Journal of Biodiversity and Environmental Sciences (JBES)
ISSN: 2220-6663 (Print) 2222-3045 (Online)
Vol. 4, No. 1, p. 109-115, 2014
http://www.innspub.net

RESEARCH PAPER OPEN ACCESS

# Utilisation of weather forecast information, herd and feed resources management strategies by pastoral and agro-pastoral communities in response to drought

**Swidiq Mugerwa[1*], Stephen Byenkya[2], Emmanuel Zziwa[3]**

[1]*National Livestock Resources Research Institute, Uganda*

[2]*Bulindi Zonal Agricultural Research and Development Institute, Uganda*

[3]*Association for Strengthening Agricultural Research in Eastern and Central Africa, Uganda*

Article published on January 16, 2014

**Key words:** Drought, adaptation, pastoralists.

**Abstract**

Pastoralists' planning and response to droughts in Buliisa and Nakasongola Districts through utilization of weather forecast information, herd and feed resources management was examined. Semi-structured questionnaires were administered to 100 respondents and the responses were used to compute percentages, generate graphs and charts using XLSTAT (2013). The study revealed that 50% and 54.8% of the respondents in Buliisa and Nakasongola respectively utilized both conventional and traditional weather forecast information. However, the respondents regarded conventional weather forecasts as unreliable and often too general to be of practical use. Limited indigenous knowledge to predict weather based on traditional indicators was the main constraint to utilization of traditional weather forecasts. Despite the increased occurrence and severity of droughts, majority of respondents in Buliisa (59.7%) and Nakasongola (72.4%) did not practice any specific adaptive measure. However, the few households that executed drought adaptive interventions noted that migration of herds in search of forage and water resources was the common adaptive strategy to drought and drought-induced forage scarcity. High prevalence of diseases and crop-livestock conflicts were noted as the major constraints during herd migration. The study therefore aggitates for more farmer to farmer dissemination of indegenous knowledge to improve farmers' capactity in predicting weather based on tradiotnal indicators. The study is also suggestive that veterinary service delivery structures tailored to spatial and temporal herd movements be established to counteract the high prevalence of diseases during migrations. Further, the study calls for demarcation and protection of migratory corriodors from cultivation to mitigate livestock-crop conflicts during migrations.

***Corresponding Author:** Swidiq Mugerwa ✉ swidiqk@yahoo.com

## Introduction

In Africa, some 43% of land is estimated to fall within the drylands, where approximately 325 million people reside and these numbers are growing faster than the global average (UNSO, 2002). While not as arid as deserts, drylands are characterized by low and erratic precipitation, high temperatures and high rates of evapo-transpiration. In the East African region, the drylands account for 40-100 percent of the land cover of Djibouti, Ethiopia, Kenya, Uganda, Somalia, and Sudan. The inhabitants are close to 25 million whose livelihoods mainly depend on livestock production. The pastoral mode of production system in the rangelands makes significant contribution to gross domestic product (GDP) in many East African countries. The drylands are rich both in plant and in animal diversity. The pastoralists have adapted to harsh climatic events particularly droughts for millennia and have developed area-specific adaptive mechanisms (Adger, 2003).

Utilization of weather forecasts, feed conservation and searching for additional feed resources, execution of various herd management strategies (Rota and Sperandini, 2009) such as splitting herds and selling off excess animals have over time been recognised as practical adaptive strategies undertaken by pastoralists in preparation and/or responding to droughts. However, the increased occurrence and/or severity of drought episodes may render the existing adaptive strategies very inefficient or at least partly ineffective in mitigating the adverse effects of global climate change. This will necessitate modification of the existing adaptive strategies to make them more responsive to the contemporary dangers associated with climate change. In an a attempt to gain an insight on the efficacy of existing adaptive strategies, the study sought to establish the extent and challenges associated with utilization of weather forecast information in planning for adverse climatic events. It also aimed at describing the mechanisms and challenges faced by pastoralists when executing various herd management strategies as well as to establish the temporal variability in feed availability and the various copping strategies to feed scarcity.

## Materials and methods

A cross sectional study was conducted in Nakasongola (N1°19'N, 32°23'E) and Buliisa (02°11'N, 31° 24'E) Districts located in the Central and Mid-western regions of Uganda respectively. During the study, both qualitative and quantitative data were collected using pre-tested semi-structured questionnaires through face-to-face interviews. The questionnaires sought to establish the extent and challenges faced in utilization of weather forecast information; farmers' herd management strategies during drought, causes and magnitude of feed scarcity as well as farmers' responses to drought-induced feed shortages. The District Livestock Production Departments provided a sampling frame which contained all livestock keeping households in the study districts. After consultations with the district extension staff, fifty households were then selected from each district using the sampling frame following systematic random sampling procedures. In totality, 100 questionnaires were administered in the two districts. Focus group discussions (two per district) were also held to corroborate the information gathered in direct interviews. The information collected was used to generate tables and graphs using XLSTAT (2013).

