

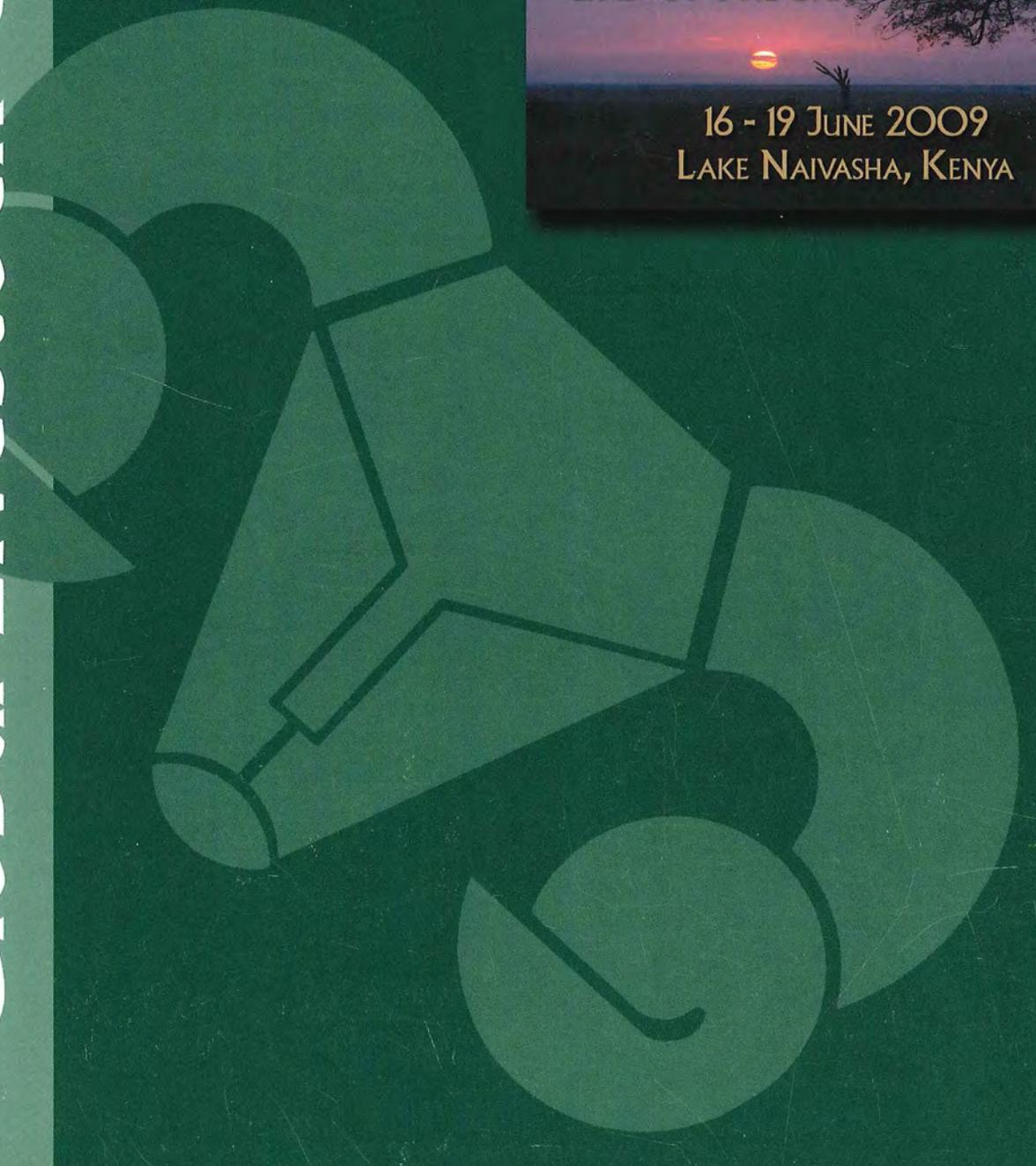
Global Livestock CRSP

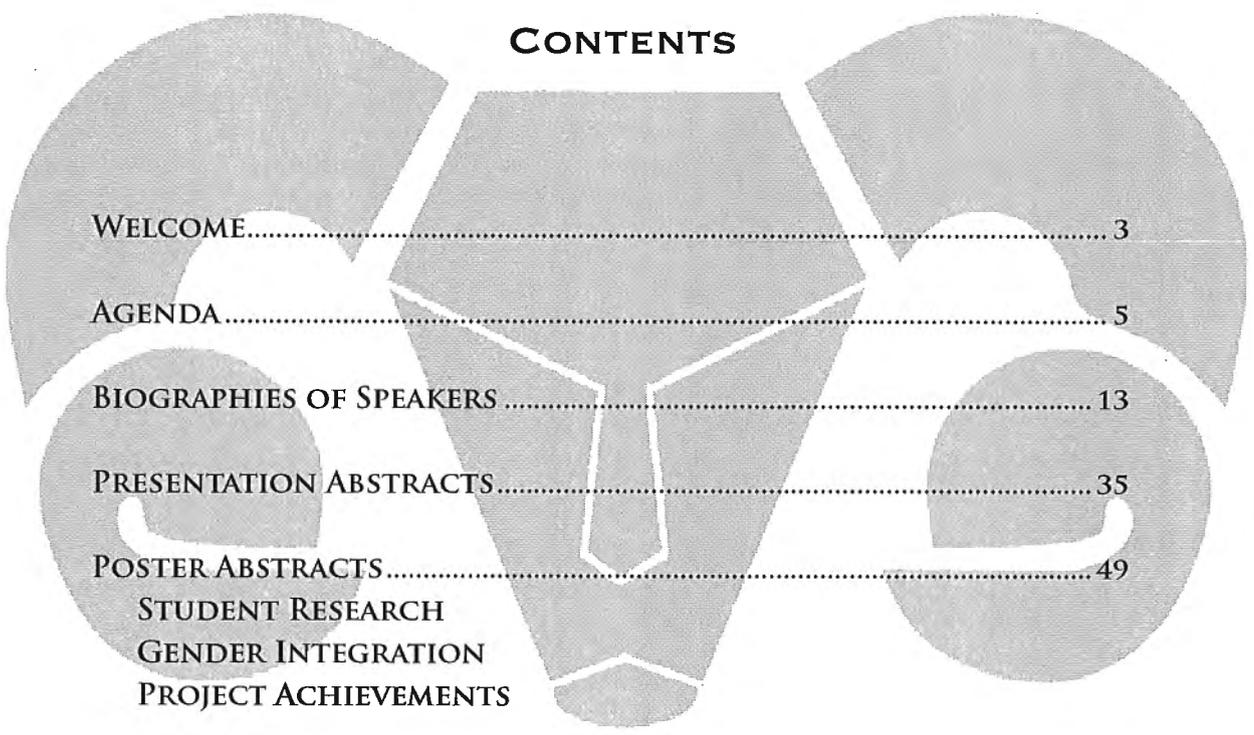
FROM PROBLEM MODELS TO SOLUTIONS:

LEARNING TO COPE IN A RISKY WORLD

END OF PROGRAM CONFERENCE

16 - 19 JUNE 2009
LAKE NAIVASHA, KENYA





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WELCOME

I welcome you to the Global Livestock Collaborative Research Support Program (GL-CRSP) end of program conference. This conference represents the culmination of over 11 years of effort on your part, and that of hundreds of our colleagues and partner institutions. Over the years of the GL-CRSP, much has changed both in our CRSP world and in the world that supports our efforts.

We have seen our projects achieve and end successfully, evolve and have impact, learn from the past and make additive contributions to significant issues of development. Technologies that you have developed are now in use from Mali to Mongolia. They are on the ground across Africa, Latin America and Asia. We see women's groups employing GL-CRSP generated knowledge, making remarkable gains in social status and income that impact the development of their children. Across the globe, GL-CRSP projects have trained trainers to respond to avian flu and understand the links between the environment and zoonotic disease. The GL-CRSP has aggressively addressed the serious divides that exist between agriculture, nutrition and human development, showing that meat consumption in developing countries is critical to child cognitive and physical development. We were leaders in recognizing the importance of risk management for the poor, pastoralists as prime targets for mechanisms to cope with risk, and grasslands as carbon sinks, marketable as credits if efficient measurement methods could be developed.

On the larger landscape of international development in the U.S., we have witnessed significant changes. In the beginning of the GL-CRSP, there was hardly a mention of the "A" word; agriculture was not part of the donor agenda. Rather the often heard phrase, "the world has plenty of food, it is just not evenly distributed," was widely stated (Of course the same could be said of money and poverty). To make matters worse, the last administration did not recognize the concept of global warming. Along with the lack of focus on these key issues and their impact on the poor, research and higher education were equally dismissed. Multilateral donors, using crude calculations of economic rates of return, had long ago, rejected higher education for exclusive support of basic education. Research was considered an unaffordable luxury.

How times have changed in the last few years. The food crisis has demonstrated, among other things, how close we are to the fine line of adequate supply in the face of growing global demand. Years of neglect for

research in agricultural production caught up with us. Suddenly agriculture is back. Likewise global warming is now clearly accepted as a major force to be addressed in the development portfolio of the U.S. government (USG). The world is scrambling for systems to measure carbon in the landscape (something the CRSP developed years ago for grasslands in Central Asia and North America). The tsunami of students demanding higher education in Africa, a product of the emphasis on basic education, is doubling every five years, posing a major challenge to higher education in the region that if unaddressed could be a destabilizing force for national governments. There is now wide recognition that without the creative contribution of people with higher education, achieving further economic development and food security is not possible.

Major legislation in the Congress to address the food crisis is progressing rapidly and encompasses a major role for US higher education institutions. At the G20 Summit, President Obama recently announced a billion dollar effort in agriculture in developing countries and specifically mentioned the role of land grant universities and colleges in research and capacity building as a means to carry out that agenda. Secretary Gates has made similar statements. Congress is in considerable debate about the form of carbon markets and tax, while California has established a formal carbon market with offsets.

In recent years, I have been working on what is now known as the Africa-U.S. Higher Education Initiative whose goal is to raise the awareness of higher education as a critical force in development in Africa. The Initiative is led by the Association of Public and Land-grant Universities (APLU) with a multitude of partners including the Partnership to Cut Hunger and Poverty in Africa and the Forum for Agricultural Research in Africa (FARA). The Initiative has raised awareness, particularly with Congress and the new Administration, of the importance of research, and human and institutional capacity building as fundamental steps in development. In addition, we

have worked hard to raise awareness of the challenges faced by USAID in staffing, and advocated for restoring the Agency's leadership position in the USG's development efforts. Supported by a wide consortium of stakeholders, including APLU, the Agency recently received a \$143M increase in USAID's operation budget that will finally begin to address some of its staffing issues.

So now the tide has turned and a number of forces are aligned to create an environment where higher education and research can take their rightful place in USAID's toolbox of development interventions. The critical lesson is that what we learn through research should impact how we and others should plan development work. As partners with USAID, we in the research community have an obligation to produce relevant products, and likewise, the development community has an equal responsibility to use the relevant knowledge we produce in their design of development activities. This conference is about being relevant for development goals, both the challenges and the successes. We hope, through the conference, to engage you and profit from your experiences over the past 11 years to capture what we all have learned to do a better job for developing countries and their people. In the process America can become more globally engaged, aware and competent to contribute to improved global wellbeing.



Montague W. Demment
Director, Global Livestock CRSP

AGENDA

For over ten years, the Global Livestock CRSP portfolio has been centered on a theme of managing risk in a changing environment and unpredictable world. Through broad-based interdisciplinary projects focused on human nutrition, economic growth, environment, zoonotic diseases and policy, the program has developed knowledge and capacity to address important topics in the international livestock development sector.

The GL-CRSP grant, funded by USAID, comes to an end in September 2009. The GL-CRSP End of Program Conference is intended to highlight GL-CRSP programmatic achievements, discuss our lessons learned and identify the major challenges of conducting international development research. The conference will also examine the challenges and the process by which our program has functioned. While we are all interested in impact, we would like to go a bit deeper and examine why things did or did not happen. We hope to stimulate dialogue and develop the way forward for animal agriculture research in international development.

TUESDAY, 16 JUNE 2009

- | | |
|-----------------|--|
| 12:00 - 7:00 pm | Hotel & Registration Check-in
<i>Hotel Reception, all participants must pre-register online.</i> |
| 12:30 – 2:00 pm | Lunch
<i>Sopa Lodge Dining Room</i> |
| 12:00 – 4:00 pm | Meetings, Team and Panel
Poster and Presentation set-up |
| 6:00 – 7:00 pm | Welcome Reception
<i>Sopa Lodge Lawn, weather permitting</i> |
| 7:30 – 10:00 pm | OPENING CEREMONY & GALA DINNER
<i>Sopa Lodge Dining Room</i> <ul style="list-style-type: none">- Welcome remarks- Highlights of the Global Livestock CRSP |

WEDNESDAY, 17 JUNE 2009

6:30 – 7:30 am Breakfast, *at hotel where residing*

Registration Check-in, *Longonot Conference Room Foyer*

8:00 – 8:30 am **OVERVIEW AND INTRODUCTION**

Montague W. Demment, Director, Global Livestock CRSP

8:30 am – 1:00 pm **AGRICULTURE, HUMAN HEALTH AND NUTRITION**

Session Chair: Ephraim Mukisira, Kenya Agricultural Research Institute

Nutrition, Sustainable Livelihoods and Extension:

Linking Agriculture, Human Health and Nutrition with ENAM

Owuraku Sakyi-Dawson, University of Ghana

**The One Health Approach: Identifying Solutions to Complex Problems
at the Livestock-Wildlife Interface**

Rudovick Kazwala, Sokoine University of Agriculture

Jon Erickson, University of Vermont

**Animal Source Foods Promote Cognitive Function, School Performance,
Increased Muscle Growth and Activity in Kenyan School Children:
From Observational to Evidence-based Findings**

Nimrod Bwibo, University of Nairobi

Charlotte Neumann, University of California, Los Angeles

Constance Gewa, George Mason University

Research on the Interface between Agriculture and Public Health

JH Tim Williams, Peanut CRSP, University of Georgia

**The Interrelationship between Food Security, Nutrition and HIV:
Findings from Ongoing Field Work**

Grace Ettyang, Moi University

**PANEL: Challenges to Managing an Effective Development/research
Project that Crosses Disciplines, Cultures and Oceans**

Montague W. Demment, University of California, Davis (Moderator)

Grace Marquis, Iowa State University and McGill University

Patterson Semenyi, SUMAWA project

Tim Moermond, University of Wisconsin-Madison

WEDNESDAY, 17 JUNE 2009 (CONTINUED)

1:00 – 2:00 pm Lunch
Sopa Lodge Dining Room

2:00 – 2:15 pm **Synthesis and Introduction**
Ephraim Mukisira, Kenya Agricultural Research Institute
Montague W. Demment, University of California, Davis

2:15 – 5:00 pm **PEACEBUILDING, CONFLICT AND DEVELOPMENT**
Session Chair: A.A. Aboud, Egerton University

Empowering Afghan Herders to Build Peace
Michael Jacobs, Texas A&M University
Raz Mohammed Dalili, Sanayee Development Organization, Afghanistan

Livestock Early Warning System: A Tool That Holds Promise for an Integrated Natural Resource-based Conflict Management
Abdi Jama, FAO/IGAD Livestock Policy Initiative

PANEL: Addressing Conflict and Political Volatility in Development Programs
Peter Little, Emory University (Moderator)
Catherine Schloeder, Texas A&M University
Abraham Siika, Moi University
Hussein Mahmoud, Egerton University

6:00 – 7:30 pm **POSTER SESSION: HONORING STUDENT RESEARCH AND JIM ELLIS GRADUATE MENTORSHIP PROGRAM AWARDEES**
Poolside, weather permitting

8:00 pm Dinner
Sopa Lodge Dining Room

THURSDAY, 18 JUNE 2009

6:30 – 7:30 am Breakfast, *at hotel where residing*

8:00 – 8:30 am **KEYNOTE: The Need to Convince Policymakers that Research Matters**
*Hon. Prof. Ruth Oniang'o, Rural Outreach Program and
African Journal of Food, Agriculture, Nutrition and Development*

8:30 am – 1:00 pm **RESEARCH FOR DEVELOPMENT**
Session Chair: David Sammons, University of Florida

**The Quest for Impact: The Transformation of Research
from a Traditional to a Participatory Format in Southern Ethiopia**
Layne Coppock, Utah State University

The ENAM Model for Research, Outreach and Learning
Lorna Butler, Iowa State University

**From Problem-focused to People-centered:
Reframing the Science of Sustainable Development**
Tim Moermond, University of Wisconsin – Madison

**Engaging Policymakers in Project Design:
The Experience of LEWS and LINKS**
*Paul Dyke, Texas A&M University
Robert Kaitho, Texas A&M University
Gatarwa Kariuki, LINKS Kenya, International Livestock Research Institute*

Listening, a Driving Force for Applied Research
*David Bunn, University of California, Davis
Peter Msoffe, Sokoine University of Agriculture*

**PANEL: The Political Ecology of Linking Research Findings
with Community Mobilization**
*Steve Hockett, Utah State University (Moderator)
Dinah Amoah, ENAM Project
Jay Angerer, Texas A&M University
Jacynther Were, Nakuru Water Resource Management Authority*

THURSDAY, 18 JUNE 2009 (CONTINUED)

- 1:00 – 2:00 pm Lunch
Sopa Lodge Dining Room
- 2:00 – 2:15 pm **SYNTHESIS AND INTRODUCTION**
David Sammons, University of Florida
Montague W. Demment, University of California, Davis
- 2:15 – 2:45 pm **Rethinking Relevance:**
Human Development and the Contemporary University
Anne-Claire Hervy, Partnership to Cut Hunger and Poverty in Africa
and Africa-US Higher Education Initiative
- 2:45 – 4:20 pm **Working Group Discussion**
Break-out Rooms
- 4:30 - 5:30 pm **Working Group Reports**
Longonot Conference Room
- 6:30 - 7:30 pm **POSTER SESSION: GENDER INTEGRATION RESEARCH**
AND GL-CRSP PROJECT ACHIEVEMENTS
- 8:00 pm Dinner
Sopa Lodge Dining Room

FRIDAY, 19 JUNE 2009

6:30 – 7:30 am Breakfast, *at hotel where residing*

8:00 am – 1:00 pm **RISK AND CHANGING LIVELIHOODS**

Session Chair: Getachew Gebru, International Livestock Research Institute

KEYNOTE: Social Dimensions of Climate Change

Robin Mearns, World Bank

**The Economy of Change: Maasai Land Use Change
and Livelihood Diversification in Simanjiro, Tanzania**

Stacy Lynn, Colorado State University

Evolving Livelihoods in a Risky Environment

John McPeak, Syracuse University

Peter Little, Emory University

**Collective Action and Capacity Building Improves Lives
in Southern Ethiopia**

Layne Coppock, Utah State University

Solomon Desta, Utah State University

**PANEL: Potential Impact of Climate Change on Water Resources:
What Does it Mean for Development?**

Tracy Baker, International Water Management Institute (Moderator)

Jay Lund, University of California, Davis

William Shivoga, Egerton University

Emmanuel Gereta, Tanzania Wildlife Research Institute

Technology Transfer:

A Model for Pastoral Regions, the GOBI and Mali Experience

Jay Angerer, Texas A&M University

Narangerel Davaasuren, Mercy Corps

Jerry Stuth: The Legacy of his Life and Work

Montague W. Demment, University of California, Davis (Moderator)

1:00 – 2:00 pm

Lunch

Sopa Lodge Dining Room

FRIDAY, 19 JUNE 2009

2:00 – 4:30 pm

THE FUTURE OF RISK

Session Chair: Joyce Turk, United States Agency for International Development

**The Future of Information Communication Technology
and its Role in Pastoral Livelihoods**

Paul Dyke, Texas A&M University

Robert Kaitho, Texas A&M University

Gatarwa Kariuki, LINKS Kenya, International Livestock Research Institute

**PANEL: Risk at the Noxious Nexus of Unintended Consequences:
Livestock, Wildlife, People, Disease and Development**

Peter Coppolillo, Wildlife Conservation Society (Moderator)

George Aning, University of Ghana

Rudovick Kazwala, Sokoine University of Agriculture, Tanzania

David Wolking, University of California, Davis

**Opportunities, Constraints and Challenges
to Linking Nutrition, Agriculture and Development**

*Lindsay Allen, USDA, ARS Western Human Nutrition Research Center,
University of California, Davis*

From Problem Models to Solutions: A Final Word

Montague W. Demment, Director, Global Livestock CRSP

6:00 – 7:00 pm

Sundowner

Lakeside, weather permitting

8:00 pm

CLOSING CEREMONY & DINNER

Lakeside, weather permitting

SATURDAY, 20 JUNE 2009

7:30 – 9:30 am

Breakfast, *at hotel where residing*

8:30 – 10:30 am

Breakfast Meeting for present and former members of AP/PAC/EPAC
Offsite, meet in lobby of Sopa Lodge

8:30 – 10:00 am

Hotel Check-out and Departure for Nairobi

THE SPEAKERS

ABOUD, Abdillahi A. Abdillahi A. Aboud, PhD, is a Professor of Socio-ecology in the Department of Natural Resources, Egerton University with a strong background in range management and ecology at undergraduate training, and rural sociology at postgraduate training. He holds 14 professional certificates in relevant disciplines. He has had 17 years work experience with the Ministry of Agriculture and Livestock, starting as the District Range Officer, rising to District Agricultural Officer, and finally to Provincial Range Officer, serving in many arid land districts, especially in the North Eastern Province. His last posting was the Rift Valley Provincial Range Office. For the last 26 years he has been serving at Egerton University, rising in rank from lecturer to full professor in December 2002, in the Department of Natural Resources. He teaches: Social Research Methods; Social Impact Assessment; Sociology of Rural Development; Rural Development Strategies; Pastoralism and Pastoral Development; and Dryland Livelihoods.

Professor Aboud has undertaken 18 consultancies in the last 10 years, and has been involved in 14 research projects since 1985, with 3 of these still continuing. Between the consultancy and the research reports, the Professor has some 74 publications to his credit. He has also written and presented papers for many of the 79 seminars and

conferences he has attended in many parts of the world since the early 1970s, including: Australia, Belgium, Costa Rica, China, Cote d'Ivoire, El Salvador, Ethiopia, Germany, Ireland, Kenya, Mexico, South Africa, Tanzania, Uganda, and the USA. He has not only attended the professional meetings, seminars, conferences, congresses and workshops, but has also presented papers, and/or officiated, and/or served as resource person.

