



# RUMINATIONS

NEWSLETTER OF THE GLOBAL LIVESTOCK COLLABORATIVE RESEARCH SUPPORT PROGRAM

## Spirit of Cooperation and Equal Partnership Reinforced at Livestock-Natural Resources (PLAN) Workshop in Mexico

*By Timothy Moermond*

For the first time since our initial project planning meeting in Quito in May 1997, the Livestock-Natural Resources Project team members came together for a comprehensive workshop and conference in Mexico. Six team members from Bolivia, three from Ecuador, six from Wisconsin, and a dozen from Mexico spent five days presenting the results of the first two years, exchanging



*Representing the four countries involved in the project, PLAN team members pose in front of a giant fig tree in the village of Zenzontla.*

experiences and perspectives, and planning our future path of the project as a group.

After a full day of presentations of our results, we set into the real work: planning our future together. We revisited our objectives and activities to replan our directions. In our discussions and debates, we selected three cross-cutting themes that need to be part of everything that we do: 1) research design including monitoring, 2) local participation, and 3) education, formal and informal.

Our first planning conference in Quito in May 1997 fostered a spirit of cooperation and participation. After two years of working together and reinforcing this spirit, the participants to this Mexican planning conference rose to take ownership of the project as equal partners of the four groups: Bolivia, Ecuador, Mexico, and Wisconsin. We now have achieved our objective of strong, equal partnership of all teams in one overall project: Proyecto PLAN.

### ***Risk Management Among the Guji of Southern Ethiopia***

## Lack of Preparedness Indicates High Vulnerability for Next Drought

*By Tihut Yirgu*

Extensive studies have been carried out on the various pastoral groups in Ethiopia, especially on the Kereyu, Afar, Arbore, Mursi and Boran. However, studies on the Guji pastoralists are few. Available literature is focused on sociological, socio-political, and socio-anthropological aspects, but these studies have mainly been carried out among highland Guji, whose livelihood depends more

on crop production than livestock.

The Guji are one of the many branches of the Oromo that live in southern Ethiopia, currently called the 'Borana Zone.' The Guji have a relatively large population that occurs at a high density in this semi-arid and sub-humid landscape. The Guji have been labeled as aggressive

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## First Annual S. Gordon Campbell Lecture Presented

On September 13, 1999, the first annual S. Gordon Campbell Memorial Lecture on International Veterinary Medicine was given at Cornell University. Dr. Montague Demment, Director of the Global Livestock CRSP, was honored to give the lecture. Dr. Demment's presentation discussed a range of issues that portrayed the role of veterinarians and animal scientists as a key element in the international development process. He initiated the talk by presenting information on the role of the US in international development. The US commitment has steadily dwindled over the last three decades and far from being the leader in development by most indices, the US ranks about 35<sup>th</sup> of all nations in its financial

commitment to development. In any discussion of international development Americans must understand exactly where our commitment ranks.

Dr. Demment then described a model of development that suggested that the development of human capacity was fundamental to the national economic and societal growth. Human capacity is a function of education and innate genetic creativity. US Universities in partnership with USAID have had a major training role in developing countries that has produced several cohorts of national leaders in science and administration. He also indicated while training was one of the most effective and sustainable of USAID's

interventions, the Agency had diminished its efforts in this area in the last decade.

The most fundamental component of his development model was the enhancement of innate cognitive capacity of children. He reviewed the work on micronutrient nutrition that shows the relationship between cognitive and physical development and the consumption of adequate micronutrients. These studies indicate that large proportions of children in developing countries (often above 50%) suffer from deficiencies that negatively impact their cognitive capacity, their behavior, their performance in school, their resistance to disease, and their physical development. The development community has placed strong emphasis on improvement of cereal production that has had the unintended effect of narrowing the diets of the poor and contributing to micronutrient deficiencies.

Dr. Demment then introduced a conceptual model that allowed the ranking of development interventions based on their cost-benefit ratio with the goal of increasing cognitive development of children. Within the model the consumption of animal products, which are rich in micronutrients, was considered

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## ALO Grant Awarded for Training and Partnership Program in Central Asia

The Association Liaison Office for University Cooperation in Development has awarded Dr. Emilio Laca, University of California – Davis, over US\$90,000 for a training and partnership program in Central Asia.

The project will develop the capacity of regional scientist to use GIS technologies for measuring and modeling CO<sub>2</sub> fluxes in rangelands as potential atmospheric carbon sinks

affecting global climate change and agricultural productivity.

The program complements the GL-CRSP Livestock Development and Rangeland Conservation Tools project which is establishing the technological capacity and collecting data on CO<sub>2</sub> fluxes in Central Asia. The GL-CRSP project will provide an applied backdrop for efficient training and development of human

# Characteristics of Smallholder Livestock Production Systems

*By Emilo Laca & Abigail Breuer*  
 Because household farms manage more than 70% of the total livestock in Kazakhstan, the constraints faced and decisions made by households have a substantial impact on the livestock sector and natural resources. Rangelands are the basis of the Kazak livestock industry. Since the transition to market economics, the livestock infrastructure has collapsed and there is a lack of basic information about characteristics of production systems. Among other things, our research addresses one of the most basic pieces of information necessary to diagnose and improve livestock production systems: a comparison of livestock nutrient requirements and production calendar versus forages and feeds available. This comparison will identify deficiencies and suggest management modifications to correct them. With this information, researchers and livestock producers will be able to examine whether current breeding schedules take full advantage of the forage potential of available grazing areas. In collaboration with scientists from the Baraev Institute, Sheep Breeding Institute, Institute of Economics and Institute of Feed and Pasture of Kazakhstan, we surveyed 270 households in Northern, Central, and Southern Kazakhstan, to describe household livestock systems quantitatively. The survey included portions of the Akmola and former Dzhezkazgan (now

part of Karaganda), Dzhambul, and Almaty Oblasts.

Preliminary analyses of data indicate that most households have very few animals. Production is mainly for subsistence, and management practices do not seem to be market-oriented. The main problem is a lack of forage to feed animals during the winter months, when rangeland grazing is not feasible. Yet, animals give birth in late winter, which results in maximal energy demand when feed is least available (Table 1). As is typical in systems limited by management of feed, animals are not weaned until late (>8 mo cattle, >7 mo sheep). Although the country has experienced a decline of more than 50% in its livestock numbers, lack of resources and poor market infrastructure result in extremely high stocking rates near villages and

<b>Table 1</b>	<b>Calving season</b>	
<b>Region</b>	Start	Duration (mo)
Northern	20-Feb	2.15
Central	27-Feb	1.62
Southern	11-Mar	1.69
	<b>Lambing season</b>	
<b>Region</b>	Start	Duration (mo)
Northern	22-Feb	2.15
Central	17-Mar	1.74
Southern	12-Feb	1.69

riparian areas. This supports the hypothesis that degradation of rangelands continues to take place in Kazakhstan.