## Results

*Utilization of weather forecast information*

Famers generally utilize weather forecast information as an adative strategy to climate chnage and variability, with 50% and 54.8% of the respondents in Buliisa and Nakasongola respectively reporting the use of both conventional and traditional weather forecast information (Table 1.). 10% and 23.8% of the respondents in Buliisa and Nakasongola respectively acknowledged use of conventional, while 40% and 21.4% of the respondents in Buliisa and Nakasongola respectively reported the use of traditonal weather forecasting

information. The respondents utilising conventional weather forecast information generally regarded it as less relaible, difficult to interprete and often not available during the periods when its needed most. Majority of the respondents (Buliisa=91%, Nakasongola=82%) regarded traditional weather forecast information as more relable than conventional weather forecast information but also noted lack of adequate skills to forecast weather based on tradional indicatros was the main constraint to utilisation of traditional weather forecast information

**Table 1.** Proportional of respondents utilizing weather prediction information in drought management.

| Category | Response | Buliisa | Nakasongola |
|---|---|---|---|
| Type of weather forecast information utilized | Conventional forecast | 10 | 23.8 |
| | Traditional forecast | 40 | 21.4 |
| | Both | 50 | 54.8 |
| Limitations with utilization of conventional weather forecast information | Less reliable | 46.1 | 48.6 |
| | Less timely | 26.9 | 19.4 |
| | Hard to understand | 27 | 32 |
| Limitations with utilization of traditional weather forecast information | Less reliable | 23 | 18 |
| | Lack of adequate forecasting skills | 77 | 82 |
| Most reliable weather forecast information | Conventional weather forecast | 8.7 | 18 |
| | Traditional Conventional | 91.3 | 82 |
| How do you receive conventional weather information | Radio | 95.5 | 100 |
| | TV | 4.5 | 0 |

Crop failure, dalayed/hurried planting were noted as the negative effects of unreliable weather forecast information to crop production in both districts while delayed migration, death of animals and migration to inappropriate grazing areas were reported as the the major effect to animal production (Fig.1.).

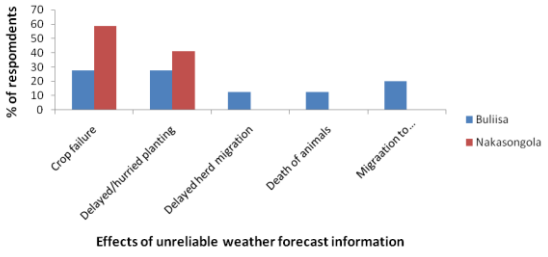


**Fig. 1.** Effects of unreliable weather information on crop and animal production.

There are several weather indicators which are traditionally used to predict weather with most of them being used in the two districts except sight of mirage which was only used in Buliisa (Table2).

**Table 2.** Traditional signs used as indicators of drought.

| Indicators | Percent using indicator | | Mean number of weeks to occurrence of drought (weeks) | Intensity of drought |
|---|---|---|---|---|
| | Buliisa | Nakasongola | | |
| Direction of wind | 68.2 | 48.2 | 4 | normal |
| Mirages | 2.3 | 0 | 4 | normal |
| Emigration of Birds | 4.5 | 22.2 | 2 | normal |
| Dry winds | 13.6 | 7.4 | 4 | severe |
| Mist/Fog | 4.5 | 7.4 | 4 | severe |
| Bright moon light | 2.3 | 3.7 | 8 | severe |
| Tree shading leaves | 2.3 | 3.7 | 4 | normal |
| Too much dew | 2.3 | 7.4 | 1 | normal |

Direction of winds was the most used indicator in Buliisa (68.2%) and Nakasongola (48.2%). Dry winds (13.6% in Buliisa and 7.4% in Nakasongola), mist/fog (4.5% in Buliisa and 7.4% in Nakasongola), and bright moon light (2.3% in Buliisa and 3.7% in Nakasongola) were the only indicators mentioned to indicate severe drought. The disperities in percentage of respondents using particular indicators signified that not all people in the community knew all the indicators and thus rely on elders who notice the signs and inform them through causal meetings and discussions. All the indicators for severe drought are sightened in a period of four to eight weeks and could therefore be effectively used in designing efficient early warning systems in pastoral communities of Uganda.

