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SMALL RUMINANT

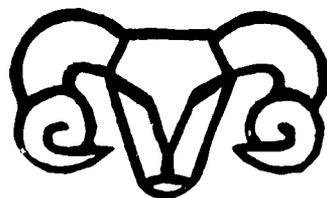
COLLABORATIVE RESEARCH

SUPPORT PROGRAM

INTEGRATED PROGRAM PLAN

PART I BACKGROUND

Prepared by the Management Entity



THE TITLE XII
SMALL RUMINANT
COLLABORATIVE RESEARCH SUPPORT PROGRAM (SR-CRSP)
INTEGRATED PROGRAM PLAN

Prepared in the Management Entity Office
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April 1979 - April 1980

CONTENTS

PART I BACKGROUND

Historical Perspective

1. Evolution of the US Land Grant University System
2. US Participation in Foreign Aid Programs
3. Title XII, "Famine Prevention and Freedom from Hunger"
4. Collaborative Research Support Program (CRSP)
5. Justification for Small Ruminant CRSP (SR-CRSP)

Organization of the SR-CRSP

1. Selection of Research Projects, Management Entity (ME), and Committees
2. Definition and Function of Committees
3. Overseas Worksite Selection
4. Negotiation of Memoranda of Understanding (MOU)
5. Integrated Program Plan

SR-CRSP as a Research Endeavor

1. Principles of Research
2. Current Husbandry Practices and Problems in LDC's

SR-CRSP Research Projects

1. Ecosystems, Production Systems, and Disciplines
2. Goals and Objectives
3. Participating Institutions

PART II BRAZIL REGIONAL SUB PROGRAM

1. Integrated Regional Sub Program
2. Individual Institutional Sub Programs
3. Memorandum of Understanding

PART III PERU REGIONAL SUB PROGRAM

1. Integrated Regional Sub Program
2. Individual Institutional Sub Programs
3. Memorandum of Understanding

PART IV INDONESIA REGIONAL SUB PROGRAM

1. Integrated Regional Sub Program
2. Individual Institutional Sub Programs
3. Memorandum of Understanding

PART V KENYA REGIONAL SUB PROGRAM

1. Integrated Regional Sub Program
2. Individual Institutional Sub Programs
3. Memorandum of Understanding

PART VI SMALL RUMINANT - CRSP BUDGET

1. Background of the SR-CRSP Budget
2. The Participating Institution Sub-Contract Budgets
 - A. Program Year One
3. The Management Entity Budget
 - A. Budget Year One and Beyond
4. Budgets for the Overseas Sites
 - A. Brazil
 - B. Peru
 - C. Indonesia
 - D. Kenya
 - E. Morocco
 - F. Overseas Site Development Funds
5. Summary

PART I

BACKGROUND

TITLE XII

SMALL RUMINANT COLLABORATIVE RESEARCH SUPPORT PROGRAM

HISTORICAL PERSPECTIVE

Agriculture is the primary occupation of mankind, and in all its long history there has scarcely been an agricultural revolution comparable to that in North America during the past 100 years. With its vast natural resources of abundant land, ample water, favorable climates, and readily available energy, North America has been transformed, in a relatively short span of human history, from a negligible agricultural producer to the most important primary producer in the world. Indeed, the United States has become to a large degree the broker of the world's food surpluses. Given the burgeoning world population with its insatiable demand for food, agriculture has not only provided the US with a powerful economic tool, but an increasing political advantage more powerful than all the weapon systems devised by man. While nations may threaten each other with war in the future, the ever-present threat of hunger must be met now, every day, in every homestead.

The spectacular success of US agriculture can be attributed to many factors, among them the already mentioned abundance of its natural resources. Other factors include the far sighted legislation which Congress, as early as the Civil War Era, recognized as necessary to provide the capability, in a new and expanding nation, for problem solving through innovative research. The landmarks of this legislation are as follows:

1. In 1862, the Morrill Act recognized the importance of education and provided for the establishment of State land grant institutions with the objective of supplying the nation with publicly funded teaching, research, and community service that would focus on the problems of what was, at that time, a largely agrarian society.
2. In 1887, the Hatch Act recognized the importance of research and provided the land grant institutions with Federal funds to enable them to pursue original research basic to the problems of agriculture in its broadest aspects.
3. In 1890, agricultural and technical colleges were established in the Southern states to ensure that the Federal largesse did not bypass the predominantly black minority groups.