Analysis of these data will result in detailed feed calendars, accurate descriptions of small holder livestock systems, and will help in the generation of recommendations for management. 🐾🐾

*We are indebted to the villagers and administrators from Shetskii, Zhanarkinskii, Aktogayskii Raions in the Karaganda Oblast, Kurgalzhinskii, Krasnozamskii, and Astrakhanskii Raions in the Akmola Oblast, Dzhambul Raion in the Almaty Oblast, and Sarysuiskii, Talaskii, and Baizaksii Raions in the the Dzambul Oblast for their participation in the surveys.*

## I N T H I S I S S U E

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## LEWS Biophysical Modeling Workshop at Texas A&M

A training workshop on the use of critical biophysical models in early warning systems within the Livestock Early Warning Systems Subproject (LEWS) was held in the Department of Rangeland Ecology and Management at Texas A&M University in College Station August 10 – September 10, 1999. The models are used to monitor and detect emerging crisis conditions in rangeland or pastoral regions in terms of forage supply and nutritional well being of livestock. The training workshop was organized, with funding from SPAN/ILRI/USAID, to develop the modeling skills of critical zonal coordinators of the LEWS host countries in East Africa. The workshop was attended by six NAR scientists and one ILRI scientist from four East African countries (Uganda, Tanzania, Kenya and Ethiopia) who are critical to the LEWS research program



*Workshop participants: (from left to right) Angello Mwilawa, Central Tanzania Zone Coordinator, Livestock Production Research Institute; Stephen Byenkya, LEWS Western and Central Uganda Zones Coordinator, Namulong Ag. & Animal Research Institute, NARO Livestock Department; Jerry Stuth, LEWS Co-Principal Investigator, Texas A&M University; Stella Bitende, LEWS North Eastern Tanzania Zone Coordinator, Selian Agricultural Research Institute; Peter N. Kamau, LEWS Kenya/Northern Zone Coordinator, Dept. of Animal Science, Egerton University; Azage Tegegne, LEWS team member - Ethiopia, Ethiopia International Livestock Research Institute; William Mnene, LEWS Kenya/Southern Zone Coordinator, Kenya Agricultural Research Institute, National Range Research Centre. Photo by Abdi Jama.*

and responsible for implementing the zonal monitoring and analysis system in the East African region.

The primary objectives of the workshop were:

- To review the models and the spatial tools for the Livestock Early Warning System project
- To provide participants an understanding of the steps involved in model use
- To give the participants a comprehensive knowledge of how these set of models and spatial tools can be used as an early warning package for livestock.
- To provide participants an opportunity to interact and share experiences in setting up route monitoring plans, selection of household for monitoring, data handling, analysis and advisory preparation.

Questionnaires were provided to each participant at the beginning of the workshop to confirm computer skill level and current understanding of the analysis and delivery system within the network of LEWS, and to listen to their understanding and expectations of the project for the region. A follow up questionnaire sought among other things, how well the workshop achieved its objectives and allowed the LEWS program to identify future training issues.

This training is part of a broader initiative by LEWS project management to build a network of scientists that has the skills needed to ensure timely monitoring and effective analysis of emerging crises in pastoral areas. The focus of the project is capacity building for a more decentralized modeling effort with more centralized aggregation of modeling output, thereby involving more local analysis in zonal areas in East Africa. The ASARECA Crisis Mitigation Office (CMO), currently being set up

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## Biennial Research & Outreach Workshop in Addis Ababa

The first biennial research and outreach workshop to improve pastoral risk management in Kenya and Ethiopia was held on the campus of the International Livestock Research Institute (ILRI) in Addis Ababa, Ethiopia, during July 27-29. Over 80 participants from Kenya, Ethiopia, and the United States represented some three dozen research, development, and relief organizations. The objectives of the workshop included: (1) to review progress in research and outreach during the first phase of the Pastoral Risk Management Project in southern Ethiopia and northern Kenya; and (2) to determine the direction that research and outreach should take in the second phase.

On the first day, the workshop was opened by Ato Retta Badada, Head of the Economic Sector for the Council of Oromia, Ethiopia. Dr. Layne Coppock of the GL-CRSP then gave an overview of workshop goals. Mr. Vincent Lelei, representing the Office of the President (Kenya) and the Arid Lands Resource Management Project (ALRMP) was the first invited speaker. He addressed the broad development issues for northern Kenya. Lelei was followed by Dr. Tafesse Mesfin, Head of the Pastoral Development Unit of the federal Ministry of Agriculture (PDU/MoA), who described development issues for the

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*Workshop Participants Included (left to right):* **Front row** (sitting on the ground): Prof. Abdillahi Aboud (GL-CRSP and Egerton University), Ato Tewodros Fisseha (VOCA), Ato Solomon Desta (GL-CRSP and Utah State Univ.), Mr. Moses Esilaba (GL-CRSP and Egerton University), Mr. Frank Lusenaka (GL-CRSP and Egerton Univ.), Ato Getu Reta (SC/USA), Ato Dadhi Amosha (OCPB); **Second row** (kneeling or sitting on chairs): Ato Galama Halake (Ethiopian Evangelical Church), Ato Mulugeta Shibru (GL-CRSP and Egerton Univ.), Ato Belete Tefera (Norwegian Church Aid), Ato Omar Gobe (Borana Zonal Administration), Ato Alemayehu Boka (PDU/MoA), Ato Derege Tolu (OADB), Ato Alemu Adere (Southern Rangelands Development Unit—SORDU), Ato Zerihun Tadesse (Oromia Cooperative Promotion Bureau—OCPB), Dr. Henry Cheruiyot (KARI), Dr. Michael Fleisher (GL-CRSP and Utah State Univ.), Dr. Tafesse Mesfin (PDU/MoA); **Third row** (sitting on chairs): Ato Tadi Liben (private consultant for education), Mr. Golich Sora (KREP/FSA), Dr. Cheryl Doss (GL-CRSP and Yale University), Dr. Kevin Smith (GL-CRSP and Utah State Univ.), Dr. Layne Coppock (GL-CRSP and Utah State Univ.), Ms. Elizabeth Daoudi (SC/USA), Dr. John McPeak (GL-CRSP and Cornell University), Dr. Paul Box (GL-CRSP and Utah State University), Dr. Chris Barrett (GL-CRSP, BASIS CRSP, and Cornell University), Mr. Boru Halake (ALRMP); **Fourth row** (standing): Ato Ahdurheman Ame (FARM Africa), Mr. Clement Lenachuru (GL-CRSP and Egerton University), Ato Misgina Lelissu (OADB), Ato Daibissa Arero (private consultant—conflict resolution), Wzo Abaynesh W/Giorgis (Ethiopian MoA), Ato Feyisa Taffa (Borana Zonal Agriculture), Ato Million Kebede (SC/USA), Dr. Peter Little (GL-CRSP, BASIS CRSP, and University of Kentucky), Mr. Geoffrey Leparteleg (Drought Preparedness Intervention and Recovery Program—Kenya), Mr. Francis Chabari (MDP/GTZ), Mr. Vincent Lelei (OP and ALRMP), Wzo Felekech Lemecha (ORS), Ms. Sosina Asfaw (University of Illinois), Mr. Godana Doyo (KARI-Marsabit); **Back row** (standing): Mr. Ben Irwin (SOS-Sahel), Ato Eyasu Elias (SOS-Sahel), Mr. Roger Kamidi (Crisis Mitigation Unit, Association for Strengthening Agricultural Research in Eastern and Central Africa—ASARECA), Dr. Jon Moris (GL-CRSP and Utah State University), Mr. John Tangu (GL-CRSP and Egerton University), Ato Abraham Bongasse (SC/USA), Ato Yosef G/Hiwot (SC/USA), Dr. John Unruh (USAID-FEWS), Dr. Fisseha Meketa (SC/USA), Ato Sora Adi (BLPDP/GTZ), Ato Abdi Abdullahi (Pastoral Concern Assoc. of Ethiopia—PCAE), and Dr. Abakano Kereyu (private consultant—animal health). (Note: over 25 other participants are not shown in this photo). Photo by Wzo. Menbere W/Giorgis.