ALLEN, Lindsay. Lindsay Allen, PhD, has been the Center Director of the USDA, ARS Western Human Nutrition Research Center at the University of California since 2004. She was formerly a Professor in the Department of Nutrition where she is now an adjunct Research Professor. Dr. Allen's research focuses on the prevalence, causes and consequences of micronutrient deficiencies, primarily in developing countries. She has evaluated interventions with micronutrient supplements, food fortification and food-based approaches (including animal source foods) to improve nutritional status, pregnancy outcome and child development, resulting in over 200 publications from many countries. One of her main achievements has been to document the widespread high prevalence and functional consequences of vitamin B¹² deficiency, and to evaluate interventions for its prevention. Dr. Allen is currently Second Vice President of the

International Union of Nutrition Sciences. She served on ten committees of the Food and Nutrition Board, Institute of Medicine, including the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, and advised many national, bilateral and international organizations including WHO, UNICEF, the Asian Development Bank, the World Bank, PAHO, and FAO. She is principal author of the book "What Works? A Review of the Efficacy and Effectiveness of Nutrition Interventions", and of WHO's "Guidelines on Food Fortification with Micronutrients". She served as President of the American Society of Nutritional Sciences and the Society for International Nutrition Research, and received the Kellogg Prize from the Society for International Nutrition Research, and the Conrad A. Elvehjem Award for Public Service in Nutrition from the American Society for Nutrition. Dr. Allen is currently on the steering committee of the Micronutrient Forum and the International Nutrition Foundation, and the Advisory Panel of CGIAR's Agriculture and Health Research Platform.

AMOAHA, Dinah. Dinah Amoah holds a Bachelor of Science degree in Agricultural Technology from the University for Development Studies, Temale, Ghana. She has extensive experience in community mobilization and facilitation processes. Her development activities have focused on livelihood and micro-credit services to farmers- and women's- groups in rural Ghana. A creative communicator, she facilitated the formation of the most successful women's credit groups in the ENAM project. Currently she serves as supervisor for the ENAM project's women's credit and savings associations and

trainer for the project's Nutrition Education and Entrepreneurship Peer Education Program.

ANGERER, Jay. Jay Angerer, PhD, is an Assistant Professor at the Blackland Research and Extension Center in Temple, Texas. He received a B.S. in Range Management (1986) from Texas Tech University, a M.S. in Range Science (1991) and a Ph.D. in Rangeland Ecology and Management from Texas A&M University (2008). During the past 20 years he has worked on a variety of research projects including arid land restoration, technology impact assessment in East and West Africa, and livestock early warning systems in East Africa, Mongolia, and the U.S. His current research focuses on using satellite imagery and simulation modeling to improve landscape estimates of livestock forage and building decision support systems for improving livestock and vegetation management on rangelands.

ANING, Kwame George. Professor George Aning, PhD, is currently the Head of the Department of Animal Science at the University of Ghana, Legon, and the chairman of the Committee to establish a Faculty of Veterinary Medicine at the University of Ghana. He served as Director of the Animal Research Institute, of the Council for Scientific and Industrial Research in Ghana from 2003-2006, and was a Principal Research Scientist at the Institute from 1992-2002. Dr. Aning was a Senior Lecturer and Acting Head of the Department of Animal Production and Health at Federal University of Technology, Akure, Nigeria from 1983-1992. From 1976-1983, he was a research scientist with

the Animal Research Institute. Dr. Aning served as Veterinary Officer for the Veterinary Services Department in Ghana from 1975-1976.

BAKER, Tracy. Tracy Baker, PhD, is an experienced spatial analyst focused on land use change and the spatial analysis of watersheds and has worked on projects in Ghana, Burkina Faso, India, Kenya, and USA. She is currently a Post Doctoral Fellow with the International Water Management Institute in their West Africa office where her focus is on the impacts of climate change on water storage options in sub-Saharan Africa. Tracy works on methods and applications for decision making where there are multiple competing interests. In developing tools for natural resources management, Tracy has experience working with a multitude of stakeholder groups from individual farmers to Water Resources User Associations and governmental offices. She worked on the USAID GL-CSRP Sustainable Management of Watersheds (SUMAWA) project in Kenya where she developed land use change maps now on display in Lake Nakuru National Park (LNNP) while she was a USAID GL-CRSP Jim Ellis Graduate Mentorship Program grantee. More significantly, as part of SUMAWA, Tracy was instrumental in developing a multiple objective spatial decision support system for water resources planning (SEADS). She was selected as a NASA Graduate Research Fellow from 2005 - 2006 and assessed the impact of error and uncertainty in remote sensing analysis on distributed hydrologic models. For this research, she received an award in 2006 for outstanding graduate research. In 2008, she was again awarded for outstanding graduate research for collaborative work with Kenya Wildlife Service to assess changes in

waterbuck populations within LNNP. Tracy has worked extensively with NASA's Women in Science program since 2003, teaching GIS and remote sensing workshops for girls aged 11 - 15, and serving as a mentor for the NASA McNair program from 2003 - 2005. Tracy's efforts have resulted in a variety of co-authored publications involving a multidisciplinary team of researchers with backgrounds in watershed management, ecology, and socio-economics.

BUNN, David. David Bunn manages research and training projects for the UC Davis Wildlife Health Center in the School of Veterinary Medicine. He has managed the Global Livestock CRSP Avian Flu School and Poultry Health for Development Projects. He is also the UCD manager for the USAID STOP-AI training program. He has coordinated HPAI and poultry-related workshops in Kenya, Tanzania, Uganda, Ghana, Ethiopia, Djibouti and Benin. Between 2004 and 2006 he co-authored and managed the development of *California Wildlife: Conservation Challenges*, California's Wildlife Action Plan. The project evaluated species at risk statewide and assessed major causes of species decline and habitat degradation in each region of the state. The plan provides recommendations for restoration and conservation of wildlife resources. Prior to working at the UC Davis School of Veterinary Medicine, David Bunn served as Deputy Director of Legislative Affairs for the California Department of Fish and Game. He managed legislative issues and guided natural resources, marine conservation and wildlife policies and programs from 1999-2003. He served as Principal Consultant and Legislative Director for the Speaker pro Tem of the California Assembly

(1997-1999) and as Consultant to the Senate Natural Resources and Wildlife Committee (1984). He co-founded the California-based trash management and recycling company, American Trash Management, 1991-1995. David completed his M.S. in International Agricultural Development ('87) and his B.S. in Wildlife and Fisheries Biology ('83) at UC Davis.

BUTLER, Lorna Michael. Lorna Michael Butler, PhD, currently serves as Global Agriculture and Life Sciences Fellow, College of Agriculture and Life Sciences, and Professor Emeritus, Departments of Sociology and Anthropology, Iowa State University. She is also an International Consultant to the Office of the Dean, College of Agriculture and Life Sciences, Iowa State University. Since 2004, she has been a member of the ISU–University of Ghana ENAM (Enhancing Child Nutrition through Animal Source Food Management) Global Livestock Collaborative Research Support Program (CRSP) team, providing support for program organization, community outreach and research processes. These activities complement Lorna's commitment to sustainable livelihoods for rural communities through participatory research and community engagement. Since her retirement in 2007, she has served as Advisory Board Chair for the Center for Sustainable Rural Livelihoods; as a Review Editor for the International Assessment of Agricultural Knowledge, Science and Technology for Development; and as a Governor of the ISU Foundation.

Lorna holds degrees from University of Manitoba (BSc/Human Ecology); Colorado State University (MEd/Continuing Educ), and Washington State University (PhD/

Anthropology). She was the first holder of the Henry A. Wallace Endowed Chair in Sustainable Agriculture, Iowa State University (2000-2007). In this role, she was instrumental in the creation of ISU's Center for Sustainable Rural Livelihoods (CSRL). With the support of private benefactors, a long-term program was initiated in 2004 to improve the livelihoods of rural people in developing countries. Currently CSRL operates in Uganda in Kamuli District, providing opportunities for students, faculty and staff to work in partnership with rural community members and their institutions. The program partners with VEDCO (Volunteer Efforts for Development Concerns) and Makerere University. Previously, Lorna was an Extension Anthropologist and Professor at Washington State University (1977-2000); an extension specialist at Colorado State University, and a youth specialist with the British Columbia Department of Agriculture. Her career in higher education, development, applied research and extension has provided great joy and many rewarding friendships through out the world.

BWIBO, Nimrod O. Dr. Nimrod Bwibo holds a MD and MPH, and is Professor Emeritus in the Department of Pediatrics at the University of Nairobi, Kenya. He is one of the foremost Pediatricians in East Africa. He received an MPH in Maternal and Child Health at the University of California, Berkeley, and his postgraduate resident and fellowship training at UC San Francisco and University of Washington in Pediatrics. Dr. Bwibo has been a long-term collaborator with Drs. Charlotte Neumann, Suzanne Murphy and Marian Sigman and others at UCLA going back to 1978. He was the Co-PI for the Human

Nutrition CRSP in Embu in the 1980's and was the Co PI and Kenyan Director for the GLCRSP Child Nutrition Project. Dr. Bwibo serves on many commissions in Kenya and internationally, and has been the Deputy Director-General of AMREF in East Africa as well as the Deputy Vice Chancellor of the University of Nairobi. He has been a visiting scholar at UCLA and has numerous research publications, chapters and articles on Child Health and Nutrition.

COPPOCK, D. Layne. D. Layne Coppock, PhD, is an associate professor in the Department of Environment and Society in the College of Natural Resources at Utah State University. He has been a lead principal investigator of the Pastoral Risk Management (PARIMA) project with the GL-CRSP since 1998. Originally educated as a rangeland ecologist, Dr. Coppock has expanded his work to include studies of risk management and participatory approaches with African pastoralists and Utah ranchers. Prior to joining Utah State in 1991, he was a research scientist at the International Livestock Center for Africa (ILCA) in Addis Ababa.

COPPOLILLO, Pete. Pete Coppolillo, PhD, Coordinator of the Yellowstone Rockies Program for the Wildlife Conservation Society (WCS), joined WCS' in 2000 as part of the Living Landscapes Program (based in New York), and from 2003-2008 directed WCS's Ruaha Landscape Program. Coppolillo received a bachelor's degree in Biology and Environmental Conservation from the University of Colorado, and a Ph.D. in Ecology from the University of California, Davis. He has published scientific papers in Conservation Biology, Biological

Conservation, Human Ecology, Landscape Ecology and Science, and is a co-author of the book *Conservation: Linking Ecology, Economics, and Culture* (2004 Princeton University Press). He has studied Ferruginous Hawks (*Buteo regalis*) in North America, avian community ecology in Kenya, large herbivore ecology and herding systems in Tanzania, and, in collaboration with other WCS conservationists, helped to develop protected area strategies in Bolivia, Ecuador, Argentina, Congo, Tanzania, the United States and Cambodia.

DALILI, Raz Mohammad. Raz Mohammad Dalili graduated from Kabul University with a Masters degree in Economics. After Directing the Kabul English Language Center in Pakistan, he founded the Sanayee Development Foundation and is its Executive Director. This Foundation specializes in peace building and conflict resolution, community mobilization and community empowerment, and community health programs. Mr. Dalili has also produced many books and founded several magazines devoted to teaching children about peace and non-violence. In addition, he is responsible for supervising the production of a peace education curriculum for grades 1 through 12 for Afghanistan. Since 1997 he has been an active member of Afghan Civil Society.

DAVAASUREN, Narangerel. Narangerel Davaasuren worked as Project manager for the GL-CRSP Gobi Forage project during 2007 to 2008. Prior to this she worked on several projects in Mongolia including the UNDP-funded project "Conservation of Great Gobi & Its Umbrella Species" and the GTZ funded

“Land management-Fiscal Cadastre” project. She began her career with the Informatics Institute, Mongolian Academy of Sciences in 1995. Her Areas of expertise include application of GIS for vegetation mapping and land cover changes. She completed MSc studies at ITC, International Institute of Geoinformation Sciences, Enschede, the Netherlands in 2001.

DEMMENT, Montague W. Montague W. Demment, PhD, is the Director of the Global Livestock Collaborative Research Support Program, a program funded by USAID and the US university community, and professor of ecology in the College of Agricultural and Environmental Sciences at the University of California, Davis. He has served in this role since June 1994. A native of New York, Demment earned his BA from Harvard in Architectural Sciences, his MS and PhD from the University of Wisconsin-Madison in Zoology. He received an NIH postdoctoral fellowship to study animal nutrition at Cornell before arriving at UC Davis in 1982.

Demment oversees and directs the GL-CRSP program, which involves scientists from 12 US universities and 60 foreign institutions that address issues of food security, trade, environment and policy related to the livestock sector in developing countries. As director Demment is responsible for the Management Entity at UC Davis, including programmatic and fiscal responsibility for the 5M per year program. He also is responsible to USAID to provide direction and advise on issues related to development particularly with regards to livestock. Demment also serves as Associate Vice President for International Development at APLU where he is focused on the role of higher

education in development. He has been involved in advocacy for higher education support for Africa and been instrumental in the creation of APLU’s Africa U.S. Higher Education Initiative team on which he continues to serve.

Demment conducts his own research on nutritional ecology of herbivores. He teaches two courses in nutrition and ecology and one course in agriculture and environment. NSF, BARD, BSE, and a number of smaller entities have funded his research program. Demment is past president of AIARD (Association for Agriculture and Rural Development) and chaired NASULGC’s (National Association of State Universities and Land Grant Colleges) International Agriculture Coordinating Committee that advocates for international issues in agriculture. He chaired the Globalization Commission for UC Davis and is past director and founder of its Sustainable Agriculture Program. He led the effort to establish LTRAS (Long-term Research on Agricultural systems) a 100-year experiment into the functioning of Mediterranean cropping systems.

DESTA, Solomon. Solomon Desta, PhD, is a research associate in the Department of Environment and Society in the College of Natural Resources at Utah State University. He has played a key role in leading participatory and outreach phases of the Pastoral Risk Management (PARIMA) project in Ethiopia since 1999. Dr. Desta received his PhD in rangeland economics in 1998 based on research concerning pastoral asset diversification. Prior to arriving at Utah to begin graduate work, he completed an MSc in agricultural economics at Wye College, University of London. Desta served as a senior staff member

on various range development projects managed by the Ethiopian government during 1982-93.

DYKE, Paul. Paul Dyke, PhD, is the PI for Agricultural Systems Research Program at the Blackland Research Center - part of Texas AgriLife Research/ Texas A&M University in Temple, Texas. His expertise is in natural resource and environmental planning and modeling. He received his PhD in Agricultural Economics from Oregon State University, and a MS and BS in Agricultural Economics from Oklahoma State University. Dyke is responsible for managing a program that develops, adapts and links field scale to river system simulation and economics models for studies of complex agricultural systems. The models are interfaced with GIS tools for use in international national, state and local policy analysis and development. His research also develops and maintains national and international resource databases (soil, weather, land use, etc.) and economic data for use in complex agricultural system models. He served as PI for the GL-CRSP LEWS Project in the early days and again for LINKS after the passing of Dr. Stuth.

ERICKSON, Jon. Jon Erickson, PhD, is Associate Professor of Ecological Economics at the Rubenstein School of Environment and Natural Resources and the campus-wide environmental studies program, and Fellow of the Gund Institute for Ecological Economics at the University of Vermont. He teaches both undergraduate and graduate courses in ecological economics (EE); leads an international service-learning program in the Dominican Republic focused on human rights and health in migrant

communities; co-supervises a graduate certificate program in EE; participates in the ongoing development of online EE teaching resources (metacourses.org); and leads a research program on both the theoretical development of EE and applied work on human and ecosystem health, rural livelihoods, regional sustainable development, land and biodiversity conservation, watershed planning, forest management, climate change policy, and renewable energy technology. He has published extensively on these topics in journals such as *Science*, *Ecological Economics*, *Land Economics*, *Climatic Change*, *Bioscience*, *Energy Policy*, and *Landscape and Urban Planning*. Dr. Erickson's work on problem-based learning in EE was published with Josh Farley and Herman Daly in a workbook with Island Press (2005), and recognized by Vermont's inaugural service-learning award. His most recent co-edited book on *The Great Conservation Experiment: Voices from the Adirondack Park* will be released by Syracuse University Press in July of this year. He is also president-elect of the U.S. Society for Ecological Economics, past president of the Adirondack Research Consortium (ARC), past board member and treasurer of the International Society for Ecological Economics, and currently serves as board member of the ARC, trustee of the Conservation and Research Foundation, executive editor of the *Adirondack Journal of Environmental Studies*, and editorial board member of *Environmental Policy and Governance*.

KEVERENGE-ETTYANG, Grace. Grace Keverenge-Ettyang, PhD, a Senior Lecturer in the Department of Epidemiology and Nutrition in the School of Public Health at Moi University in Eldoret, Kenya, has been a faculty member

at Moi since 1992 in the area of public health nutrition. Her training in Home Economics (B.Ed), Applied Human Nutrition (MSc) were obtained at the University of Nairobi, Diploma Human Nutrition (PGDip) at the University of London, and Human Nutrition (PhD) at the University of Maastricht, the Netherlands. In addition to her extensive teaching experience she has several certificates in additional training in the fields of Nutrition Education, Computer Applications, Epidemiology and Biostatistics, and the Prevention of HIV/AIDS. She was a founding member and first chairperson of the Nutrition Association of Kenya. Dr. Etyyang also acts as a coordinator for the establishment of a Centre for Child Development and Nutrition (CCDN) in collaboration with the University of Maastricht, the Netherlands, and for the establishment of a Regional Reference Nutrition Laboratory at Moi University in collaboration with the Institute of Human Nutrition (IHN) Columbia University, USA. She served as a consultant to the Millennium Development Goals (MDGs) Project in Kenya for the development of adaptation of food intake assessment tools and supervision of students undertaking PhD nutrition research, represented the School of Public Health to the Moi University Senate Academic Affairs Committee as well as the Institute for Gender Equity Research and Development, chairs the School of Public Health Graduate Studies Committee and has served as the acting dean School of Public Health.

Dr. Etyyang's investigation of the impact of pregnancy and lactation on the body composition and micronutrient status of women living in rural Kenya, Nandi and West Pokot Districts is the only body composition validation study in sub-Saharan Africa using deuterium labeled water

(D₂O). With seed money from International Atomic Energy Agency (IAEA) and the Letten Foundation, Oslo Norway, Dr. Etyyang is leading a study on zinc and infant growth and a validation study on changes in maternal body composition using D₂O deuterium as the gold standard compared to bioelectrical impedance analysis and anthropometric measurements with the aim of developing a local prediction equation critical in monitoring changes in body composition of HIV + persons. Dr. Etyyang is the Host Country PI of the on-going study "Increasing Animal Foods in Diets of HIV-infected Kenyan Women and their Children" which is funded by the GL-CRSP and the National Institutes of Health.

GEBRU, Getachew. Getachew Gebru, PhD, is a research associate in the Department of Environment and Society in the College of Natural Resources at Utah State University. Dr. Gebru is based in Ethiopia with the GL-CRSP Pastoral Risk Management Project, and his main responsibilities included serving as the coordinator and supervisor for the research component in Ethiopia, and also as a member of the outreach team based in Ethiopia. Dr. Getachew Gebru is an animal scientist with interest in animal production systems. He has a special interest in understanding the biophysical and socioeconomic factors that affect agro-pastoral and pastoral systems.

Awarded a World Bank fellowship, Dr. Gebru completed his doctoral study at the University of Wisconsin-Madison in 1999. He was a Rockefeller Fellow while conducting his doctoral research on land tenure and access to feed resources in the agricultural and agro-pastoral systems of Ethiopia. Dr. Gebru completed his

MSc in 1987 through a joint graduate program between Alemaya University in Ethiopia and the Agricultural University of Norway. For over 12 years Dr. Gebru was member of the Faculty of Agriculture, in Ethiopia, at Addis Ababa and Alemaya Universities and has been teaching and conducting research in the Department of Animal Sciences, and assumed academic and administrative positions in the university including senior lecturer, research coordinator and Head, Department of Animal Sciences. In 2008, Dr. Gebru was a gold medal award recipient from the Ethiopian society of Animal production.

GERETA, Emmanuel. Emmanuel Gereta, PhD, is the Personal Assistant to the Director General of the Tanzania National Parks. Dr. Gereta was formerly the Principal Ecologist and Head of the Ecology Department for the Tanzania National Parks. Dr. Gereta received his PhD from the Norwegian University of Science and Technology, and his MS and BS in Range Science from Texas A&M University. In 2005, Dr. Gereta served as a Technical Coordinating Committee member and Project Manager with the GL-CRSP, representing Tanzania and Kenya on a collaboration between the Serengeti Greater Ecosystem and Yellowstone Greater Ecosystem. Dr. Gereta has served as a sub-committee member with UNESCO on their International Hydrological Programme, a committee member of the National Liaison Committee on Important Bird Areas, and was nominated and registered for the International Directory of Distinguished Leadership Hall of Fame and Man of the Year-2000 by the American Biographical Institute of North Carolina.

GEWA, Constance. Constance Gewa, PhD, MPH, received her MS degree in Applied Human Nutrition from the University of Nairobi in Kenya. She worked as a nutritionist and project coordinator for the Child Nutrition Project in Embu District of Kenya before joining UCLA to pursue her doctoral studies. She received her PhD in Public Health from the University of California at Los Angeles in June 2007. Dr. Gewa recently joined George Mason University as an Assistant Professor at the Global and Community Health Department within the College of Health and Human Services. Her research focus is on the role of nutrition in improving health outcomes among mothers and children in low-income nations. As part of her research work she continues to look at ways of improving dietary assessment methodology among populations with low literacy levels and also examines the role of diet in influencing both health and developmental outcomes among these populations. She is a 2002 Jim Ellis Graduate Mentorship Program Awardee.

HERVY, Anne-Claire. Anne-Claire Hervy is the Chief Operating Officer of the Africa-U.S. Higher Education Initiative. The Initiative was launched in July 2007 by a number of U.S. and African organizations, led by the Association of Public and Land-grant Universities (APLU) to advocate for increased U.S. engagement in African higher education capacity building and to facilitate deeper and more effective collaboration between African and U.S. institutions of higher education in key priority areas for development (science and technology, agriculture, environment and natural resources, engineering, business, health, education and teacher training). Anne-Claire

is also a Mickey Leland International Hunger Fellow with the Partnership to Cut Hunger and Poverty in Africa, a research and advocacy organization founded in 2000 to build consensus and mobilize support for strategic, long-term investments in African agricultural and rural development. The Mickey Leland International Hunger Fellowship is a two-year leadership development program focused on bridging the gap between field and policy work. Prior to this, Anne-Claire was Communications Manager for a Washington-DC based nonprofit community development organization called Manna, Inc. and Program Director at the Center for Peace Building International. She holds an MS in International History from the London School of Economics, and an MA in International Relations from American University's School of International Service.

