GLOBAL LIVESTOCK CRSP

Analysis of the November 2005- April 2006 Drought in Kenya

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Increasing frequency of drought occurrences and a decline in the capacity of traditional mechanisms to deal with this situation is increasingly becoming a serious threat to the livelihoods of a majority of people who depend on livestock. Over three million people are currently faced with starvation due to the prevailing drought in Kenya. The challenges posed by this emerging scenario demand that decision makers devise and adopt new ways of dealing with the situation. The collection, analysis, dissemination and use of early warning information are necessary for equipping agencies and communities of livestock producers with the tools to aid in timely decision-making. This brief demonstrates how the technologies developed by the Global Livestock Collaborative Research Support Program were able to effectively track the conditions that resulted to the current drought in Kenya. The analysis is based on information derived from forage conditions and also shows how this affected livestock condition and prices. It is suggested that equipping decision makers and livestock producers with early warning tools will help them make informed choices for moving and marketing livestock and identifying appropriate options to reduce the risk of asset loss when droughts occur.

Background

Drought constitutes one of the greatest threats to people's livelihoods in agricultural and grazing lands throughout the world. Many areas in the world are experiencing changing drought frequencies and temporal shifts in precipitation and temperatures. Chances of drought occurring in parts of the Greater Horn of Africa have increased from a probability of one in six years to one in three years. Repeated occurrences of drought and high variability in precipitation have reduced the ability of pastoral communities in the region to maintain their assets while lack of timely early warning information has reduced their capacity to respond when conditions are still good. Decision makers in these areas are finding that traditional coping strategies of farmers, ranchers and pastoralists are not appropriate for the changing conditions, thus requiring new innovations in characterizing, monitoring, analyzing and communicating the emergence of drought conditions in good time.

In recent years, great strides have been made in satellite–based weather monitoring systems, information and communication and modeling technologies to allow integration of spatially explicit, near real-time weather data acquisition with sophisticated automated modeling tools to predict the amounts of forage available within given locations at given times. The Livestock Early Warning System (LEWS) project of the Global Livestock Collaborative Research Support Program led by Texas A&M University developed a spatial forage-based early warning system since 1997. This is an automated modeling, Geographic Information System and communications technology package where real-time, satellite weather data is used to drive a biophysical model known as PHYGROW (Phytomass Growth Simulator) to produce daily estimates of forage conditions every 10 days with up to 90-day forecasts since 1999. The model is the foundation of the LEWS toolkit designed to monitor the impact of emerging weather events on forage supply for livestock in the pastoral regions of eastern Africa. The model uses soil parameters, plant community characteristics, livestock traditional management decision rules and weather data for a particular location to simulate daily forage available for livestock and other major herbivores. Various geo-statistical methods and GIS techniques are employed to produce surface maps of available forage using the point data generated through the automation process. Using the Auto Regressive Moving Average (ARIMA) forage forecasting technology developed by LEWS (Kaitho et al., 2003), a comprehensive view of emerging forage conditions of up to 90 days is updated every 30 days.

Emergence of the Current Drought in Kenya

Available forage and weather data shows that the LEWS model tracked the forage situation on the ground very well. The forecasts issued in September 2005 and updated

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monthly had warned of emerging forage scarcity and subsequently deteriorating animal condition. This forecast was made before the expected November-December rains and the forecast tracked very well with the realized rainfall and forage condition. The areas forecasted to have severe forage deviations (drought) were in Northeastern (Mandera, Wajir, Garissa) Southeastern (Machakos, Kitui, Makueni, Kajiado) and parts of the Coast province (Kwale, Kilifi). Most of these areas had experienced consecutive seasonal rainfall deficits culminating in the drought and lack of pasture for livestock and therefore the deficient rainfall experienced during the November-December season aggravated the drought situation. The monthly forecasts updates provided in October and December covering January and February 2006 indicated a rapid decline in forage conditions as these areas were expected to have mainly sunny and dry conditions. The Climate Outlook Forum and FEWS-NET have confirmed that the LEWS forecast was on target because it clearly indicated the forage scenario observed. The field data collected in the project monitoring sites since 2001 was highly correlated with the PHYGROW available forage simulated model outputs (R2=0.96 and SEP=161 kg/ha) (Jama et al., 2003).

Using the data from January 2001 to December 2005 on the 60-day forecasts and available forage matching the forecasts indicated that the ARIMA time series forecasting methodology provided suitable projections well within normal sampling errors. The observed R2 and SEP (kg/ha) values for the 30, 60 and 90-day forecast of grazeable standing crop were 0.97/83, 0.92/139, and 0.87/185 respectively (Figure 1). The forecasting power decreases as the time horizon is increased but still remains good even after 90 days.