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## Spirit of Cooperation Highlights Workshop

The project has expanded its scope to take into consideration the entire bio-physical and socio-economic and cultural context of the watersheds in which we are fostering local planning and sustainable use of natural resources. Livestock husbandry, crop production, and extraction of forest products remain the dominant activities within this context. Our approach toward solutions of local poverty and land degradation has broadened to include encouraging community organization, building local community planning capabilities, and fostering local linkages with local and regional government and private support groups. Two years of experience and study in the communities of our project sites has created the basis

*Workshop participants viewing a model of the watersheds of the Zenzontla site in Mexico. The model was created by researchers and students of the University of Guadalajara in Autlan, Mexico.*



for a more focused, systematic approach to social and policy problems and opportunities.

During the conference, we focused on mechanisms to apply consistent, effective research methodologies across the three sites to take advantage of differential progress among the country teams. These have included a plan for investigator exchanges related to key thematic research lines and the creation of an informative bulletin to enhance communication and diffusion of ideas and experiences among the project teams as well as with the

communities and local authorities of the project sites.

We spent a day and a half working through the adoption and application of a new overall research/development monitoring framework adapted from the Biodiversity Support Program (BSN): "Measures of Success: Designing, Managing and Monitoring Conservation and Development Projects" by R. Margolius and N. Salafsky. The approach proposed and in use by BSN projects has considerable promise for guiding an effective monitoring program for adaptive management and for researching the effectiveness of interventions.

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*For more information on the Livestock - Natural Resources (PLAN) project, please contact Dr. Timothy Moermond, University of Wisconsin - Madison, Dept. of Zoology, Madison, WI 53706. Tel: 608-262-5868, Fax: 608-265-6320. Email: [tcmoermo@facstaff.wisc.edu](mailto:tcmoermo@facstaff.wisc.edu).*



*Local residents of the Zenzontla communities watching a slide show of the project community work in Ecuador and Bolivia. Over 100 villagers attended the presentation.*

*Photos courtesy of Tim Moermond.*

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## A day with local residents of the villages of Zenzontla and Las Ventanas

For one full day, the 25 researchers of the four teams participating in this project, visited our Mexican site to see and comment on local activities with local farmers and families participating in all aspects of the visit.

We took everyone into the shade of one of the typical riparian strips of this zone. These narrow seasonal streambeds are dominated by the “mojote” tree (*Brosimum alicastrum*) and hence are locally called “mojoteras.” Local residents counted out the numerous local uses of the mojote tree including its importance as livestock forage. They were pleased with the idea that conservation of the mojoteras would benefit them and nature through maintaining the presence of the valuable mojotes, decreasing erosion, increasing water quality, and acting as a home for local birds species endemic to this western Mexico region.

Farmers, men and women, from the nearby communities, stood side by side with the Ecuadorian, Bolivian, and Wisconsin visitors while the Mexican team members explained their research using livestock exclusion and grazing

Ramon Rodriguez showing researchers from Ecuador and Bolivia his plantings of *Leucaena* in his cornfield in Zenzontla.



plots as a means to study regeneration of vegetation and impact of grazing/browsing pressure. One of the farmers, Cresencia Moya, wanted us to establish additional plots in pastures close to his small village of Las Ventanas so that they could watch the changes and learn how to improve their grazing practices.

We walked into the cornfield of Ramón Rodríguez to see his use of *Leucaena* trees in rows interspersed with his corn. The *Leucaena* were already over a meter tall. As I walked back with Ramón, he said he was very pleased with us because we clearly valued his experience. He believed that the use of *Leucaena* to retard erosion and to enhance the productivity of his fields were practices that his neighbors should use also. The *Leucaena* came from a tree nursery established by our Mexican team members in the community. The nursery contains seedlings of *Leucaena* species native to the region, as well as six other tree species,

some of which have only been germinated successfully using methods developed by our Mexican team researchers.

Over one hundred villagers came to see a slide presentation of the work of our project with communities of Ecuador and Bolivia as well as their own. We hoped the exchange would open new vistas of opportunities for them. Isabel Murillo, researcher of Fundación Antisana, showed pictures of their women’s workshop at our project site in Ecuador. One of the women from Zenzontla, Berenice Pisano, requested that the project develop a women’s workshop for them also. After the talk, people crowded around the Ecuadorian and Bolivians to thank them, ask questions, and to get their names for future contacts.

One old gentleman of the community, José Cervantes Reynaga, walked up to us, beamed, and said, “I have lived here for 70 years, and I have never seen anything like this before. Thank you!” 🍷



## Conference in Almaty Informs Policy Makers about the Livestock Sector

As part of the outreach efforts aimed at stimulating and informing the discussion on the livestock sector in Central Asia, an international conference on “The Present State of Livestock-Breeding and Animal Husbandry in Kazakhstan and the Prospects for Their Development” was held in Almaty on January 12-13, 1999. The conference was organized by the University of Wisconsin-Madison, the Ministry of Science-Academy of Sciences of the Republic of Kazakhstan and the Russian Center for Strategic Research and International Studies, and in part supported with USAID funds from the Global Livestock Collaborative Research Support Program (CRSP) through the Management Entity, University of California, Davis.

The conference served as a forum to review work from the first year of the CRSP project, “Impacts of Economic Reform on the Livestock Sector in Central Asia,” and to hear papers from scholars in the region working on related topics. Along with anthropologists, economists, sociologists, biologists and representatives of other scientific disciplines, leaders and experts working in the agricultural and livestock sectors participated in the conference.

A number of government officials attended and

participated. Vladimir Sergeyevich Shkolnik, Minister of Science and President of the Academy of Sciences of the Republic of Kazakhstan delivered the welcoming remarks. He noted the extraordinary importance of the project’s research on the current state and potential development of animal husbandry and livestock raising in Kazakhstan. In particular, he noted that the development of the animal husbandry branch of the economy was a main priority for the government as it sought to ensure adequate meat and milk to the population.

The Deputy Minister of Agriculture, Kadyrkhan Makhmudovich Otarov, and the Head of the Department of Animal Husbandry of the Ministry of Agriculture of the Republic of Kazakhstan, Sovet Saimanovich Satigulov attended the conference and delivered a paper on “The Animal Husbandry of Kazakhstan at the Present Stage.” Their report highlighted the dramatic decline in the numbers of all types of livestock, which the GL-CRSP funded project at the University of Wisconsin is attempting to address through a program of cross-breeding aimed at introducing a prolificacy gene into the Kazakh sheep herds. Also in attendance were representatives from the Ministries of Agriculture of the Kyrgyz Republic and the

Republic of Uzbekistan.

The conference received wide coverage in the mass media. Lengthy articles about the conference appeared in two newspapers with republic-wide circulation, the weekly newspaper, *Panorama* and the republican newspaper, *Science Kazakhstan*. A number of television news programs also covered the conference, including those broadcast on KHABAR, ATV, RAKHAT and ASTANA stations. Finally, reports and interviews about the conference were aired on Republic Radio and on the special program “Village Hour” broadcast on the Shalkar radio station.

The project plans to continue its outreach efforts through the dissemination of the conference proceedings and by launching a research paper series, *The Central Asian Livestock Sector in Transition*, published in both Russian and English. 🇷🇺🇺🇸

*For more information on this project, please contact Dr. Kenneth Shapiro, University of Wisconsin - Madison, International Agricultural Programs, Madison, WI 53706-1562. Email: kenneth.shapiro@ccmail.adp.wisc.edu.*



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## Guji of Southern Ethiopia: High Vulnerability for Next Drought

by neighboring communities who can recall raids and skirmishes along the borders of Guji land. However, presently this situation is changing as Christianity is becoming a dominant religion in the area. Recent studies indicate that Guji are more interested in defensive action to protect their lives and property when it comes to warfare, rather than taking the offensive.

