams	Latin America	$138,542.00
University of Wisconsin	Tim Moermond	Latin America	$104,655.00
UC Davis	Ken Brown	Latin America	$99,878.00
UCLA	Charlotte Neumann	East Africa	$106,687.00
Texas A&M University	P. T. Dyke	East Africa	$130,930.00
Colorado State University	Michael Coughenour	East Africa	$117,678.00
Subtotal New Programs			$1,169,298.00
Program Enhancement			$228,522.00
Management Entity			$361,142.00
Research Support			
Workshops & Conferences			$62,750.00
Meetings-Other			$5,000.00
Technical Committee			$10,000.00
Small Grants			$15,000.00
Publications			$19,795.00
Advisory Panel			$43,925.00
EEP			$21,963.00
Grant Extension			$30,000.00
Total			$2,362,085.00

FN: YR 18 Bud 4 Rept-2
Prepared: 1/29/97jws

SR/GL-CRSP YEAR-END CONFERENCE AGENDA

TUFTS UNIVERSITY JUNE 27 - 30, 1997

Friday, June 27, 1997

12:00 - 2:00	Registration — *South Hall*
1:00 - 2:00	Lunch
	Administrative Review Meeting Presentations: *Pearson Hall (#55 on map)*
2:00 - 3:00	Welcome and SR-L CRSP Evolution Dr. Montague Demment
3:00 - 4:30	SR-Livestock CRSP in Context Dr. Gordon Campbell
	The Assessment Team Process Dr. Kenneth Shapiro
	SR-L CRSP Relevance to U.S. Ms. Jane Shey
	SR-L CRSP and University of California Dr. Robert Shelton, UC Vice Provost for Research
4:30 - 4:45	Break
5:00 - 6:00	Regional Perspectives of SR-L CRSP Dr. Don Brown, ASARECA Representative Dr. Manuel Ruiz, IICA-RISPAL Dr. Mekhlis Souleimenov, ICARDA
	Benefits of CRSP Training Ms. Lita Buttolph and Dr. Robert Shavulimo
6:00 - 7:00	Advisory Panel Meeting — *Campus Center* Conference Procedures Feedback Guidelines
6:00 - 7:00	Administrative Review Meeting — *Campus Center*
7:00 - 9:00	Registration — *South Hall*

SR/GL-CRSP YEAR-END CONFERENCE AGENDA (CONTINUED)

Saturday, June 28, 1997

7:30 - 8:00	Registration — *Pearson Hall (#55 on map)*
8:00 - 12:00	General Meeting — *Pearson Hall* Overview of Conference Presentation Process Public Presentation of Assessment Team Progress
12:00 - 1:00	**Lunch Break**

Latin America Assessment Team Presentations — *Pearson Hall*

1:00 - 1:45	*"Land Use and Nutrient Management Decision Making in Latin America Agrosilvopastoral Systems"* Principal Investigator: Dr. Blake
2:00 - 2:45	*"Assessment of the Importance of Animal Products for the Nutrition of Young Children in the Andean Region: Team Building and Identification of Appropriate Animal Products"* Principal Investigator: Dr. Brown
3:00 - 3:30	**Break**
3:30 - 4:15	*"Livestock-Natural Resource Interfaces at the Internal Frontier"* Principal Investigator: Dr. Moermond
4:30 - 5:15	*"Livestock Information Network Development"* Principal Investigator: Dr. Williams
5:30 - 6:30	External Evaluation Panel Meeting — *Campus Center* Latin America Teams
7:00 - 7:30	**Reception — Mugar Hall** *Courtesy of Tufts University*
7:30 - 10:00	**Dinner — Mugar Hall, Faculty Dining Room** *Courtesy of University of California*

SR/GL-CRSP YEAR-END CONFERENCE AGENDA (CONTINUED)

Sunday, June 29, 1997

East Africa Assessment Team Presentations: *Pearson Hall*

8:00 - 8:45	*"Diversification of Livestock Assets for Pastoral Risk Management and Regional Development in East Africa"* Principal Investigator: Dr. Coppock
9:00 - 9:45	*"An Integrated Management and Policy System for Conserving Biodiversity in Spatially Extensive Pastoral Ecosystems"* Principal Investigator: Dr. Coughenour
10:00 - 10:30	**Break**
10:30 - 12:30	General Meeting: *Pearson Hall* Question and Answer: Full Proposal Criteria Full Proposal Guidelines SR/L-CRSP Five-year Proposal Timeline Assessment Team Process: Feedback & Discussion
12:30 - 1:30	**Lunch Break**
1:30 - 2:15	*"An Early Warning System for Monitoring Nutrition and Health of Livestock and the Food Security of Humans"* Principal Investigator: Dr. Dyke
2:30 - 3:15	*"Role of Animal Source Foods to Improve Diet Quality and Growth and Cognitive Development in East African Children"* Principal Investigator: Dr. Neumann
3:30 - 4:00	**Break**
4:00 - 4:45	*"Regionalization of the Kenya Dual Purpose Goat"* Principal Investigator: Dr. Valdivia
5:00 - 6:00	External Evaluation Panel Meeting: *Campus Center* East Africa Teams
6:00 - 8:00	Administrative Review Meeting (as needed)

SR/GL-CRSP YEAR-END CONFERENCE AGENDA (CONTINUED)

Monday, June 30, 1997

Central Asia Assessment Team Presentations: *Pearson Hall*

8:00 - 8:45	*"GIS Modeling Tools for International Donors and Local Policy Makers to Understand and Predict Regional Trends of Rangeland Production in Central Asia"* Principal Investigator: Dr. Laca
9:00 - 9:45	*"The Impacts of Decollectivization"* Principal Investigator: Dr. Shapiro
10:00 - 10:15	**Break**
10:15 - 10:45	External Evaluation Meeting — *Campus Center* Central Asia Teams
10:30 - 12:00	Advisory Panel Meeting: Wrap-up — *Campus Center*
10:30 - 12:00	Administrative Review Meeting (as needed)
12:00 - 12:30	**Lunch**
12:30 - 2:00	Administrative Review Meeting — *Campus Center*

MATERIALS DISTRIBUTED TO EEP FOR REVIEW

Annual Report 1996
Annual Report 1995
Annual Report 1994

External Evaluation Panel Report 1994-95
External Evaluation Panel Report 1993
External Evaluation Panel Report 1992
External Evaluation Panel Report 1991
External Evaluation Panel Report 1990

