# Water Monitoring for Livestock Early Warning



## Background:

In 2007, Texas A&M partnered with the United States Geological Survey (USGS) and South Dakota State University for a National Aeronautics and Space Administration (NASA) funded project to integrate the LEWS system with a near real-time water monitoring system to complement and enhance early warning for forage conditions. The information is updated daily and system products can be viewed at http://watermon.tamu.edu.

## Technology:

The NASA Earth-Sun data technologies are designed to address multiple problems in the region including drought, floods, conflicts, and land degradation. The location and hydrologic regime of important waterholes as well as forage and migration maps are characterized by using a combination of image classification, hydrologic modeling, and remote sensing techniques:

*Advanced Space borne Thermal Emission and Reflection radiometer (ASTER)*
- Identifies waterholes.

*Shuttle Radar Topographic Mission (SRTM)*
- Delineates watersheds.

*Tropical Rainfall Measuring Mission (TRMM)*
- Monitors daily water level changes and daily precipitation estimates.

*National Oceanic and Atmospheric Administration's (NOAA) Global Data Assimilation System (GDAS) data*
- Data used to extract the climatic parameters needed to calculate reference evapotranspiration (ET).

*Hydrologic Water Balance Model*
- Estimates daily waterhole depth variations.

## Result:

The water monitoring system webpage offers users the ability to monitor and download waterhole depth information since 1998. In phase I, 41 representative waterholes in the region are being monitored with the technology. The site provides the current depth variations for each waterhole on a daily basis, which would enable decision makers to provide timely guidance to pastoralists in the monitored areas.

## Future Efforts:

**Integrated Livestock Information System**

Future efforts are geared toward the integration of the above 3 project system and their technology to allow stakeholders to examine risk and evaluate potential tradeoffs associated with drought and changing climates. A GIS system platform will likely be developed to examine current and forecast conditions and to delineate hotspots, or areas that are trending toward hotspots, with regard to low forage and water. The system would also be linked to the livestock market information system data streams to allow users to examine current prices in relation to other markets and to assess risk for buying or selling animals based on current and forecast forage and water conditions. Because the system would be built upon an integrated GIS platform, it would allow the system to be scalable to add new regions or areas without having to change the design of the system.

**Climate Change Impact Tool**

The current framework for early warning and water monitoring provides an opportunity to build a climate change impact tool to provide stakeholders with the capability to conduct spatially explicit assessments of climate change impacts on livestock and forage production. Downscaled climate data, acquired from research groups examining projected climate change in East Africa, would be staged to allow participating stakeholders to examine how climate change will potentially influence forage productivity, animal numbers, and livestock herd productivity. Using the plant and animal information from the forage monitoring locations, the simulations would be used to depict how a given livestock herd would be affected over time under the climate change scenario.

The envisioned tool would have capabilities to graph and map the projected climate change information in formats that would allow pastoralists to visualize the impacts of climate change, thus allowing comparisons of projected changes to that observed in the past. We would work with planning and disaster management agencies, along with regional projects to develop guidelines for adaptive management practices that could be used to reduce risks associated with changing climate. The simulator will also allow stakeholders to examine different management options being promoted by these groups to visualize and understand the potential benefits.

# Livestock Early Warning System (LEWS)

## Background:

The Livestock Early Warning System (LEWS) project was funded by US Agency for International Development as part of the Global Livestock Collaborative Research Support Program (GL-CRSP) from 1998 to 2003. LEWS is an early warning system for monitoring nutrition and livestock health for food security of humans in East Africa. Prior to this project, pastoral communities relied on traditional knowledge or scouts to locate forage and water sources in East Africa. The goal is to disseminate forage availability information via the web: http://glews.tamu.edu/eastafrica

## Technology:

An integrated suite of technologies were developed with the capability of providing estimates of livestock forage availability, deviation from average conditions, and maps of forage conditions for a large portion of the pastoral areas in four African countries. The system uses the PHYGROW plant growth simulation model as the primary tool for simulating forage conditions. The model is driven by near real-time climate data provided by the National Oceanic and Atmospheric Administration. The model outputs are statistically coupled with satellite greenness images (Normalized Difference Vegetation Index) information to create regional maps of forage supply.

Maps showing deviation from long-term average have proven to be the most useful for stakeholders in identifying areas of drought and poor forage conditions. The LEWS system also uses a 90-day forecasting system projects forage conditions for the next 90 days as well as a projected deviation from long-term average. Simulations are conducted every 10 days and the information is made available via a web portal : http://glews.tamu.edu/eastafrica

# Livestock Market Information System (LMIS)

## Background:

Like LEWS, the Livestock Market Information System (LMIS) project in East Africa was funded by the USAID as part of the Global Livestock Collaborative Research Support Program and was initiated in 2003. A goal of the LMIS project was to develop a useful and timely market information system to make price and volume information from livestock markets in Kenya, Tanzania, and Ethiopia available to the public through cell phone messaging on a near real-time basis.

## Results:

After the end of GL-CRSP project funding in 2009, Texas A&M has been working with each of the countries to institutionalize the system. In Kenya, The Kenya Ministry of Livestock Development has adopted the system, institutionalized the system in early 2011, and currently covers 35 markets. In Tanzania, the system is currently located in the Ministry of Industry, Trade and Marketing, and provides data from 45 markets. In Ethiopia, the system is currently being administered by the Ethiopia Meat and Dairy Technology Institute within the Ministry of Agriculture. The LMIS systems have also been deployed in Mali (www.malibetail.net) and in Afghanistan.

Texas A&M is currently testing a new version of the LMIS software with the following new capabilities:

- Market volume mapping for user-defined time periods
- SMS push for daily or weekly market information
- Email push for user-defined markets
- Enhanced situation report development
- RSS feeds
- Enhanced livestock product and commodity reporting
- A Google map interface to provide spatial representation of market status (e.g., price increasing, decreasing or neutral)
- Improved graphing and query tools
- Multiple language options for SMS and web interface

**Blackland Research & Extension Center • 720 E. Blackland Rd, Temple, TX 76502 • blackland.tamu.edu**

**Center for Natural Resource Information Technology • cnrit.tamu.edu**