HUCKETT, Steve. Steve Hockett, PhD, holds a Bachelors degree in Agronomy from Kansas State University, and a Masters degree in Biology (arid lands/riparian zones ecosystems ecology) from the University of New Mexico. Steve successfully defended his PhD dissertation in May 2009 in the interdisciplinary program – Human Dimensions of Ecosystem Science and Management in the College of Natural Resources at Utah State University. Using household surveys, ethnographic narratives, and participant observation his research sought to uncover key socioeconomic and contextual factors which facilitate or constrain adoption of soil and water conservation practices in the rural River Njoro watershed in Kenya, East Africa. In addition, Steve has over 20 years of professional experience as an agronomist, environmental consultant,

state government scientist, protected natural areas manager, a project manager and supervisor. Steve has worked extensively with citizens groups, ranchers/farmers, advocacy groups, and scientists to implement natural resource protection and habitat restoration measures. Steve has been a 'house-mom' in Germany where he raised his two children and he has served as a Guest Ranch Manager in southwestern Montana.

JACOBS, Michael. Michael Jacobs, PhD, is a range ecologist with over 25 years experience working with communities and institutions to identify and solve complex socio-environmental problems. Michael brings a unique perspective to his work, which along with his infinite abundance of good humor has earned him the trust and dedication of the people he works with. Michael became interested in working with the environment when he was a boy scout and then an eagle scout. After graduating with his MSc from West Virginia University, he applied his expertise to solving issues related to integrating marginalized societies in resource management in foreign countries. He has published on the effects of fire and grazing in savanna landscapes, is coauthor on the impacts of conflict on biodiversity and protected areas, author of a management plan for brown bears on the Kenai Peninsula, Alaska and a management plan for Awash National Park, Ethiopia. Michael earned his doctorate degree at Utah State University, looking at small-scale issues related to vegetation dynamics in Omo National Park, Ethiopia. Michael is now working to resolve issues related to the Kuchi, livestock production and rangelands in Afghanistan.

JAMA, Abdi Adan. Abdi Jama (American-Somali origin), PhD, has served as a Livestock Information Advisor for the FAO IGAD Pro-Poor Livestock Policy Initiative based in Addis Ababa, Ethiopia for the past 3 years. He received a B.S. degree in Animal Husbandry from Somali National University and M.S. and Ph.D. degrees in Rangeland Ecology and management from Texas A&M University, in College Station, Texas, USA. Dr. Jama has over 20 years of experience in pastoral issues, information management, technical assistance and management of donor-funded projects mostly in the eastern Africa region. Dr. Jama coordinated the Livestock Information and Knowledge System (LINKS) project for Eastern Africa, along with its predecessor, the Livestock Early Warning System (LEWS) project implemented by the Agricultural Experiment Station of Texas A&M University.

Both LEWS and LINKS are part of the USAID funded Global Livestock Collaborative Research Support Program, focusing on the development of an integrated Livestock Information System based on forage supply modeling and Livestock Market Information in the pastoral regions of Eastern Africa. These programs have given Dr. Jama the opportunity to work with the National Agricultural Research System in Eastern Africa (NARS), the Consultative Group for International Agricultural Research Centers (CGIAR), Land Grant Universities and Agricultural Experiment Stations in United States, USAID missions, NGOS and most importantly with key policy makers and stakeholders in the livestock industries in the Eastern Africa region from producers, field staff to decision makers.

KAITHO, Robert. Robert Kaitho, PhD, is an Associate Research Scientist in Texas A&M University, Department of Ecosystem Science and Management. He has experience in farm level based research, developing and managing research projects, and biophysical and economic modeling. Dr. Kaitho received his PhD and MSc in Animal Nutrition from Wageningen Agricultural University, and his BSc in Agriculture from the University of Nairobi. He has contributed significantly to the research and development of Livestock Information and Knowledge System and Livestock Early Warning System in East Africa since 1998. He has also worked on the International Livestock Research Institute smallholder dairy program and developed the smallholder zero-grazing system as the lead scientist affiliated to the Kenya Agricultural Research Institute. Currently, he is the Greater Horn of Africa regional coordinator of programs, which assists, supports, and strengthens national government extension agents, National Agricultural Research scientists, policy makers and producers in range lands in Ethiopia, Kenya, Uganda, Tanzania, Djibouti and Somaliland.

KARIUKI, Gatarwa. Gatarwa Kariuki is a country project officer with the Livestock Information Network and Knowledge System (LINKS) project of the Global Livestock Collaborative Research Support Program (GL CRSP) where he coordinates collaborative activities in livestock early warning and marketing information systems in the pastoral areas of Kenya. He holds a Bachelor of Science degree in Agriculture, a Masters degree in Social Anthropology both from the University of Nairobi and several on-the-job trainings in diverse areas of social research and

development. Before joining LINKS, he worked as a training officer with Kenya's Ministry of Livestock Development, then moved to Kenya Agricultural Research Institute as a researcher in socioeconomics and later to the World Agroforestry Centre (ICRAF) as a research assistant in the collective action and property rights program.

KAZWALA, Rudovick Reuben. Rudovick Kazwala, PhD, is a Professor in the Department of Veterinary Medicine and Public Health at Sokoine University of Agriculture. He is the Health for Animals and Livelihood Improvement (HALI) project Co-PI and leader of the Tanzanian team. Professor Kazwala received his BVSc at Sokoine University of Agriculture in 1984 and then went on to obtain a Masters degree at the University College Dublin and PhD at the University of Edinburgh. In addition to international prominence in bovine tuberculosis research, planning, and policy, Professor Kazwala is a leading expert in zoonotic diseases and public health and maintains an extensive collaborative network of Tanzanian and African institutions of public health, economic development, and wildlife conservation. He is actively facilitating infectious disease study at the human-livestock-wildlife interface. Professor Kazwala leads these efforts through the Veterinary Faculty of the Sokoine University of Agriculture. In recent years, this faculty has developed several research initiatives to investigate the epidemiology of zoonoses that infect human, wildlife and domestic animals. Professor Kazwala has mentored the training of two Tanzanian MPVM students on the HALI project, as well as many honors bachelor projects.

LITTLE, Peter. Peter Little, PhD, is a development and economic anthropologist who currently is Professor of Anthropology and Director of the Program in Development Studies, Emory University, Atlanta, Georgia. During the past 28 years, Dr. Little has researched and directed interdisciplinary programs on pastoralism, development and globalization, natural resources management, and food insecurity in several African countries, but with primary emphasis on eastern Africa, including Kenya, Somalia, and Ethiopia. In this period, he has earned several prizes and awards, including fellowships and grants from the John Simon Guggenheim Memorial Foundation, John D. and Catherine T. MacArthur Foundation, National Science Foundation, and the Social Science Research Council; and the Kirwan Memorial Research Prize (2005) and the Wethington Research Award (2007) both from the University of Kentucky, Amaury Talbot Book Prize from the Royal Anthropological Institute (2003), and a *Choice* Outstanding Academic Book award (2004). Dr. Little has been a consultant and advisor to the United Nations Food and Agriculture Organization, the World Bank, Rockefeller Foundation, US Agency for International Development, International Institute for Environment and Development (England), the U.S. Congress Office of Technology Assessment, Japan International Cooperation Agency (JICA), OXFAM-America, and several other agencies and foundations. He is the author or co-author of more than 80 journal articles and book chapters and author or co-editor of 8 books, including *Somalia: Economy Without State* and *Pastoral Livestock Marketing in Eastern Africa: Research and Policy Challenges* (with J. McPeak). Currently Dr.

Little is completing a book on the 'anthropology of reform and restructuring in Africa' with support from the Guggenheim Foundation, and remains involved with a long-term study of social change and pastoralism in northern Kenya.

LUND, Jay. Jay Lund, PhD, is a Professor of Civil and Environmental Engineering at the University of California - Davis. He specializes in the management of water and environmental systems. His activities have included system optimization studies for California, the Columbia River, the Missouri River, and several other systems—as well as studies of climate change adaptation, water marketing, water conservation, water utility planning, and reservoir operations. He was on the Advisory Committee for the 1998 and 2005 California Water Plan Updates, is a past Editor of the *Journal of Water Resources Planning and Management*, and author or co-author of over 200 publications. He was a lead author of the reports *Envisioning Futures for the Sacramento-San Joaquin Delta* and *Comparing Futures for the Sacramento-San Joaquin Delta* published by the Public Policy Institute of California.

LYNN, Stacy. Stacy Lynn is a PhD Candidate in the Graduate Degree Program in Ecology (GDPE) at Colorado State University, based at CSU's Natural Resource Ecology Laboratory (NREL). She is also a Program Coordinator for CSU's Center for Collaborative Conservation (CCC). Her dissertation research explores the implications of increasing cultivation by Maasai livestock herders for both Maasai livelihoods and migratory wildlife in Simanjiro, Tanzania. Her PhD advisor is Mike Coughenour. Stacy also received her MSc in Rangeland Ecosystem

Science at CSU studying conservation policy and human welfare in Ngorongoro Conservation Area and Loliondo Game Controlled Area, Tanzania, with Jim Ellis. Her research interests are focused on finding balance between conservation and livelihoods in arid and semi-arid lands in Africa through multi-disciplinary approaches and collaborative processes. In 2002, she received one of the first Jim Ellis Graduate Mentorship Program Awards.

MAHMOUD, Hussein A. Hussein A. Mahmoud, PhD, is a Lecturer in the Department of Geography at Egerton University, Kenya. Dr. Mahmoud received his PhD in Anthropology from the University of Kentucky in 2003 focusing on the dynamics of cattle trading, specifically the role of trust and social relations in market networks, in northern Kenya and southern Ethiopia. He received his MA in geography and his BA in geography and economics from Egerton University. Dr. Mahmoud's research interests include: livestock marketing in the pastoral areas of the Horn of Africa, pastoral livelihoods, conflict in the pastoral areas of the Horn of Africa, pastoral resource management and land degradation processes in the arid and semi-arid lands (ASAL). Dr. Mahmoud's current research with the Max Planck Institute for Social Anthropology is entitled "The genesis and transformation of conflict in northern Kenya: implications for pastoral livelihoods." He is a member of the Council for the Development of Social Science Research in Africa's (CODESRIA) Multi-National Working Group on Citizenship and Identity in Contemporary Africa and a recipient of the Margaret Lantis Award for Excellence in Original Research by a Graduate

Student in the Department of Anthropology, University of Kentucky. Dr. Mahmoud completed his PhD research through the Global Livestock CRSP PARIMA project and has worked with the LITEK project of the GL-CRSP on research entitled "Innovations in Pastoral Livestock Marketing: The Emergence and the Role of Somali Cattle Traders-cum-Ranchers in Kenya." Also, he has worked on two IDRC-funded research projects on cross-border pastoral conflicts in the Horn of Africa and the second on obstacles to peace in the Great Lakes Region.

MARQUIS, Grace S. Grace S. Marquis, PhD, is Associate Professor and Canadian Research Chair in Social and Environmental Aspects of Nutrition. She received her doctorate in international nutrition from Cornell University and was a university professor for 10 years in the USA before joining the School of Dietetics and Human Nutrition at McGill University. Her research on child nutrition began in Peru 25 years ago and continues today both there and in Ghana. The diets of infants and young children are determined by many social, biological, and environmental factors. Dr. Marquis' research program examines how these factors interact and influence nutrition and health of children living in poverty. Longitudinal studies in Ghana have contributed to understanding the mechanisms by which HIV alters households' ability to provide optimal feeding and care giving for infants and, based on this knowledge, to develop alternative feeding and care giving strategies that will support child health and growth and are feasible for HIV-affected families to carry out. Projects in both Peru and Ghana support community-based adult education and income-generation

activities in agriculture production to improve the availability, accessibility, and use of animal source foods in the diets of young children.

MCPEAK, John. John McPeak, PhD, is currently an associate professor in the Department of Public Administration in the Maxwell School of Syracuse University. He teaches microeconomics and development economics at the graduate level. After graduating as an undergraduate from Saint Lawrence University, he was a Peace Corps volunteer in Senegal. He then entered the graduate program in agricultural economics at the University of Wisconsin-Madison. He received his master's and PhD from this program, conducting field work in northern Kenya that served as the basis for his dissertation. After receiving his doctorate, he took a post doctoral research associate position with Cornell University assigned to work in Kenya with the USAID / GL-CRSP funded Pastoral Risk Management Project. After three years of field work with this project he joined the faculty of Syracuse University in 2002. He has continued to conduct research in Kenya, Ethiopia, and Mali largely focused on livestock production, marketing, and livestock crop interactions.

MEARNS, Robin. Robin Mearns, PhD, is a geographer specializing in the social and institutional dimensions of natural resource management and community-based risk management in developing countries. He is currently the Lead Social Development Specialist and team leader for the Social Dimensions of Climate Change in the Social Development Department of the World Bank. He has spent most of his 11 years in the World Bank as team

leader for operations, analytical and policy advisory activities in East Asia and Pacific, Latin America and Caribbean (LAC), and South Asia (SAR) regions, primarily on community-driven development, natural resource management, land reform, and participatory poverty assessment. He recently spent four years with the rural team in the Vietnam country office, where he also served as country sector coordinator for social development. This followed four years leading the Bank's rural development program in Mongolia, and shorter assignments in LAC and SAR. Formerly Chair of the Bank-wide NRM thematic group, he is also a practitioner of participatory learning and action methods and approaches. Prior to joining the Bank, he was a Fellow of IDS, University of Sussex (1990-97) and a Research Associate with IIED, London (1987-89). He holds PhD and MA degrees in Geography (University of Cambridge), an MPhil in Development Studies (University of Sussex), and has published extensively on environment and sustainable development.

MOERMOND, Timothy. Timothy Moermond, PhD, is a Professor Emeritus of Zoology and Environmental Studies at the University of Wisconsin-Madison. Dr. Moermond received his B.S. in Zoology from the University of Illinois, Champaign-Urbana, in 1969 and his Ph.D. in Biology from Harvard University in 1974. He was professor at the University of Wisconsin-Madison for 31 years and principle advisor for 22 Ph.D. and 33 M.S. students. He created new courses in conservation biology and established a new Master's Degree program in Conservation Biology and Sustainable Development in 1990, which he chaired for 9 years. Tim received UW-Madison's

"Distinguished Teacher Award" in 1984 and was recognized by the Wisconsin Student Association as one of the Top 100 Educators at UW-Madison in 1992. Tim received the John Leddy Phelan Award for Distinguished Interdisciplinary Service from the Latin American, Caribbean and Iberian Studies Program in 2003.

Tim has been to 50 countries where he and his students conducted research on community ecology, behavioral ecology and optimal foraging, and animal seed dispersal and natural regeneration of forests in temperate and tropical forests in the Americas and Africa and elsewhere. In 1985-86, Tim was a Fulbright Professor at the Université Nationale du Rwanda. Since then, Tim expanded his work on conservation, sustainable forestry and sustainable agricultural and community development in Latin America as Lead Principal Investigator of the GL-CRSP funded Project PLAN, and in Yunnan, China, on a GEF forest conservation and community development project. He retired from UW-Madison in 2003 to devote more time working with farm communities in Ecuador and Bolivia and teaching workshops on "integrated adaptive management" for the Wolong "Giant Panda" Nature Reserve in Sichuan, China, as well as volunteer work with grassroots and national conservation organizations in Wisconsin.

MUKISIRA, Ephraim A. Ephraim A. Mukisira, PhD, is the Director of the Kenya Agricultural Research Institute (KARI). Dr. Mukisira was formerly KARI's Deputy Director for Research and Technology. Dr. Mukisira began his research career in KARI in 1980 with the Scientific Research Division of the Ministry of Agriculture as a Research Officer. He rose through the ranks

to become Principal Research Officer, Assistant Director, Deputy Director-Research and Technology and finally to the current position of Director-KARI. Dr. Mukisira holds board positions in local and international bodies. In 1999-2003, he was a member of the World Council of Animal Production (WCAP). In 1998, he was elected to the post of the Secretary to the African Chapter of the World Association of Animal Production, and from 1999-2000 was elected to serve as the National Chairman of the Animal Production Society of Kenya. He is also a member of the Netherlands-based CTA Advisory Committee on Science and Technology.

During his research career, Dr. Mukisira has authored and co-authored several scientific papers, and has contributed to book chapters and presented scientific papers in local and international conferences. Two of these presentations won him meritorious awards by the Canadian Society of Animal Science and the European Poultry Conference. He has also won several scientific awards locally. Dr. Mukisira holds a Doctorate degree in Animal Science from McGill University, Canada. He received his MS from Louisiana State University, and BA (Honors) from the University of Nairobi.

MSOFFE, Peter. Peter Msoffe, PhD, MVSc, BVM, has over nine years experience in delivering training programs to undergraduate and postgraduate students at Sokoine University of Agriculture in Tanzania. He trains in the areas of poultry diseases, animal behavior, animal health and production, prevention of animal diseases and molecular biology. In the past six years Msoffe has been involved in development and delivering training programs in matters

related to village poultry health, production and marketing. In collaboration with others, he has developed training materials at various levels including farmers, policy makers, and diploma and graduate levels. He is an instructor in three international courses; Avian Flu School (AFS), USAID STOP AI and Global Health Course (GHC). The AFS courses were conducted in Tanzania, Ghana and Uganda, the STOP AI courses were conducted in Tanzania and Ethiopia and the GHC were in Tanzania and Finland. In 2008 he served as an instructor and rapporteur in an FAO workshop on development of village poultry biosecurity curriculum. He is currently involved in developing and implementing village level biosecurity measures with respect to control of Avian Flu and Newcastle disease in village chickens in Tanzania. He is also working with colleagues from the US, Ghana, Kenya and Uganda in developing and testing a poultry curriculum and a handbook suitable for Africa. This work is under generous support of the Global Livestock Collaborative Research Support Program (GL-CRSP). He has co-authored several papers in international peer reviewed journals.

NEUMANN, Charlotte. Charlotte Neumann, MD, MPH, is a Professor of Community Health Sciences and Pediatrics at the University of California, Los Angeles Schools of Public Health and Medicine. She has boldly pioneered and directed initiatives for over five decades that demonstrate the interaction of nutrition, infection and child development and the identification of unique and practical ways to improve the nutritional status of children and mothers with limited food resources.

Dr. Neumann has enjoyed successful research

projects in Nairobi and in rural Kenya in close collaboration with Professor Nimrod O. Bwibo, Professor of Pediatrics at the University of Nairobi, and Faculty of Medicine for over 25 years. Dr. Neumann's extensive research has resulted in over 100 publications that communicate her work to communities around the world and in turn has helped reduce malnutrition among pregnant women and children in developing countries and reduce the risk of developing childhood obesity in California. Currently, funded by USAID's GL-CRSP and the National Institutes of Health, Dr. Neumann and colleagues from Indiana University and Moi University in Kenya have implemented an on-going randomized controlled intervention feeding study entitled "Increasing Animal Foods in Diets of HIV-infected Kenyan Women and their Children." This study is based on her previous work in Kenya, the GL-CRSP Child Nutrition Project that showed the importance of meat in diets for health, growth and mental development of children.

ONIANG'O, Ruth. Ruth Oniang'o, PhD, is an elected Member of Parliament in Kenya, and full professor of Food Science and Nutrition at Kenya's Jomo Kenyatta University of Agriculture and Technology. She received her first and second degrees from Washington State University in the USA and her PhD from the University of Nairobi, Kenya. Her research and consultation areas have included household food and nutrition security, women's nutrition, child health and community-level agro processing. She serves on the Poverty Eradication Commission of Kenya, is a member of the Monsanto Biotechnology Advisory Board, has been elected to the Board of the International Fertilizer Development Council, serves on the

Executive Committee of the UN's Sub-committee on Nutrition, and is a member of the Board on Food Security and Sustainable Development of the Economic Commission for Africa. She is also a member of the Steering Committee of the Eastern, Central, and Southern African Association of Food Science and Technology. She is the executive director of Rural Outreach Program, an NGO she founded about a decade ago as a way of bringing the university closer to the people and of mobilizing resources to enhance rural livelihoods. In addition, Dr. Oniang'o is editor-in-chief of a newly launched peer-reviewed professional journal: the African Journal of Food, Agriculture, Nutrition and Development

SAKYI-DAWSON, Owuraku. Owuraku Sakyi-Dawson, PhD, is Senior Lecturer in Agricultural Extension and Microfinance. He received his doctorate in Extension and Rural / Microfinance from Reading University, England and has been a university lecturer and development consultant for the past 12 years. Rural livelihoods are influenced by knowledge and a combination of technical, socio-economic and organizational factors. His research has focused extension strategies, rural finance and enterprise development, institutional and product development aimed at sustainable livelihoods and agricultural innovation systems within the context of rural poverty in West Africa. Some of his studies in Ghana have contributed to understanding the role information asymmetry in technological and financial innovation in smallholder agriculture and micro-enterprise development. Projects in Ghana have included support for community-based adult education and income-generation activities in agriculture to improve the availability, accessibility, and

use of animal source foods in the diets of young children.

SAMMONS, David J. David Sammons, PhD, is currently Director of International Programs in the Institute of Food and Agricultural Sciences (IFAS) at the University of Florida. This office provides administrative leadership and support for international activities in the teaching, research, and outreach mission areas of IFAS. For a two-year period prior to his appointment at the University of Florida, Dr. Sammons was on assignment with USAID/Washington (on leave from Purdue University) working as "Senior Advisor for University Relations and Agricultural Research, Training and Outreach" in the Office of Agriculture at the Agency. At Purdue, he held the position of Associate Dean of the College of Agriculture and Director of the Office of International Programs in Agriculture for the period 1993 to 2004. Previous to moving to Purdue, Dr. Sammons was employed for 15 years (1978 to 1993) at the University of Maryland as Professor of Agronomy with responsibilities in small grain (wheat, barley) breeding as well as multiple administrative assignments. He has a wide range of international experiences, first as a Peace Corps volunteer in the Philippines (1968-70), and in recent years in short term consultant positions with USAID in West Africa, Egypt, and Sudan, and as a Fulbright Senior Fellow/Lecturer at Egerton University in Kenya. He has also acquired professional experience internationally in more than 50 countries across wide areas of Africa, Europe, Southeast Asia, the Pacific Rim, the Middle East, Latin America, and the Caribbean. He is the author of over 170 scientific articles and seven books and/or book

chapters. In 2001, Dr. Sammons was elected a Fellow of the American Society of Agronomy. He also serves on the Board of Trustees of the International Center for Agricultural Research in the Dry Areas (ICARDA).

Dr. Sammons received his PhD in Agronomy from the University of Illinois, his AM in Biology from Harvard, and a BS in biology from Tufts University. He has long been affiliated with the GL-CRSP serving as a current member of the External Program Administrative Council, and previously as Chair of the External Evaluation Panel.