With support from the GL-CRSP Pastoral Risk Management Project, NORAGRIC, and the Norwegian Ministry of Education, University of Norway students Tihut Yirgu and Kirsi Saaristo recently conducted a

*Many Guji families have had to resort to farming in order to supplement the meager milk production.*  
*Photo by Solomon Desta.*



utilized both Participatory Rural Appraisal (PRA) methods (i.e., mapping, focus group discussion, wealth ranking exercises) and structured interview. The household survey covered 46 out of 199 households in a study area that represented four Peasant Associations.

Results of the study indicated that the Guji household economy is poorly diversified. Ninety-five percent of sample households

depend upon a combination of livestock (cattle) production and maize cultivation. Other income-generating activities were rare.

Current livestock holdings were said to be very low because of

drought losses in 1991-2 and 1996. Drought impacts were further aggravated by border conflict with the Boran, reportedly claiming many human lives. It was reported that Guji pastoralists have become impoverished and must now resort to cultivation of maize to sustain themselves.

Twenty-four percent of respondents mentioned drought and marketing problems as the most important risks which threaten their livelihood. Livestock disease was the third most important risk (21%), followed by loss of access to grazing land and ethnic conflict (both at 11%). Presently, many Guji are unable to cope with an extended dry spell, let alone drought.

Risk management tactics were divided into two groups: (1) those employed in advance to minimize the negative effects of future shocks (ex-ante); and (2) those employed to minimize

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*The Guji household economy shows few signs of diversification making it difficult for families to cope with periods of dryness and drought. Photo by Solomon Desta.*

joint study among the pastoral Guji for several months in 1998. The major objectives of the study were to identify the nature of risks threatening the production system and to characterize risk management tactics employed by households. The field study

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## Guji of Southern Ethiopia

effects of shocks once they have occurred (ex-post).

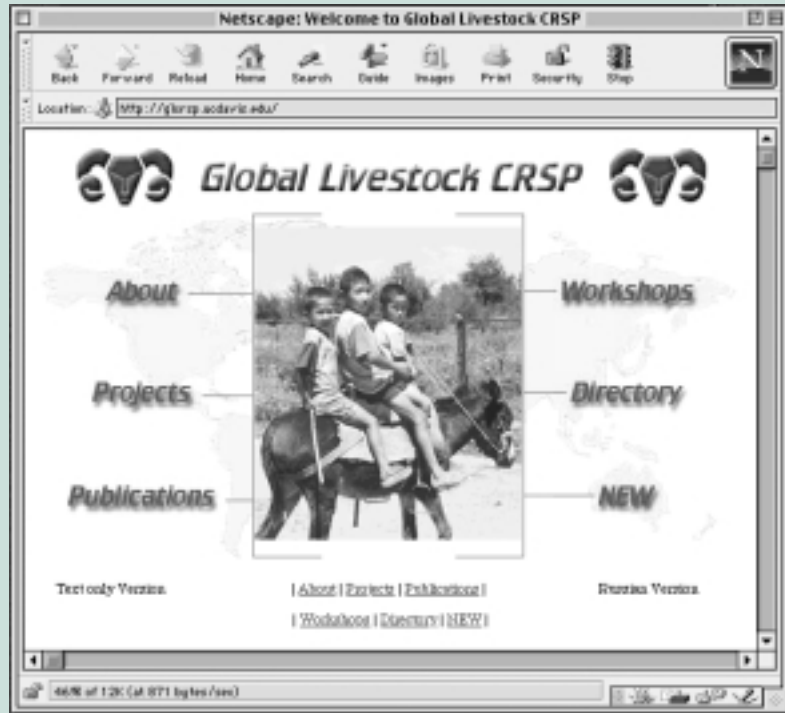
The most important ex-ante tactics were attempts to maintain herd mobility and migration, followed by expansion of cultivation and fodder collection. Over half of respondents reportedly had no ex-ante tactics, however.

In the Guji community ex-post strategies are reportedly more common than ex-ante tactics. Respondents mentioned ten types of ex-post tactics they employ. The most commonly mentioned coping tactic (25% of respondents) is selling animals to buy food. The second most important tactic is receiving food aid from GOs and NGOs (19% of respondents). Other important tactics were rationing and substitution of food as well as migration.

Finally, the traditional networks used by the Guji to share resources in times of stress are gradually becoming diminished. Options for mobility have been curtailed because of constraints imposed by population pressure and local bureaucracy.

In conclusion, a couple key points can be made. First, the Guji pastoral community has been transformed in recent times to agropastoralism due to internal and external pressures. Second, the population

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## WEB SITE UPDATED

The GL-CRSP World Wide Web site has a whole new look. The site was recently redesigned to include detailed information about the research being conducted by each of the projects. Technical reports and workshop proceedings are also posted at the site. A searchable publication page and Russian language version will be coming soon! The URL is:

**<http://glcrsp.ucdavis.edu>**

Webmasters Jimmy Chan ([jimchan@ucdavis.edu](mailto:jimchan@ucdavis.edu)) and Ilya Podobedov ([ipodobedov@ucdavis.edu](mailto:ipodobedov@ucdavis.edu)) welcome your comments.

currently lives in a very precarious situation in which only a minority makes proactive plans to deal with pending disasters. Reliance on food aid is an expectation among the population. This is a recipe for disaster when the next drought comes.

The Pastoral Risk Management Project of the GL-CRSP plans to continue research and promote outreach among the

Guji. One outreach concept is to foster multi-faceted, voluntary cooperatives that help the population diversify their economic base. ☺☺

*This study was undertaken as part of an MSc thesis jointly carried out by Tihut Yirgu and Kirsi Saaristo, submitted to the Agricultural University of Norway in May, 1999. For more information on the study please contact the principal investigator for the GL-CRSP Pastoral Risk Management Project, Dr. Layne Coppock, at Utah State University ([lcoppock@cc.usu.edu](mailto:lcoppock@cc.usu.edu)).*

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## PRMP Research & Outreach Workshop in Addis Ababa

rangelands of southern Ethiopia. The remainder of day one was comprised of seven research presentations and four outreach presentations. For research, presentations focused on aspects of (1) mapping out various risks experienced by pastoralists in the study region, given by Dr. Kevin Smith (GL-CRSP); (2) cattle herd dynamics among Boran pastoralists in southern Ethiopia and the role that improved rural financial systems could play in mitigating asset losses, given by Dr. Solomon Desta (GL-CRSP); (3) risk management issues among the Guji pastoralists of southern Ethiopia, given by Wzo. Tihut Yirgu Asfaw (CARE-Ethiopia); (4) a summary of a literature review pertaining to African livestock marketing and new research directions, given by Dr. DeeVon Bailey (GL-CRSP); (5) cross-border trade between Kenya and Ethiopia, given by Ato Alemayehu Azeze [Organization for Social Science Research in Eastern and Southern Africa (OSSREA) and the BASIS CRSP], (6) patterns of pastoral economic diversification in East Africa, given by Dr. Peter Little (GL-CRSP); and (7) a review of changing pastoral development policies in Kenya and Ethiopia from 1963-98, given by Dr. Jon Moris (GL-CRSP). For outreach, presentations focused on recent experiences of key development organizations that deal with important aspects of risk management: (1) Ato Tewodros

Fesseha representing an NGO called Volunteers in Cooperative Action (VOCA) in Ethiopia, spoke about plans to form voluntary producer cooperatives among the pastoral Boran; (2) Mr Golich Sora, representing the NGO Kenya Rural Enterprise Project (KREP), gave a paper prepared by Ms. Miriam Cherogony on implementation of community-based financial systems in Kenya; and (3) Dr. Chip Stem of OAU/IBAR/PARC spoke about implementation of community-based animal health systems in the Greater Horn of Africa. Finally, Mr. Francis Chabari of the bilateral Marsabit Development Project (MDP/GTZ) in Kenya summarized recent information regarding efforts to revisit the issue of improving the major road between Isiolo, Kenya, and Moyale, Ethiopia, which has major implications for trade and pastoral livelihoods in the region.