4. In 1914, the Smith-Lever Act recognized the importance of extension and expanded its role within the land grant institutions with Federal support.

The classical concept of tying education, research, and extension into a common institution which has characterized the American land grant university system was now in place. Since then the achievements of this system speak for themselves. The ever increasing productivity of US agriculture provided the American people with one of the most ample and varied diets in the world and, combined with the rapidly shrinking globe of the post-World War II era, gave impetus to the US to recognize and actively fulfill its perceived responsibilities abroad.

It became apparent, however, that simply supplying the world's hungry with food was at best a temporary measure which in no permanent way altered the cycle of poverty and deprivation in the less developed countries (LDC's). Improving the capability of these areas to supply their own food needs was the only reasonable long term solution to the problem and our early efforts in this direction include participation in International Centers and FAO and establishment of the Peace Corps. More recently, in recognition of the US land grant universities' established expertise in agricultural research and proven record of successfully implementing this research to dramatically increase domestic agricultural production, the US Congress passed the International Development and Food Assistance Act of 1975. The Act provided for the amendment of the Foreign Assistance Act of 1961 by the addition of a new title as follows:

Title XII--Famine Prevention and Freedom from Hunger

Section 296 General Provisions--(a). The Congress declares that, in order to prevent famine and establish freedom from hunger, the United States should strengthen the capacities of United States land grant and other eligible universities in program-related agricultural institutional development and research, consistent with sections 103 and 103A, should improve their participation in the United States Government's international efforts to apply more effective agricultural sciences to the goal of increasing world food production, and in general should provide increased and longer term support to the application of science to solving food and nutrition problems of the developing countries.

Additionally, the legislative language of Title XII stated that ". . . as used in this Title the term Administrator means the Administrator of the Agency for International Development (AID)" and ". . . the President shall exercise his authority under this section through the Administrator." Clearly then, the activities of Title XII were to be administered through AID.

Furthermore, mechanisms for facilitating the implementation of Title XII were specified and included authorization for the President to create The Board of International Food and Agricultural Development (BIFAD) to initiate and implement the intent of the act. BIFAD began its work by the appointment of two Joint Committees with differing responsibilities. First, the Joint Committee on Agricultural Development (JCAD) to deal with development projects and second, to deal with research related projects, the Joint Research Committee (JRC) was appointed. The JRC recommended that research aspects of work under Title XII be implemented through Collaborative Research Support Programs (CRSP's) and selected a number of research topics for consideration. By 1978 four topics rating high priority for implementation were Aquaculture, Millets and Sorghums, Human Nutrition, and Small Ruminants. First steps in the establishment of this last topic into a CRSP involved the preparation of a detailed working paper entitled the State of the Art Study by Winrock International Livestock Research and Training Center. The following information is taken in part from their report.

Background Information on Small Ruminants

There are approximately one billion sheep and 400 million goats in the world; 40 % of the sheep and 77 % of the goats are in the developing countries of Africa, Asia, the Near East, and Latin America. Sheep and goats provide about 11 % of agriculture's share of the gross domestic product in the Near East and Southwest Asia, 3 % in Africa, and 1 % in Latin America. There is a strong demand for sheep and goat meat. The Food and Agriculture Organization of the UN (FAO) estimates that in 1980 world economic demand will exceed production by approximately 600,000 metric tons or the equivalent of production from 30 to 40 million sheep and goats.

In the developing countries sheep and goats are usually owned by small pastoralists and farmers. Small ruminants are particularly well suited for smallholders in LDC's because they have low initial cost and modest requirements for housing and maintenance and the ability to graze marginal lands, scavenge crop residues and provide meat and milk in small, readily usable quantities. In addition, almost any member of the household can care for them. It is obvious then, that increasing the productivity of small ruminants in the LDC's could directly improve the diet and standard of living of a great many people.