Assessment Team Mid-Point Reports
Assessment Team Trip Reports
Assessment Team Orientation Workshop - November 1996 Minutes

Advisory Panel Meeting Summary 1995
Advisory Panel Meeting Minutes - June 1996
Advisory Panel Meeting Minutes - September 1996

Standard Provisions
SR-CRSP Global Plan 1990-1995
Grant Document
Fiscal Reports

GLOSSARY

AID	Agency for International Development
AP	Advisory Panel
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
AT	Assessment Team
BOD	Board of Directors
CIP	Centro Internacional de la Papa
CRIAS	Coordinating Research Institute for Animal Science, Indonesia
CRSP	Collaborative Research Support Program
EEP	External Evaluation Panel
FTE	Full Time Employee
GL-CRSP	Global Livestock Collaborative Research Support Program
HBCU	Historically Black Colleges and Universities
HPI	Heifer Project International
IARC	International Agricultural Research Center
IBTA	Instituto Boliviano de Technology Agropecuaria
ICARDA	International Centre for Agricultural Research in the Dry Areas
ICRAF	International Centre for Research on Agroforestry
IFPRI	International Food Policy Research Institute
IICA	Interamerican Institute for Cooperation in Agriculture
ILRI	International Livestock Research Institute
ISNAR	International Service for National Agricultural Research
KARI	Kenya Agricultural Research Institute

KDPG	Kenya Dual Purpose Goat
KEVEVAPI	Kenya Veterinarian Vaccine Production Institute
LGU	Land Grant University
MALDM	Ministry of Agriculture, Livestock Development and Marketing
ME	Management Entity
MIAC	Mid-America International Agricultural Consortium
MOU	Memorandum of Understanding
NARS	National Agricultural Research System
NGO	Non-Governmental Organization
NIS	Newly Independent States
NPI	New Partnership Initiative
NSF	National Science Foundation
PI	Principal Investigator
PVO	Public Volunteer Organization
RAINAT	Research and Assessment Installation for Agricultural Technology
REDSO	Regional Economic Development Support Office
RIAP	Research Institute for Animal Production, Bogor, Indonesia
SSRC	Social Science Research Council
SR-CRSP	Small Ruminant Collaborative Research Support Program
SR/GL-CRSP	Small Ruminant/Global Livestock Collaborative Research Support Program
TC	Technical Committee
USAID	United States Agency for International Development

ORIENTATION AND REGIONAL COORDINATION WORKSHOP
SMALL RUMINANT/GLOBAL LIVESTOCK CRSP
OCTOBER 23-25 1997

Thursday, October 23, 1997

139 Hunt Hall

8:45 - 9:00	Registration
9:00 - 9:15	Welcome Kevin Smith, Vice Chancellor of Research University of California, Davis
9:15 - 9:30	Opening Remarks Ahmed Sidahmed Program Administrative Council (formerly Advisory Panel)
9:30 - 10:15	Overview, Workshop Goals & Objectives Tag Demment, Program Director Global Livestock (formerly Small Ruminant) CRSP
10:15 - 10:30	Break
10:30 - 12:00	Project Introduction 10 minute presentation by Principal Investigators of each project
12:00 - 1:30	Lunch
1:30 - 2:15	Review of Grant Renewal Proposal Tag Demment Sherry Smith-Williams —Calendar of Events —Content/Outline —Brainstorming/Feedback —Procedure/Task assignments
2:15 - 2:30	Break
2:30 - 4:00	Global Program —Brainstorming themes across regions —Cross-Team Cooperation

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SR/GL-CRSP Orientation and Regional Coordination Workshop Agenda (continued)

Friday, October 24, 1997

139 Hunt Hall

8:00 - 8:30	ASARECA Regional Livestock Priorities & Programs Jean Ndikumana, ILRI
8:30 - 9:00	Creating a Regional & Global Program Involving Collaborators — Private Sector, HBCU, Gender Including a Training Component
9:00 - 9:15	Break
9:15 - 12:00	Regional Meetings East Africa: Ralph von Kaufmann (facilitator) Central Asia: Ahmed Sidahmed (facilitator) Latin America: Tag Demment (facilitator)
12:00 - 1:00	Lunch
1:00 - 4:30	Indiviudal Meetings with Tag (258 Hunt Hall) Thematic Group meetings (proposed)

Time	Meeting with Tag *258 Hunt Hall*	Time	Thematic Group Meetings *241 Hunt Hall*
1:00 - 1:30	Shapiro Team	1:00 - 2:00	1.Coughenour/Laca/Moermond/Dyke
1:30 - 2:00	Coppock Team		
2:00 - 2:30	Dyke Team	2:00 - 3:00	1. Shapiro/Coppock
2:30 - 3:00	Coughenour Team		2. Moermond/Neumann
		2:30 - 3:30	1. Dyke/Laca
3:00 - 3:30	Neumann Team	3:00 - 4:00	1. Coughenour/Moermond
3:30 - 4:00	Laca Team		
4:00 - 4:30	Moermond Team	4:00 - 5:00	1. Coppock/Coughenour/Dyke
			2. Laca/Shapiro

SR/GL-CRSP Orientation and Regional Coordination Workshop Agenda (continued)

Saturday, October 25, 1997

139 Hunt Hall

9:00 - 10:30	Organizational Structure • Technical Committee, Program Administrative Council, External Evaluation Panel, Regional Committee, etc. • Election of Chair for TC • Regional Administrative units • Training
10:30 - 10:45	Break
10:45 - 12:00	Reporting Requirements and Responsibilities • Workplans and Budgets, Annual Reports, Progress Reports • Meetings, Conferences, etc. • Red Ink Days (Calendar of Important Deadlines and Events)
12:00 - 1:30	Lunch
1:30 - 3:00	Operational Procedures • Subgrants, budgets, fiscal reports • Travel approvals • Policies (PI salary)
3:00 - 3:15	Break
3:15 - 4:30	Renewal Grant - Sherry Smith-Williams —Next step —Wrap-up
6:30 - 10:00	Dinner/Oktoberfest Sudwerks

MATERIALS AVAILABLE FOR REVIEW

Small Ruminant CRSP Achievements

Small Ruminant Collaborative Research Support Program training report, 1978-1994.