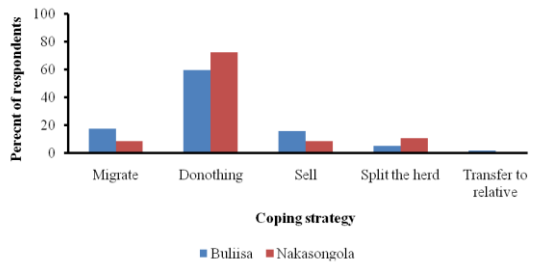


**Fig. 2.** Coping practices used by herders in response to drought.

*Herd management during drought*

Despite the regular occurrence of dry seasons and the current increase in frequences of droughts, the majority of herds in Buliisa (59.7%) and Nakasongola (72.4%) do not practice any specific measure to cope and/or adapt to droughts (Fig.2.). Migration (17.5%) is the major adaptive strategy practicesd by herders in Buliisa, followed by selling of animals (15.8%), herd spliting (5.3%) and transfering animals to relatives. In Nakasongola, herd spliting (10.6%), migration (8.5%) and selling animals (8.5%) are the common adaptive and coping practices used by herders. All farmers that migrate in response to drought practice transhumance pastoralism, returning back to their original settlement when conditions normalize. Herders in the two districts mentioned several challenges faced during herd migrtation includinng animal diseases, crop-livestock conflicts and high costs incurred during migrations (Fig.3.). In Buliisa, all migratory herders faced the problem of diseases but this was faced by only 50% of herders in Nakasongola while crop-livestock conflicts were more encountered in

Nakasongola (75%) than in Buliisa (30%).

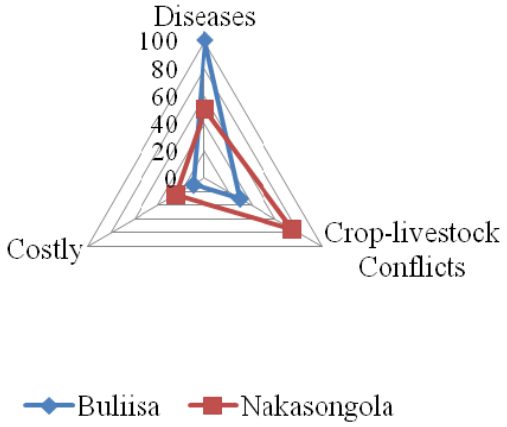


**Fig. 3.** Challenges encountered by migratory herders in response to drought.

*Feed resources management*

All farmers in Buliisa reported occurance of feed shotages during the year while 31.9% in Nakasongola reported year round availability and 68.1% reported lack of year round forage. Severe feed shortages were experienced during the months of December to March, with Buliisa being most hit than Nakasongola (Fig. 4.).

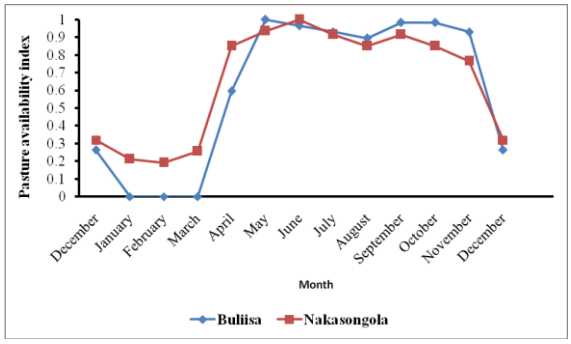


**Fig. 4.** Feed availability index in the two districts on the scale of 0 to 1 with 0 representing complete unavailability of pasture while 1 representin peak availability of adequate forage.

Feed shortages were also experienced in the months of July to August while periods of adequate feeds are April to June and September to November. Majority of respondents in Buliisa (77.2%) believed that over-stocking and/or over-grazing was the major contributor to feed shortages, followed by droughts (64.9%) and non-judicious burning (40.4%). In Nakasongola, the majority of respondents believed that the increased occurrences of droughts (55.3%), inappropriate burning regimes (34.0%) and termite activity (17.0%) were reported as the major causes of forage scarcity. Peculiar to Nakasongola was the high percentage of respondents reporting blockage of migratory routes (14.9%) and invasion of pastures by weeds among the factors contributing to feed scarcity.