ORGANIZATION OF THE SMALL RUMINANT CRSP

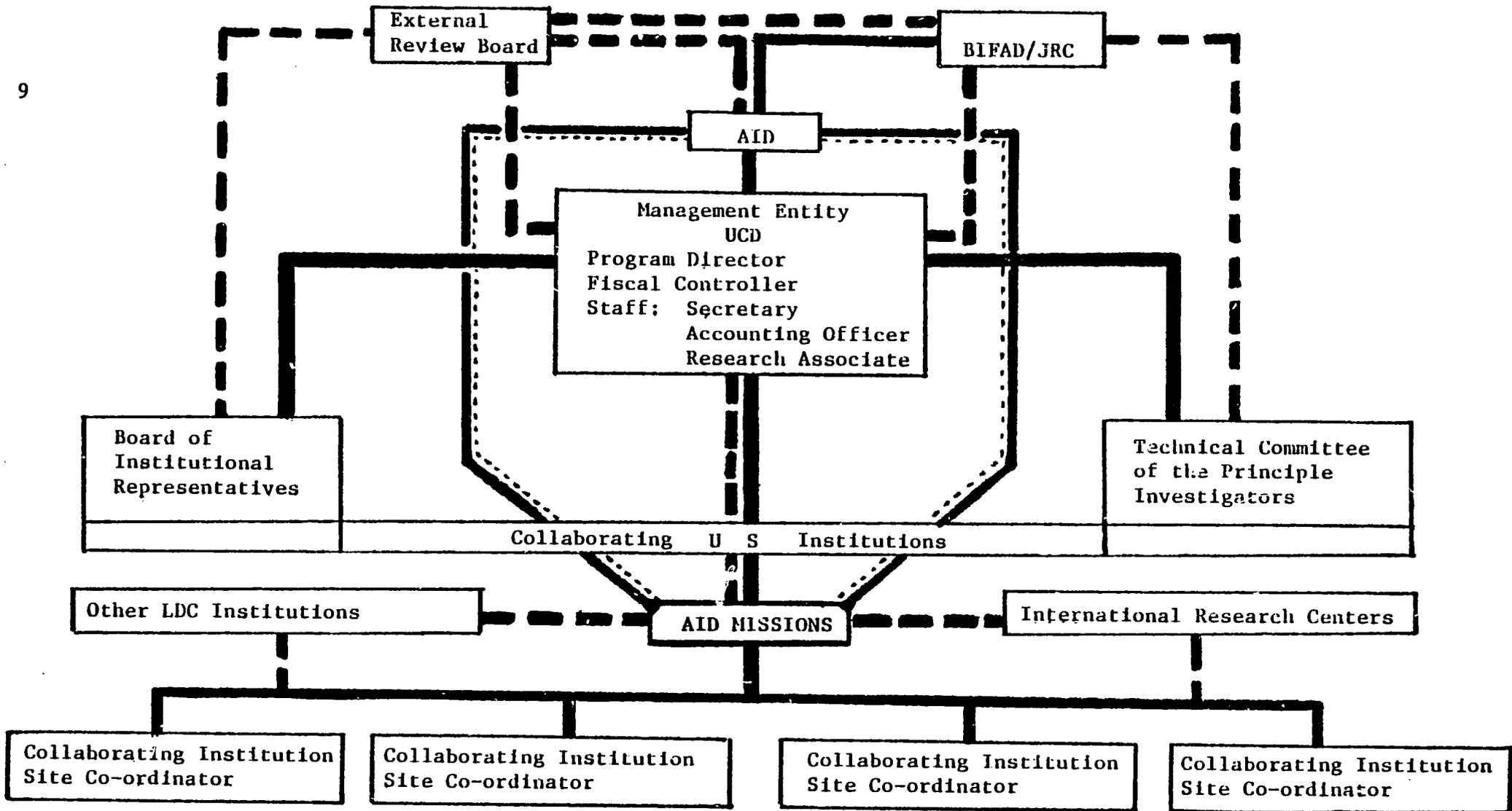
The preparation of the State of the Art Study clearly indicated the need for a Small Ruminant CRSP (SR-CRSP). The Research Triangle Institute (RTI) of North Carolina was contacted to prepare a proposal for the program development, actual implementation, and subsequent management including the cost of all these activities of this, the first CRSP to be launched under Title XII. Following a call for projects to all eligible land grant institutions and the selection, by an expert panel, of 13 institutions with 17 such projects from among over 60 submitted, the RTI prepared a report for the JRC and BIFAD which was accepted. RTI was authorized to transfer responsibilities for the SR-CRSP to the appropriate committees designated in the proposed management structure (see Figure 1). RTI accordingly called together, in May 1978, representatives of all the 13 selected participating institutions from which one was selected by ballot to be the Management Entity (ME).

Committee Selection

A ME Program Director was appointed on November 1, 1978, and the three important committees of the SR-CRSP were established: the Technical Committee (TC), the Board of Institutional Representatives (BIR), and the External Evaluation Panel (EEP).