Hafner, James A., compl. 1994. *Small Ruminant Collaborative Support Program (SR-CRSP): A Summary of Accomplishments and Impacts*, 1979-1993

Merrill, Reed. 1993. SR-CRSP: *Global Research that Benefits the United States.*

Sainz, Susan, compl. and ed. 1993. *Small Ruminant Collaborative Research Support Program: Publications, 1978-1993.* SR-CRSP, University of California, Davis.

Small Ruminant CRSP Annual Reports

Annual Report, 1997

Annual Report, 1996

Annual Report, 1995

Annual Report, 1994

Transition and Re-engineering Documents

Gore/Chernomyrdin Commission. 1997. Trip Report and Recommendations (August 31 - September 18, 1997).

Latin America Livestock Assessment Workshop Proceedings (San José, Costa Rica, 15- 18 April 1996).

Central Asia Livestock Assessment Workshop Proceedings (Tashkent, Uzbekistan, 27 February - 1 March 1996).

East Africa Livestock Assessment Workshop Proceedings (Entebbe, Uganda, 29 January - 1 February 1996).

Summary report: Meeting of Advisory Panel, U.C. Davis Center, Washington D.C., October 19-20, 1995.

Synthesis of Discussions: May 8-9, 1995 Planning Meeting, Winrock International Conference Center, Petit Jean Mountain, Arkansas.

External Reviews

External Evaluation Panel Report, 1996-1997 [See also Appendix F]

External Evaluation Panel Report, 1994-1995

Swindale, Leslie D., et al. 1994. *An Evaluation of the USAID and Universities Collaborative Research Support Programs.*

APPENDIX H: LIST OF MATERIALS AVAILABLE FOR REVIEW

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GORE/CHERNOMYRDIN COMMISSION
TRIP REPORT AND RECOMMENDATIONS
AUGUST 31 - SEPTEMBER 18, 1997

Objectives:

A four person team visited five oblasts, MOAF, some Moscow institutions, some Russian agricultural businesses, and various Russians during the period August 31 to September 18, 1997. The teams schedule and daily activity report are given in appendices 1 and 2.

The primary objective of the team was to determine if there should be university to university/institution partnerships between the US and Russia, and how such partnerships could facilitate and promote business development and recommend appropriate themes and structure for such partnerships. The specific questions evaluated were:

1. Have understandings and attitudes among potential US and Russian partners evolved to where there would be mutual benefits if partnerships were established?
2. Would such partnerships facilitate the development of business relationships between the US and Russia?
3. Are the responsible officials at the institutional, state/oblast, and national level, sufficiently interested to Snake the necessary commitments for partnerships to work?
4. Do the Russians recognize the unique elements of the US Land-grant system, and are they willing to work toward developing a functioning system which integrates research, education, and extension?
5. Are the potential US partners flexible as to the management structure needed in Russia?
6. Are the resources and fiscal management capabilities in place for such partnerships to be successful?

Observations:

Rational rebuilding of Russia's rural economy is a catical egg at in assuring a stable political and economic future for Russia. Rising incomes and quality of life in rural communities will be built on the successful recovery of Russia's agriculture and food industries. The long term viability of Russian economic recovery requires that not just trading, but also agricultural production become a profitable form of business there. As Russian food industry grows, it will open markets for US exports of essential inputs, including commodities, machinery, and chemicals, and it will invite investment in production, processing and marketing enterprises.

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The success of several Russian private entrepreneurs with whom we met, and of a few Western investors who have made long-term commitments there convince us that the critical element of change in the system is human resources. One team member coined the phrase 'mind and market', or M&M to capture this idea. While Russian scientists and educators are highly trained and proud of their research and educational heritage, the new world requires a new approach if they are to be able to apply their knowledge in today's world.

Market forces (supply and demand) affect not only the planting decisions of farmers, but also the management and production strategies of former state farms, and the curriculum and research agendas of universities. Marketing is needed for everything: to determine the value Of products (from grain to retraining courses), to identify the potential customers for those products, and to seek ways to communicate with the customer to build their interest and confidence.

There is an excellent opportunity for collaborative scientific research between US and Russian scientists, and for benefits to spill over into education, research, and extension for the revitalization of Russian agriculture. But at every step of that process a new market mentality' will be a critical element for our Russian partners. In spite of a few outstanding exceptions, most Russian agriculture is still heavily dependent on government for inputs, marketing, and subsidies. Higher education is still driven by the constitutional right to free education, with most funding coming from the federal government. This dependency on central control fosters national policies which have become a constraint in the new market environment. Changing these customs will require strong initiatives at the federal, oblast, and local level of government. The team identified three general areas which the Russians must address to accelerate the pace of positive change. They are:

1. ***Communications.*** Russian agricultural specialists are isolated from each other and from the rest of the world. Government officials, administrators, and scientists need to build an information network which enables them to know what is going on in their country, and throughout the rest of the world. This entails not only the technology (like e-mail and Internet, etc.), but more fundamentally, a new working environment that promotes the attitude that gets information in the right form, delivers it according to need and places value on information transfer.

2. ***Restrictive government policies.*** Russian research and education are still constrained by 'conventional wisdom' about how things must be done, or how research or education must be organized. This sometimes takes the form of government norms or bureaucratic processes which inhibit creative thinking about alternative solutions. Russian scientists and education leaders need to examine their assumptions, to look critically at the rules which have governed them, and change or discard those rules which limit their ability to adapt to the

new market environment. These rules and regulations include: a mandated student/faculty ratio, an enrollment quota, and a predetermined number of students in each of the different areas.

3. ***Leadership.*** The ability to promote change is inextricably linked to leadership, and we saw a diversity of leadership attitudes. Some leaders in the institutions we visited are still wedded to the past. University and government bureaucracies are difficult to change in the best of circumstances. Russia needs to assure that creative, forward thinking people are rising to leadership positions in the universities and research institutes.

There are a large number of areas where Russian agriculture could benefit from partnerships with US universities and institutes. These range from technology development and extension for production sciences, to management and marketing. By creating relationships between US and Russian institutions it should be possible to develop, in Russia, science and educational linkages similar to those that so greatly assisted the development of US agriculture. The product of such partnerships should be an improvement in the conservation of natural resources, the environment, agriculture production, and economic growth. As a result there should be an increase in both the quality and quantity of food available to Russians which will result in improved human nutrition, child development and survival, increased adult productivity and improved human health.