SCHLOEDER, Catherine. Catherine Schloeder, PhD, is an ecologist with over 25 years experience working on issues related to sustainable natural resource management and biodiversity. Catherine became interested in these issues at an early age during her upbringing in the Canal Zone, Panama. Catherine started her career as a wildlife biologist, working mostly on endangered species issues. When it soon became apparent to her that humans were a part of the equation for solving the problem, she steadily turned her attention on solving the problem of how to integrate humans into the management of species and protected areas. Catherine became interested in pastoralist societies during her work in Ethiopia. She is co-author of a management plan for Awash National Park, which stressed the importance of integrating the Kereyu in the management of the park. She has published papers on the ecology of red and gray foxes, the impacts of conflict on biodiversity and protected areas, the use of geostatistics with limited data, constraints to vegetation distribution in savanna landscapes. She earned her doctorate degree at

Utah State University, looking at large-scale issues related to vegetation dynamics in Omo National Park, Ethiopia. Catherine is now working with her husband Michael Jacobs in Afghanistan, to resolve issues related to the Kuchi, livestock production and rangelands.

SEMENYE, Patterson Poli. Patterson Poli Semenye, PhD, is the Project Coordinator of the GL-CRSP SUMAWA Project. Dr. Semenye received his PhD in Animal Production from the University of Nairobi, and his MS in Animal Science from Utah State University. Dr. Semenye has over thirty-five years experience in agricultural research and development. He is a specialist in on-farm livestock research with focus on integration of crop and animal production. Over the years he has had the opportunity to work with varied livestock production systems including pastoral, mixed farming small and large scale and commercial ranching. In the last ten years he has been worked primarily on project management and consultancies. He has consulted for national and international bodies in agricultural research and development. He is widely travelled and has working experience in Eastern and Southern Africa countries.

SHIVOGA, William Aino. William Aino Shivoga, PhD, is an Associate Professor of Environmental Studies at Egerton University in Kenya. He has been a dean and head of department in the Faculty of Environment and Resources Development at Egerton University, Kenya. He is a Lead Expert of the Environmental Impact Assessment registered by the National Environmental Management Authority. Professor Shivoga has a PhD in Ecology (Limnology) from

the University of Vienna, Austria, a MPhil in Environmental Studies from Moi University, a Masters of Education from Kenyatta University, and a Bachelor of Education (Biology) from the University of Nairobi. He is a Fellow of the United Nations University Biodiversity Program. Shivoga has supervised 3 PhD and 15 Masters of Science graduates. He has over 20 publications to his credit and a member of a number of national and international scientific associations.

Professor Shivoga is active in research and outreach programs in areas of environmental Conservation. His work for the last fifteen years has focused on long-term sustainable management and ecological health aspects of degraded river and lake basin systems and biodiversity indicators of national use. Shivoga is currently working on ecosystem health assessment, environmental impact assessment and monitoring, biological indicators, bioaccumulation of agrochemicals/ecotoxicology, biodiversity conservation, and multidisciplinary project management. He is a principal investigator of the Sustainable Management of Watersheds (SUMAWA): Biophysical, Livestock and Human Interactions project. In addition, Shivoga is to provide project co-ordination and leadership in a joint Kenya-Canada Lake Naivasha Sustainability Ecohealth Project funded by the International Development Research Centre, Canada. He is also the team leader of the Ecosystem Services theme of the project. He will coordinate research work on ecosystem health and services in Lake Naivasha Watershed including identification, valuation and assessment of ecosystem services and their uses.

SIIKA, Abraham Mosigisi. Abraham Mosigisi Siika, MBChB, MMed, has been a Lecturer in the School of Medicine at Moi University and a Physician at the Moi Teaching and Referral Hospital in Eldoret, Kenya since 2002. Dr. Siika's training in general medicine and surgery (MBChB) and internal medicine (MMed) were obtained at the University of Nairobi. He also completed a Fellowship in medical informatics and a Masters in Clinical Research at Indiana University School of Medicine. He has served as the Director of the USAID-Academic Model Providing Access To Healthcare (AMPATH) Training Institute. AMPATH is a collaboration between Moi University School of Medicine and a consortium of universities from North America led by Indiana University School of Medicine.

Dr. Siika is a Co-principal Investigator with the on-going study "Increasing Animal Foods in Diets of HIV-infected Kenyan Women and their Children" which is funded by the GL-CRSP and the National Institutes of Health. He also leads the Moi University Clinical Research Site that conducts clinical trials for the ACTG Network of the Division of AIDS, NIAID, NIH.

TURK, Joyce. Ms. Turk's career spans thirty years as Foreign Service Officer and Civil Service employee to U.S. Agency for International Development with focused experience in agricultural and livestock program management. She develops and supervises global livestock production, health and research projects, manages multidisciplinary teams of scientific researchers in the United States and developing countries, and negotiates and resolves problems in project design and implementation. Her responsibilities include managing a multimillion

dollar portfolio of livestock projects and the implementation of research activities and teams, analyzing the feasibility of technical proposals and negotiating terms of reference, evaluating international research programs, coordinating strategic portfolio planning, and organizing and chairing international and domestic symposia on global livestock production and trade. She has conducted technical analyses for policy and program development related to livestock production and health worldwide. In addition she assists partners in developing potential market opportunities for U.S. trade in collaboration with livestock industry representatives, and advises developing country governments on strategies for livestock production, health and marketing. As USAID's Senior Livestock Advisor, she represents the U.S. Government at European Union and United Nations conventions.

Her international consultancies have included: The Wellcome Trust, United Nations Food and Agriculture Organization, the International Fund for Agricultural Development, World Animal Health Organization, European Union, and the International Atomic Energy Agency. International residencies have been in the Sudan and the Philippine Islands. Ms. Turk is a multi-year recipient of USAID's Meritorious Performance Awards and is listed in Who's Who of American Women.

WERE, Jacynter. Ms. Jacynter Were is the Community Mobilizer cum Water Bailiff at the Regional Office of the Water Resources Management Authority in Nakuru, Kenya. She has worked with the Ministry of Water Development from 1985 to 2005, when the newly formed water corporation took up functions of

the Ministry. Over the years she has performed her dual duties of community mobilization and water bailiff with distinction. Lately due to changes in development approaches her docket has grown to include gender mainstreaming and promotion of voluntary counselling and testing (VCT) of HIV. Her current focus is on formation of water resources user's association. Her target is for each watershed within her entire Rift Valley Catchment to be managed by it association.

WILLIAMS, Jonathan H. Jonathan "Tim" Williams, PhD, was born in South Africa and grew up in urban Zambia, and rural Zimbabwe. He was educated in Harare where he studied genetics and physiology; and worked as a research scientist with the Zimbabwe Agricultural Research Service as a Peanut Physiologist (1969-80). He received his BSc in Plant Breeding from the University of London, and his Masters and PhD from the University of Rhodesia-Zimbabwe. Recruited to the CGIAR system he lived in India and then Niger while researching genotype x stress interactions in peanuts, and cropping systems (Niger). In 1995, he moved to Georgia and 1996 joined the Peanut CRSP, which he has lead since 1998. Although trained in plant sciences his farming background has allowed him to contribute across the full value chain of peanuts; producing innovative solutions in the areas of management, environment, systems analysis, energy and mechanization, production, processing and marketing and public health.

The Peanut CRSP initiative to prevent human aflatoxicosis was developed by Dr. Williams; this topic has now expanded to include the role of mycotoxins in the HIV epidemic. Dr. Williams is also the co-inventor of a soil moisture probe

sent by NASA with the latest Mars exploration/probe. He has written or coauthored many chapters, papers, articles and abstracts, including 127 peer-reviewed publications.

WOLKING, David J. David Wolking is a graduate student in International Agricultural Development at the University of California, Davis focusing on zoonotic disease and health for pastoralists in rural Tanzania. His current research project, supported by the GL-CRSP HALI project, is investigating the prevalence of water and fecal-born pathogens in neonatal livestock, and the subsequent risk factors associated with their transmission to human caretakers. Mr. Wolking leads the Global Livestock CRSP support team, and is an editor and contributing author to GL-CRSP research briefs, newsletters, and reports. He is a Jim Ellis Graduate Mentorship Program grant recipient, Jastro-Shields Research Award for Graduate Students recipient, and Jessie D. Carr Fellow at UC Davis. He is also an avid blogger on topics ranging from field research, development and health, to bicycle culture.

THE PRESENTATIONS

NUTRITION, SUSTAINABLE LIVELIHOODS AND EXTENSION: LINKING AGRICULTURE, HUMAN HEALTH AND NUTRITION WITH ENAM

O. Sakyi-Dawson¹, G. S. Marquis^{2,3}, E. Colecraft^{1,2}, L. M. Butler², A. Lartey¹, B. Ahunu¹, H. Jensen³, M. Reddy², and E. Lonergan²

¹University of Ghana, Legon, ²Iowa State University, ³McGill University

Strategic linkages between agriculture and nutrition are required to combat malnutrition sustainably in developing countries through food based strategies. The measure, extent and causes of malnutrition and the appropriate communication and other interventions to address these are dependent on the particular populations and regions for which an appropriate framework is needed. The search for appropriate framework such linkages must consider ways in which agriculture can contribute to finding sustainable solutions to food system failures through holistic food-based system approaches, thereby closely linking agriculture to improving human health, livelihood and well being. Such a framework will stimulate support for agricultural research especially in developing countries because it addresses both nutrition and human health issues as well as agricultural development issues and is, therefore, politically supportable. A framework for such strategic linkages encompasses several components and need to be interdisciplinary. The Enhancing Child Nutrition through Animal Source Food Management (ENAM) project explores the research and development implications of linkages between agriculture, nutrition and human health and extension by integration of several components including food security, value chain development, sustainable livelihoods, determinants of nutritional status and food systems model with knowledge systems with multi-stakeholder processes. The way this integrated framework is used for guiding the search for a relevant problem model, designing the appropriate communication and other interventions and their implementation, as well as assessment of outcomes and impacts of the interventions is analyzed. Lessons for strengthening the framework and using it for developing and a nutrition extension short course to enhance its contribution to improvement of nutrition and human health through linkages agriculture are highlighted.

THE ONE HEALTH APPROACH: IDENTIFYING SOLUTIONS TO COMPLEX PROBLEMS AT THE LIVESTOCK-WILDLIFE INTERFACE

J. Erickson¹, J. Mazet², D. Clifford², P. Coppolillo³, and R. Kazwala⁴

¹University of Vermont, ²University of California, Davis, ³Wildlife Conservation Society, ⁴Sokoine University of Agriculture

When livestock and wildlife are in close proximity, diseases can have severe impacts on livelihoods, biodiversity, and even human health. Mitigating these complex *One Health* problems requires identification of implementable and sustainable solutions. Because disease transmission between livestock and wildlife tends to place livestock keepers and conservationists at odds, approaches to solving these problems need to be framed in a neutral context to encourage participation. Using a transdisciplinary ecosystem approach, we addressed disease transmission between livestock and wildlife, especially bovine tuberculosis, in the Ruaha ecosystem of South-central Tanzania. Existing information was evaluated, and critical gaps were targeted for data collection, including disease testing, health and socioeconomic surveys, and evaluation of wildlife and livestock demography and land usage. The data were then used to assess risk of disease transmission and identify interventions. Science-based interventions likely to mitigate the problems and be implementable in the economic and cultural contexts were identified through stakeholder involvement with health scientists, ecologists, socioeconomists, cultural anthropologists, and public educators. Economics and work stress were common justifications for unhealthy practices, but cultural traditions were often at the root of behaviors rather than finances. Some stakeholders were open to behavioral change based on scientific and financial justifications, while others were unwilling to participate in such solutions. In this landscape, government agencies may not have the capacity to implement interventions even if the political will to do so is strong. The main obstacle to implementing change is tradition. While strong science is an excellent foundation on which to base recommendations, interventions can succeed only if stakeholders are involved in the characterization of the problem and are willing to make the tradeoffs necessary to balance the needs of people and wildlife.

ANIMAL SOURCE FOODS PROMOTE COGNITIVE FUNCTION, SCHOOL PERFORMANCE, INCREASED MUSCLE GROWTH AND ACTIVITY IN KENYAN CHILDREN: FROM OBSERVATIONAL TO EVIDENCE-BASED FINDINGS

C. G. Neumann¹, N. O. Bwibo², and C. Gewa³

¹University of California at Los Angeles (UCLA), ²University of Nairobi, ³George Mason University

GLCRSP has had a long and profound involvement in research on human health and nutrition. Most notable has been the testing of the impact of Animal Source Foods (ASF), mainly meat, on the growth,

cognitive function and development, school performance, nutritional states, and physical activity and behavior. These studies were carried out in Embu District, Eastern Province Kenya, a collaborative effort of the University of California at Los Angeles, the University of Nairobi, and the University of California at Davis. An earlier longitudinal observational study in Kenya, Egypt and Mexico, found significant positive associations between meat intake and growth and development in children and pregnancy outcomes, but these were not causal associations. Thus a randomized controlled feeding intervention study in Kenya was funded by GLCRSP and Cattleman Beef Association to test the impact of meat vs. milk vs. usual plant based diet and a control group on growth, body composition, cognitive function, school performance, physical activity, and morbidity. This was the first randomized controlled study showing a causal link of the benefits of meat intake on the above important human functions. Further studies testing implementation strategies for increasing meat in children's diet are now being carried out in Ghana by Dr. Grace Marquis and her Ghanaian colleagues Dr. Anna Lartey, Dr. Esi Colecraft, and others.

RESEARCH ON THE INTERFACE BETWEEN AGRICULTURE AND PUBLIC HEALTH

J. H. Williams, University of Georgia, Director, Peanut CRSP

A widely neglected area of research, particularly so for developing countries, is the improvement of public health through agricultural technologies. Investing in this area has great potential to increase both the value of agriculture to farmers, and provide affordable health benefits to the consumers of these products. Three examples of the approach to and benefits of, 'interface' research will be considered. 1) Research on the influence of peanut in the diet on cardio-vascular risks that resulted in a health claim has allowed the peanut industry to promote consumption of this food in the USA over the past years. The consumption has increased 5-10 percent annually and has maintained prices for farmers; delivering an estimated annual \$500 million benefit in the USA. 2) Proving the ability of peanut to prevent infant malnutrition has resulted in this commodity becoming a part of the standard infant rehabilitation food worldwide. 3) The major health risks associated with peanut are aflatoxicosis (global) and allergies (developed countries). Aflatoxin is a largely neglected issue in the developing country context, only attracting government attention when people die of acute poisoning and when trade shipments get rejected. Chronic aflatoxicosis interferes with nutrition and immunity and may therefore modulate up to 43% of the burden of disease in developing countries. Current research exploring the connection between mycotoxins and HIV indicate new, low cost food based interventions in the epidemic may be more sustainable than ARV therapies for those already with HIV. Our research also shows that easily corrected food toxins in maize are probably a driving force in the HIV epidemic, accounting for 62% of the variations in HIV between countries.

THE INTERRELATIONSHIP BETWEEN FOOD SECURITY, NUTRITION, AND HIV: FINDINGS FROM ONGOING FIELD WORK

G. Ettyang¹, J. Ernst², C. Neumann³, W. Nyandiko^{1,4}, A. Siika^{1,4}, and C. Yiannoutsos^{2,4}

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After more than 20 years, HIV/AIDS is still a disease whose heaviest burden falls on the populations of low income and food insecure countries. Food insecurity limits capacity to meet the specific nutritional needs of HIV/AIDS affected people. Under nutrition due to insufficient food availability, access, and utilization, may hasten progression to AIDS- related illness, undermine adherence and response to antiretroviral therapy and exacerbate socio-economic impacts of the virus. HIV infection itself undermines food security and nutrition by reducing work capacity and productivity and jeopardizing house hold livelihoods. The interaction between HIV/AIDS and food security has been recognized relatively recently and interventions to address this issue continue to emerge. Addressing food security and nutrition in all settings is vital to the success of feasible and more effective HIV/AIDS nutritional care and support interventions. This presentation focuses on the interrelationship between food security and HIV and highlights the approach that the HIV Nutrition Project (HNP) has taken to promote food security and nutrition in the context of the AIDS epidemic. Following a short introduction, the basic conceptual frame works are reviewed. Subsequently, the procedures and data collected to assess household food insecurity are described. Food assessment indicators used, include months of adequate household food provisioning (MAHFP) and household dietary diversity score (HDD). A section is devoted to a brief description of the nutrients contributed by the food intervention and results of nutrient intake as determined by food frequency and 24-hour recall questionnaires. Preliminary data on a sub-sample of 30 HIV+ drug naïve, WHO Stage 1 or 2 with $250 > CD4 < 500$, show that 39% of households (HH) had >8 members with 54% as females. HH that owned no land or cultivated < 2 acres were 54%. With sources of HH income primarily from casual work, 71% earned $< \$285$ US/year. The mean \pm (SD) HDD score of 6.10 ± 1.9 suggested a prevalence of low food diversity in diets. The mean \pm (SD) MAHFP score of 5.17 ± 1.4 reflected HH worry due to inadequate food, and eating fewer or small meals. The comparison of this data to future data will enable evaluation of a food-based intervention to reduce under-nutrition and disease progression in rural HIV infected and affected HH.

EMPOWERING AFGHAN HERDERS TO BUILD PEACE

M. Jacobs¹ and R. M. Dalili²

¹Texas A&M University, ²Sanayee Development Organization, Afghanistan

The Pastoral Engagement, Adaptation, and Capacity Enhancement (PEACE) project has been working to increase extensive livestock production in Afghanistan since 2006. We are institutionalizing technologies with both the Range and Livestock Production Departments within the Ministry of Agriculture, Irrigation and Livestock that will help them to better manage their rangelands. Transhumanent populations called “Kuchi” are the primary extensive livestock producers in Afghanistan and make up about 8% of the population. They are responsible, however, for about 75% of the livestock that reach the major livestock markets. Like other transhumanent livestock producers, land tenure issues and insecurity are major challenges for them. Thirty years of war has completely changed the social landscape for herders. Good rangeland management is essential but if extensive producers cannot reach the important mountain rangelands in summer, management becomes less relevant. Therefore, the PEACE project has also been working to develop conflict resolution and peace building capacity within the Independent Department of Kuchi (a department directly under the President). In collaboration with Sanayee Development Foundation, a local NGO experienced in delivering conflict resolution training, we have been able to assist in training Kuchi Provincial Directors and many other Kuchi leaders from various provinces across Afghanistan. One hundred and thirty eight leaders from 26 Provinces have undergone training. Working within the context of the Kuchi’s organizational structure and culture we have been able to use several different methods to empower these leaders. We are attempting to build a large cohort of Kuchi leaders that understand how, and have the tools necessary, to solve problems peacefully.

LIVESTOCK EARLY WARNING SYSTEM: A TOOL THAT HOLDS PROMISE FOR AN INTEGRATED NATURAL RESOURCE-BASED CONFLICT MANAGEMENT

A. Jama, Food and Agriculture Organization Intergovernmental Authority on Development (FAO-IGAD) Livestock Policy Initiative

Pastoral communities in Eastern Africa and in many other parts of the world have faced increased variations in weather, and degradation of forage resources that led not only to large losses of livestock but also to increased conflict as a result of increased mobility and competition for the limited resources. The Livestock Early Warning Project (LEWS) has conducted many studies and created a suite of technologies to predict forage conditions in remote livestock and pastoral technologies areas in many parts of the world to assist policy makers to make pro-active decision before drought sets in.

Some of these key studies and products of LEWS include the following: 1) Automated forage supply modeling package; 2) Satellite based rainfall estimates (RFE); 3) Satellite based Normalized Difference Vegetation Index (NDVI) to assess whether the target being observed contains live green vegetation or not; 4) Livestock movement modeling; 5) Water monitoring system; and 6) Deployment of a rural ICT technology and development communications strategies. These products can add value to existing conflict early warning systems such as the Intergovernmental Authority on Development (IGAD) Conflict Early Warning System (CEWARN) in Eastern Africa that has on the ground network of institutions, which is very well connected to decision makers and response mechanism throughout the region.

THE NEED TO CONVINCING POLICY MAKERS THAT RESEARCH MATTERS

R. Oniang'o, African Journal of Food, Agriculture, Nutrition, and Development (AJFAND)

There are probably no two groups that are more incongruent than policy makers and researchers. Yet they both need each other for the sake of the citizens and the country's development. Scientists often feel politicians should know better and accordingly allocate adequate resources for research. Yet politicians do not see what the fuss is all about. No country can develop without the ability to generate new knowledge. It is also important to remember also, that no culture or society has a monopoly over knowledge. As such, every society should strive to make meaningful contributions to the world body of knowledge. For a government to be able to do this properly, however, they need to be convinced by scientists who often do not know how to express themselves.

THE QUEST FOR IMPACT: THE TRANSFORMATION OF RESEARCH FROM A TRADITIONAL TO A PARTICIPATORY FORMAT IN SOUTHERN ETHIOPIA

D. L. Coppock, Utah State University

Applied researchers desire "positive impacts" from their work, whether this occurs as peer accolades, influencing policy, or yielding technical or management innovations that improve the lives of local people. Completing the link, however, between academic scholarship, practical application, and real-world impact is difficult. This challenge has been magnified where the connectivity between research and extension has been lacking and top-down control of the overall process has prevailed. Few incentives exist for university scientists, in particular, to take research concepts through an obstacle course of problem identification, stakeholder involvement, pilot-project implementation, and impact assessment in a developing-world context. Despite such challenges, participatory research approaches are gaining

credibility in the university community as scientists seek new ways of working and increasing their relevance to the world. In this presentation the transformation of a research agenda from a traditional to participatory format is described for southern Ethiopia. It is concluded that a Livestock CRSP can be an excellent vehicle to promote participatory approaches that generate new forms of knowledge, stronger collaborative partnerships, and increase the likelihood of on-the-ground impact.

THE ENAM MODEL FOR RESEARCH, OUTREACH AND LEARNING

L. M. Butler¹, G. S. Marquis^{1,2}, E. Colecraft^{1,3}, O. Sakyi-Dawson³, A. Lartey³, B. Abunu³, H. Jensen², M. Reddy¹, and E. Lonergan¹

¹Iowa State University, ²McGill University, ³University of Ghana

There is growing recognition that the integration of knowledge systems with multi-stakeholder approaches offers greater possibilities for achieving sustainable development goals than do strategies that are more narrowly focused. But what is the best way to increase the diversity and cooperation of actors and organizations, and to achieve effective integration of sectors, interests, methods, and processes (IAASTD Global Report 2009)? The Enhancing Child Nutrition through Animal Source Food Management (ENAM) project is a collaborative research and development effort intended to enhance children's animal source food (ASF) intakes in six rural communities of Ghana, and to increase caretakers' capacities to identify and respond to children's health and nutrition needs in project communities. Beginning with the planning phase, and continuing throughout the four-years of project implementation, we included different but complementary research, outreach and learning strategies to facilitate behavioral change, institutional sustainability, and the development of a new generation of practitioners and scientists. ENAM methods actively involved program participants and stakeholders in planning, implementation and evaluation. Diverse strategies contributed to program and methodology complexity: focus group discussions, interviews and observations; a community-based micro-credit system for caregiver-entrepreneurs; nutrition and entrepreneurship education; baseline surveys reinforced by participant case studies; stakeholder workshops and organizational partnerships to strengthen project knowledge and to facilitate sustainability; training of volunteer peer educators; and course development for practitioners. Analysis of these knowledge systems and learning processes can provide insights in to the interdependence of research, outreach and learning strategies for identification of appropriate program interventions, and for understanding underlying issues of ASF incorporation into children's diets.