Day two began with presentations on progress in student training by Prof Abdillahi Aboud and Dr. Layne Coppock, both of the GL-CRSP. Dr. Zinash Sileshi of the Ethiopian Agricultural Research Organization (EARO) and Dr. Henry Cheruiyot of the Kenya Agricultural Research Institute (KARI) gave talks on the status of rangeland research within their respective organizations.

Dr. Layne Coppock also spoke on progress in outreach during the first phase of the project. He noted that members of the outreach network that had attended three previous workshops in East Africa had identified (1) need for more effective education of pastoralists; (2) means to facilitate pastoral marketing and investment; (3) means to mitigate resource-based conflict, and (4) need for innovative pastoral diversification and development concepts as paramount and common to both countries (see the Winter 1999 Issue of *Ruminations* for discussions of previous outreach workshops).

The rest of the workshop consisted of presentations of plans for phase two of the project and debate over those plans. Dr. Chris Barrett gave an overview of the field-based research plans, which focused around household- and community-level analyses of risks, variation in risks, and identification of factors that exacerbate or mitigate risks. It was described that Drs. John McPeak and Michael Fleisher would have key roles in phase-two research. Dr. Solomon Desta then gave a summary of the evolving outreach plan whereby the GL-CRSP would facilitate implementation of pilot projects among pastoral

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## PRMP Research & Outreach Workshop in Addis Ababa

groups in northern Kenya and southern Ethiopia in partnership with outreach network members. Pastoral groups and outreach partners would submit proposals, and it would be likely that major themes would include previously mentioned priorities for outreach intervention such as facilitation of pastoral cooperative organization, innovative education, marketing, alternative investment, diversification, etc. It was proposed that funding for outreach come from bilateral USAID mission resources as well as regional resources such as the Greater Horn of Africa Initiative (GHAI).

A break-out session was used for discussion groups to debate the phase-two priorities for research and outreach. While there was a general consensus that the project was headed in the right direction, the following points were noted: (1) research and outreach must be done in tandem using multi-method approaches including rapid rural appraisal and use of “action” research; (2) project information dissemination needs to be thought out more carefully to ensure rapid transfer of new research or outreach findings—the current structure is inadequate; (3) research needs to involve more collaboration with partners; (4) pastoralists need to have a greater and more

frequent input to the project—this will help ensure that project outputs are meaningful; (5) gender issues need to be mainstreamed and be integral to all outreach and research; (6) the broader policy environment is a constraint, thus continued effort must be made to identify, engage, and inform policy makers at the national level—the project needs to have a more macro-level view of pastoral problems; (7) need to increase research focus on how problems in public service delivery, human health, and livestock marketing exacerbate risks for pastoralists; (8) detailed criteria for outreach pilot projects must be developed; (9) more institutional links need to be formed within Ethiopia; and (10) the project must be designed so it can sustain itself once original GL-CRSP funding is over.

The workshop concluded by nominating Africans to serve on a review panel that would

oversee outreach proposals and set outreach priorities. Ten people were nominated with five for each country. Three would serve as the primary panel members while two would serve as alternates. For Kenya, the primary nominees were: Ms Miriam Cherogony (KREP), Mr. Boru Halake (ALRMP), and Mr. Godana Doyo (KARI). The Kenya alternates were Dr. Daniel Too (Egerton University) and Ms. Allyce Kureiya (MDP/GTZ). For Ethiopia, the primary nominees were: Dr. Tafesse Mesfin (PDU/MoA), Ato Aliyu Hussen (Oromia Agricultural Development Bureau or OADB), and Ato Sora Adi (Borana Lowlands Pastoral Development Program or BLPDP/GTZ). The Ethiopian alternates were Dr. Fisseha Meketa (Save the Children/USA) and Wzo Felekech Lemecha (Oromia Research Service). 🇰🇪🇪🇹

*For more information on this project or workshop, contact Dr. Layne Coppock at L.Coppock@cc.usu.edu.*

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an effective intervention relative to supplementation and fortification for large portions of the rural poor. The positive link between animal products and cognitive and physical development is a critical component of the diversification of the diets of the poor. He stressed that the role

of veterinarians is to enhance human capacity through improvement the delivery of animal produces and the training of veterinarian students to support these systems in their home countries. 🇰🇪🇪🇹

*The S. Gordon Campbell Memorial Lecture is presented annually in memory of Dr. Campbell who served on the SR-CRSP EEP for over ten years.*

# Livestock to 2020: The Next Food Revolution

by Christopher Delgado, Mark Rosegrant, Henning Steinfeld, Simeon Ehui, and Claude Courbois

A revolution is taking place in global agriculture that has profound implications for human health, livelihoods, and the environment. Population growth, urbanization, and income growth in developing countries are fueling a massive increase in demand for food of animal origin. These changes in the diets of billions of people could significantly improve the well-being of many rural poor. Governments and industry must prepare for this continuing revolution with long-run policies and investments that will satisfy consumer demand, improve nutrition, direct income growth opportunities to those who need them most, and alleviate environmental and public health stress.

## TRANSFORMATION OF CONSUMPTION AND PRODUCTION

Unlike the supply-led Green Revolution, the “Livestock Revolution” is driven by demand. From the early 1970s to the mid-1990s, the volume of meat consumed in developing countries grew almost three times as much as it did in the developed countries. Developing-world consumption grew at an even faster rate in the second half of this period, with Asia in the lead (see table).

Beginning from a small base, developing countries have begun to catch up with developed-world consumption levels, but they have a fairly long way to go, primarily because of low income levels. People in developed countries obtain an average of 27 percent of their calories and 56 percent of their protein from animal food products. The averages for developing countries are 11 and 26 percent, respectively. The difference in consumption levels gives an indication of the dramatic changes in store for global food production as the Livestock Revolution unfolds. Production of animal food products grew most rapidly where consumption did. Total meat production in developing countries grew by 5.4 percent per year between the early 1980s and mid-1990s, more than

## 2020 VISION

2020 Brief, May 1999. This brief is based on 2020 Vision Discussion Paper 28 of the same title. “A 2020 Vision for Food, Agriculture, and the Environment” is an initiative of the International Food Policy Research Institute (IFPRI) to develop a shared vision and consensus for action on how to meet future world food needs while reducing poverty and protecting the environment. Reprinted by permission.

Actual and projected meat consumption by region

Region	Annual growth of total meat consumption		Total meat consumption		
	1982-94	1993-2020	1983	1993	2020
	(percent)		(million metric tons)		
China	8.6	3.0	16	38	85
Other East Asia	5.8	2.4	1	3	8
India	3.6	2.9	3	4	8
Other South Asia	4.8	3.2	1	2	5
Southeast Asia	5.6	3.0	4	7	16
Latin America	3.3	2.3	15	21	39
West Asia/N. Africa	2.4	2.8	5	6	15
Sub-Saharan Africa	2.2	3.5	4	5	12
Developing world	5.4	2.8	50	88	188
Developed world	1.0	0.6	88	97	115
World	2.9	1.8	139	184	303

Sources: FAO annual data. Total meat consumption for 1983 and 1993 are three-year moving averages. 2020 projections come from IFPRI's global model, IMPACT.