The Technical Committee (TC) is defined as:

The Principal Investigator (PI) of each component research project of the CRSP shall be a member of the Technical Committee along with the Program Director who will be an ex-officio, non-voting member. With the leadership of the Program Director, the Technical Committee will develop the means for integration of research and training activities of the component projects to maximize progress toward the objectives of the program. A particular responsibility of the Technical Committee will be the development of plans for overseas facilities and the foreign scientists, foreign institutions, and the International Agricultural Research Institutes for approval by the Board of the CRSP. The Technical Committee will collaborate with the Program Director on:



-  AID Washington & Overseas Communication
-  Executive Lines of Communication
-  Advisory Lines of Communication

Figure 1.

ORGANIZATIONAL CHART
 COLLABORATIVE RESEARCH SUPPORT PROGRAM
 ON SMALL RUMINANTS

1. Development of plans for the research and training programs and technical services including the addition, modification, or deletion of component projects and program elements;
2. Evaluation and recommendation of foreign work sites;
3. Development of staff and facilities at foreign work sites and planning their utilization;
4. Development of the annual budget plan for allocation of funds for component projects and work in foreign sites;
5. Development of policies on publication and dissemination of research results, including joint publications; and
6. Preparation of reports.

LDC representatives or site coordinators may be added to the Technical Committee as desired by the Program Director with the approval of the Board.

The Board of Institutional Representatives (BIR) is defined as:

Each eligible Participating Institution (including UC) shall appoint one Representative to the Board of Institutional Representatives. Each such institution may also appoint an Executive of the Participating Institution (such as Dean of Agriculture, Experiment Station Director, or other designee). Each Participating Institution shall prescribe its own procedure for the selection of said representative and alternate. The Board will:

1. Provide a liaison between institutional administrations and Management Entity;
2. Advise the ME on general program policy and objectives, taking into account changing technical requirements of the program and the recommendations of the External Evaluation Panel;
3. Assess the content and balance of the CRSP and the adequacy of funding and resources;
4. Review cost sharing by the Participating Institutions and make recommendations as needed;
5. Review the general expenditure pattern of the CRSP and approve the annual budget plan for allocation of funds to component projects and work in foreign sites;

6. Approve the addition or deletion of component projects and program elements and changes in program objectives;
7. Review the progress and accomplishments of the CRSP including research and training elements and technical services;
8. Concur in the selection of the Program Director;
9. Concur in the selection of foreign work sites.

The External Evaluation Panel (EEP) is defined as:

The External Evaluation Committee shall be composed of a multidisciplinary group of six eminent scientists representing a wide spectrum of interests including FAO, LDC's, World Bank, USDA, and the land grant institutions. Committee members, none of whom will be from the institutions participating in the SR-CRSP, will insure that the activities of the SR-CRSP will be subjected to internal review by the Technical Committee, the Board, and the ME before annual refunding and also to the scrutiny of an independent body knowledgeable in many fields. The Committee will be appointed by the Management Entity in consultation with the Technical Committee, and with the advice and consent of the Board and JRC. The Committee will:

1. Review at least annually the projects and program of the CRSP and provide written evaluation reports to the Management Entity, to AID, and to BIFAD/JRC;
2. Recommend changes in program objectives;
3. Recommend additions, deletions, or modifications of component projects or program elements;
4. Recommend selection of foreign work sites.

Overseas Worksite Selection

The overseas component of the SR-CRSP was deemed to be both the cornerstone of the project and the element which would take the longest period of time and the most strenuous effort to establish. Therefore, as soon as responsibility was transferred to the ME, cables were immediately dispatched via the Development Support Bureau (DSB) of AID to all overseas USAID Missions. Over 40 responses were received and approximately

half of these were receptive to the possibility of the CRSP working in their particular region. Teams consisting of one AID person from each AID Regional Bureau with two Principal Investigators of the CRSP were each sent to the four regions of Asia, Africa, Near East, and Latin America. In each region four or five countries were visited¹ and recommendations to the Technical Committee by these teams were received in April 1979 that major CRSP sites should be established in Morocco, Indonesia, Kenya, Brazil, and Peru. These recommendations were placed before the BIR in early May 1979 in the form of a draft integrated program plan prepared on behalf of the TC by the ME. The plan was accepted and in mid-May the Program Director began a series of administrative site visits the purposes of which were to discuss:

- Which institute should collaborate with the CRSP in the selected countries.
- Which scientists within each of the selected institutes should collaborate with US counterparts.
- The content and nature of the memorandum of understanding (MOU) between the overseas institute and UCD representing the CRSP participants.
- The time schedule for the scientist to scientist contacts required for initiation of the research program.
- The preparation of a work plan for each overseas site.