Areas where the team believes partnerships should focus include (not in priority order):

1. Environmental and resource constraints on sustainable crop production (soil conservation, pest management, soil nutrient management, and maintenance of biodiversity);
2. Constraints to the revival of the animal industry (crop production, animal nutrition, livestock management, processing, and marketing).

Some issues will necessarily be components of any focus area. These include:

1. building networks to promote flow of information between and among projects participants and with other interested Russian and foreign parties;
2. identifying and breaking down traditional ways of thinking which constrain creativity, initiative and market-oriented operations, in both the public and private sectors;
3. providing opportunities to support forward thinking leaders, who will serve as an example to others, and persuade government agencies to reward such excellence;
4. improving the link between teaching, research, and application to effectively enhance the viability of commercial operations;
5. assuring that methods of production and processing meet acceptable standards of safety and environment.

Because Russia is such a large and diverse country, partnerships should be developed for at least two and preferably three of the major geographical zones to insure that any effort has broad applicability and impact. At least four major zones have been identified: southern Russia, western chernozem zone (west of the Ural mountains), western Siberia chernozems, and the brown soil zone (north of the western chernozems). The team found that many of fee ministries, oblast, universities, institutes, businesses and individuals are making significant adaptations to a market economy, a new political systems and the free flow of information. As would be expected, in such a large country, there is great variability in the changes that have and are being made. Some of the organizations and their leaders are still hoping for a return to the former system, whereas other leaders and their institutions have and are making many and significant changes. In these latter institutions an attitude and understanding critical to the formation of mutually beneficial partnerships exists. Along with attitude the team found a wide range of capabilities in the institutes they visited. Some of the institutions did have the capabilities for managing partnerships and also were ready to make the commitments necessary for a partnership to succeed.

Some of the Russians do recognize the role of the linkages between research, education, and extension and the uniqueness of the US system. They are interested, and in some cases committed to engendering this integration in the future system for Russia.

The team believes that since such wide variability in both quality and attitude were found that with a sound assessment process (assess the institutions for their attitude and quality of collaboration) good institutional partners will emergent The assessment would be followed by pilot projects that would build on fee CRSP model of developing linkages which form institutional and scientific bonds that create an environment of trust and collaboration which in turn fosters change. Through these linkages the Russians will learn how research, extension and teaching work together, the most fundamental concept of land-grant universities, and from that evolve fee appropriate mechanism for Russia. Collaboration at the oblast level will, hopefully, lead to changes in how the Russian food and agriculture system works. These should serve as models for other oblasts and provide suggestions for change at both the oblast and national levels.

One final word about the plans and logistics for this team. The arrangements made and willingness of all parties to adjust schedules and meetings were excellent. All of the people involved and particularly the USAID Moscow staff, the Ministry of Agriculture and Food (MOAF), and officials and scientists of the oblasts, the universities, the institutes, PVO's and individuals from small and large corporations were most cooperative and accommodating. We thank them for their time and effort.

Conclusions:

1. The team believes that it would be most appropriate and beneficial to develop partnerships between US and Russian institutions. If such partnerships are fostered and developed there is the potential for substantial benefit to both US science and agribusiness. Any such partnerships should be awarded competitively, should be located in at least three of the four major agricultural zones of Russian, and each partnership should include more than one oblast in Russia and more than one state in the US. Ideally the principal partnerships should be between US universities and oblasts that have appropriate scientific, educational, and extension expertise for the agriculture of their oblast partners.

2. In addition to the development of partnerships at the oblast and regional level there is also a need for the Gore/Chernomyrdin Commission to help address some national issues that have major implications for this partnership specifically and Russian agriculture generally.

Recommendations:

The team makes the following recommendations:

1. Partnerships

a. USAID should provide funding to support initially a partnership program of at least three projects between US and Russian universities/institutes/private sector. Each project should include more than one oblast, and projects should be located in a minimum of two Russian agricultural zones or regions.

b. The US-Russian Partnership Program should be problem oriented and have a common theme that includes soil, plant, and animal components.

c. In agriculture, the revival of the animal industry in Russia should be the first Partnership Program. This program should have as its central theme the production of high protein feeds for animal production. Widespread limitations of protein in animal feed have been well documented and is a critical constraint in the production of animal products. The program should encompass the broad issues of crop production from soil preparation and conservation through plant and animal production, animal feeding, food processing, economics, and marketing. The value of this domestic production coupled with the vast potential for animal production in Russia makes this a logical first theme for collaboration. Since this production system integrates soil, plant, and animal components, it also represents the ideal system for a broad and effective interaction between US and Russian colleagues. Its economic potential should be attractive to agribusiness investment in the most

entrepreneurial oblasts and its national importance should insure interest, adoption, and adoption in all four regions of Russia.

d. It is estimated that $1.5 million will be needed for the three projects. Initially this program should be administered by one of the existing CRSPs. The funding should not come from current USAID research projects.

e. The following actions should be taken to initiate the Partnership development process:

(1) Six assessment grants of approximately $30,000 each should be made to US Universities (assessment will include identification of partners and planning of activities).

(2) The assessment grants should be made through a competitive bid process.

(3) The assessment grant funds should be used by the recipients to develop partnerships and a five year program proposal. The developed proposals should demonstrate a partnership between more than one US and more than one Russian University/institute and should include both Russian and US private sector. Development of the partnership should involve oblast administration and include a training component.

(4) The assessment grant process should begin in the fall of 1997 and be completed by April 1998. This process should be modeled after other CRSP assessments and competitions.

(5) The proposals originating from the assessment grants should be evaluated by a panel of experts and the best three proposals selected for funding.