FROM PROBLEM-FOCUSED TO PEOPLE-CENTERED: REFRAMING THE SCIENCE OF SUSTAINABLE DEVELOPMENT

T. Moermond, University of Wisconsin-Madison

Project PLAN began as *problem-focused* with the focus at the interface between livestock and native forests in mountainous agro-ecosystems in Mexico, Ecuador and Bolivia, and the problem being to determine how livestock could be incorporated into the environment in a manner that was sustainable and would improve the livelihoods of local farmers. Our strategy was to use a *process-oriented, participatory* approach to work with local farmers to establish a local, on-going community planning process for sustainable management of livestock and land use practices. Ecologists and agronomists are apt to frame our initial *problem-focus* as a “*people—thing*” problem, with emphasis on the “*thing*”—the agro-ecosystem, but sustainable land use has less to do with instrumental *people—thing* problems, and more to do with social relationships, *people—people* problems. What is more, the goal of sustainability demanded considering the entire social-ecological system including economics, culture and government, which involve complex *people—people* problems, many of which are *divergent problems* that have more to do with reconciling differences in local human values than with facts or science. To meet the needs of farming communities and foster local sustainability, agricultural and rural development projects need to rethink their approaches and be more *people-centered*.

ENGAGING POLICYMAKERS IN PROJECT DESIGN: THE EXPERIENCE OF LEWS & LINKS

R. Kaitho^{1,2}, G. Kariuki² and P. Dyke^{1,2}

¹Texas A&M University, ²LINKS project

The Livestock Early Warning System (LEWS) project of GL CRSP was implemented between 1997 and 2003 and culminated in development of spatial models for assessing and forecasting forage situation as the basis for providing early warning information for livestock-based production systems in eastern Africa. The system assembles new technologies to create a system that has the ability to detect changes in livestock forage and nutritional status over large landscapes in the pastoral areas through a network of collaborators with the capacity to implement a full-scale livestock early warning system to more effectively respond to changing climatic conditions including emerging drought crises. LEWS transformed to LINKS in 2003 to incorporate livestock marketing information as an additional module towards an integrated early warning system. The system is implemented and managed through the collective effort of different collaborators contributing resources (personnel, equipment, funds, training materials) to support different aspects of the system to ensure prudent use of resources and

to provide a coordinated management and supervisory system to safeguard credibility of data and information. The process has resulted to the adoption of LINKS's technologies to develop national livestock marketing information systems in Kenya, Ethiopia and Tanzania.

LISTENING, A DRIVING FORCE FOR APPLIED RESEARCH

D. Bunn¹ and P. Msoffe²

¹University of California, Davis, ²Sokoine University of Agriculture

The application of research in the field, involves listening to stakeholders to identify and prioritize their problems. The development of the Avian Flu School (AFS) Project was based on an understanding of the core principles of cooperative extension. Effective agricultural extension requires 1) identifying the priority problems and issues facing farmers or animal producers, 2) facilitating the appropriate applied research to address those priority issues, and 3) sharing the results of the research with the farmers so that the new knowledge may be applied. No assumption was made that the initial AFS program design would adequately address the local priority poultry health problems but rather with the expectation that the programs would be modified based on local input. In the case of AFS, participant interaction in the pilot workshop in Tanzania in 2006 concluded that improving biosecurity to prevent highly pathogenic avian influenza (HPAI) at small farms and villages would require a broader approach that also addressed Newcastle disease. Based on the combined experience the participants, it was also concluded that extension efforts should start with the engagement of local leadership. Careful listening to field veterinarians in the AFS workshops resulted in the identification of the need for a holistic poultry health and production training program focused on local poultry. In the workshop setting or during informal conversations, listening is a key extension skill required to identify critical research priorities for a local community.

RETHINKING RELEVANCE:

HUMAN DEVELOPMENT AND THE CONTEMPORARY UNIVERSITY

*A.C. Hervy, Africa-US Higher Education Initiative, Association of Public and Land-grant Universities
Partnership to End Hunger and Poverty in Africa*

Higher education is basic to long-term, broad-based development, to the ability of nations and people to collaborate and compete in an increasingly complex world and to effectively manage global challenges and opportunities. But what characterizes effective higher education? What are the relevant skills and knowledge that universities ought to be teaching? Taking a global perspective, this presentation will

examine different models of higher education and explore the notion of relevance in higher education. It will also explore the challenges institutions face in transforming themselves and adapting to a changing environment.

THE SOCIAL DIMENSIONS OF CLIMATE CHANGE

R. Mearns, The World Bank

Climate change is arguably the most profound challenge facing the international community in the 21st century. Tremendous strides have been made over recent years in improving scientific understanding of the human processes driving climate change, but much less understood is how these dynamics in the physical environment interact with socio-economic systems. This presentation is intended to provide an overview of a book bringing together the work of prominent researchers and practitioners who take stock of the latest knowledge on the social dimensions of climate change.

EVOLVING LIVELIHOODS IN A RISKY ENVIRONMENT

P. Little¹, J. McPeak² and D. Layne Coppock³

¹Emory University, ²Syracuse University, ³Utah State University

Residents of pastoral areas in Kenya and Ethiopia have developed a variety of strategies for surviving in a risky environment. This presentation draws on the PARIMA survey data to illustrate four livelihood groups, the strategies they employ, and the kinds of outcomes they experience. Households are divided into livelihood strategies on the basis of access to livestock and access to the cash economy. One important finding is that livestock and livestock products remain the most important contributor to total household income for all groups. The research also illustrates that milk production is a critical component of livelihood strategies. When considering cash income, this message is reinforced as the main source of cash income is the sale of livestock and livestock products. However, it is also found that one of the main differences between higher cash income and lower cash income groups is access to wage, salary, trade, or business income. Overall, support to livestock production systems is confirmed to be the most promising way to reduce vulnerability and poverty in this area while improving access to the cash economy also offers some long term potential.

COLLECTIVE ACTION AND CAPACITY BUILDING IMPROVES LIVES IN SOUTHERN ETHIOPIA

D. Layne Coppock and Solomon Desta, Utah State University

A major goal of the PARIMA project has been investigation of opportunities for livelihood diversification among pastoralists. Since 2000 PARIMA has used participatory approaches where 46 stakeholder entities have worked together to solve problems. This process was stimulated by the discovery of dynamic pastoral women's groups in northern Kenya that pursued an ambitious development agenda with little outside assistance. Combining cross-border diffusion of innovations, peer-to-peer learning, Participatory Rural Appraisal (PRA), and careful investment in capacity building, the approach led to the rapid emergence of 60 sustainable collective-action groups in southern Ethiopia. Dominated by women, group activities have been founded on micro-finance, micro-enterprise, and livestock marketing. Over 13,000 people have been directly affected. About US\$647,000 has been extended in 5,300 micro-loans with a repayment rate of 96%. Thousands of livestock have been sold to traders and new income streams created. Other findings derived from detailed interviews of 180 respondents suggest that collective action and capacity building have had strong, positive effects on perceived quality of life when people engaged in group activity are compared to those that have not. Ten lessons for success are forwarded to implement this process. It is not a quick fix; 2-3 years is required to transform raw volunteers into well-functioning groups. Our observations support the idea that the gap in human capacity is vast in the rangelands, and filling that gap should be a development priority.

THE ECONOMY OF CHANGE: MAASAI LAND USE CHANGE AND LIVELIHOOD DIVERSIFICATION IN SIMANJIRO, TANZANIA

S. Lynn, Colorado State University, 2002 Jim Ellis Award Recipient

In northern Tanzania, large areas of high-potential land have been taken out of the hands of Maasai livestock herders to create national parks to reduce wildlife vulnerability to land use change and consumptive use. These parks had the additional effect of eliminating Maasai access to some traditionally important water and forage resources. Conservation efforts continue to request pastoral land use modifications. During the past decade, cultivation by Simanjiro Maasai has been targeted as a land use not compatible with wildlife conservation. Despite the high temporal and spatial variability of rainfall in East African savannas that makes cultivation a risky venture, over the past thirty years most Maasai in the area have diversified from pure pastoralism to a mixed pastoral-agricultural land use system. Every year a crop is planted there is a risk of complete loss. An important question arose as to whether cultivation was a financial sink, or whether this diversification was truly helping people to survive.

Household interview data collected in two Simanjiro villages during one average rainfall (2002) and one dry (2003) year indicate that while median cultivation-related income did decrease significantly in 2003 (\$80 vs. \$451 in 2002), when the two years were combined only 12% of households were at a net loss, 80% of households showed a net gain, if small, and 8% of households effectively broke even. This demonstrates that despite poor years, cultivation was not a financial sink for most households in these villages. Rather, cultivation possibly increased resilience by 1) providing a mechanism for simultaneously coping with short-term food and cash needs through intermittent good harvests, and 2) presenting an opportunity to cultivate and harvest with the very first rainy season following a drought, allowing a quick rebound while livestock populations recover over the course of years. Cultivation in a third village was much less successful. The success of cultivation in the first two villages and failure in the third neighboring village demonstrates the magnitude of this system's spatial and temporal rainfall variability (important for both cultivation and livestock management), and the risk that people are willing to undertake by cultivating every year in anticipation of potential successful years.

TECHNOLOGY TRANSFER:

A MODEL FOR PASTORAL REGIONS, THE GOBI AND MALI EXPERIENCE

J. Angerer¹ and N. Davaasuren²

¹Texas A&M University, ²Gobi Forage project

The Gobi Forage and the Mali Livestock and Pastoralist Initiative (MLPI) Projects are two examples of technology transfer by the GL-CRSP that could potentially serve as models for other pastoral regions. For Gobi Forage, a series of droughts and winter disasters in Mongolia resulted large die-offs of livestock during 1999-2002. In 2003, discussions between the Mongolia USAID Mission and GL-CRSP resulted in an agreement to transfer the GL-CRSP Livestock Early Warning System (LEWS) technology, developed in East Africa, to Mongolia as risk mitigation program for these extreme events. For MLPI, technologies developed for livestock market information systems under LINKS, and strategies for examining risk management and improving risk management options in pastoral regions of East Africa under PARIMA and LITEK were transferred to improve the productivity and income of the pastoral producers in the northern regions of Mali. Overall, the general transfer of technology was successful in both countries. The blueprints developed for implementation in East Africa reduced the amount of time to have systems fully operational in each of the new countries. In Mongolia, the infrastructure and protocols that were developed for East Africa allowed us to have a fully operational forage monitoring system within two years; almost two years less than the implementation in East Africa. In Mali, we were able to have the Livestock Market Information System operational within 6 months. However, as would be expected, some protocols, procedures, and data streams had to be modified to accommodate the implementation in each of the countries. Examples of these will be discussed.

THE FUTURE OF ICT AND ITS ROLE IN PASTORAL LIVELIHOODS

R. Kaitho^{1,2}, G. Kariuki² and P. Dyke^{1,2}

¹Texas A&M University, ²LINKS project

Poverty situation seems to be more prevalent in the pastoral communities where livestock production is the mainstay. For instance in Kenya, the poverty level among pastoral households is above 60%. The welfare of pastoralists is closely intertwined with livestock production and marketing, including terms of trade for acquiring other goods and services. Factors that contribute to this situation include lack of marketing infrastructure especially roads and relevant marketing information. The LINKS's ICT-based livestock marketing information system is run by stakeholders with interest in livestock marketing information. The system in Kenya, Tanzania and Ethiopia has incorporated a number of attributes to ensure the effectiveness of livestock markets in terms of its usefulness for producers and traders and also consumers to make timely informed decisions. ICT has significantly reduced the digital divide between urban terminal markets with well-connected traders/middlemen and remote primary and secondary markets with more disadvantaged producers. Producers can now get information on other markets outside their immediate locality including regional and international export markets. This means they can make better choices on where to sell their animals and increases their bargaining power with traders.

OPPORTUNITIES, CONSTRAINTS AND CHALLENGES TO LINKING NUTRITION, AGRICULTURE AND DEVELOPMENT

L. H. Allen, USDA, ARS Western Human Nutrition Research Center, University of California, Davis

Agriculture provides the world's food supply yet a very high proportion of its population, especially children and women, are micronutrient deficient, and increasingly so, overweight as well. Clearly the global food supply fails to match the nutritional needs of many or most populations. Although many effective nutrition-related technologies and interventions are known, these are often poorly implemented. Major barriers remain at the interface between nutrition and agriculture including lack of globally-accepted indicators to rate the quality of country's food supply, the weak nutrition focus of agricultural policy makers and managers, and lack of appropriately trained nutritionists. The GL-CRSP results presented by speakers at this conference support a recent report by IFPRI and the World Bank. They highlighted four major pathways that link food production to nutrition outcomes (encouraging production of micronutrient-rich foods for the household's own consumption, income-oriented production for sale in markets, empowerment of women, and lower food prices); four factors that are causing change in the agriculture -nutrition context (agricultural technology and policy, changing consumption patterns, and food marketing systems); and four elements that should be

incorporated into agricultural programs to improve nutrition (nutrition outreach and behavior change; empowerment of women as agents of improved nutrition, accounting for local context and factors that affect household consumption, and giving small producers support to capitalize on changing market demand). It is essential for agriculture and health to collaborate intersectorially; facilitators for this will be presented. A key factor is the need for more and better evaluation of successful agriculture and nutrition programs (scaling up from smaller efficacy trials), to increase the visibility of malnutrition and provide decision makers at all levels with evidence and information that can show how linking agriculture and nutrition can improve food security and human capital, income and health.

POSTER PRESENTATION SESSION: JUNE 17, 2009

To encourage student participation at the Global Livestock CRSP Program conference, the Management Entity provides a select number of travel grants to students requesting poster sessions. The Poster Session Travel Grants serve not only to inform about the students' research but also brings students into contact with researchers from other projects. Eleven awards were made this year for the End of Program Conference. The recipients were:

1. Charles Asem-Bansah (ENAM), University of Ghana
2. Mamadou Chetima, Cornell University, Borlaug LEAP Fellow
3. Aaron Christian (ENAM), University of Ghana, Jim Ellis Graduate Mentorship Program Awardee
4. Lynda Hagan (ENAM), University of Ghana, Jim Ellis Graduate Mentorship Program Awardee
5. Philip Homiah (ENAM), University of Ghana
6. Steven Hockett (SUMAWA), Utah State University
7. Gloria Kobati (ENAM), University of Ghana
8. Elizabeth Micah (ENAM), University of Ghana, Jim Ellis Graduate Mentorship Program Awardee
9. Richard Mwakapuja (AFS), Sokoine University of Agriculture, Jim Ellis Graduate Mentorship Program Awardee
10. Shelmith Mwaniki, Kenya Agricultural Research Institute, Borlaug LEAP Fellow
11. Katherene Osei-Boadi (ENAM), University of Ghana, Jim Ellis Graduate Mentorship Program Awardee

ENHANCING BACKYARD POULTRY PERFORMANCE IN THE TECHIMAN AREA OF GHANA: A VALUE CHAIN APPROACH

C.K. Asem-Bansah, University of Ghana, Legon

Although over 79% of households in Ghana are involved in backyard poultry, demand far outstrips supply. Several interventions in the sector have been biased towards production with a disregard to social and organizational aspects. A value chain framework was used to examine how the involvement of different actors, activities of actors, relationships between actors and then between actors and support services in the value chain of the backyard poultry enterprise affects its performance. Focus group discussions and individual interviews were used to obtain data and the content analyzed by comparing low and high performing enterprises. Only five main actors were identified to be involved in the primary activities. These are input suppliers, producers, village brokers, district level market retailers and consumers. At both levels of performance, relationships between the actors are largely uncoordinated, erratic and with little or no trust. The support services provision to the primary activities is mainly from the nascent informal providers with serious limitations though. These weaknesses identified account for the industry's current low production and lack of competitiveness. Addressing the identified weakness should enhance the backyard poultry value chain to make the sector competitive and capable of reducing mass poverty.

DOES DEVELOPMENT IMPACT GENDER EQUITY? THE CASE OF LIVESTOCK AND FOOD SECURITY IN THE SAHEL

M. M. Chétima, Cornell University

This study was conducted in a Sahelian community with limited poverty-alleviation opportunities. Building on comprehensive data of livestock and owners collected between 1983 and 2007 in the villages of Sadeïzé Kwara and Samari, we investigated the group specificity of vulnerability to food crises. Over the study period, overall animal assets declined. However, in Samari, there was a slight increase in total livestock and number of livestock owners, while there were dramatic decreases in Sadeïzé Kwara. Notably, average livestock wealth per owner declined for women in both villages. In Samari, where total livestock increased, women lost economic ground to men and remained poorer (livestock-wise) compared to their counterparts in Sadeïzé Kwara. Simultaneous to these changes, Samari residents established a livestock market, and with government and international aid interventions, credit opportunities expanded substantially. There were no similar developments in Sadeïzé Kwara. The effects of these interventions may help explain the paradoxical findings above. While indicating areas where development efforts can strengthen resilience to food crises, they also point to the importance of

considering the gender and market dimensions of intervention strategy. These findings are particularly relevant given the recent food and financial crises, and instructive for those committed to improving rural livelihoods.

CAREGIVER'S INCOME GENERATION ACTIVITIES AND DIVERSITY OF ANIMAL SOURCE FOODS IN CHILDREN'S DIETS IN GHANA

A. K. Christian¹, A. Lartey¹, E. K. Colecraft¹, O. Sakyi-Dawson¹, G. S. Marquis^{2,3} and B.K. Abunu¹
¹ University of Ghana, Legon, ²McGill University, ³Iowa State University

Animal source foods (ASF) have been identified as an important factor positively associated with early childhood growth and cognitive development. Income generation activities (IGA) focused on ASF may influence children's intake through increased availability at home and increased income to purchase ASF. This study compared ASF diversity of children in 12 communities in 3 agro-ecological zones in Ghana whose caregivers did or did not engage in ASF-related IGA. 466 caregivers were interviewed on household demographics and socioeconomic status and diets of their 2- to 5-year-old children. ASF diversity was not predicted by type of caregiver's IGA. Living in the forest transitional zone and belonging to a medium/high wealth households were significant positive predictors of children's ASF diversity while increased number of children in the household and living in the Interior savannah zone were inversely associated with children's ASF diversity ($P < 0.0001$).

In conclusion, ability to purchase ASF rather than its availability in the home through an IGA may be a more important determinant of ASF in children's diets in these communities.

IDENTIFYING THE INFLUENCE OF MALE HOUSEHOLD HEADS ON THE EXPECTED OUTCOMES OF THE ENAM PROJECT COMMUNITY- BASED INTERVENTIONS

L.L. Hagan, University of Ghana, Legon

Evaluation of microcredit programs have shown that husbands of women who receive loans can influence how these loans are invested and how income earnings associated with the loans are ultimately used. This study assessed the influence of caregivers' male household heads (MHH) on expected outcomes of ENAM project micro-credit and nutrition education interventions. The study was carried out in 4 communities in 2 different ecological zones of Ghana. Using a structured questionnaire, the socio-demographic characteristics of 91 MHH and their perception of the impact of the ENAM project on their households as well as the importance of ASF to young children were obtained. Data was also collected on the anthropometry and diets of their 2- to 5-year old children. MHH perceived that

caregivers contribution to family expenses have increased since joining the program. The ASF quantity and diversity consumed by children of caregivers whose MHH played very strong role was higher than those who played weaker role ($p < 0.05$). In conclusion, involvement of MHH in microcredit with education programs may influence children's ASF intake.

EFFECTS OF MICRO ENTERPRISE DEVELOPMENT ON CAREGIVERS' HOUSEHOLD EXPENSES AND CONSUMPTION OF ANIMAL SOURCE FOODS BY THEIR HOUSEHOLDS

A. P. Homiah¹, O. Mensah-Bonsu¹, O. Sakyi-Dawson¹, E. K. Colecraft¹, G. S. Marquis^{2,3}

¹University of Ghana, Legon, ²Mcgill University, ³Iowa State University

Low-income levels and lack of knowledge has been identified as key constraints to the use of animal source foods (ASF) in the diets of most Ghanaian children. The ENAM project (introduced September, 2005) sought to improve ASF levels in children's diet by combining education on the importance and use of ASF with microenterprise development (microfinance and entrepreneurial development education) for caregivers of selected households. This study assessed effects of the intervention on participants' contribution to key household and child related expenses as well as their households' purchases and consumption of ASF. Results show that household of participant caregiver contributed more to all the household and child related expenses than non-participants. Microenterprise development coupled with nutrition education given to caregivers is effective in improving women contribution towards household expenses and ASF consumption at the household level.

SOIL AND WATER CONSERVATION IN RIVER NJORO: OCCURRENCE AND CONSTRAINTS OF ADOPTION

S. Hockett^{1,2} and D. L. Coppock²

¹Sustainable Management of Rural Watersheds (SUMAWA) Project, ²Utah State University

Population pressure often forces the poorest people onto marginal lands for their subsistence, thus contributing to natural-resource degradation. The River Njoro watershed (280 km²) in Kenya is a case-in-point where recent settlement has resulted in rapid deforestation and degradation of soil and water resources. Land ownership is often unclear. From a population of 6,500 smallholders, representing eight ethnic groups, 222 farmers were surveyed using a stratified-random sample. Mixed quantitative and qualitative data were collected to characterize use of soil and water conservation practices (SWCPs) and assess factors constraining adoption. Education, income, tenure status, access to extension, and

agroecological factors were hypothesized as major constraints. Statistical methods were used to sort 26 possible explanatory variables. Results showed that adoption of SWCPs was surprisingly common throughout the watershed, with 6.5 SWCPs implemented per farm. Higher incomes and more-secure land tenure only slightly increased adoption rates suggesting that policies promoting income generation and tenure security may only marginally contribute to improved watershed management. Conversely, qualitative analysis revealed important farm-level contextual considerations that better explained 'why' SWCPs were adopted suggesting that consideration of contextual factors can facilitate creation of more robust policies and more practical watershed management strategies in resource-limited communities.