Notes: Meat includes beef, pork, mutton, goat, and poultry. Suspected overestimation of meat production in China in the early 1990s suggests that actual 1993 consumption was 30 million metric tons (a 6.3 percent annual growth rate since 1983). If so, the level of world meat consumption for 1993 is overestimated here by at most 4.3 percent and by even less than that for 2020 because IMPACT incorporates pessimistic assumptions that are compatible with the conservative view for 1993.

five times the developed-world rate. Per capita production kept up with population in most developing regions, except in Sub-Saharan Africa (for meat) and West Asia/North Africa (for milk).

Whether these consumption trends will continue in the future is a question explored through IFPRI's global food model, which includes data for 37 countries and country groups and 18 commodities. Known as IMPACT (International Model for Policy Analysis of Agricultural Consumption), the model's baseline scenario projects that consumption of meat and milk in developing countries will grow 2.8 and 3.3 percent per year between the early 1990s and 2020. The corresponding developed-world growth rates are 0.6 and 0.2 percent per year. By 2020 developing countries will consume 100 million metric tons more meat and 223 million metric tons more milk than they did in 1993, dwarfing developed-country increases of 18 million metric tons for both meat and milk.

Growth rates for meat production through 2020 again follow those for meat consumption quite closely in most regions. Meat production will grow about four times as fast in developing countries as it will in developed countries. By 2020 developing countries will produce 60 percent of the

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world's meat and 52 percent of the world's milk. China will lead meat production and India milk production.

### **IMPLICATIONS FOR WORLD FOOD PRICES**

The increase in livestock production will require annual feed consumption of cereals to rise by 292 million metric tons between 1993 and 2020. While some are concerned that such large increases will raise cereal prices substantially over time, the inflation-adjusted prices of livestock and feed commodities in fact are expected to fall by 2020, though not as rapidly as they have in the past 20 years. In a "worst-case" scenario, which by common accord is much too pessimistic, feedgrain requirements per unit of meat are assumed to rise 1 percent per year through 2020 due to increased industrialization of production and lack of a countervailing increase in livestock feeding efficiency. Even so, IMPACT shows that real maize prices in 2020 would be at most one-fifth above their present levels and remain substantially below their levels in the early 1980s.

Even with increases in livestock productivity far below historical trends, enough meat, milk, and feed will be available in 2020 without prices rising above 1992–94 levels. The key issue, then, is not availability, but what direct effect rapidly escalating livestock production and consumption will have on the poor, the environment, and human health.

### **LIVESTOCK AND THE POOR**

Far from being a drain on the food available to the poor, increased consumption of animal products can help increase the food purchasing power of the poor. Considerable evidence exists that the rural poor and landless, especially women, get a higher share of their income from livestock than better-off rural people (with the main exceptions found in areas with large-scale ranching, such as parts of Latin America). Furthermore, livestock provide the poor with fertilizer and draft power, along with the opportunity to exploit common grazing areas, build collateral and savings, and diversify income. The Livestock Revolution could well become a key means of alleviating poverty in the next 20 years. But rapid industrialization of production abetted by widespread current subsidies for large-scale credit and land use could harm this major mechanism of income and asset generation for the poor. Policymakers need to make sure that policy distortions do not drive the poor out of the one growing

market in which they are presently competitive.

Livestock products also benefit the poor by alleviating the protein and micronutrient deficiencies prevalent in developing countries. Increased consumption of even small additional amounts of meat and milk can provide the same level of nutrients, protein, and calories to the poor that a large and diverse amount of vegetables and cereals could provide.

### **ENVIRONMENTAL SUSTAINABILITY AND PUBLIC HEALTH**

At the low levels of calories consumed by the poor, lack of access to animal products, not overconsumption, should be the concern of policymakers. The greater health risks from livestock products in developing countries come from animal-borne diseases, such as avian flu and salmonella, microbial contamination from unsafe handling of foods, and a build-up of pesticides and antibiotics in the food chain through production practices.

The effects of the Livestock Revolution on the environment are also potentially worrisome. Livestock typically contribute to environmental sustainability in mixed farming systems that strike a proper balance between crop and livestock intensification. In these systems livestock provide the manure and draft power to sustain intensive crop production. But the larger concentrations of animals in periurban areas needed to meet growing urban meat and milk demand have led to the degradation of grazing areas and pollution problems. Policies have also encouraged overstocking or deforestation by shielding producers and consumers from the true costs of environmental degradation. In high-intensity systems, the large quantities of greenhouse gases and excess levels of nutrients produced by livestock pose dangers to the environment. This pollution needs to be, but rarely is, reflected in financial costs to the producer and consumer.

### **CONCLUSIONS FOR POLICY**

Some want to halt the Livestock Revolution. But the ongoing nutritional transformation in developing countries driven by income, population, and urban growth leaves little room for policy to alter the widespread increase in demand for animal food products. Policy can, however, help make the form of the revolution as beneficial as possible to the overall well-being of the poor. To do this, policymakers

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## Grant Awarded for Training and Partnership Program in Central Asia

capacity in the region. The training will ensure that the current dependence on US scientists to conduct GIS modeling of C fluxes is replaced with regional expertise.

“A well focused training and research effort fits well with the Mission’s technical assistance activities in GCC (Global Climate Change).” stated Ken McNamara, Environmental Specialist, USAID Mission to Central Asia. “In order to increase the sustainability of the USAID technical assistance, it is necessary to train local scientists in all aspects of measuring carbon fluxes and GIS modeling. . . . We are confident that the project is of excellent

quality and will make a valuable contribution to the larger GCC assistance program.”

The project partners five educational and research institutions of Central Asia and three US Universities. In Central Asia: Samarkand State University, Uzbekistan; the Academy of Sciences, Uzbekistan; the Institute of Ecology and Sustainable Development, Kazakhstan; Baraev Institute of Grain Farming, Kazakhstan; the Institute of Deserts, Flora and Fauna, Turkmenistan and in the US: UC Davis, Utah State University and South Dakota State University will participate in the program.

“This grant offers a wonderful opportunity for synergism between the GL-CRSP LDRCT project and the ALO training project,” said Dr. Montague Demment, Director of the GL-CRSP and co-PI on the ALO project. “The LDRCT project provides a context and rationale for the training project. The ability of the region to participate in carbon credit schemes that are emerging from the Kyoto Summit depends on regional capacity to value its resources. This training program will provide them with the ability to estimate the potential value of these credits in their natural system.” 🌱🌱

For more information, contact Emilio Laca (ealaca@ucdavis.edu).

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will have to focus on four key issues:

*Small-scale producers have to be linked vertically with processors and marketers of perishable products.* The poor find it difficult to gain access to productive assets such as credit and refrigeration facilities and to information such as knowledge about microbial infection prevention. The integration of small-scale livestock producers and larger-scale processors would combine the environmental and poverty-alleviation benefits of small-scale livestock production with the economies of scale and human health benefits that can be had from larger-scale processing.

*Policy can help facilitate the incorporation of smallholders into commercial production by remedying distortions that promote artificial economies of scale, such as subsidies to large-scale credit and grazing.* Success in this effort will require political commitment as well as public and private partnership to develop the technologies and practices necessary to minimize risks from animal disease that are inevitable when animals from large numbers of small-scale producers are mixed in a single finishing or processing facility. Much greater attention should be given

to livestock productivity and health issues, including in postharvest processing and marketing.