2. Gore/Chernomyrdin Commission:

There are some constraints placed on the universities and institutes by the MOAF which if removed would greatly facilitate operations at the oblast level. These are issues that are national and provide an important role for several of the GCC subcommittees.

a. The GCC should work with the MOAF and other ministries to improve and increase the capacity of the communication systems. Ideally there should be electronic communications between all of the universities and institutes and with counterparts in the other parts of the world. The development of such capabilities could lead to the use of distant education between the two countries, including remotely transmitted classes. This capacity would greatly enhance the ability of Russians to interact and participate effectively in advancing their own agricultural goals. Many essential resources are available

in Russia but are not accessible to scientists. Furthermore much information of critical significance to agriculture resides outside the country and there is a distinct economy to build communication access rather than recreate the knowledge.

b. The GCC should work with the MOAF and the US military to develop a system of transporting to Russia, copies of professional journals that would be donated by US scientists. These journals would then be transported to various Russian institutions by the Russians. The availability of such journals would greatly increase the scientific capability of the institutions.

c. The MOAF has a number of institutional requirements that greatly restrict the innovation and flexibility of the Russian institutions. Removal of these restrictions would allow fee institutions to try and find solutions to their problems, make adjustments to their conditions, and begin to teach students how to adapt to ones own situation. Among the constraints that should be looked at are: student/ faculty ratios (currently set at approximately 8/1, which is much lower than comparable institutions in the US), student quotas for each institution, institution curricula control, local enrollment and tuition and down sizing control.

d. USAID and USDA should provide at least $100,000 per year to address the above needs.

1998 SOUTH EAST ASIA POULTRY TRIP REPORT
(INDONESIA, MALAYSIA, AND THAILAND, FEBRUARY 15-28)

Nancy Morgan, Dairy, Livestock and Poultry Division

Purpose: To assess the S.E. Asian poultry sector, quantifying the impact of the financial crisis on the sectors in Indonesia, Malaysia, and Thailand, identifying opportunities for investment in Indonesia and Malaysia (traveling with the US-ASEAN Business Council in Indonesia), and assessing market access issues and marketing opportunities. In Thailand, the competitiveness of the poultry sector will be examined in the context of the devaluation of the Baht and attention be focused on the specific product mix exported. To met the above objectives, meetings were held in all three countries with government, poultry industry and feed mill representatives.

Delegates:

Mr. Michael Deegan, President and CEO, ACDI/VOCA
Mr. Jim Echle, American Soybean Association, Singapore Office
Mr. Awad Ali Basri, American Soybean Association, Indonesia
Mr. Budiarto Subijanto, P.T. Cargill Indonesia, Jakarta
Mr. Lars Amstrup, Area Director Southeast Asia, HAVI Food Services Worldwide, McDonald's Distribution Centre
Mr. Ray Cesca, Managing Director, McDonald's World Trade, McDonald's Corporation
Mr. Bill Krygsman, Director, Quality Assurance, International Operations, McDonald's Corporation
Mr. Michael C. Boccio, Business Affairs Manger -Asia/Pacific, OSI International Foods
Mr. Rob Bernsen, Technical Consultant -Asia/Pacific, OSI International Foods
Ms. Julie P. Westendorf, Marketing Manager, Pioneer Hi-Bred International, Inc.
Mr. Garry Norder, General Manager, Purina Philippines, Inc.
Dr. Edward Price, Asst. Vice Chancellor for International Agriculture, Texas A&M University
Mr. Jason Mooney, Graduate Student, Texas A&M University
Ms. Lisa Mar, Director, Tricon Restaurants International
Mr. Michael Morrison, Vice President & Managing Director, Tyson Foods
Ms. Tina Valdecanas, Director, Food and Agriculture Working Group, US-ASBEAN Business Council
Ms. Nancy Morgan, Agricultural Economist, US Department of Agriculture, Foreign Agricultural Service

Trip Overview

INDONESIA- Economic turmoil has wreaked havoc on the Indonesian poultry industry, an industry which supplies nearly all protein requirements for Indonesia's population of more than 200 million. Prior to the economic crisis, the Indonesian poultry industry experienced growth rates of nearly 15 percent per annum, with per capita consumption still less than 5 kg/year. Since the crisis, however, a breeding industry that produced nearly 14-15 million day old chicks/week (nearly 900,000 tons annually) is operating at only 30 percent capacity. Nearly all small producers have liquidated their stock and only a few of the four major integrators–Charoen Pokphand, Japfa Comfeed, Subur, and Anwar Sierad–have breeding stock. It is estimated that the country will be out of chicken in mid- March, a time which will follow the election and the lifting of fuel subsidies–a scenario which poses extreme political concerns.

In this difficult economic environment, it is inevitable that the longer term outlook will be for increased consolidation of the industry, particularly among small-to mid-size breeding farms and processors. In the short term, however, all the integrators are experiencing extremely tight capital flows and, even if working capital is obtained, it would take three months for the industry to jump start itself. Overall demand for chicken meat and feed ingredients in 1998 is likely to be down 30-50 percent,

implying lower corn imports. This trip, undertaken in conjunction with the U.S. ASEAN Business Council, generated numerous recommendations to attempt to assist the Indonesian industry. While there is obviously no immediate solution to the crisis which continues to worsen, these proposed actions are an attempt to provide follow-up to a mission that generated visibility in the Indonesian press. Specific suggestions are: two assistantships offered by Texas A&M in the poultry science department, monetizing PL-480 (Title II) for Indonesia (estimated at $30 million) to support poultry education/training, and investigate using Facilities Guaranteed Program to invest in cold storage (or emerging markets program).

Participation of FAS in this type of private sector market development mission is highly recommended. The delegation was composed of every link in the value added chain for the poultry industry, including government, development assistance representatives, and academia. While the focus initially was on market access issues, the context of the economic environment in Indonesia expanded the focus to include investment opportunities and development assistance. The very broad interests represented by the delegation led to a very comprehensive overview of the issues facing the Indonesian poultry industry. As the poultry industry undergoes serious contraction, it may be advantageous for the USG to have consultations with the Indonesian government on import licensing regulations. While tariffs have dropped to nearly nothing (5 percent), the government continues to have a policy of import licensing, a policy which lacks transparency and can be resurrected as a trade barrier when market conditions improve in Indonesia.

Visits to Wet Market, Wholesale, and Retail Chains

We visited one wet market which if indicative of the nature of constrained demand revealed the extent of the economic crisis on individuals' purchasing power. No-one was in the market, except some sellers and no killing was occurring. The use of the prices is limited to comparing the prices for the different cuts and different meats. Prices have literally doubled over the past week; consequently any time comparison of prices is useless. In general, from a brief overview of the prices, beef tends to command a premium over chicken meat while fish, if available, is the cheapest form of protein. Live birds were very small, indicating that producers are quickly liquidating their stocks. Birds of 1.2 kg sold for 11,000 rps (usually individuals bargain to get the price down). Reportedly the birds are sold at 4-5 weeks: normally the wholesalers buys the bird for 5-6,000 and sell parts at the wet market for 11-14,000 rupias. Imported broiler breeds sold for 14,000-17,000 but I'm not sure how large the birds are. Cooked chicken leg quarters sold for 2,000 rps per piece, last week they were 1,000 rps.