DIETARY INTAKES OF NON-PREGNANT, NON-LACTATING WOMEN PARTICIPATING IN THE ENAM PROJECT IN RURAL GHANA

G. Y. Kobati¹, A. Lartey¹, E. K. Colecraft¹, G. S. Marquis^{2,3}

¹University of Ghana, Legon, ²Iowa State University, and ³McGill University

Information on the dietary intakes of non-pregnant, non-lactating (NPNL) Ghanaian women is lacking. A cross-sectional survey was undertaken to compare the dietary intakes of NPNL women living in the Coastal (n=79) and Northern (n=89) zones of Ghana.

Data collection included an interviewer-administered socio-demographic questionnaire and a 12-hour weighed food record over one working and one non-working day. A food frequency questionnaire was used to assess foods consumed in the past week. Approximately 49 – 53% of the women reported consuming two meals (breakfast and supper) daily. Cereal-based foods were consumed daily by all participants. Fish was the predominant ASF consumed by both groups of women. There were no significant differences in the mean energy intakes of women in the coastal and northern zones. The diets of women in both zones did not meet their energy requirements and were low in some micronutrients, especially calcium. The overall quality of the diets was lower for the northern women compared to that of the coastal women. About 68% of the northern women compared to 22% of the coastal women had low dietary diversity (Diversity score ≤ 5). Efforts to increase women's energy intakes and education on the benefits of a diversified diet are needed to improve women's nutritional status.

THE CONTRIBUTION OF READY-TO-EAT FOODS (RTEF) TO THE DIETARY INTAKES OF YOUNG GHANAIAN CHILDREN

E. B. Micah¹, E. K. Colcraft¹, A. Lartey¹, G. S. Marquis^{2,3}

¹University of Ghana, Legon, ²McGill University, ³Iowa State University

High consumption of purchased Ready-to-eat foods (PRTEF) by children is influenced by several factors, including the fact that more women now work outside the home. This study explored the contribution of RTEF to the total Animal Source Foods (ASF) of children 2-to-5 years in four communities in the coastal savannah (CS) and Forest transitional (FT) zones in Ghana. Caregivers' and children's information was collected through questionnaires. Twelve-hour weighed food observation was done and hemoglobin concentration was determined using finger prick blood. About 88% of children consumed PRTEF. RTEF contributed about 22% of the total ASF intakes of children in the FT zone compared to 1% in CS zone. Significantly more children in the FT zone consumed meat/poultry than those in the CS zone ($p<0.05$). RTEF contributed about 30% of energy intakes of children in both areas but contributed significantly more protein to the intakes of children from the FT zone compared to those from the CS zone ($p<0.05$). No relationship existed between high or low consumption of PRTEF and children's nutritional status. Consumption of PRTEF may contribute to the ASF intake of children. Educating mothers in the selection of nutritious foods when purchasing RTEF will improve children's diet.

FIELD IMMUNIZATION IN FREE-RANGE VILLAGE CHICKENS IN TANZANIA

R.S. Mwakapuja and P. Msoffe, Sokoine University of Agriculture

A study to monitor and evaluate the effectiveness of Newcastle Disease (ND) vaccination program in free-range village chickens (FRVC) was carried out in three regions (Morogoro, Mtwara and Iringa) of Tanzania. Investigation on immune response after village chickens vaccinated with thermostable I-2 vaccine were done using Haemagglutination-Inhibition (HI) test. A total of 1602 sera were collected from FRVC of different age categories from nine project villages and six non-project villages. I-2 vaccines were provided to FRVC in project villages under supervision of trained personnel while FRVC in non-project villages were not provided with the vaccines; however the owners were not restricted from vaccinating their poultry with I-2 vaccines. HI antibody titre of ≥ 23 was taken as protective against ND virus. The average numbers of birds with protective NDV antibodies in project wards were 30.1 ± 5.5 , 25.9 ± 5.5 and 5.2 ± 5.5 (mean \pm standard deviation). Average numbers of birds with seropositive titres in project wards were significantly ($p<0.05$) higher than in non-project wards, there was significant difference in number of immunized birds by age categories between project and non-

project wards; chicks were the least protected compared to adults. Parasite infections and nutrition deficiency still pose a big challenge in village poultry and have negative effect to immunization.

INCORPORATING ENTOMOPATHOGENIC NEMATODES IN SWEET POTATO WEEVIL MANAGEMENT IN KENYA

S. W. Mwaniki, Kenya Agricultural Research Institute (KARI) - Kabete, Kenya

Sweet potato weevil is a major constraint to sweet potato production wherever sweet potato is grown. Conventional systemic insecticides effectively manage the weevil but they are harmful to the environment and to operators among other negative effects. Alternative control methods that are environmentally friendly are necessary to maintain production of quality sweet potatoes. This study carried out laboratory bioassays of entomopathogenic nematodes *Heterorhabditis indica*, *Steinernema karii* and *Steinernema jirgalemense* on weevil larvae and adults in Petri dishes. The study also tested the effectiveness of burying weevil-infested trash at various depths as a control method for the sweet potato weevil and the effectiveness of nematodes applied on the surface against weevil inoculum at different soil depths. Additionally, the study assessed entomopathogenic nematodes *H. indica* and *S. karii* for effectiveness on weevils during sweet potato growth, at harvest and one month in store for three consecutive seasons. Weevil larvae were more susceptible to the three entomopathogenic nematodes than adult weevils. Weevils at 10 cm depth and above moved to the surface and attacked growing vines but the growing vines were safe from attack when weevil inoculum was below 10 cm depth. Nematodes applied on the surface moved along the depths and effectively reduced weevil populations at all depths between 0 and 25 cm. Entomopathogenic nematodes reduced weevil infestations in the field and in store in the first and second seasons but the infestations were low in all treatments in the third season.

DIETARY INTAKES AND IRON STATUS OF VEGAN AND NON-VEGETARIAN GHANAIAN CHILDREN

K. Osei-Boadi¹, A. Lartey¹, E. K. Colecraft¹, G. S. Marquis²

¹ *University of Ghana, Legon,* ² *McGill University*

There is a dearth of information on the diets of vegan children in Ghana. We compared the diets and iron status of vegan children (9-60 mo and >5-11 y; n= 26) with matched controls, non-vegetarian children (n=26) within the same age range. Dietary intake was assessed using 24-hr food recall. Hemoglobin, plasma ferritin and transferrin receptors were determined. The results showed that diet

of vegans compared to non-vegetarian children was devoid of vitamin B12 (0.0 ± 0.2 mg vrs 1.5 ± 1.8 mg, $p= 0.000$). However, vegan children had significantly higher intakes of dietary fibre (17.1 ± 11.9 g vrs 8.4 ± 6.2 g, $p= 0.002$), thiamine (1.1 ± 0.8 mg vrs 0.5 ± 0.3 mg, $p= 0.001$) and vitamin A (1702.1 ± 1887.1 RE vrs 671.2 ± 690.9 RE, $p= 0.01$). Dietary diversity based on 9 food groups was not significantly different among groups. Plasma ferritin was significantly higher for non-vegetarian children compared to the vegans (59.15 ± 48.18 ng/ml vrs 34.05 ± 25.88 ng/ml, $p= 0.012$). The mean prevalence of anemia (Hb < 11.0 or 11.5 g/dl) was about 25% in both groups. Typical diets of Ghanaian children lack variety. Addition of more animal source food to the diet is likely to improve diet quality.

POSTER PRESENTATION SESSION: JUNE 18, 2009

Alphabetical listing by first author.

1. Angerer, Jay. Poster Title: Verification of Simulation Model Output And Forage Maps Used to Provide Livestock Early Warning In The Gobi Region of Mongolia.
2. Aboud, A.A. Poster Title: Agro-pastoralists Concerns over the Prosopis Tree: The Case of the IlChamus of Baringo District, Kenya.
3. Boone, Randall B. Poster Title: Factors Related to Marketing Success for Fiber Production in Middle Asia.
4. Buluku, Elizabeth. Poster Title: Increasing Animal Source Foods in Diets of HIV-Infected Kenyan Women and Their Children: Gender Activities.
5. Cardona, Carol. Poster Title: Detection and Prevention of Highly Pathogenic Avian Influenza in Communities with High Poultry Disease Burdens.
6. Cardona, Carol. Poster Title: Preparing Rural Africa for Avian Influenza: Directions for Future Research.
7. Clifford, Deana. Poster Title: The HALI Project: Applying the One Health Paradigm.
8. Colecraft, Esi. Poster Title: Partnerships for Sustainability and Livelihoods Diversification: An Overview of USAID-WID Supported Initiatives in the ENAM Project.
9. Coppock, D. Layne. Poster Title: Lessons Learned from Participatory Research on the Pastoral Risk Management Project (PARIMA).
10. Desta, Solomon. Poster Title: Collective Action by Women's Groups to Combat Drought and Poverty in Northern Kenya.
11. Doss, Cheryl. Poster Title: Gender Analysis of the PARIMA Data.
12. Ernst, Judith. Poster Title: Increasing Animal Source Foods in the Diets of HIV-Infected Kenyan Women and Their Children: Introduction to the Project.
13. Ernst, Judith. Poster Title: Increasing Animal Source Foods in the Diets of HIV-Infected Kenyan Women and Their Children: Project Accomplishments and Lessons Learned.
14. Galvin, Kathleen. Poster Title: Production Strategies of Livestock Herders in the Grasslands of Kazakhstan: Implications for the Marketing of Fibers.
15. Gombosuren, Udval. Poster Title: Development of Near Infrared Spectroscopy Techniques for Predicting Nutritional Status of Livestock in Mongolia.

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16. Jenkins, Marion. Poster Title: Household BioSand Filters for Drinking Water Improvement in the Njoro Watershed, Kenya.
 17. Jenkins, Marion. Poster Title: Tools and Techniques for Improving Scientific Understanding and Management of Water Resources in Kenya's Njoro Watershed.
 18. Kaitho, Robert. Poster Title: Application of ICT in Developing Livestock Marketing Information System in Eastern Africa.
 19. Kaitho, Robert. Poster Title: Livestock Information Network Knowledge Systems (LINKS).
 20. Knueppel, Danielle. Poster Title: A Socioeconomic Impact Assessment of a Chicken Newcastle Disease Vaccination Project on Households in Rural Iringa, Tanzania.
 21. Krupnik, Tim. Poster Title: Net Present Value Analysis to Assess the Economic Consequences of Changing Farming Systems in the Upper River Njoro Watershed.
 22. Lartey, Anna. Poster Title: Multidisciplinary Efforts to Improve Child Nutrition: Achievements of the ENAM Project.
 23. Magsar, Urgamal. Poster Title: Implementation of a Livestock Early Warning System in Mongolia: The Gobi Forage Example.
 24. Marques, Guilherme Fernandes. Poster Title: Improving Water Management in a Climate Change Scenario with a Computer Modeling Participatory Tool.
 25. Masozera, Michel. Poster Title: Bioregulation of Disease at the Landscape-Scale: Analysis of the Human-Livestock-Wildlife Interface in Semi-Arid Ecosystems of East Africa.
 26. McPeak, John. Poster Title: Evolving Livelihoods in a Risky Environment.
 27. McPeak, John. Poster Title: Pastoral Livestock Marketing in Eastern Africa: Research and Policy Challenges.
 28. Miller, Scott. Poster Title: Sustainable Management of Rural Watersheds.
 29. Moermond, Timothy. Poster Title: Empowering Women to Improve Household Security and Quality of Life in Farming Communities.
 30. Moermond, Timothy. Poster Title: Improving Sustainable Livestock and Livelihoods through Community Empowerment.
 31. Msoffe, Peter. Poster Title: Preparation for the prevention and Control of Highly Pathogenic Avian Influenza in Rural Tanzanian Village Settings.
 32. Riegels, Niels. Poster Title: Preliminary Assessment of Surface Runoff, Groundwater Recharge, and Changes in Groundwater Levels over Time: Middle and Lower River Njoro Catchments.
 33. Semenyé, Patterson. Poster Title: Tangible Outputs and Sustainability: SUMAWA Project, River Njoro Watershed, Kenya.
 34. Semenyé, Patterson. Poster Title: Women in Development Boosts SUMAWA Project with Interventions in the River Njoro Watershed, Kenya.
 35. Shivoga, W.A. Poster Title: The Impact of Land Use on Water Quality in River Njoro Watershed, Kenya.
 36. Tezera, Seyoum. Poster Title: Women's Health, Collective Action, and Risk Management in Southern Ethiopia.

POSTER SESSION: GENDER INTEGRATION

Recognizing the critical importance of incorporating gender-based constraints in project design to achieve greater impact, the GL-CRSP has been a leader in ensuring that gender is a focus of research and development efforts. In particular, the GL-CRSP has engaged multiple stakeholders to tackle tough gender issues, especially in pastoral societies, and has focused on the advancement of women from Central Asia to Latin America by partnering with USAID's Women in Development (WID) program. Current GL-CRSP projects like PARIMA, ENAM, and SUMAWA have demonstrated extraordinary success in empowering women as agents of change for improved education, nutrition, health, and overall economic growth. This poster session is intended to highlight these achievements, and draw attention to remaining challenges and obstacles.

INCREASING ANIMAL SOURCE FOODS IN DIETS OF HIV-INFECTED KENYAN WOMEN AND THEIR CHILDREN: GENDER ACTIVITIES

E. Buluku¹, J. Ernst², G. Ettyang¹, C. Neumann³, W. Nyandiko^{1,5}, A. Siika^{1,5}, L. Allen⁴ and C. Yiannoutsos^{2,5}

¹ Moi University, ²Indiana University, ³ University of California at Los Angeles, ⁴USDA Western Human Nutrition Research Center, University of California at Davis, ⁵USAID - Academic Model Providing Access To Healthcare (AMPATH)

The GL-CRSP HNP is focused on improving the diets of drug naïve HIV-infected rural Kenyan women and their young children. The GL- CRSP HNP uses a strategy that (1) empowers HIV-infected Kenyan women with a nutrition intervention, knowledge and other resources such as filters and treatment for safe water, treatment for parasites and bed nets to prevent malaria, (2) builds capacity within Kenya by training Kenyan women and men to lead and carry out successful project implementation and outcome assessment and (3) provides compassion to the women and their families as part of the healing process. Assessment outcomes include immune function, health, body composition, quality of life, nutrient intake, food security, socioeconomic status, time allocation in women and growth and cognitive development of children; field enumerators visit the homestead or women and children come to the rural clinic. **Results thus far:** *Gender roles for women*, determined

by time allocation, are food preparation, fetching water, childcare, farming and collecting firewood; women are seen walking long distances in search of safe water. *Coping mechanisms by women in times of food scarcity* in the communities include: (1) Food is purchased by families who are employed but without land to plant food, (2) Food is borrowed by needy families from neighbors who have more resources, (3) When there is no food, then families sleep hungry. Men are the main income earners in homesteads reported to have men as household heads. *Project area leadership is held by women* in the majority of the project areas. Close to 70 Kenyan staff are required for project implementation and assessment at full enrollment with greater than 50% of field staff being women. *Field staff become friends and advocates to the enrolled participants*: (1) Women found pregnant at baseline screening were referred to the prevention of mother to child transmission (pMTCT) program at the AMPATH clinic, (2) Women with CD4 counts < 250 cells at baseline screening, were referred for assessment for antiretroviral drug therapy, (3) Two women, found by field staff to be victims of domestic dispute, were accompanied to the AMPATH health center for care and counseling. **Conclusions:** If HIV-infected women are malnourished, they are unable to adequately grow and prepare food, take care of small animals, fetch water or fire wood and thus the well-being of their families is jeopardized. If nutritional intervention is effective in reproductive age women, then the way may be opened to slow disease progression to AIDS, delay the need for antiretroviral therapy, and improve the quality of life that allows normal activities for daily living and supports the growth and development of their children. The involvement of trained community outreach workers is essential, to deal with emotional and safety issues as they arise within this highly stigmatized population. The HNP management, food production and field staff are uniquely trained for the successful implementation and outcome assessment of this multifaceted field nutrition intervention study.

PARTNERSHIPS FOR SUSTAINABILITY AND LIVELIHOODS DIVERSIFICATION: AN OVERVIEW OF USAID-WID SUPPORTED INITIATIVES IN THE ENAM PROJECT

E. K. Colecraft¹, G. S. Marquis^{2,3}, O. Sakyi-Dawson¹, A. Lartey¹, B. Ahunu¹, H. Jensen², M. Reddy³, and E. Lonergan³

¹University of Ghana, Legon, ²McGill University, ³Iowa State University

The GL-CRSP's Enhancing Child Nutrition through Animal Source Food Management (ENAM) Project is a micro-credit and nutrition education intervention to improve women's access to Animal Source Foods (ASF) for improved child nutrition in three regions of Ghana. A grant from the USAID's Women in Development program facilitated collaboration with Freedom from Hunger, Ghana (FFHG), to institutionalize the program within selected rural banks in the intervention areas. This partnership has resulted in the program's expansion into other communities with more than 40 women's micro-credit groups established by the three partner banks to date. To enhance sustainability of the

education components of the intervention, 24 women received training as peer educators to support the banks' credit with education programs in the ENAM project communities. The WID grant also provided opportunity to partner with Heifer Project International, Ghana, to provide technical and financial assistance for selected ENAM project participants to adopt poultry egg (14 women in the Techiman communities) and guinea fowl (28 women in the Navrongo communities) production as a supplemental livelihood activity. The women also benefited from the GL-CRSP Avian Flu School Trainer of Trainers program for poultry disease management. Support from the USAID-WID program has fostered institutional collaborations to enhance sustainability of the ENAM project's community interventions.

COLLECTIVE ACTION BY WOMEN'S GROUPS TO COMBAT DROUGHT AND POVERTY IN NORTHERN KENYA

S. Desta¹, D. Layne Coppock², A. Wako³, I. Aden³, G. Gebru¹, S. Tezera¹, and C. Tadecha¹

¹International Livestock Research Institute (ILRI), ²Utah State University, ³Community Initiative Facilitation and Assistance (CIFA)

Achievements of women's groups supported by the GL-CRSP PARIMA project have been impressive. The groups are very similar despite the great distances that separate them. The important roles of collective action, micro-finance, micro-enterprise, and income diversification were repeatedly observed by project team members. Although the economic impact of building social capital via these groups was not quantified, we would speculate that it seems to be enormous. A synergism exists among efforts to build social, human and economic capital in these groups. Such collective action has important roles in community risk management, especially when government is unable to provide safety nets or insurance. We believe that development agents should support these group efforts whenever possible. Groups need small grants and technology as well as capacity building in leadership, group dynamics, micro-finance, and micro-enterprise. Policies that promote investment in rural development – prominently including improvements to physical infrastructure, reducing insecurity, increasing access to education, improving governance, and promoting cross-border trade, would also benefit groups at the local level by expanding economic opportunity.

GENDER ANALYSIS OF THE PARIMA DATA

C. Doss, Yale University

One innovation of the PARIMA research design was to conduct surveys not only with household heads, but also additional individuals within the household. This has allowed the research team to focus on gender issues within and across households. Three different results are presented. First, we relate the issue of female-headed households to the livelihood categories defined by access to livestock and access to cash income. We illustrate and discuss the implications of female-headed households disproportionately being present in the most disadvantaged group, and bring in some findings from a survey that asked female household heads questions about their status. The second result builds on this and illustrates how activities undertaken by women differ depending whether or not the female is a household head or not. In particular, female heads of households rank herding, and most interestingly herding at satellite camp, much higher than do females who are not household heads. The final result presents a different kind of outcome; when we investigated topics and found that gender did not play the major role that we had expected it would. Here, we present findings from our risk ranking and development ranking work where both efforts led to the conclusion that gender did not play a clear role in determining rankings.

HOUSEHOLD BIOSAND FILTERS FOR DRINKING WATER IMPROVEMENT IN THE NJORO WATERSHED, KENYA

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¹University of California, Davis, ²Egerton University, ³Center for Environmental Research - Leipzig, Germany, ⁴Ministry of Public Health, Kenya

Access to improved water supplies is poor or unavailable in much of Kenya. Negative consequences from domestic use and drinking of polluted surface waters fall on women who are responsible for household water and health. A three-phased research program was launched in 2006 under SUMAWA-POU WID to adapt and evaluate the BioSand filter (BSF) for local manufacture and use by mothers to treat river water and reduce disease burdens among vulnerable households in the River Njoro watershed. Laboratory experiments, field-scale verification, and a six-month randomized controlled behavioral trial by mothers of filter effectiveness, acceptability, consumer benefits, and health impacts were undertaken. The BSF is a slow sand filter modified for intermittent household operation. Key findings and achievements of the research and follow-on activities launched in 2008 to test local commercial production and marketing of the filters in the Njoro and similar rural and peri-urban settings in Kenya are presented. In the final trial of the adapted Kenyan filter design with 30 rural

and peri-urban mothers, average filter removal performance matched controlled laboratory results and child diarrhea rates were reduced by 54%. Filters demonstrated high user satisfaction, good evidence of commercial demand, and important non-health benefits for trial mothers.

EMPOWERING WOMEN TO IMPROVE HOUSEHOLD SECURITY AND QUALITY OF LIFE IN FARMING COMMUNITIES

T. Moermond, University of Wisconsin-Madison

Project PLAN worked with farm communities at the interface of extensive cattle production and native forests within mountainous buffer zones of nature reserves in Mexico, Ecuador and Bolivia. Within these resource-poor communities, women on average had less access to land, education, credit, and technology than men. Alcoholism and domestic violence were common; while access to health and human services was limited. A qualitative food security assessment revealed significant nutritional problems for children and women, especially for pregnant women and infants. Yet it is the women who more often took initiative to carry out new changes needed to improve the overall nutrition, health and security of their families. In these communities, women formed support groups that allowed them to discuss problems and identify possible interventions to improve the household economy. We became convinced that we could increase quality of life for many families just by increasing women's access to decision-making and resources. To do this, we encouraged women's participation, strengthened women's groups, and assisted women's efforts to increase income-producing activities. The best alternatives identified to diminish food insecurity were home gardens and small animal breeding projects. Women increased their participation throughout the Project and assumed greater roles and leadership within their communities.

WOMEN IN DEVELOPMENT BOOSTS SUMAWA PROJECT WITH INTERVENTIONS IN THE RIVER NJORO WATERSHED, KENYA

P. Semenyé, Egerton University

Sustainable Management of Watersheds Project (SUMAWA) received in 2007 supplementary funding from Women in Development to engage in gender analyses that culminated in demand driven interventions. Although the interventions focused on improvement of the lives and livelihoods of women it dovetailed well with training and outreach activities of the Project. Two female students one each from Kenya and US were competitively recruited to undertake master's degree research on sex disaggregated natural resources use and participatory three-dimensional community mapping. Out

of these efforts and in consultations with the Njoro River Water Users Association the following interventions were successfully initiated and implemented: three dimensional model maps were built by the community; 94 medicinal plants were identified and referenced; two domestic water collection points were constructed off the river; two livestock troughs were constructed off the river to reduce direct pollution; eight schools in school greening programs have planted 10,000 tree seedlings; eight community tree nurseries were established and have 70,000 tree seedlings ready for planting; a water pipeline was extended by 310 meters to serve the neighborhood and a tree nursery; and pilot mushroom growing was introduced as an alternative enterprise. In conclusion, with limited resources a lot is achievable when it is community initiated and driven.

