Test Monitoring Zones Established in East Africa

Dr. Cyprian Ebong provides national coordination of LEWS in Uganda with Mr. Steven Byenky leading the Southwestern zone and Dr. Sarah Ossiya heading the Eastern Zone. Ms. Rose Omaria is providing additional zonal coordination in the central region. Ms. Stella Bitende provides national coordination of LEWS in Tanzania with Mr. Angello Mwilawa, Dr. Nickolaus Massawe and Suleiman Kaganda providing zonal coordination in central, north and western Tanzania, respectively. TAMU graduate student, Zola Gibson, is working on the Mpala Research Centre in collaboration with Dr. Nicholas Georgiadis.

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What is LEWS Trying to Accomplish?

The goal of the LEWS project is to develop a decision support system that provides information in a timely manner to allow pastoralists to destock their animals in a proactive manner, to allow national and international EWS agencies to respond to emerging drought conditions earlier and devise sound mitigation strategies and policies that improve the livelihood of pastoralists and sustain the natural resource capacity of associated grazing lands.

To insure sustainability of the suite of computer and monitoring tools, major investments in communication infrastructures, capacity building and mitigation research will be made by LEWS in the East Africa region.
Translating Weather into Forage Conditions

The LEWS technology suite utilizes the NOAA weather satellite FTP site to acquire 8 km x 8 km maximum/minimum temperature and precipitation data. This data is delivered to the following searchable website http://cnrit.tamu.edu/rsg/rainfall/rainfall.cgi/. The automation modeling tool links the PHYGROW forage production model with the geo-referenced weather data representative of a network of monitoring households to simulate forage production under grazing. Each monitoring point is characterized in terms of dominant rangeland plant community, soil and livestock destock/restock/movement rules.

For each point, a geo-corrected weather generator is used to create 30 years of statistically robust weather data. The PHYGROW models then determines the average grazed standing crop of forage for cattle, sheep and goats for 365 daily values. Using the NOAA weather data, the model is updated every 10 days and daily forage production for cattle, sheep and goats compared to the long term average standing crop. The percent deviation and percentile ranking of the current forage conditions are computed and contrasted with NDVI data. Advisories are constructed from the resulting analysis for multiple levels of decision making.

Information Technology Linking Multiple Scales

The LEWS technology suite is designed to minimize the amount of time that specialists in developing countries have to spend on software and data maintenance and to maximize the effectiveness of their analysis. The satellite data is assembled from an array of sources (NASA, NOAA, EROS, etc) and the LEWS automation tools acquire, assemble, and initiates the analysis in a form to allow a trained analyst to interpret the output.

LEWS must deliver products to international EWS such as FEWS NET, GIEWS, regional agencies such as IGAD and ASARECA and national EWS units. The challenge is to deliver the information in a understandable manner at all levels. We must reach village leaders and individual households to influence the decision making process of pastoralists. This requires investment in innovative communication and information delivery systems.

For impact the local level, we are working with local pastoral organizations, FARM AFRICA, Mpala Research Centre, and other NGOs to determine the most appropriate information delivery system to the pastoral community.

We have invested heavily in building analytical infrastructures to insure that key institutions can adopt and maintain the technology suite.

Geo-Statistics Allow Regional Projections

Point-based biophysical responses of forage deviation, percentile and standing crop are distributed within a monitoring zone by climatic cluster. Simultaneous monitoring of NDVI vegetation greenness data is linked with the point model output using co-kriging to estimate forage conditions in regions not monitored. The methodology allows limited investment in carefully selected monitoring sites to represent larger regions. The key to the monitoring methodology is use of the Almanac Characterization Tool’s climatic surfacing data developed by Dr. John Corbett on the LEWS team.

Currently, the TAMU-LEWS group is developing automated co-kriging mapping tools to help reduce the time between observed weather and delivery of analysis to decision makers.
Linking Remote Regions with Advanced Communications and Computing Technology

The TAMU LEWS team has developed a suite of automation tools that allow establishment of a server that acquires weather data from NOAA Meteosat 7 FTP site and NDVI data from EROS’s FEWS NET FTP site and deliver that information to the ASARECA Crisis Mitigation Office and zonal coordinators.

LEWS is experimenting with World Space Foundation’s African Learning Channel to download advisories to remote regions via their Afristar communication satellite using low cost receivers and solar powered laptop computers to process the data. Experiments are underway in Southern and Northern Kenya. If the system proves effective, efforts will be made to develop decision support technology linked to the communication system that facilitates delivery of information in remote regions in a manner valued by pastoral communities. Institutionalization of the LEWS technology is the key to the success of the program. Investments in capacity building and technology design must be directed at all levels of decision making.