*Regulatory mechanisms for dealing with the health and environmental problems arising from livestock production need to be developed.* Technologies that address environmental and public health dangers will not work unless regulatory enforcement backs them up. Such institutional developments will likely occur when the political demands for better regulation become strong.

*Above all, small-scale producers need to be included in the response to this dynamic opportunity.* Lack of policy action will not stop the Livestock Revolution, but it will ensure that the form it takes is less favorable for growth, poverty alleviation, and sustainability in developing countries.

*Christopher Delgado and Mark Rosegrant are senior research fellows and Claude Courbois is a research analyst at the International Food Policy Research Institute. Henning Steinfeld is senior officer for livestock development planning at the Food and Agriculture Organization of the United Nations. Simeon Ehui is coordinator of the Livestock Policy Analysis Project at the International Livestock Research Institute.*

## Strong Support for IMAS Implementation

This summer the Integrated Modeling and Assessment project held a series of mini-workshops in Tanzania. The purpose of the workshops was to demonstrate the IMAS to stakeholders and key policy makers. Participants included representatives of research institutes, national parks, universities, USAID, governmental Ministries, international and local Maasai NGO's.

In Arusha, the IMAS demonstration was hosted by African Wildlife Foundation (AWF) at the Community Conservation Service Centre. Programme Director Dr. Patrick Bergin and Senior Project Officer Dr. James Kahurananga have expressed strong interest in applying IMAS to their 'heartland' projects in Amboseli and Tarangire-Manyara. Many participants saw direct applications of the IMAS to various projects they are working on. Mr. Martin Loibooki, TANAPA, is working on a 'poaching/modeling' project with Dr. Ken Campbell and thought that IMAS would be useful for extending the application of their project. Mr. Gereta, Chief Ecologist for TANAPA is trying to revive ecological monitoring in National Parks and IMAS has direct application both in

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## KazAgro's Zhambakin Visits Wisconsin

Zhapar A. Zhambakin, General Director of KazAgro Co-op, traveled to Madison in May to collaborate with his colleagues at the University of Wisconsin-Madison about the Global Livestock-CRSP project entitled "Impacts of Economic Reform on the Livestock Sector in Central Asia." KazAgro Co-op is the National Private Farmers'

Federation of Kazakhshtan.

During his visit, Dr. Zhambakin had an opportunity to inform his colleagues about the development, present state and future prospects of private farming in Kazakhstan and to learn about production cooperatives and credit unions in the United States.

Dr. Zhambakin shared his knowledge about agriculture in Kazakhstan during several meetings with Profs. Kenneth Shapiro and Anatoly Khazanov, who are the principal investigators on the GL-CRSP



project. They discussed a variety of issues including the three phases of agricultural privatization in Kazakhstan since 1990, the evolution of new forms of ownership and organization, the importance of debt and bankruptcy, and the needs of new private farmers. These three were joined by Drs. William Dobson, Gary Frank and Edward Jesse of the University of Wisconsin's Department of Agricultural and Applied Economics for a discussion about the marketing

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*From left to right: Victoria Danilova, interpreter; Dr. Zhapar Zhambakin, General Director of KazAgro Co-op; John Loncle, project assistant; and Prof. Anatoly M. Khazanov, principal investigator.*

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of wool, meat and milk in Kazakhstan.

Dr. Zhambakin also met with a variety of individuals representing organizations which could serve as useful resources for KazAgro in its goal of assisting private farmers in Kazakhstan. Some of these organizations are affiliated with the University. The University of Wisconsin Center for Cooperatives develops, promotes and coordinates educational programs, technical assistance and research on the cooperative form of business. The Land Tenure Center operates a number of programs which assist governments, organizations and individuals with land redistribution and land tenure reforms. The

University's Extension Program works to educate and assist agricultural producers and rural communities by providing access to the resources and practical knowledge developed at the University.

Dr. Zhambakin also visited a number of organizations located



*Dr. Zhambakin discussing the marketing of wool, meat and milk in Kazakstan with Drs. Gary Frank (left), William Dobson and Edward Jesse of the University of Wisconsin Department of Agricultural and Applied Economics.*

in Madison which are not a part of the University. The World Council of Credit Unions has programs that seek to establish and foster the growth of credit unions throughout the world. ACDI/VOCA recruits volunteers with expertise in various fields of agricultural production and policy to assist with programs in various countries, including Kazakhstan and Kyrgyzstan. The

Wisconsin Farm Bureau Federation unites member-farmers to improve rural life and farm incomes and to represent farmers' interests to all levels of government and the general public. In its structure and goals, the Farm Bureau is very much analogous to Dr. Zhambakin's KazAgro Co-op. 🌱🐏







*Trainees display their diplomas after successfully completing the workshop.*

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## **LEWS Biophysical Modeling Workshop**

at ILRI-Nairobi, will serve as a focal point for the network of zones and in making key linkages to other international and regional EWS organizations. The

intensive training program conducted at TAMU is critical to this strategy. Each zonal coordinator will be responsible for running the models for their assigned zones, provide advisories to local leaders, key NGO's, public markets and national EWS agencies. They will also report results to the regional coordinator in the CMO. The workshop provided the field teams of the LEWS project with the necessary skills required for resource inventory, analysis, reporting of emerging crisis and delivery of information generated.

The training program included seminar type lectures, presentations, discussions, facility tours and hands-on training with the models and problem solving with data collected during the pilot monitoring program. Various technical staff of the Center for Natural Resource Information Technology, Ranching Systems Group, Integrated Information Management Laboratory, and Characterization and Assessment Group at Texas A&M were also available for the trainees for further questions and consultations.

The workshop initially focused on technical concepts needed to understand parameterization requirements and functional uses of the software for the PHYGROW, EPIC and the NUTBAL PRO models, using

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## **IMAS Demonstration**

determining the data that should be collected and analysing and integrating the available information.

There was good representation from the NCA, Danida, local Maasai NGO's, and research personnel at the IMAS demonstration in Ngorongoro. Mr. Victor Runyoro, Chief Ecologist at Ngorongoro Conservation Authority was impressed by the demonstration and expects that IMAS will be useful to the NCA and the country as a whole. Ole Ndangoya (LADO) expressed interest in involving local NGO's.

At the IMAS demonstration at the University College of Lands and Architectural Studies (UCLAS), University of Dar es Salaam, a tentative agreement was reached to hold a short training course at UCLAS that would be facilitated by Dr. Mtalo, Senior Lecturer and Dean of the College. Dr. Mtalo was also enthusiastic

about incorporating IMAS into regular courses that are given for students and for special courses for 'regional type' managers. The direct application of IMAS for natural resource utilization and conservation in Tanzania was noted by Cisco Ruybal from the USAID Mission in Tanzania.

The final demonstration was held at the Department of Animal Science, Sokoine University, Morogoro. Many

scientists from Mpwapwa Research Station and the Department of Animal Science attended the demonstration. Dr. J.K.K. Msechu, from the Ministry of Agriculture also participated. Discussions focused on areas in Tanzania where the model could be applied.

*For more information on the IMAS, please contact Dr. Michael Coughenour, [mikec@nrel.colostate.edu](mailto:mikec@nrel.colostate.edu).*

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## LEWS Biophysical Modeling Workshop at Texas A&M

household, vegetation, weather, soils and livestock herd/fecal data that was collected in a 2-month pilot program from June to August, 1999. Training also focused on data gathering, entry, analysis and reporting logistics needed to support the regional reporting capacity of the LEWS program. A tour of the GAN Lab provided insights in how the NIRS fecal profiling technology is used in the USA and how the NIRS labs need to be organized in each country. An updated version of ACT was demonstrated and further training programs scheduled in Nairobi and Addis Ababa to learn the new capabilities of the system. Eventually, the various outputs of the models were synthesized into meaningful

reports which were displayed using WORD, POWERPOINT and ACT. Various display and reporting methods of model outputs were examined using hypothetical examples (Fig. 1). The figure shows the difference between the long term (20-yr run) and recent total forage available at Adami Tulu, Ethiopia.