WOMEN'S HEALTH, COLLECTIVE ACTION, AND RISK MANAGEMENT IN SOUTHERN ETHIOPIA

S. Tezera¹, S. Desta² and D. Layne Coppock²

¹PARIMA Project, ²Utah State University

Since 2000 the PARIMA project has conducted participatory research among pastoralists in southern Ethiopia. This has led to the formation of collective-action groups dominated by women, stimulation of sustainable micro-finance and micro-enterprise activities, and improved linkages of pastoral producers to livestock markets. Despite such gains, other challenges remain. We used funding from Women in Development (WID) to conduct a participatory assessment of women's health problems among members of six collective-action groups from the Borana and Gugi zones in Oromia Regional State. Conventional wisdom from local public-health authorities suggested that malaria and diarrhea would be the most common ailments. Our results, however, indicated that women are most concerned with challenges to their reproductive health [i.e., pregnancy-related problems, sexually transmitted diseases (STDs), etc.] Community-action plans have been developed and funded to implement problem-solving processes; these include training local birth-attendants and investing in awareness-raising, prevention, and treatment of STDs. Improved health could have major effects on the welfare of pastoral women and the performance of collective-action groups; it is a vital aspect of risk management. Collective action provides a framework for supporting new channels of community dialogue and innovative local interventions such as self-funded health insurance schemes.

POSTER SESSION: PROJECT ACHIEVEMENTS

The problem model approach to project development (the concept that a project must have an identifiable problem of importance to solve as its core) was developed by the GL-CRSP in 1996 and has led to a problem solving focus for all its projects. The USAID Office of Agriculture is now using the problem model approach as its new idea for future livestock activities. In this poster session, fundamental achievements and examples of GL-CRSP program transitions from problem models to solutions are highlighted, along with lessons learned in order to improve future program impact.

VERIFICATION OF SIMULATION MODEL OUTPUT AND FORAGE MAPS USED TO PROVIDE LIVESTOCK EARLY WARNING IN THE GOBI REGION OF MONGOLIA

J. Angerer¹, L. Bolor-Erdene², M. Urgama², and D. Tsogoo³

¹Texas A&M University, ²Mercy Corps Mongolia, ³Agricultural University of Mongolia

Abstract: Assessment of vegetation productivity on rangelands using conventional methods such as clipping can be very time consuming and expensive, and becomes very impractical to do on a near real time basis. Near real time information is critical for timely decision-making in the face of drought and other disasters, especially in the Gobi Region of Mongolia. In this study we sought to assess the ability of a forage simulation model (PHYGROW) to accurately predict forage standing crop at 300 sites, and whether the output from the simulation model could be combined with satellite greenness data to produce landscape maps of forage production on a near real-time basis. The assessment required three steps: 1) model calibration, 2) model verification, and 3) map cross-validation. For model calibration and verification, we found that the PHYGROW model generally did a good job of predicting forage biomass at the monitoring sites with linear regression indicating a good correspondence between model and observed data ($r^2 = 0.76$). An assessment of the landscape maps found a good relationship between forage model biomass and the mapped biomass, thus indicating that forage model outputs can be useful for creating near-real time forage maps. These technologies will provide timely information on forage conditions to increase lead-time for making risk mitigation decisions by herder groups and policy makers in Mongolia.

AGRO-PASTORALISTS CONCERNS OVER THE PROSOPIS TREE: THE CASE OF THE ILCHAMUS OF BARINGO DISTRICT, KENYA

A.A. Aboud, F.W. Lusenaka, C.I. Lenachuru and P.K. Kisoyan, Egerton University

The *Prosopis* tree was introduced to the arid and semi-arid lands of Eastern Africa in the 1970s, through governmental forest development agencies to curb environment degradation and provide fodder for small stock. A number of the other benefits were also than attributed to the tree. However, the *Prosopis* tree has turned out to be a cause of serious concerns, as it has invaded, dominated and almost totally removed all grass and short vegetation species from pasturelands. In Baringo District of Kenya, *Prosopis* has been the worst enemy of the local IlChamus agro-pastoralists, who have now raised much concern over the species, calling for its complete eradication, and threatening to sue the government for damages caused by the tree. The poster highlights the examination of the case against *Prosopis* species, based on the agro-pastoralists' perspectives, as well as the numerous benefits of the tree that these agro-pastoralists are apparently unaware of.

FACTORS RELATED TO MARKETING SUCCESS FOR FIBER PRODUCTION IN MIDDLE ASIA

R. B. Boone and K. A. Galvin, Colorado State University

Livestock owners in Kazakhstan and Kyrgyzstan herd sheep and goats for meat and fiber for home use and sale. The indigenous breeds of small stock in the region produce high quality fibers. For example, laboratory tests show cashmere from some Kazakh goats to be equal in quality to cashmere sold for high prices in international markets. However, livestock owners typically shear their animals, reducing fiber length and combining guard hairs and cashmere. Also, owners sell unsorted fiber to local buyers for low prices. The CSU portion of the GL-CRSP WOOL project has been promoting combining, sorting, and selling cashmere in competitive markets. We used a systems modeling approach to simulate the economics of a small stock herd in south-central Kazakhstan. We quantified, in an integrated way, the value of combining and sorting fiber, and of transporting that fiber to larger markets. Findings show that: 1) modeling the small stock population and economy independently of other owner costs and attributes proved helpful; 2) coming rather than shearing fibers of high quality goats can double net profits; and 3) transporting light-weight fiber to large markets adds small and relatively fixed costs, and larger net profits.

DETECTION AND PREVENTION OF HIGHLY PATHOGENIC AVIAN INFLUENZA IN COMMUNITIES WITH HIGH POULTRY DISEASE BURDENS

C. J. Cardona¹, D. Byarugaba², P. Mbutia³, G. Aning⁴, S. Sourou⁵, D. A. Bunn¹, and P. L. Msoffe⁶

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The implementation of strategies to detect, prevent and control highly pathogenic avian influenza (HPAI) in developing countries presents several challenges, one of which is the presence of other diseases in poultry populations. Training workshops in developing countries using the Avian Flu School curriculum have revealed that in areas with heavy Newcastle disease burdens, smallholder poultry keepers do not prioritize the need to detect and respond to HPAI. Our findings suggest that in these settings, poultry have very little monetary value to their owners because they don't produce many eggs or much meat, and they always die from diseases therefore people don't want to invest in disease prevention strategies or even take time to report diseases to animal health authorities. Additionally, many owners accept heavy mortality from disease as inevitable, and simply ignore or accept it. Our strategy has been to address the more proximal needs and priorities of these communities as a means to create value in poultry, thus improving disease detection overall. To this end, we have created the Poultry Health Development project, which trains graduate veterinarians and paraprofessionals in the specifics of poultry disease diagnosis, control and treatment. These trainees then serve their local communities to improve poultry health and to implement disease detection and management programs. Our training in all poultry disease helps to build understanding of diseases and their control generally. This generic health literacy makes HPAI detection, prevention and control more realistic especially in developing countries where food security is threatened by high disease burdens in poultry.

PREPARING RURAL AFRICA FOR AVIAN INFLUENZA: DIRECTIONS FOR FUTURE RESEARCH

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¹University of California, Davis, ²Sokoine University of Agriculture, ³Makerere University, ⁴University of Nairobi, ⁵University of Ghana

Poultry are an important resource in developing countries, contributing to food security and economic empowerment for rural populations. However, the health of rural poultry has often been compromised by a lack of information about poultry diseases and good husbandry practices. The emergence and

spread of HPAI H5N1 avian influenza threatens village poultry flocks and their owners in rural village settings both through zoonotic disease exposure and by the elimination of an important source of food. Avian Flu School (AFS) was developed to address the challenges of a multi-disciplinary response through a three-level train-the-trainer program presented in targeted tiers, with the final tier teaching farmers at the village level. We found that to increase receptivity to the training, HPAI should be presented with other issues of immediate importance to the village community. To this end, we implemented a village ND vaccination program through which the principles of HPAI prevention and reporting could be taught while addressing current community poultry health needs. The Poultry Health Curriculum was created to strengthen the capacity of veterinary services to respond to broader poultry health issues. Experience gained through the development of these programs has demonstrated that offering solutions to real world problems through community engagement is an efficient way to increase both poultry and human health. Avian influenza remains a threat to rural African poultry keepers and their families but addressing poultry health and management broadly creates a system in which AI can be prevented and detected while also increasing food security.

THE HALI PROJECT: APPLYING THE ONE HEALTH PARADIGM

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Assessing and reducing the impacts of zoonotic diseases and resource limitation on health and economic livelihoods requires governments, non-governmental organizations, and academic institutions to work with citizens to develop interventions that are both effective and conservation minded. In 2006, the Health for Animals and Livelihood Improvement (HALI) project was initiated to test the feasibility of the One Health approach and to find creative solutions to these problems by investigating the impact of zoonotic disease on the health and livelihoods of rural Tanzanians living in the water-limited Ruaha ecosystem. HALI addresses these complex disease and natural resources issues on a platform that recognizes that the health of domestic animals, wildlife, and people are inextricably linked to the ecosystem and natural resources on which all depend. In planning the HALI project, an overwhelming consensus emerged from the diverse stakeholder communities, including multiple levels of government, non-profit organizations, and academic institutions: a significant proportion of the rural population in the Ruaha landscape is affected by diseases impacted by water supply, and these diseases are affecting health, agricultural productivity, food security, and biodiversity in the region. Accordingly, the HALI project is assessing the impact of the interactions between water and disease in the Ruaha ecosystem by simultaneously investigating the medical, ecological, socioeconomic, and policy issues driving

the system. The multi-level approach includes: testing of wildlife, livestock, and their water sources for pathogens and disease; environmental monitoring of water quality, availability and use; assessing wildlife population health and demography; evaluating livestock and human disease impacts on livelihoods of pastoralist households; examining land and water use impacts on daily workloads and village economies; introducing new diagnostic techniques for disease detection; training Tanzanians of all education levels about zoonotic disease; and developing new health and environmental policy interventions to mitigate the impacts of zoonotic diseases. Perhaps most importantly, the HALI project is examining these issues in a common framework with specific emphasis on the interactions between them, instead of attempting to isolate a single issue.

LESSONS LEARNED FROM PARTICIPATORY RESEARCH ON THE PASTORAL RISK MANAGEMENT PROJECT (PARIMA)

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A major goal of the PARIMA project has been investigation of opportunities for livelihood diversification among pastoralists. Since 2000 PARIMA has used participatory approaches whereby researchers, pastoralists, and development agencies work together to solve problems; this has involved 46 formal and informal institutions. This process was stimulated by the discovery of dynamic pastoral women's groups in northern Kenya that pursued ambitious development goals with little outside assistance. Combining cross-border diffusion of innovations, peer-to-peer learning, Participatory Rural Appraisal (PRA), and careful investment in capacity building, the approach led to the rapid emergence of 60 sustainable collective-action groups in southern Ethiopia. Dominated by women, group activities have been founded on micro-finance, micro-enterprise, and livestock marketing. Over 13,000 people have been directly affected. About US\$647,000 has been extended in 5,300 micro-loans with a repayment rate of 96%. Thousands of livestock have been sold to traders. As the Ethiopian groups matured we shifted attention back to north-central Kenya where new groups have been formed by Egerton University collaborators. Approaches undertaken by PARIMA partners KARI and OARI increasingly emphasize stakeholder engagement, demand-driven research, and transfer of innovations. Lessons for success include attention to small-scale intervention, conflict management, and respect for local cultures. Participatory approaches are emerging as a major new wave for applied research. In our case they have led to on-the-ground impact in just a few years.

INCREASING ANIMAL SOURCE FOODS IN DIETS OF HIV-INFECTED KENYAN WOMEN AND THEIR CHILDREN: INTRODUCTION TO THE PROJECT

J. Ernst¹, G. Ettyang², C. Neumann³, W. Nyandiko^{2,5}, A. Siika^{2,5}, E. Buluku², L. Allen⁴ and C. Yiannoutsos^{1,5}

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Many of the 28 million people with human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) estimated to be living in sub-Saharan Africa also suffer from malnutrition. Reproductive-aged women, their infants and young children are among the most vulnerable to malnutrition and progression of HIV to AIDS. As seen in eastern and southern Africa, mortality is increased in the malnourished. The HIV Nutrition Project (HNP) researchers are evaluating the effect of protein quality and micronutrients found in meat on the health and nutritional well being of women living with HIV in rural Kenya and the health and development of their children. By means of a randomized nutrition feeding intervention, the study will determine if a meat supplement in the diets of HIV-infected women and their children (1) protects the immune system and prevents severe infection, (2) prevents the loss of lean body mass, enhancing the quality of life among these drug naïve women and enabling women to carry out their activities of daily living, and (3) supports the growth and development of their vulnerable children when compared to those given supplements with the same amount of energy, but with either soya or wheat protein. The intervention food with beef provides significantly more vitamin B₁₂, lysine and bio-available iron and zinc when compared to the soya and wheat supplements. Deficiencies of these nutrients may hasten HIV disease progression.

INCREASING ANIMAL SOURCE FOODS IN DIETS OF HIV-INFECTED KENYAN WOMEN AND THEIR CHILDREN: PROJECT ACCOMPLISHMENTS AND LESSONS LEARNED

J. Ernst¹, G. Ettyang², C. Neumann³, W. Nyandiko^{2,5}, A. Siika^{2,5}, E. Buluku², L. Allen⁴ and C. Yiannoutsos^{1,5}

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The GL-CRSP HIV Nutrition Project is evaluating the effect of protein quality and micronutrients in meat on the health and nutritional well being of women living with HIV in rural Kenya and the health

and development of their children by means of a randomized nutrition feeding intervention. Project Accomplishments include: (1) Iso-caloric biscuits that contain beef as an ingredient were developed; field-tested and are used in a controlled and randomized nutrition intervention trial in rural Kenya. (2) An infrastructure for conducting a randomized and controlled nutrition intervention clinical trial in rural Kenya was established. (3) Leveraged funding was secured but additional funds are needed and now being sought that allows the sample size required for statistical power as well as expansion of the intervention phase and inclusion of a post-intervention phase to support the continuation of the project to completion by 2012. Lessons Learned include: (1) Working with a highly stigmatized and vulnerable population in Kenya presents challenges for recruiting and retaining subjects. (2) A field nutrition intervention study such as the HNP requires significant effort to assure accurate intake data for the intervention. Using directly observed treatment (DOT) methodology is the most expensive aspect in Phase III of the study. (3) Partnerships and collaborations are essential components for the successful development and execution of a field nutrition intervention trial with a medically vulnerable population. (4) Many variables can affect immune function and morbidity in rural Kenya and therefore additional control measures are needed to prevent confounding effects.

PRODUCTION STRATEGIES OF LIVESTOCK HERDERS IN THE GRASSLANDS OF KAZAKHSTAN: IMPLICATIONS FOR THE MARKETING OF FIBERS

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Livestock production is the principal source of income for thousands of pastoralists throughout Kazakhstan. Ecological conditions of variability in forage and water made Kazak pastoralists mobile prior to incorporation into the Soviet Union and collectivization, when livestock numbers plummeted. However, livestock numbers steadily rose in Kazakhstan over the past ten years since independence and goats were preferred by farmers trying to restock, especially in the region where research was conducted. Goats, as well as sheep and camels are currently multi-purpose animals providing income from sales of animals, cashmere, milk and meat. This is expected to change as the terms of trade change for high quality wool and cashmere, and as households comb for fine down.

DEVELOPMENT OF NEAR INFRARED SPECTROSCOPY TECHNIQUES FOR PREDICTING NUTRITIONAL STATUS OF LIVESTOCK IN MONGOLIA

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As part of the Gobi Forage project in Mongolia, portable near infrared reflectance spectroscopy (NIRS) for monitoring livestock nutrition was tested and implemented. A series of experiments were conducted to develop the necessary equations and databases for Mongolian conditions. Results indicate that fecal chemistry of Mongolian cattle and yaks were highly analogous to US cattle. Mongolian sheep and goats exhibited greater differences in fecal chemistry, as compared to their US counterparts, than did the larger ruminants but were still within an acceptable range. Fecal chemistry of the equine species was very different between US and Mongolian animals. A total of 25 feeding trials have been implemented to develop region specific equations for cattle, sheep, goats, yaks, and equines. Fecal NIRS equation results for diet crude protein (CP) in Mongolian sheep were good ($r^2 = 0.81$ and $SEC = 1.30$). Portable NIRS yielded results comparable to static NIRS and can thus be used in field conditions. Fecal NIRS has also been developed to discriminate between pairs of sympatric species (i.e. cattle and yak, sheep and goat, horse and khulan). The NIRS technology is also being developed for cashmere grading, milk quality, and fodder nutritive value. The use of portable NIRS technology shows promise as both a research and management tool in Mongolia.

TOOLS AND TECHNIQUES FOR IMPROVING SCIENTIFIC UNDERSTANDING AND MANAGEMENT OF WATER RESOURCES IN KENYA'S NJORO WATERSHED

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A range of computer modeling and analytical techniques have been developed and applied to the River Njoro watershed under the SUMAWA and NJORO WATER Projects of the GL-CRSP to support local and regional stakeholder decision-making in addressing integrated water resource management and public health problems facing local communities and management agencies. These tools involve the examination and mathematical modeling of biophysical, livestock, and human interactions at different watershed scales in order to characterize and quantify problems, clarify underlying causes, and identify important information gaps. This poster reports key outcomes, major insights, and lessons learned from application of: a) net present value analysis of small holder farming systems to evaluate the economics of conservation-related adoption behavior in the upper catchment, b) water

balance modeling of Njoro watershed's integrated water supply and demand system under current and future conditions using the WEAP System to address water scarcity, c) new genetic techniques to track fecal pollution sources and detect water-borne pathogens of concern for human and animal health, and d) water budget modeling of Lake Nakuru to identify causes of water level fluctuation and drying, and explore impacts of continued regional population growth and basin land use change on the lake's sustainability.

APPLICATION OF ICT IN DEVELOPING LIVESTOCK MARKETING INFORMATION SYSTEM IN EASTERN AFRICA

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¹Texas A&M University, LINKS Project - ²Kenya, ³Tanzania, and ⁴Ethiopia

The Livestock Information Network and Knowledge System of the Global Livestock Collaborative Research Support Program has developed a livestock marketing information system based on information communication technologies that has now been adopted as the basis for developing national livestock marketing information systems for Kenya, Tanzania and Ethiopia. The primary objective is to provide livestock producers, traders and policy makers with an efficient, fast and reliable system that improves access to livestock marketing information to inform on national and regional market trends and terms of trade. The system is implemented in collaboration with national institutions in each country, which ensures a larger multiplier effect and helps to build confidence in adoption and use of the technologies. The system has incorporated a number of attributes to ensure the effectiveness of livestock markets in terms of its usefulness for producers and traders and also consumers to make timely informed decisions. Developing the technical and human capacity to meet market information needs and decision support for livestock producers helps to bridge the gap between markets on the one hand and producers on the other allowing producers to make better choices on where to sell their animals.

LIVESTOCK INFORMATION NETWORK KNOWLEDGE SYSTEMS (LINKS)

R. Kaitho¹, G. Kariuki², A. Ali² and P. Dyke¹

¹Texas A&M University, ²LINKS Project

The GL-CRSP Livestock Information Network and Knowledge System (LINKS) project has developed and implemented a flexible and standard regional livestock marketing information system. The LINKS system is fostering data collection at the country level through training and capacity building in order to harness information and communication technologies to support livestock market

information development, and to promote and facilitate regional cooperation and information sharing by establishing a general framework that incorporates data from different sources in a standard format. LINKS has been integrated into a National Livestock Marketing Information System (NLMIS) active in Kenya.

A SOCIOECONOMIC IMPACT ASSESSMENT OF A CHICKEN NEWCASTLE DISEASE VACCINATION PROJECT ON HOUSEHOLDS IN RURAL IRINGA, TANZANIA

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The purpose of this study was to assess the socioeconomic impact of a chicken Newcastle disease (ND) vaccination project on villagers and households in rural Tanzania. Households in the project (chickens were vaccinated) villages kept a larger number of chickens than households in control (chickens were not vaccinated) villages ($P < 0.0001$). There was no significant difference in income earned from chicken and egg sales between households in control and project villages. Likewise, no significant difference in the frequency of chicken consumption among mothers and children from project and control village households was found. However, both mothers and children from project village households consumed eggs more frequently than mothers and children from control village households. While bivariate relationships showed that control village households were more food insecure than project village households ($P = 0.0195$), this relationship was not significant in a multivariate analysis. Women in project villages reported higher measures of empowerment than women in control villages. However, measures of support for the vaccination of chickens were greater in control villages than in project villages.

NET PRESENT VALUE ANALYSIS TO ASSESS THE ECONOMIC CONSEQUENCES OF CHANGING FARMING SYSTEMS IN THE UPPER RIVER NJORO WATERSHED

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Upper elevations of the River Njoro watershed have recently come under cultivation by new settlers in-migrating to clear-cut areas. Changes in the river's hydrologic regime and water quality have focused attention on relationships between land use and water supply. Agroforestry is a promising approach to counter soil and forest resource degradation as well as declining watershed services. However adoption

of agroforestry practices represents a change from existing cultivation that is likely to alter farmers' economic circumstances. Net present value (NPV) analysis allows the projection of economic costs and benefits from different cropping systems over seasons. Farmer field trials, research experiments, and pricing information provide the agronomic and economic data to characterize proposed new practices such as agroforestry, riparian tree planting, set-aside, and soil conservation in the analysis. Such agro-economically grounded quantitative estimates of smallholder income and cash flow impacts and sensitivity from adoption of natural resource management and conservation practices provide a critical input to the process of developing locally successful environmental land and water management programs in threatened resources systems such as the Njoro watershed.