Major farmers' responses to inadequate feed availability included herd migration (54%) followed by long distance grazing (37.2%) in Buliisa while long distance grazing (76.6%) and migration (12.8%) were executed in Nakasongola (Table 3.). Farmers often move their herds towards permanent water resources such as Lake Albert in Buliisa and Lake Kyoga in Nakasongola in addition to restricted national parks. Long distance grazing is either done by encroaching on national parks in Buliisa or on communal lands in Nakasongola. However, because of the uncontrolled stock movement and density to dry season grazing areas, 85% of the respondents reported that they do not get adequate amounts of pasture upon migration.

**Table 3.** Coping strategies for inadequate feed availability.

| Coping strategy | Percent of household practicing Strategy | |
|---|---|---|
| | Buliisa | Nakasongola |
| Buy | 0 | 0 |
| Feed relief | 0 | 0 |
| Migrate | 54.0 | 12.8 |
| Long distance grazing | 37.2 | 76.6 |
| Nothing | 8.8 | 10.6 |

## Discussion

*Utilization of weather forecast information*

Farmers regarded weather forecast information from the national meteorology department as unreliable, hard to interprete and often released untimely. As such, they cling on traditional forecasts that are based on indegenous knowledge which has been preserved over time and transferred from generation

to generations. The farmers depend upon close observation of nature (direction of wind, emigration of birds, mist/fog, presence of dry winds, e. t. c.) to forecast onset and severity of droughts. However, it was noted that such community weather forecasting skills seemed limited to few farmers suggesting the need for mechanisms to promote farmer-to-farmer dissemination of such important information. Farmers in Philippine (Galacgac and Balisacan, 2003) and western India (Kanani, 2002) also regard weather forecast information from meteorological departments as being too general and often not representative of predicted location-specific forecast. As such, the information is considered unreliable and is blamed for leading to crop failure, delayed/hurried planting, delayed herd migration, death of animals and movement to innapropriate grazing areas.

*Herd management during drought*

Like in other pastoral and agro-pastoral production systems, the pastoralists in Bullisa and Nkasongola Districts mainly respond to drought by moving their herds to areas with better feed and water resources. During such movements, the pastoralists face a number challenges including high prevalence of livestock diseases, crop-livestock conflicts and the high costs of migratory operations. The growing population coupled with conversion of grazing lands to cropland has significantly narrowed the migratory corridors and quite often the hungry animals are tempted to graze on the crops on either side of the corriodors. The pastoralists have to use more labour to keep their herds under control, and the potential for aggravating the conflict between cultivators and pastoralists is apparent. The challenges faced during migration may explain why majority of the households do not practice any adaptive strategy to droughts in the study area.

*Feed resources management*

Feed availability in the two districts responds to the bimodal rainfall regimes received from March to June and September to November. The critical feed scarcity levels in Buliisa may however be attributed to the high stock densities on communal lands as compared to low densities in Nakasongla. This also explains why there are more stock migrations in Buliisa in search for pastures unlike in Nakasongola. The existence of communal lands and limited cultivation of land provides for efficient movement of stock from place to place in search for pastures in Buliisa as compared to Nakasongola, which is dominated by individually owned land and with more cultivation. The fencing of individual lands and cultivation often blocks stock migration routes and hence farmers have to devise other drought coping strategies rather than migration. The effects of drought and high stock densities on forage availability are exacerbated by denudation of the sparse pasture vegetation by termites. Termites can consume up to 70% of the available pasture biomass, contributing to creation and/or expansion of bare surfaces and hence feed scarcity (Mugerwa *et al.*, 2011a, b).

**Conclusion**

Farmers utilize both conventional and traditional weather forecast infromation in prepapring for adverse climatic events but largely regard conventional weather forecasts as unrelaibale, hard to understand and too general to be be of practical use. As such, farmers are hugely dependent on traditonal weather forecasts but many of them lack sufficient indegenous skills to predict weather based on tradional indicators. This justifies the desire for more farmer-to-farmer dissemination of such knowledge. Also, efforts should be made to ensure timely delivery of conventional weather forecast information to farmers in addition to packaging the information in a way that is easilly understood b the end users particularly the farmers. In an attempt to mitigate the adverse effects on droughts, farmers move with their herds in search of grazing resources but face a number of challenges such as livestock diseases and livestock-crop conflicts. This calls for establishment of dynamic veterinary service delivery

systems that are tailored to the spatial and temporal to be demarcated and protected from cultivation to mitigate livestock-crop conflicts during herd migrations. Otherthan long distance grazing and herd migration, the pastoralists need to embrace other forage management practices such as feed conservation and utilization of crop residues to counteract feed scarcity.

**Acknowledgement**

The study was funded by the Association for strengthening Agricultural Research in Eastern and Central Africa.

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