The wholesale chain we visited, Goro, was a Dutch run company, managed by an Australian. The store was beautifully stocked like a Price Club, and no-one was in the store. They had planned to expand to 10 by the year 2000, but now the plans are on hold. They import feeder cattle from Australia, feed them out for 90 days with a cooperator. They also sell Tysons whole chickens (900 grams) when available-paying a 25 percent agents commission(usually whole birds are not imported under license). Pre-crisis they used to bring in 30 tons of red meat per week; now they simply can't get product. Corruption has also increased; prior to crisis they used to pay 18-20 million rps to bring in 17 containers, now they are asking 300 million.

Diamon (retail chain owned by Indonesian).

Sogo (joint venture with the Japanese). Meat demand down 30-40 percent, but poultry demand stays the same.

General Overview of the Poultry Sector

Mr. Ir Erwin Soetirto, D.G.. Livestock Service, Min. Ag.

Prior to the economic crisis, the Indonesia poultry industry experienced growth rates of nearly 15 percent per annum, supported by nearly 14 breeding farms for g.p. stock and 109 for parent stock. These breeding farms produced nearly 13-14 million final stock per year. Since the crisis, nearly 70 percent have shut down, with only 40 breeding farms presently in operation. Feed costs have escalated. Nearly 1.2 million tons of corn was imported in 1997, this could have been avoided by increasing corn hectares. Also soybean meal is imported while 50-60 percent of the fish meal requirements are produced domestically. In January 1998 feed prices were 2,000 rps compared to 700-800 the year prior ($320). In addition,

constrained domestic demand has made it difficult for the producer to pass off the higher costs of production to consumers.

They have requested assistance from the World Bank to help finance feed imports while increasing the production capacity for fish meal. They have also submitted a request to the Bank of Indonesia to provide working capital for small farmers (for the purchase of doc and feedstuffs). Allocation: 25 million rupias/farmer for 5,000 farmers. The IFAD loan is for cattle only, not poultry.

Cost of Production: Prior to the crisis, the average farm price for broilers was 4,000-5,000 rupias ($2/kg-$.90/pound) with feed price of 800 rp ($.30/kg). Feed conversion ratio of 2. Now the cost of production (live wt) is 2,300 rp with wholesale prices at 2,600 rp. Net 300 rupias per kg-good. There is presently an oversupply of poultry with dressed wt prices at 7-8,000 kg ($1/kg) with the contract grower getting 4,500-5,000 kg ($.75/kg). Presently supply can only supply 20 percent of demand.

Trade barriers-import licensing: They haven't received any pressure to open up licenses. Some areas import, particularly parts/chicken nuggets. Long term outlook for the industry. Increase local production, research on feed improvements using low cost inputs. Change protein sources. How to strengthen the industry without losing the small farmers. Examples of model of providing small farmers with activities. The question is balance with mgmt sharing the responsibilities with a small cooperative (15-20 farmers). Ask joint ventures to assist with these cooperatives with breeding. Corn hybrid program. Continue and expand. Normal conditions 3 million tons. However feed mills at presently at 60% capacity at 4.5 million tons.

Embassy Overview

Priority: focus on the currency board issues. Preconditions not in place-no foreign exchange reserves, banking system isn't strong enough, nor is there enough confidence in the government. Political-Habiba is the main candidate for vice president with the military relatively uncommitted. The issue of the nature of the new cabinet is more important to economic mgmt than the V.P. position in terms of continuity in strategy. The question is whether Habiba can influence the nature of the cabinet-disrupt the harmony of the economic team.

Market collapse-disturbances sporadic, out of the major center: Supplies are presently adequate but distributed and stored (held in store for prices to go up, example cooking oil). Staples are a good investment compared to currency.

Competitive position of US in terms of investment/trade-not losing but not gaining: Oil, gas, banking-the US is the largest investor. W/o above, however, the advisor aspects in terms of TEDA/AID slipping.

Military Role: the army is important to national stability, not a politically loose cannon. Small military given the size of the population. They are focusing on the demonstrators, rather than on the rioting.

Recommendation for the team: get a good feel for the present situation and be concerned about the image conveyed.

Chareon Pokhand: Subsidiary of Thai company, they are involved in broiler production, aquaculture, GP farms, feel mills (8), grow-out facilities, further processing (for exports, following USDA standard). They process 4,000 bird/hr (one shift) for exports, using USDA standards. Per capita broiler consumption-30-40 percent decline in consumption in the urban area with an even more acute decline in rural areas. Cost of production has increased 10-12% in 1997, supported by profit analysis, assume mortality of 5 percent. Since 1997 the profit margin has averaged between 71-240 (300 for US); however, it was -300 in the last quarter of 1997.

Feed mills-CP has 38%.Given increased cost of production, decreased demand, industry can survive with 5,000r/$. CP has 35 percent share of DOC, followed by Comfeed at 12% and Amwar Sierad at 6%. Using Arbor Acres, Avian breeds; however, difficulties in 1998 have resulted in the elimination of CPs breeding operations. In normal years, they produced 20,000 doc/week with the total industry producing 6-7 million bird. The normal price for DOC is 700; however price has dropped to 200, given the oversupply. In terms of DOC, CP produces 27% of supply while Comfeed is second at 20%. Nearly 80% of their product is sold as whole bird, with exports to the EU/Japan. Now labor costs are 6 times lower for further processed products (supported by the government).

Actions needed: government actions needed to support the industry through encouraging corn production, lower import duty for feed ingredients. The Indonesian corn industry used half of production for human consumption, with less than 20% using hybrid seeds. In 1998, because of the drought, rice acreage will be lower, switching to corn. The industry needs cheap credit, new technologies, policies such as promoting hybrids for corn and soybean (increase acreage and yields).

Indonesian Poultry Breeders- an organization set up in the early 1980's, usually have 120 members but some members are presently out of business with supply down to 27% of normal levels. The growth of the industry has averaged 15 percent annual but the problem is that 92 percent of production is sold in local wet markets which are very subject to severe seasonal and price fluctuations. Typically demand fluctuates 30-40% over the year because they don't have the ability to store product; prices can move in the 1500-3000 rp range. The breeders previously agreed among themselves to reduce production seasonally, reducing the fluctuations in the doc price. This practice was changed two years ago with the government citing collusion; this resulted in significant more price volatility. One solution recommended was to encourage the government to set up slaughter facilities to allow for slaughter and storage during periods of excess supply.