MULTIDISCIPLINARY EFFORTS TO IMPROVE CHILD NUTRITION: ACHIEVEMENTS OF THE ENAM PROJECT

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The Enhancing Child Nutrition through Animal Source Food Management (ENAM) project is a collaborative initiative aimed at improving children's ASF intakes in six rural Ghanaian communities and increasing human resource capacity to identify and address nutrition issues in Ghanaian populations. The project's interventions included community level microcredit with entrepreneurial skill development, nutrition education and institutional level research and nutrition extension training. This presentation highlights some achievements of the ENAM project. These include 100% repayment on four loan cycles with sequential increase in the women's savings. Child nutrition knowledge increased among mothers in intervention communities compared to those in the in control communities. Risk of household food insecurity was lower among households in the intervention communities than in control communities. Frequency of ASF consumption (meat, fish and poultry) by children of mothers in the intervention communities also increased. After 4 loan cycles (of 16 weeks each), children of intervention mothers had greater improvement in Weight-for-Age z-scores (0.074 vs. 0.011, P=0.05) from the baseline levels. Capacity building efforts of the project resulted in 8 graduate students obtaining MSc degrees. Other outputs of the project include the development of two training manuals on nutrition and entrepreneurial skill building. A 3rd year undergraduate course entitled 'Nutrition, Sustainable Livelihoods and Extension' has been developed and adopted as part of the teaching program of the Department of Nutrition and Food Science of the University of Ghana, Legon. This course uses extension principles and sustainable livelihood strategy for diagnosing community intervention problems and interventions. The ENAM project has shown the effectiveness of a multidisciplinary and integrated approach in improving children's nutrition and institutional capacity building.

IMPLEMENTATION OF A LIVESTOCK EARLY WARNING SYSTEM IN MONGOLIA: THE GOBI FORAGE EXAMPLE

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From 1999 to 2002, Mongolia experienced a series of droughts and severe winters that decreased livestock numbers 30% countrywide. In 2004, USAID and the GL-CRSP initiated a program to transfer the GL-CRSP forage monitoring technology from the Livestock Early Warning System (LEWS) in East Africa to Mongolia as risk mitigation program for these extreme events. The program had two major objectives: (1) develop regional forage monitoring that provides near-real time spatial and temporal predictions of current and forecast conditions, and (2) develop a communication infrastructure to assist stakeholders in making timely and specific forage management decisions. Since 2004, over 300 monitoring sites have been established and near real-time simulation modeling is being conducted. Regional and aimag maps are produced every 15 days and are mailed to 130 soums within 8 aimags. Maps include current and 60-day forecast forage and current and 60-d deviation from long-term average. The program has been exceedingly well received, with over 70% of herders having some familiarity with Gobi Forage products. Almost half of report that they had used Gobi Forage information to guide livestock movements (51%), provide supplemental feed (49%) or change their grazing strategy (40%). One third reported a net profit resulting from these actions. An overwhelming majority (93%) of government officials found Gobi Forage products to be “very useful” in advising herders on grazing management and livestock movement.

IMPROVING WATER MANAGEMENT IN A CLIMATE CHANGE SCENARIO WITH A COMPUTER MODELING PARTICIPATORY TOOL

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Smaller communities face difficulties managing shared water resources due to limited understanding of the real causes behind water scarcity and quality problems. Documentation is often lacking about local drought frequency and intensity, hydrologic and hydrogeologic interactions and pollution loading. The result is a fragmented perception of the environment and lack of common understanding about the water system, with little capability of defining problems faced by different stakeholders and addressing these in a sustainable, effective way. This study investigates the Water Evaluation And Planning System (WEAP) as a decision support tool (DST) for local stakeholders in resolving shared water issues in

the River Njoro watershed, located in the semi-arid Rift Valley of Kenya, considering the effects of population growth and climate change. It includes important downstream habitat at Lake Nakuru and multiple water uses and users. Outcomes of the Njoro watershed modeling experience indicate WEAP's potential as a participatory DST modeling tool to support local water management decision-making in Kenya's Njoro and similar watersheds. Population growth and increased hydrologic variability expected with climate change will increase the region's water vulnerability, further aggravating user conflicts, water shortage and impaired water quality in critical periods, heightening the need for DSTs like WEAP.

BIOREGULATION OF DISEASE AT THE LANDSCAPE-SCALE: ANALYSIS OF THE HUMAN-LIVESTOCK-WILDLIFE INTERFACE IN SEMI-ARID ECOSYSTEMS OF EAST AFRICA

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Recent disease events have focused national and global attention on how the interrelated factors of land use change, natural resource management, and human population pressures alter the inherent ecological balance between zoonotic pathogens – diseases that can be transmitted between others animals and humans – and their human and animal hosts. Zoonotic pathogens are the most significant cause of emerging infectious diseases in people, accounting for over half of the infectious organisms that cause human illness. Anthropogenic changes to the biophysical environment, movement of human and livestock populations, and expansion of agriculture into wildlands all contribute to the dynamics of disease. This loss of bioregulation of disease as an ecosystem service at the landscape scale has contributed to the resurgence of many zoonotics and presents one of the greatest public health threats of the current century. This poster summarizes findings of the socioeconomic study conducted in Tanzania's Ruaha landscape under the Health for Animals and Livelihood Improvement (HALI) project. A combination of irrigated agriculture, uncontrolled water diversions, and intensive livestock grazing of wetlands has resulted in dramatic decreases in both water quantity and quality. The complex interactions among economic and ecological drivers have combined to cause the normally perennial Great Ruaha River to dry up for longer periods of time each year, contributing to the spatial reorganization of wildlife and livestock movement and consequence impacts on disease vectors. The broader impacts of this collaborative and participant-driven research program is to inform management and policy to improve human, livestock, and wildlife health; facilitate economic development through improved livestock productivity and wildlife-based tourism; strengthen national and international capacity to model the drivers and impacts of zoonotic disease across ecological, social, and economic domains; and contribute to the design of integrated, landscape-level disease prevention programs worldwide.

EVOLVING LIVELIHOODS IN A RISKY ENVIRONMENT

J. McPeak, Syracuse University

This poster focuses on the nature of the risky environment. It presents evidence on the nature of the risk in terms of production conditions, and links this to evidence on the impact this has on households. Variation over time in total income and cash income is presented, illustrating that poverty is characterized not only by low means for these variables but also higher variation about these means. Detailed information on the causes of livestock mortality and patterns in mortality over time are then presented and related to the discussion of the production environment. Survey findings on risk management and risk coping mechanisms are presented. Finally, the main findings of our risk ranking research are presented, illustrating that rankings vary significantly across space and time, but not as much across households or across individuals within households

PASTORAL LIVESTOCK MARKETING IN EASTERN AFRICA: RESEARCH AND POLICY CHALLENGES

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In 2006, John McPeak and Peter Little published an edited volume on livestock marketing in eastern Africa. The book has fourteen chapters, and collects a variety of studies conducted by numerous authors concerning livestock marketing. One set of studies uses household level data to investigate patterns in how marketing decisions are made. A second set of studies uses the market as a unit of analysis, and investigates what influences price formation in a given market. A third set of studies looks at connections between markets, presenting studies of what influences the flow of animals from the remote rangelands to their eventual destination. A final set of studies looks at cross border flows of livestock and how the national policy environment influences livestock markets. This poster presents the main findings of the volume.

SUMAWA: SUSTAINABLE MANAGEMENT OF RURAL WATERSHEDS

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Watersheds in East Africa and their associated lakes and riparian zones have unique terrestrial and aquatic life. The lakes and inflowing rivers have recently been subjected to a high degree of changes in land use. These collectively threaten the ecological integrity of the watersheds. The main challenges come from the increasing human pressure, including urban expansion, pollution, uncontrolled grazing, deforestation and unregulated cultivation.

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IMPROVING SUSTAINABLE LIVESTOCK AND LIVELIHOODS THROUGH COMMUNITY EMPOWERMENT

T. Moermond, University of Wisconsin-Madison

Project PLAN worked with resource-poor farm communities at the interface of extensive cattle production and native forests within mountainous buffer zones of nature reserves in Mexico, Ecuador and Bolivia. We integrated research and development through a holistic, process-oriented, and participatory approach. An iterative research planning process provided deeper understanding of local problems and led to more appropriate, effective strategies to improve agricultural production and land use practices. We discovered new findings about seasonal foraging dynamics and social economics of extensive cattle production. Maize production was improved with local races, agroforestry, and native 'weeds' to sustain soil fertility, reduce use of chemicals, and enhance cattle forage. In Ecuador, we promoted whole farm planning of agricultural production and catchment forest protection, including design of adaptive management guides. Through collaborative research, we created an improved, more sustainable dairy production system through rotational grazing of pastures with a strategic mix of exotic and native forage species, which has been adopted by area farmers. The key element for sustainable development was empowerment of farm family associations and strengthening their collective planning and action. Our support included providing learning opportunities and technical assistance to address such related critical concerns as tenure security, food security, and income diversification.

PREPARATION FOR THE PREVENTION AND CONTROL OF HIGHLY PATHOGENIC AVIAN INFLUENZA IN RURAL TANZANIAN VILLAGE SETTINGS

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Free-ranging local chicken flocks are important for the livelihood of resource-poor farmers in Tanzania. Most poultry are raised in the rural areas of the country; they are critical sources of animal protein and can be a quick source of income through the sale of chickens and eggs. Rural areas of Tanzania are organized into settlements in the form of villages and sub-villages. A village or sub-village may consist of tens to hundreds of individual households or groups of households most of which keep a few free-range poultry. These flocks of chickens, ducks, guinea fowl, turkeys and pigeons are cared for by women, children and vulnerable individuals (aged, chronically ill or physically challenged). The free-ranging poultry from different households form a series of contiguous flocks, which may become one large flock during feeding and breeding times. The free-range status of poultry in villages presents serious challenges for the application of disease prevention and control interventions. An individual farmer/household's effectiveness in disease management is highly dependent on the actions of neighbors. Additionally, the short-term consequences of an implemented control strategy may be greater than its benefits. In Tanzania, the national policy for HPAI response is to stamp out affected birds and those nearby. It is evident therefore, that an occurrence of HPAI in the village settings of Tanzania would result in a disastrous loss of livelihoods. This paper attempts to offer an alternative way of preventing and controlling HPAI in village settings of Tanzania through community-based approaches.

PRELIMINARY ASSESSMENT OF SURFACE RUNOFF, GROUNDWATER RECHARGE AND CHANGES IN GROUNDWATER LEVELS OVER TIME: MIDDLE AND LOWER RIVER NJORO CATCHMENTS

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¹Technical University of Denmark, ²University of California, Davis, ³Egerton University

As part of SUMAWA project efforts to assessment of physical processes governing water availability in the River Njoro watershed, a water balance was developed to identify the extent to which precipitation contributes to surface runoff and groundwater recharge. Changes in groundwater levels over time were analyzed based on borehole drilling records to identify impacts of water and land use changes.

A monthly water balance for the middle and lower catchments was developed with meteorological data from the Egerton and Nakuru stations. Results indicate average precipitation is insufficient to produce significant surface runoff or groundwater recharge, with the exception of storm water runoff, even during months with high average precipitation because of preceding soil moisture depletion. The groundwater analysis suggests the main stem river changes from a gaining stream near Njoro Town to a losing stream near Ngata in the middle portion. The lower portion of the main stem river passing Nakuru Municipality appears to be a gaining stream. Historical trends suggest groundwater levels and baseflow in the area around Njoro have declined. The hydraulic gradient perpendicular to the river in the middle catchment near Ngata may have become steeper, perhaps as a result of increased groundwater pumping.

TANGIBLE OUTPUTS AND SUSTAINABILITY: SUMAWA PROJECT, RIVER NJORO WATERSHED, KENYA

P. Semenyi, Egerton University

Sustainable Management of Watershed Project (SUMAWA) is a research, training and extension project. To avoid past research pitfalls from the outset the Project adopted demand driven research with holistic and interdisciplinary approach. Consequently, the Project started off with participation of stakeholders and monitoring research that led to researchable constraints followed with tangible outputs. The outputs began with characterization. The watershed covers an area of 270 sq kilometers and supports a population of over 300,000 people. The 50 kilometers river empties at Lake Nakuru a Ramsar site and home to world famous flamingos. Others are: Improved the watershed soil map from 1:1,000,000 to 1:50,000. Water quality measured by fecal coliform bacteria averaged 8,000 cfu/100 ml well above the tolerable level of 200 cfu/100 ml. For water quality improvement at the point of use, BioSand Filters were constructed and tested successfully with households. Mapped land cover pattern changes that showed increased agricultural land at the expense of forest cover. Studies on biodiversity have shown decreasing trends of macro invertebrates, bird species and medicinal plants. On sustainability 30 postgraduates and over 600 non-degrees have been trained. Above all Njoro Water Resources Users Association has been formed, a community vigilance and sensitization group.

THE IMPACT OF LAND USE ON WATER QUALITY IN RIVER NJORO WATERSHED,
KENYA

W. A. Shivoga¹, M. Muchiri², S. Kibichii², J. Odanga², S. N. Miller³, T. J. Baldyga³, and C. M. Gichaba¹

¹Egerton University, ²Moi University, ³University of Wyoming

In this poster, findings of an on-going research focusing on water quality-land use linkages in a rapidly changing rural watershed in Kenya are presented. Results show that dissolved nutrients are positively related to percentage of land cover under small scaled agriculture but reduce with increasing cover under grass and intact riparian strips.

JERRY W. STUTH

1947 - 2006

It was with tremendous sadness that we acknowledged the passing of Dr. Jerry Stuth in Houston, Texas on Monday, April 24, 2006 after a long battle with cancer. The friends and colleagues of the Global Livestock CRSP have created a plaque that will hang at Texas A&M University.

The plaque reads "The seeds of his generosity, creativity and caring reside in the many people he touched and his impact radiates across the globe. A creative thinker who stepped across old boundaries, an integrator who effectively pulled together distant ideas, a humanist who engaged people of other cultures and a man admired by all who met him."

To pay tribute to Jerry Stuth is both sad and uplifting. As with the many who knew and worked with Jerry, we miss him. We saw him periodically over the years and, unlike with someone you interact with daily, his absence was not novel. Sometimes in the past years I would have to correct a wayward thought and remind myself that he was truly gone. When I read through the tributes to Jerry on his memorial site at Texas A&M, I fully realize that he has not gone from us. The seeds of his creativity and caring reside in the many people Jerry touched. "Touched" may be an inadequate word; perhaps it should be "invested." Jerry invested himself in others.

Jerry was one of those rare people who lived in quality and produced in quantity. Perhaps it was that Germanic background and the work ethic it engendered, but he reached many people and reached them deeply. The tribute page is filled with people's stories of his dedication of time and thoughtfulness that impacted their lives. He was politely demanding and driven but considerate and



sensitive. In his projects, he engaged people with an enthusiasm that ensnared them and a spirit that made them devoted colleagues and collaborators.

One of the tributes talks about how Jerry ran his projects from his hospital bed, as if he was working from his office. I had a similar experience when I visited him at M.D. Andersen in his final days. He apologized for some problem with his CRSP budget and argued for greater funding for the project. It sounds a bit trivial to recall, but this reflected the level of devotion to his work, his family and his commitments that defined his life.

So many tributes to Jerry mention that he was a great man. He was indeed. He was a creative thinker who stepped across old boundaries, an integrator who could effectively pull together distant ideas, a humanist who engaged people of other cultures and a man admired by all who met him.

Montague W. Demment
Director, Global Livestock CRSP



JIM ELLIS 1938 - 2002

Jim Ellis was killed tragically in an avalanche in Colorado on March 14, 2002. In response to his death, the Global Livestock CRSP established the Jim Ellis Graduate Mentorship Program. Since its inception, a total of 25 grants have been awarded to GLCRSP graduate students in support of their dissertation and thesis research. The following appeared in Ruminations, Spring 2002.

The death of Jim Ellis was both sudden and shocking. As time has passed and we come to grips with this loss, I have reflected on Jim, our relationship with him and his contributions to the Global Livestock CRSP and the science that forms the foundation of our program. I knew Jim for almost 30 years. I first met him at NREL back when the IBP (International Biological Program) was winding down. I was a graduate student in search of unique data and the IBP had that data. The time he took with me to discuss my needs was both generous and sincere. But most memorable was how our discussion expanded to cover a wide and diverse set of topics and I left stimulated and energized. My sense from talking to his students is that this was a typical interaction with Jim.

Our paths crossed later in the 1970s when he was working on the Turkana project and I was doing my thesis fieldwork in Kenya. More often than might be predicted by chance I ran into Jim in Nairobi. We would sit and have a beer or two and discuss our work. Again I always left the meetings with some new vision that Jim has imparted. Little did I realize how what he was doing in Turkana would have so much impact on an area seemingly far from my interest then but now so close.

When I became Director in 1994, the Small Ruminant CRSP, as our CRSP was then known, was slated to be terminated. We had to work hard to reestablish its credibility

and a major part of that effort was to redesign the program. The process was initiated with a major meeting at Winrock in 1995 where we gathered some of the most experienced livestock and development people to set abroad goals for the future GL-CRSP. Jim was a key participant. Transitional times are always difficult for any organization and certain people have the characteristics of calm objectivity and clear insight to guide the process. Jim was such an individual. His contributions at the meeting helped bring resolution both organizationally and scientifically.

Shortly thereafter I asked Jim to join our Advisory Panel (AP). In the AP discussions, he always contributed scientific insight, figured a way to present a seemingly intractable issue in a way that welcomed a solution and drew conflicting parties to compromise. Jim's scientific vision was broad and integrated and brought a perspective to range systems that made a major contribution to understanding the ecology of pastoral systems. Livestock development was being viewed by donors as a failed venture and they were refocusing on the other development options. The problem was, as the Turkana work demonstrated, the application of an inappropriate model for tropical semi-arid systems.

The work was critical to the development community and fundamental for the GL-CRSP in a number of ways. First, it provided a logical reason for the failure of past livestock projects. It was not something inherent in the

concept of livestock development that caused ineffective development outcomes but rather it was that we had the wrong model. Donors began to look again with guarded optimism on investing in livestock and pastoralists.

Second, Jim's work demonstrated clearly the role of research in the development process. If an inappropriate model is applied then the interventions do not work. Jim's work showed that if the donors want programs that are integrative and multidisciplinary then they must invest in research to understand how these complex systems function before they can have effective intervention. Third, the work clearly illustrated the role of spatial scale in the lives of people living in an unpredictable world. Jim was asked to present a keynote paper at our program conference in Tarangire National Park in Tanzania. The key point of his talk was that stock rate per unit area increased with the size of the landscape under consideration. The idea was that in semiarid areas the larger the land area the more heterogeneity encompassed and so the greater number of options available for herders in times of stress. The fundamental importance of this concept is that space and its characteristic heterogeneity are critical resources and their loss to increasing population and cultivation renders traditional pastoral lifestyle vulnerable. These ideas have come to form a core theme of the GL-CRSP that has led to our strength in pastoral systems.

After an initial year on the AP, Jim's desire to be active instead of advisory player in the GL-CRSP led him to take a pivotal role in forming a CRSP project to address the interaction between wildlife and pastoral peoples in East Africa. As both a team member and later PI, Jim's approach to life and science was serious but always wrapped in humor and a casual exterior that made him easy to approach for students and colleagues. Jim connected with people and those connections brought our program and his projects into a network of science and development that at the time of his death was truly global. Jim's death came when he was at the top of his profession. His CRSP project was making the connections with the policy makers who have an impact on decisions on critical landuse issues. He had just received a major NSF grant (linked in part to the CRSP work) on biodiversity and fragmentation of the world's rangelands. Personally he was an established and respected scientist who was doing what he wanted with colleagues of his choice.

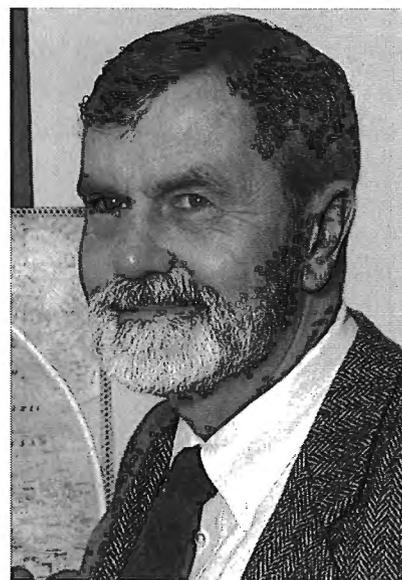
Jim Ellis will be missed and we at the GL-CRSP will no longer benefit from his gifted insight and talents. The void of his death leaves both a testimony to how much he contributed, and the integral part he was to us and this program.

Montague W. Demment
Director, Global Livestock CRSP

GORDON S. CAMPBELL

1933 - 1997

The following tribute to Gordon Campbell, a member and chair of the Small Ruminant CRSP External Evaluation Panel for 10 years, was written by Dr. Montague Demment, and appeared in the SR-CRSP External Evaluation Report 1996-1997. It has been revisited here in order to honor one of the integral figures in the creation and development of the Global Livestock CRSP, an individual who embodied the best of academia and veterinary medicine, and whose imprint can be felt today from Central Asia to East and West Africa, through the activities and interventions of GL-CRSP programs in nutrition, risk management, natural resource management, and zoonotic disease.



Gordon Campbell disappeared from our lives this fall. Gordon had been part of our program for almost 10 years. We knew him well and his vitality, humor and energy made his departure sudden and shocking. We will miss him dearly.

I came to direct the CRSP through a circuitous route that touched and was tangential to Gordon. I first met Gordon at Cornell when I was a postdoctoral researcher. We talked at a reception and our conversation moved easily from scientific topics to travels to stories of the Scottish highlands and shared ancestry. I remember the conversation well. Our paths crossed again when I shared an adjacent locker to David Robertshaw, who at the time was directing the Small Ruminant CRSP. David often shared some of his trials in directing the program and mentioned Gordon and his work on the External Evaluation Panel (EEP).

After David there were at least two more Directors before myself. The landscape was a rocky one. USAID funds were declining, the quality of the work was not appreciated, and the environment created a difficult management situation. Through all of this turmoil there was one constant, Gordon. He was there; he evaluated, he traveled, he critiqued and he supported. When I took on the job in 1994 and at the same time received notice of AID's intent to terminate the SR-CRSP program, I searched for some advice. I asked the associate director, Jim Scott, for recommendations.

Without a second's hesitation he recommended Gordon. I called Gordon and laid out the situation. He immediately responded with a wealth of ideas and actions based on his long association with the CRSP. He cautioned and encouraged me, and with those recommendations we at the SR-CRSP shaped a strategy that eventually saved the program.

As Chair of the EEP, he supplied an abundance of suggestions and tutelage for the development of a new CRSP program. Gordon's fingerprints were all over this new program that eventually grew to reach people worldwide.

In the time I served as director in collaboration with Gordon, we interacted over many issues. Some things we agreed on and some we did not. His judgment was always excellent but it was not judgment alone that I remember most. To me Gordon was a wonderful human being; intellectual but grounded, serious but with a twinkle in his eye, confident but self-effacing, and most of all a humanist who gave of himself for the benefit of others, most of whom he never met nor whose names he never knew. He embodied the best of academia and veterinary medicine, great competency and great compassion.

Montague W. Demment
Director, Global Livestock CRSP

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