NIRS Fecal Scans Predict Diet Quality of Free-Ranging Livestock

Within the network of pastoral households, an additional monitoring tool is used to link the pastoralist with the land via their animals. A series of near infrared reflectance spectroscopy (NIRS) labs have been established in each of the LEWS country (Addis Ababa, Naivasha, Kampala, Dar es Salaam). The technology allows a site monitor to collect a composited fecal sample from cattle, sheep or goats. Fresh feces is transported to a regional NIRS lab and within 48 hours after arrival the diet crude protein and digestible organic matter of the animals is determined. The results are reported to the zonal analyst where they are input into the NUTBAL PRO software to predict animal performance and future changes in body condition. An automated mapping system is being designed to map regional body condition change.

Primary School Weather Station Network

Within each LEWS monitoring zone, several primary schools have been equipped with simple weather stations and linked within the monitoring network. The goal of the program is to design information and learning programs for pastoral children to gain a perspective on cause-effect relationships of emerging drought and transfer that understanding to their parents. The network reports data to the ASARECA Crisis Mitigation Office.

Once all the NIRS fecal profiling laboratories have been established in 2001, a program will be initiated to allow students to collect fecal samples and nutritional analysis of their family’s livestock assessed. The program seeks to help link the land to the pastoralist via their animals. The cause-effect relationships between drought and nutrition of livestock will be targeted as a science project for the students.
Capacity Building and Mitigation Research

One of the major emphasis areas of the LEWS program is building the necessary capacity within key research and EWS organizations. This effort has two components. The first is effective characterization of the biological systems that are represented in the models used by LEWS. The second is the use of the various models and monitoring tools assembled in the LEWS technology suite by EWS technical staff. A cadre of regional expertise has been established in East Africa to manage NIRS labs and develop critical calibration equations. Each of the zonal coordinators have been trained in the use of the biophysical models and the ACT spatial characterization tool. Technical training has also been provided to ASARECA Crisis Mitigation Office located at ILRI. A major effort is targeted toward funding key regional scientists for M.S. and Ph.D. programs.

These Ph.D. and M.S. programs are currently addressing a wide array of issues advancing our ability to monitor cattle and goat pregnancy status with fecal NIRS, understanding how bush encroachment interacts with drought affecting normal coping strategies, improving our ability to predict diets of donkey, sheep and goats, and devising ecological restoration techniques that facilitate recovery of vegetation in traditional pastoral reserve areas. One of our major efforts is currently targeting development of a marketing system which links the LEWS technologies and other risk management research within the GLCRSP at Utah State University to address facilitation of offtake during the early phases of emerging drought conditions in north-central Kenya in collaboration with the Arid Lands Resource Management Program. Similar studies are being planned for the other 3 countries where LEWS is being implemented.

To promote the institutionalization of the LEWS methodology and technology suite, capacity is being built in key EWS agencies as well as active and stable NGO's interacting with pastoral communities. Designing effective communication instruments for pastoralists is being pursued in collaboration with ILRI extension programs, NGOs, and national research organizations.

The Ranching Systems Group (RSG) headed by Dr. Jerry Stuth in the Department of Rangeland Ecology and Management at Texas A&M University is a major information technology group within the Center for Natural Resource Information Technology (CNRIT) at Texas A&M University. CNRIT is network comprised of information technology teams in natural resource management offering a wide array of expertise including rangeland modeling, animal nutrition/production modeling, crop modeling, hydrological modeling, farm and sector level economic analyses, and spatial sciences including GIS/GPS, geostatistics, spatial characterization and remote sensing. The Ranching Systems Group has been involved in international research and consulting for over 20 years in Kenya, Tanzania, Uganda, Ethiopia, Mali, Burkina Faso, Senegal, Niger, China, Mongolia, Australia, Argentina, Paraguay, Brazil, Canada and Mexico. Since 1988, RSG has been developing decision support systems to serve conservation planning on grazing lands and livestock for the USDA-Natural Resource Conservation Service in the USA. The technologies being used in the LEWS project are currently targeted for use in the Texas Livestock Early Warning System in collaboration with the NOAA NEDIS program and US Forest Service Fire Warning System.

LEWS zonal coordinators came to TAMU for a 30-d training workshop on use of the biophysical models for early warning.