The regional survey, administrative site visits, and scientist to scientist contacts took place throughout 1979 and early 1980. Based on these contacts, an overseas worksite matrix was developed for SR-CRSP participating institutions which is shown in Table 1.

¹In all the following countries were covered by members of the CRSP either at CRSP expense or while working on other projects. Brazil, Peru, Colombia, Bolivia, Guatemala, Jamaica, Costa Rica, Nepal, India, Indonesia, Pakistan, Syria, Turkey, Morocco, Sudan, Kenya, Mali, Cameroon, Nigeria, Ethiopia, Mexico.

Table 1.

<u>Study</u>	<u>School</u>	<u>Peru</u>	<u>Brazil</u>	<u>Indo- nesia</u>	<u>Morocco</u>	<u>Kenya</u>
Range	Texas Tech	X				
	Utah		X		X	
Forages	Ohio	X				X
Byproducts	N.C.S.U.		X	X		
Health	U.C.D.		X	X		
	Colorado	X				
	Washington				X	X
Breeding	U.C.D.			X		X
	Montana	X			X	
	Texas A&M		X			
Management	Tuskegee		X			
	Winrock					X
Reproduction	Utah/CalPoly	X			X	
Economics	Winrock	X	X	X	X	X
Sociology	Missouri	X	X	X	X	X
Systems	Texas A&M	X	X	X	X	X

Memoranda of Understanding

Agreement between UCD, as the ME, and each of the overseas institutions participating in the SR-CRSP could not be negotiated in the same manner as the highly complex agreements between UCD and the individual US institutions involved in the CRSP. Many of the mandatory management responsibilities required by AID in accordance with Federal regulations are defined and transferred by these agreements. The use of such a model with each of the overseas institutions would inevitably take an inordinate amount of time to negotiate and arrangement through Government to Government agreement would take even longer. A model recommended by AID, overseas Missions, BIFAD staff, JRC, and ME alike which has proven to be a valuable rapid implementation tool has been the development of a relatively simple Memorandum of Understanding between UCD and the overseas institution specifically. This broadly defines the scope of work and the anticipated contribution from US and host country institutions. While the same template was used for each of the collaborating institutions each one was also modified to match local requirements and idiosyncracies. Currently MOU's are in place with:

- EMBRAPA representing Brazil
- INIA representing Peru
- AARD representing Indonesia
- Ministry of Agriculture representing Kenya
- HASSAN II representing Morocco (under negotiation).

Integrated Program Plan

Following these visits the present Integrated Program Plan for the Small Ruminant CRSP was prepared detailing the domestic and overseas research components, personnel, and budgets of the program. The overall framework for the Integrated Program Plan is presented in Table 2.

The future implementation of the SR-CRSP will feature:

- An overseas site coordinator for each location to coordinate the activities of PI's and their staff as approved by regional technical sub-committee.
- A draw down system of financing whereby decisions on appropriate expenditures are made by the US and overseas PI's together starting the flow of funds to the overseas sites. These funds are drawn from US subgrants

awarded by the Management Entity which in turn draws its funds from USAID on behalf of all the participating institutions.

- An attempt to maximize the effort in the overseas locations where research activities will include the efforts of local counterpart scientists, US PI's, pre- and post-doctoral US research staff and research by local personnel working toward a US/university higher degree.

Table 2.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

AID 1020-20 (1-73)

Life of Project:
From FY _____ to FY _____
Total U.S. Funding _____
Date Prepared: _____

Project Title & Number: SR-CRSP (Page 2)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal: The broader objective to which this project contributes:</p> <ul style="list-style-type: none"> o developing and testing appropriate technologies designed to improve food and fiber production. o improving the small ruminant food and fiber production capabilities of the LDC's. 	<p>Measures of Goal Achievement:</p> <p>c) Evidence of the suitability of management packages and appropriate technologies to improve small ruminant productivity.</p>		<p>Assumptions for achieving goal targets:</p> <p>d) That the capacity and capability of increasing productivity will be grasped by the LDC's.</p>
<p>Project purpose:</p> <p>systems and increased efficiency of small ruminants can be achieved.</p>	<p>Conditions that will indicate purpose has been achieved: End of project status.</p> <p>c) Research results that demonstrate significant improvement in small ruminant productivity in LDC's and U.S.</p>		<p>Assumptions for achieving purpose:</p>
<p>Outputs:</p> <p>c) The practical application of knowledge gained and its methods of implementation by publication, consultation, active workshops and trained manpower.</p>	<p>Magnitude of Outputs:</p> <p>c) Extension of the knowledge through newly trained manpower. Several at each of the Ph.D, Ms. and service course level through U.S. and LDC universities and in-country workshops.</p>		<p>Assumptions for achieving outputs:</p> <p>That suitable staff and students will be available for training in the appropriate disciplines at U.S. institutions.</p>
<p>Inputs:</p>	<p>Implementation Target (Type and Quantity)</p>		<p>Assumptions for providing inputs:</p>