Historical Forage and Drought Trends

Many parts of Kenya have been experiencing severe drought conditions for many months with likely devastating impacts to many livelihood systems including loss of large numbers of livestock and lack of food. LEWS forage and deviation maps indicate that:

- Many areas in Turkana district have been under drought conditions since August 2005.
- In Garissa district, some of the sites have consistently been under drought since June 2004.
- Areas in Wajir have experienced extensive drought since February 2005.
- In Mandera, emergence of drought started from November 2005 with the hot spot spreading from across the border with Somalia.
- In Makindu, emergence of drought started earlier than August 2004.

Graphical tracking of forage condition and 60-day forecasts is available at http://glews.tamu.edu/africa. Continued drought in these areas would have far reaching impacts if no proper intervention strategies are put in place.

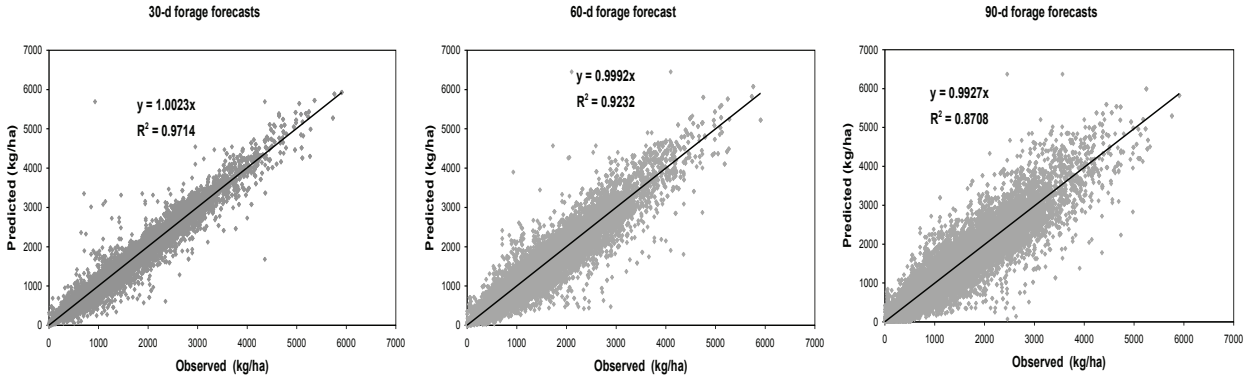
Forage Outlook

The forage outlook for the period March to May 2006 produced by GL-CRSP/ LINKS and available at the 17th Climate Outlook Forum for the GHA bulletin (http://www.icpac.net/Forecasts/GHACOF17/GHACOF17_statement.html) shows that the forage situation will remain poor and continue to decline in many parts of pastoral areas. The specific areas that will deteriorate further include southern lowlands, North Eastern and Turkana in Kenya. Forage conditions are expected to improve in South Rift Valley in Kenya. The 60-day forecasts by the LEWS team indicate no relief from these conditions for the next 2 months.

Livestock Marketing Information

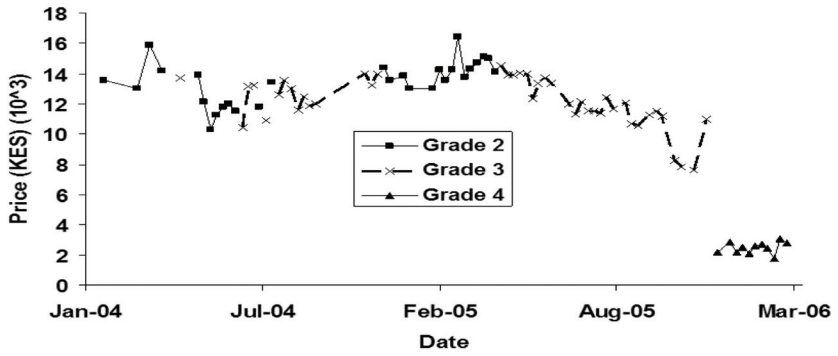
Since September 2005, cattle prices in all the primary markets have decreased significantly (LINKS, 2006). The market trend analysis by GL-CRSP/ LINKS shows a price drop in December. This could be associated with a large number of animals taken to the market on the same week after the drought signal was raised leading to a drop in price due to high supply as compared to demand. Livestock prices reflect animal grade and condition. For instance in Wajir,