The doc price is usually 500rp ($.20), resulting in stable live bird prices. However, prices have moved up to 800; most recently dropping to 200 due to oversupply and lack of demand. Price of feed is generally 700/kg. ($300/ton). With the economic crisis, prices have moved to 1500. While the live bird price is 1500, the cost of production is 2400 (since December feed prices have increased 5 times). The farmers have lost nearly 3 billion rupia and can't pay for feed. Presently there are no doc–implying that in three weeks there will be no birds in the market. Price of farm gate bird is 7,000 which the market price is 11,000. Consumers are moving to consume tofu/tempe. Labor costs have risen to nearly 200,000rp/month.

Another problem cited by the breeding industry is biosecurity problems because of the prevalence of small poultry operation. Issue is not big or small, but ownership! STATUS: production down 50%. Feed quality problems are more severe than before. DOC supply is greater than demand in addition the situation is aggravated by the fact that February is a slow month. DOC stocks down to 27% with 70% of the feed imported. Broiler production is usually 17-22 million birds/wk; it is now down to 12-14 million.

Minister Hartarto

Government actions to address the crisis include: restructuring the banking systems, let companies succeed/fail, stabilize rupia; for exports problem with letters of credit not accepted overseas (exports have been increasing 9 percent). Presently, high inflation, 6 million jobless, tourism declining rapidly. Companies needed for seed development. Education is critical to development of Indonesia.

Japfa Comfeed

Japfa Comfeed, the second largest operation after CP, gave a very impressive presentation (Macro overview, Poultry situation, Future, and Strategy for Japfa). They have operations in poultry, aquaculture, beef and dairy; they have a corn division, 6 feed mills producing 1.6 tons of feed (35 percent market share), 20 breeding farms producing 5 million docs/wk, along with 3 slaughter facilities which run in total 7,000/birds/hour. They have 2 grand parent breeding operations, hatcheries, 10 parent stocks facilities with capacity of 350 million doc (Lochman and Arbor Acres).

The issues facing the poultry industry, apart from the present economic crisis, include: an overdependence on imported raw materials, inefficiencies due to lack of integration, problems of oversupply, drought situation, lack of hygienically inspected slaughtering facilities. In summary, the recent performance of the industry has been below expectations. As a result of the economic crisis, many of the smaller companies will not survive and consolidation will continue to be the norm, leading to increased profitability. Presently demand for poultry is down 50 percent, exchange rate depreciation has raised feed prices from rp700-2300-1700/kg. The industry previously produced 20 million doc/week; how it's down to 6-8 million (capacity 12-15 million) . Production costs six month ago 2,500/kg ($1.00/kg), now 5,000 ($.60.kg- data needs to be confirmed). Many small breeders out of the business. Feed demand

is down 50 percent, implying small imports in 1998. They contract out their distribution network. They use 6-7 percent fish meat, maximum is 10 percent.

Indonesian Poultry Association

The members of this organization, which started in 1977, are small/medium size poultry producers, distributors, and cooperators. They have 80,000 members in the small scale category, 10,000 layers/15,000 broilers; these members have mktg problems with strong competition from large companies. There is a need to improve human capital through increased education. This sector accounts for 20 percent of broiler production. No integrators are members; however, then they did say that the grow-out operators of the integrators were members. They stated that the limitation of 15,000 birds/cycle restricted operations of some producers because above that level, producers are required to set up their own slaughtering facility; below that level they are required to sell to the wet market. Above 65,000 the producer can't sell to the wet market. At present because of the crisis, 90 percent of the members are out of operation.

U.S. information: 12-14 cents/pound for feed ($264/ton); cost of production 37-38 cents for feed, 12-15 cents/chick=50 cents/pound.

PT Anwar Sierad

Third largest integrated poultry company, including following operations: (they say that they are not integrated because they sell breeding stock/feed on the open market). The slaughter/processing facility processes only 10-12 percent of total production.

Feed production-3rd largest producer
Breeding-30,000 doc/week
Biotech-animal health care products

Franchises in the fast food marketing (Wendy's-40, Harts Chicken, La Brioche Dore (Doux), Pizza)

Environmental programs.

Issue: liquidity. Answer: credit

Issue: import in $ terms, have to buy in cash. Presently using operational funds, affecting productivity, manpower. Answer: develop credit model with the US, work out system, jump start the business.

Lessons to be learned: increase efficiency through education/research. Need technical advise from US government on productive investments (which include the poultry industry-not lipstick and Nike)

Information:

Industry usually produces 16-18 million doc/wk, now down to 4-5 million

Feed production down 30-40%, 80% inputs imported.

Farm gate broiler prices 3,000-7,000 (level of 15-20 years ago). Industry collapsing.

Supermarket prices 5,000-11,000; consumers can't buy.

Parent stock level closed, not hatching, selling hatching eggs as table eggs, culling breeders. 75% of chicks hatched destroyed.

Issue: how to cost product?

Remedy-focus on both supply and demand issues; can't resolve one without the other.

Idea: form farmer cooperatives to allow access to working capital (USAID). GSM-invest in distribution of imports, such as cold storage. Cold storage would stabilize the market but one needs a slaughter house.

Irony: Jakarta's per capita consumption is 25 kg and slaughter in percent has increased in percentage terms; does that influence future consumption trends.

Margins in value added chain:

The issue depicted in the above graph is that the industry would be more stable if there was more value-added component. Interesting comment made that this country produces too much feed (over

capitalized). Margins for feed mill (5-8%), breeding (10-12%). The debt for this company more of an issue for the other major players because they have investment in other industries which diversified their risk. Total investment in the industry is $1.5 billion.

Market Information Center for Poultry

Background: This Center is a non-profit organization formed in 1990 by the MOA. It is completely funded by the poultry and egg industry. It was not clear how the Center is funded although it seemed that there is some type of tax on transactions; what was clear is that the existence of the Center is seriously in jeopardy by the imminent collapse of the Indonesian poultry industry. The Center is staffed by three individuals, supported by price information sent in by local agents in the various areas. These individuals, who are local producers, phone in price and slaughter information which are released in two ways; firstly a price bulletin which is released every Sunday which includes live bird and table egg prices, and secondly, a market bulletin which is sent out by fax every month.