Table 2.
PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Indefinite with
Life of Project: 5-year minimum.
From FY 10/78 to FY 10/
Total U.S. Funding \$20,000,000 est.
Date Prepared: 6/20/79

Project Title & Number: Small Ruminant Collaborative Research Support Program.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal: The broader objective to which this project contributes: To improve the efficiency of small ruminant production in LDC's by:</p> <ul style="list-style-type: none"> o expanding the body of knowledge and its application to the solution of specific problems. o expanding the level of competence of U.S. and developing country scientists to conduct research. <p style="text-align: center;">(continued)</p>	<p>Measures of Goal Achievement:</p> <ul style="list-style-type: none"> a) Availability of published information on the new knowledge developed. b) Evidence of improved competence of U.S. and LDC manpower by the quantity and quality of new trained manpower. <p style="text-align: center;">(continued)</p>	<p>Review by involved agencies and institutions including U.S. AID, External Evaluation Committee, the Board of Institutional Representatives, IRC, BIFAD and LDC's Institution means of verification.</p>	<p>Assumptions for achieving goal targets:</p> <ul style="list-style-type: none"> a) That the constraints currently limiting small ruminant productivity in the LDC's are researchable. b) That research undertaken will succeed in providing practical solutions. c) That the research and training effort envisioned will in fact improve the competency to LDC and U.S. scientists. <p style="text-align: center;">(continued)</p>
<p>Project Purpose: To bring together the resources of U.S. institutions having expertise in the disciplines of small ruminant nutrition, physiology, management, economics, sociology, health and systems analysis with the developing institutions in the LDC's in order to facilitate the development of a base of knowledge and manpower from which improved management</p> <p style="text-align: center;">(continued)</p>	<p>Conditions that will indicate purpose has been achieved: End of project status.</p> <ul style="list-style-type: none"> a) Viable and functioning collaborative research projects in the U.S. and LDC's with identified personnel. b) Identifiable personnel under training in the LDC's, U.S., and through in-country programs. <p style="text-align: center;">(continued)</p>	<p>Provision by each subgrantee of annual reports to the Management Entity. Provision by the Management Entity of a consolidated annual report on the SR-CRSP achievements. Provision by the External Evaluation Committee of a completely independent review in writing of the attainment of the project purposes.</p>	<p>Assumptions for achieving purpose:</p> <ul style="list-style-type: none"> That the goals and objectives of the SR-CRSP are appropriate in the regional context of where collaboration takes place. That the constraints to production in LDC's are indeed related to the discipline areas identified by the SR-CRSP.
<p>Output:</p> <ul style="list-style-type: none"> a) Packages of validated improved technological practices developed in specific locations but readily adaptable to other areas. b) An understanding of the interacting forces constraining improved efficiency and development of management practices incorporating the new knowledge and techniques. <p style="text-align: center;">(continued)</p>	<p>Magnitude of Output:</p> <ul style="list-style-type: none"> a) Projected publication of experimental data in the scientific literature, in bulletins and practical manuals. b) Development of working examples of improved management practices using new technology packages. <p style="text-align: center;">(continued)</p>	<p>Review by External Evaluation Committee of data output, participation by all subgrantee staff in local, regional and international workshops, seminars and training programs. Evaluation of the publications, management packages and application of the research. Evaluation of the numbers and quality of LDC staff trained by the SR-CRSP.</p>	<p>Assumptions for achieving outputs:</p> <ul style="list-style-type: none"> That LDC's will utilize new knowledge developed and apply it through their local extension facilities in the field. That LDC facilities, staff and collaborators will be willing to work with SR-CRSP subgrantees in the appropriate field. <p style="text-align: center;">(continued)</p>
<p>Inputs:</p> <ul style="list-style-type: none"> a) Grant No. U.S. AID/DSAN/XII-G-0049 with University of California. b) 25% minimum cost sharing by each participating U.S. institution. c) Experience and expertise of U.S. and LDC staff to undertake the planned research as specified in the Integrated Program Plan. d) Students from U.S. and LDC institution for specific and advanced training. 	<p>Implementation Target (Type and Quantity)</p> <ul style="list-style-type: none"> Implementation through planning grants available through 6/1/79. Implementation of first year funding through subgrants (17) effective 7/1/79. Implementation in subsequent years through re-renewal annually of subgrant agreements as deemed appropriate by the Board of Institutional Representatives and the Management Entity. 	<p>Annual reports and periodic evaluation by External Evaluation Committee, U.S. AID, IRC and BIFAD to summarize progress made and to plan for the future. Annual audit of each subgrantee, the Management Entity and the SR-CRSP as a whole.</p>	<p>Assumptions for providing inputs:</p> <ul style="list-style-type: none"> That the SR-CRSP will receive adequate funding by AID as proposed for the period of time agreed upon. That overseas collaborating institutions will continue to receive domestic funding and adhere to the terms and conditions of the Memoranda of Understanding with Management Entity. That U.S. institutions and their faculty will continue to retain an active interest in the SR-CRSP and contribute 25% cost sharing.