Figure 1. Relationship between observed and predicted 30, 60 and 90-day forage forecasts from Jan 2001 to Dec 2005.



animal condition started deteriorating to a point where the market was dominated by grade 3 rather than grade 2 animals and prices were declining. Furthermore, there was emergence of poor grade 4 animals in the secondary markets towards the end of December (Figure 2). The analysis indicates that livestock prices are associated with animal condition which is affected by, among others, forage availability. Declining livestock prices in the markets therefore reflect deteriorating animal body condition and as the situation worsens animals start dying. Very high livestock mortalities due to shortage of forage and water have been reported in many areas while the prices of cereals particularly maize have been rising (KFSMG, 2006). Due to the weakening pastoralists' terms of trade for cereals therefore, malnutrition rates are expected to rise among the chronically food insecure populations in the pastoral areas. This scenario strengthens the case for providing timely flow of early warning information to livestock producers to equip them with choices for making better decisions to move and market livestock during both normal and distress periods so as to minimize the risk of having their livelihood assets decimated.

Figure 2. Livestock prices in Wajir market, Kenya.



Dissemination Channels for the Early Warning Information

The forage early warning information is distributed through various channels such as WorldSpace radio (via ALIN and RANET containers), internet and email and monthly situation reports. In addition, LEWS contributes to the FEWS-NET GHA Food Security Bulletin and the Climate Outlook Forum for the GHA Bulletin. With partners, efforts are under way to identify ways of improving the packaging and dissemination of the information to insure it reaches a wide range of users in easily understandable forms at the appropriate place and time. The aim is to integrate the forage-based spatial livestock early warning system into the food security analysis and early warning system throughout the pastoral and mixed farming regions of Kenya.

Conclusion

The GL-CRSP has now infused two valuable tools into the eastern Africa region which if used in a timely way by decision makers should offer substantial lead time to make rational decisions on how to respond to threats of drought. When coupled with market indicators from the newly established livestock marketing information system that spans several countries, decision makers are not only getting a local but also a regional picture of the plight of pastoral people. The challenge is to strengthen the use of the livestock early warning and marketing information systems in key organizations and broaden the coverage and dissemination among pastoral communities. Equipping agencies and communities with appropriate tools and information will help them plan for and respond to emerging drought situations. This is based on the firm belief that if the right institutions and mechanisms are put in place, most drought-associated disasters that are currently facing many communities could be mitigated, providing communities with sustainable means of meeting the demands for food and other basic necessities of life so that they can be part of the global vision of achieving the Millennium Development Goals.

Further Reading

Jama, A., M. Kingamkono, W. Mnene, J.Ndungu, A. Mwilawa, J. Sawe, S. Byenkya, E. Muthiani, E. Goromela, R. Kaitho, J. Stuth,and J. Angerer. 2003. "A Satellite-Based Technology Predicts Forage Dynamics for Pastoralists," USAID Global Livestock CRSP, Research Brief 03-03-LEWS April 2003.

Kaitho, R., J. Stuth, J. Angerer, A. Jama,W. Mnene, M. Kingamkono, J. Ndungu, A. Mwilawa, J. Sawe, S. Byenkya, E. Muthiani,and E. Goromela. 2003. "A New System to Forecast Near-Term Forage Conditions for Early Warning Systems in Pastoral Regions of East Africa." USAID Global Livestock CRSP, Research Brief 03-02-LEWS April 2003.

Kenya Food Security Meeting Group (KFSMG). 2006. "Kenya Food Security Update-March 2006." USAID FEWS NET, World Food Program/VAM, ALRMP, and Ministry of Agriculture.

Livestock Information Network and Knowledge System (LINKS), 2006. Kenya Situation Report, February 2006.

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The GL-CRSP Livestock Information Network and Knowledge System (LINKS) project developed from the GL-CRSP Livestock Early Warning System (LEWS) project which was established in 1997. The LEWS project developed and applied a suite of information communication technology to provide a regional decision-support framework for livestock early warning. The LINKS project is placing LEWS technology inside a broader livestock information and analysis system that is designed to improve livestock markets and trade, thereby enhancing the well-being of pastoralists in eastern Africa. The project was led by Dr. Jerry W. Stuth, Texas A&M University until his death in April 2006. The project is now led by Dr. Paul Dyke, Texas A&M University. Email contact: dyke@brc.tamus.edu.

The Global Livestock CRSP is comprised of multidisciplinary, collaborative projects focused on human nutrition, economic growth, environment and policy related to animal agriculture and linked by a global theme of risk in a changing environment. The program is active in East Africa, Central Asia and Latin America.

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