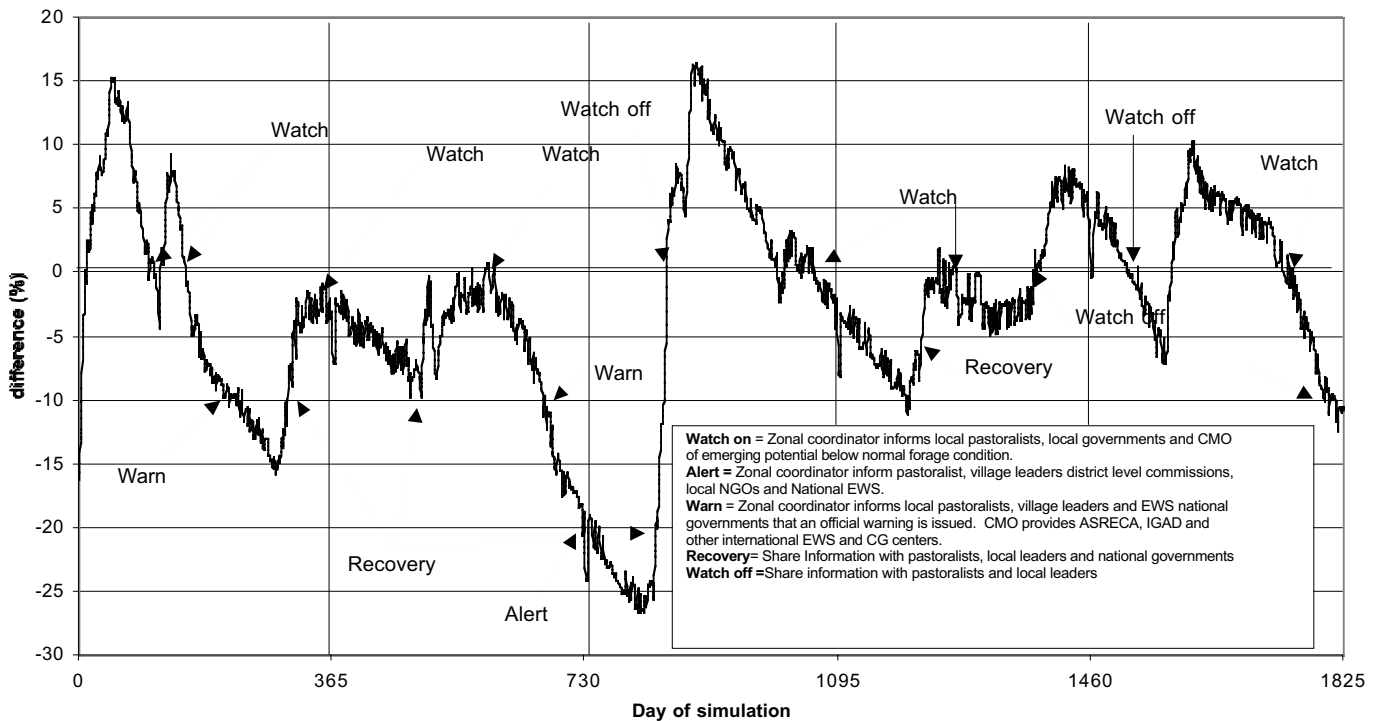
Each zone coordinator was provided a Compaq laptop via GL-CRSP/LEWS funds to use while at TAMU and to return to their respective zones. These computers were loaded with Microsoft Office, PHYGROW, NUTBAL PRO, EPIC, ACT, and several spreadsheet utilities needed to help parameterize soils and weather in the

PHYGROW model.

When the zonal coordinators arrived at TAMU, the first few days were spent on using EXCEL and transferring graphs to WORD and POWERPOINT. These sessions were followed by basic concepts in plant growth, hydrology and animal diet selection processes. Each coordinator was then instructed in the use of PHYGROW and how to move input and output between EXCEL and PHYGROW. A test case was provided by the Ethiopian team from Adami Tulu. The methods of using WMO Station weather generator coefficients and ACT to spatially correct the generator

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Fig. 1. Total Available Forage Deviation (%) from 20-year Base Weather at Adamitulu, Ethiopia



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## LEWS Biophysical Modeling Workshop at Texas A&M

was demonstrated. A set of 20-yr runs for a remote LEWS weather station in each zone was provided to the trainees and ran with PHYGROW on one of the selected modal plant communities. The long-term daily average of grazed standing crop was contrasted to an accumulated 5-year weather sequence to generate a deviation graph (see figure 1 for example). The teams then discussed how best to set up warning stages and how to communicate the information.

The next phase of the workshop focused on interfacing model

outputs and household surveys with the ACT spatial tool. The participants were taught how to generate maps, move data in and out of ACT and input GPS points as shape files from ARCVIEW.

Once the spatial analysis aspects of the workshop were completed, the EPIC model was installed on their machines and maize parameterization set up. The linkages between weather, soils and crop practices were explained. Each zone will establish a model maize cropping situation with each weather station along with the PHYGROW model plant communities.

The household monitoring forms were reviewed and modified based on the experiences of the 2-month monitoring exercise prior to coming to TAMU. Each member was taught how to enter the monthly household data into EXCEL. They were also shown how to export data from EXCEL to ACCESS and query the data.

Once the household forms were stabilized, the NUTBAL PRO program was presented with actual household data used to run nutritional advisories based on herd profiles and fecal NIRS predictions of crude protein and digestible organic matter.

The team established standard

breed attributes for cattle, sheep and goats to ensure regional continuity in the model runs. Mechanism to graph and project body condition score trends by kind and class of animal was demonstrated.

The protocol of taking geo-referenced cold cloud precipitation estimates from the EROS server and running in PHYGROW was demonstrated with weather data collected at Ntusi, Uganda during the 2-month monitoring period. This technology will be the primary extra-zonal extrapolation tool in LEWS, linking with FEWS.

The teams were able to come together and develop strong regional collaboration on the project. Working together and living in close proximity allowed a rich, 30-day period team building environment where distractions from daily work obligations were minimized and learning optimized. A greater bonding occurred between zone coordinators and the TAMU-LEWS scientists with a greater appreciation of tasks and work environments for both parties. The GL-CRSP was well served by this workshop. 🍷🍷

For more information on the Livestock Early Warning System project, please contact Dr. Paul Dyke, Blackland Research Center, Texas A&M University, 808 E. Blackland Rd., Temple, Texas 76502. Tel: 254-770-6612, Fax: 254-770-6561. Email: [dyke@brcsun0.tamu.edu](mailto:dyke@brcsun0.tamu.edu)

### ***Ruminations***

Director: Montague W. Demment  
Newsletter Editor: Susan L. Johnson  
Production Asst.: Marianna Darmina

Published quarterly by the Management Entity, Global Livestock Collaborative Research Support Program, University of California, Davis, California 95616, USA.  
Telephone: (530) 752-1721, Fax: (530) 752-7523.

E-Mail: [glcrsp@ucdavis.edu](mailto:glcrsp@ucdavis.edu)  
WWW: <http://glcrsp.ucdavis.edu>

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