THE SMALL RUMINANT CRSP AS A RESEARCH ENDEAVOR

Principles of Research

The Small Ruminant CRSP is a research venture. The development of new knowledge and its transmittal to trained manpower will be its primary products.

Research is expensive. Although it is an investment most nations cannot afford, research is an essential prerequisite to sustained development. This accounts, in part, for the existence of this program. Expensive as research is and limited as the funds are for a program of this size, it is essential that this program collaborate with well established institutions overseas.

Research topics require a high potential for success before being undertaken. Because of the cost of research in time, money, and effort the likelihood of success (even in development of basic knowledge) is a prime consideration in selection of topics and locations in which to carry the studies out. Crucial to the success of the CRSP is the presence of a labor force trained to approach problems of productivity, management, and marketing from a comprehensive and integrated stance, and the existence of appropriate facilities or the money for their development.

Research results must be to some degree universal. The applicability of CRSP findings should extend beyond the borders of any nation in which the research was conducted and be useful in other areas of similar climate and topography. The selected sites exhibit this characteristic to a high degree.

Research training depends upon availability of adequate numbers of well trained graduates. Also highly desirable is the association of CRSP research with centers of excellence in education and extension; this has proven to be a successful model in US land grant institutions.

Extension service links are pivotal to implementation of research findings. These must be in place because the program does not have the resources to directly undertake extension and development.

Research should be conducted in a politically stable environment. Political stability is a factor facilitating:

- acceptability of expatriate staff
- compatibility with neighboring countries necessary to facilitate implementation of research findings
- third country training.

Current Husbandry Practices and Problems in LDC's

The group of people towards whom the activities of CRSP will be directed will be the limited resource producers including the smallholder and those involved in transhumance and nomadic husbandry. The problems unique to their situation makes on site overseas research not only appropriate but essential if meaningful progress is to be made in improving small ruminant productivity under these conditions. Great care was taken to select overseas sites representative of the various ecosystems and production systems encountered in the tropics.

Sheep and goats are managed under both extensive and intensive systems. The principal extensive systems are the nomadic, transhumance, and/or sedentarized grazing systems of Africa, Asia, and the Near East. The main intensive systems are characterized by crop/livestock combinations found in the Asian subcontinent, the Near East, Africa, and Latin America. Under extensive and intensive management, sheep and goats provide meat, milk, hides, and fiber for both commercial and home use.

Although there are some 700 million sheep and goats in the developing countries of Africa, Asia, and Latin America, total production per animal unit is low. The principal technological constraints in both extensive and intensive systems are inadequate year-round feed supply, disease and parasitism, non-selective breeding, and low rates of reproduction. In extensive grazing systems, rangelands are often over-grazed or mismanaged causing wide-spread destruction of vegetation and erosion of the top soil which leads to a deteriorated rangeland and ultimately causes declining animal productivity. These technological constraints are exacerbated by the unavailability and/or high cost of many types of external inputs required to improve sheep and goat production systems, inefficient marketing systems, and by social factors constraining the application of improved practices.