The Center provides information on the live bird prices for the various regions. For example, the Jakarta prices on February 17th were as follows:

a. < than 0
b. 1-1.2 kg
c. 1.2-1.5 6,900
d. >1.5

Jantan (male layer)	5,500
Layer Afkim	5,500
Broiler dressed	4,800 (dressed is 65%)
DOC	1,500

Typically the Center get 50-70 calls a day, and makes 20-30 calls outside. That is the major expense of the Center, apart from staff. Presently culled hens sold as broilers are in short supply. The birds average 1.7-2 kg (45-50 weeks old). They also release slaughter information (monthly average slaughter data collected on both slaughter by integrators and the wet markets). This number for 1997 when converted to tons implies broiler production of 418,000 tons (down from 555,000 tons in 1996). But on one sheet, 1996 production estimated is 655, 365 tons. This assumes a 1.3 kg bird with a dressed wt of 65%. They stated that there has been an oversupply on the market since 1995 as producers overreacted to price increases. Growth in demand has been strong, stated at 15 percent annually in Jakarta, slightly lower at 6-7 percent in outside regions. In Jakarta it is estimated that nearly 650,000 birds are slaughtered/day with an additional 35,000 traditional birds. Now only 200,000 birds are being slaughtered. (169 tons versus 579 tons). This Center provides import data on broiler GPS imported (female D-Line), by breed (266,062 in 1995 and 233,053 in 1996). You can calculated the final stocks numbers from the female numbers (two years later). They also cover the egg market and they estimated that the population decrease has been 70% with bankruptcies thought to range between 50-60 percent. One of the representatives there sold branded product in one of the more upscale supermarkets.

Subur

Subur is the third largest, yet with 31 years of expertise probably the oldest, integrator. They produce nearly 3.6 million broilers per cycle, and 1.2 million layers on 18 farms in Western Java. They also own breeding, slaughter, and further processing facilities. They have 4 slaughter facilities in West Java that slaughter on average 2,000 birds/hour.

Assessment of market situation: they state that overall the supply of broilers is 20 percent of normal and nearly 55 broiler breeder farms have closed down (it takes, on average, 3 months to start up). Normal demand in Jakarta is 400,000 birds/day-demand has dropped nearly 60 percent.

Background: Subur has 16 percent market share and is unusual in that it maintains links with the University of Bogor and also supports small shareholder cooperatives. We visited one cooperative formed by 15 members, with 40 houses, producing 240,000 birds/cycle. Subur got funding through the Bank of Indonesia to assist the cooperative; the loan is guaranteed by Subur. The Bank of Indonesia is required to

use 20 percent for small holders. While the cost of production has increased to nearly 1,700 (compared to 700 before but actually down from 2300), the cooperative members are guaranteed a fixed return. Surbur has a ratio of 50/50–50 percent contract growers, 50 percent own grow out facilities. They have a 8 percent mortality. All feed and doc are used internally, unlike other integrators which sell them on the open market.

Cooperative Grow Out Facility: They brought their facilities from Subur in December 1995 which consist of 10 ha with 50 houses, total capacity of 250,000 birds. There are 15 shareholders who each own their own house. The price is set for the chickens once a year with producers receiving a minimum floor price and share profits when price increases. The supply of feed is stored at the farm with feed delivered every day. They also have contract with local corn producers who use hybrid seed; 10,000 ha @ 6 ton/ha= 60,000 tons. Average market return for the birds is 300-500 kg ($.5/pound at exchange rate of 2,500). They grow out the broilers for 45 days until the birds weigh 1.5 kg. They estimate a 1.8 feed conversion; and the feed requirements are estimated at 5,000 tons/cycle (6-7 cycles per year). The feed mill has a capacity of 10,000 tons per month. 70 percent of the broilers are sent to Jakarta for slaughter which has the capability of slaughtering 7-8,000/day.

Major problems: disease but the doc are vaccinated for Newcastle's and IBD; antibiotics are included in the feed. They cite a 6-7 percent mortality.

Their long term objective to expand and they have identified 2-3 farms. With the loan money they plan on buying the farms after they pay off their present houses which are 4 years old. After 10 they will need to rebuild houses which average $7,000 (rp15 million). They place 5-6,000 doc in -one house and visit the house 5-6 times a day. Land is valued at 10-15,000/meter.

Bogor University-We discussed the situation of the poultry industry with the Dean of Agriculture and various professors. While the discussions were not revealing, they were useful for developing the contacts

Jakarta Port Facilities- created in 1897 on the North side of Jakarta to facilitate handling of mainly bulk commodities. It now handles both bulk and container shipments; however, there is a new deep-water port in Jakarta where Panama ships can unload. The port has experienced growth of approximately 5-10 percent/year in ship calls and cargo traffic; container traffic has grown at a faster pace of 20 percent per year, while they also have the business of passenger ships. The terminal increases 400 ha with the depth of 10-44 meters. They do unload feed ships, taking off 3,000 tons/day (we saw soybeans for food consumption being unloaded). The meeting was not particularly revealing about the extent of the slow-down due to the economic crisis.

Visit to Diamond Cold Storage-a company that is involved in the production and distribution of ice cream and various other products. They have a trading dept (exclusive agent), and supply to the segment mkt in Jakarta and offer 11 brands in the major cities. The crisis has induced weekly changes in prices, problems with cash flow movements, volume is down by 40-50 percent with the hotels trying to substitute products (for example Australia beef for U.S. beef). Consequently they have has to make cash payments in advance, use local items (beef, pork, poultry). They bring in poultry meat through Singapore (via Bantum, a duty free pork right off the coast of Singapore). Some of their customers are out of business (10%). They usually move 30-40 containers of french fries/week, now they are down to around 20. Many customers are using local or not serving. They have two facilities, the largest of which has 700,000 tons capacity.

Comments by the delegation about issues to be addressed:

Value-added chains, missing links (particularly cold storage, distribution (trucking, storage, facilities, cold rooms), adequate protein availabilities, feed additives, pharmaceuticals. Human resources-training/education; management and technical assistance, research/development, cooperation between university/business/farmers. Research in the areas of refrigeration, microtoxins, intensive agriculture, information (Pinmar), human resources.