In most instances significant improvements can be made in sheep and goat production systems. These improvements must be based on more efficient use of

available land, feed, animal, and labor resources to achieve optimal production of meat, milk, hides, and fiber and to conserve and improve range and other natural resources. In extensive grazing systems in arid rangeland areas, reduction of sheep and goat numbers will be required in overpopulated areas to alleviate overgrazing; this will in turn allow rangelands to regenerate and conserve water and soil resources. Under these circumstances, net production will increase despite reduced animal numbers. However, in more humid areas which have substantial feed resources, the population of sheep and goats could be appreciably increased.

SMALL RUMINANT CRSP RESEARCH PROJECTS

Ecosystems, Production Systems and Disciplines

The Small Ruminant CRSP will attempt to comprehensively represent a wide spectrum of ecosystems, production systems, scientific disciplines. The ecosystems represented will be arid and semi-arid, humid and sub-humid, and highland regions. The production systems represented will be those generating meat, milk, hides, and fiber from sheep and goats. The scientific disciplines represented will be physiology, nutrition, genetics, sociology, systems analysis, economics, health, farm management, and range management.

Goals and Objectives

The long-range goal of the Small Ruminant CRSP is to increase the efficiency of production of meat, milk, and fiber by sheep and goats in order to increase the food supply and raise the income of the smallholder. Expanding the body of knowledge and increasing the level of competence of US and LDC scientists to conduct research on small ruminants and smallholder production systems will facilitate the development and testing of appropriate technologies and practices to improve productivity of target production systems in developing countries. The immediate objectives as reflected by the individual research projects are:

1. Genetic Improvement
 - A. Characterize the production norms for indigenous and introduced breeds.
 - B. Estimate the heritabilities and repeatabilities of important production

traits, the genetic and phenotypic correlations among them, and genotype X environment interactions influencing them.

- C. Evaluate the potential for genetic improvement through selection of native stock and/or cross-breeding.

2. Range Management

- A. Characterize range sites and evaluate existing plant communities in relation to their ecological potential.
- B. Determine proper species and numbers of grazing animals to assure optimal long-term productivity and stability of the range.
- C. Establish recommendations for herd and flock grazing practices which will help optimize animal productivity and range stability.

3. Nutrition and Feeding

- A. Characterize the nutritional and economic value of available forage, by-product and native range feedstuffs.
- B. Determine the nutritional requirements for goats and hairsheep in different stages of their productive life cycle.
- C. Establish recommendations for herd and flock grazing practices on the range which will help optimize animal productivity and range conservation.
- D. Establish recommendations for mineral, protein, vitamin, and energy supplementation practices which will help optimize reproductive rates, disease and parasite resistance, growth rates, feed efficiency, and carcass grade at market age.

4. Reproduction

- A. Determine the male and female reproductive parameters for goats and sheep.
- B. Establish recommendations for management practices which will optimize reproductive rates.

5. Animal Health

- A. Characterize the prevalence and impact of parasitic and infectious diseases in local herds and flocks, including seasonal, nutritional,

- management, and genetic effects.
 - B. Establish practical guidelines for prevention and control of major diseases.
6. Management
- A. Compare types of housing and evaluate their effect on mortality and productivity.
 - B. Determine optimum breeding seasons, weaning weights, and marketing ages for optimum production and reproduction.
 - C. Establish recommendations for common management practices such as weaning, castration, dehorning, animal identification, and vaccination.
7. Socio-Economic Research
- A. Document the social and cultural factors influencing smallholder decision making.
 - B. Characterize the existing production systems, including input/output relationships.
 - C. Study the facilitators and constraints in the transportation, processing, pricing, and storage systems, as they relate to producer incentive and market efficiency.
 - D. Study the availability of key inputs for the implementation of new recommended practices, including physical inputs, technical assistance, and credit.
8. Systems Research
- A. Study the dynamics of traditional and improved production systems, identifying the key factors for influencing productivity and productive efficiency.

Participating Institutions

The CRSP on Small Ruminants will be comprised initially of 17 component research projects in 13 US universities and research institutions, including:

1. University of California, Davis (UCD)
breeding and genetics, animal health
2. California State Polytechnic University, Pomona
reproductive physiology (male)
3. Colorado State University
animal health
4. University of Missouri
rural sociology
5. Montana State University
breeding and genetics
6. North Carolina State University
by-products and nutrition
7. Ohio State University
forages and nutrition
8. Texas A&M University
systems analysis, breeding and genetics
9. Texas Tech University
range management
10. Tuskegee Institute
intensive management
11. Utah State University
range management, reproductive physiology (female)
12. Washington State University
animal health
13. Winrock International Livestock Center
economics, dairy goat production systems.