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Drought coping strategies at Lonhlupheko community, a semi-arid rural area in Swaziland

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Climate change predictions reflect that temperatures in Swaziland will increase by 2.5°C and annual rainfall could decrease by 100 mm by 2050. Drought frequency and intensity is likely to increase in future and its occurrence could not be divorced from climate change. A descriptive research using questionnaire survey procedures and personal interviews was designed to determine drought coping strategies at Lonhlupheko, a semi-arid area in Swaziland. The target population was 150 households with a sample size of 108 households. The data collected was both qualitative and quantitative in nature. Quantitative data were presented as percentages following analysis by Statistical Package for Social Sciences computer software. Results reflected the drought coping strategies practiced by households as vegetables marketing and selling (19.4%), labour for food and money (5.6%), brewing and selling traditional brew (9.3%). External and institutional support obtained by households included food rations and farming inputs from non governmental organizations (32.4%), free primary education and feeding schemes (8.3%). Adaptation measures proposed by households included provision of irrigation water (56.5%), construction of dams and structures for rainwater harvesting (23.1%), agricultural extension services revival (13.0%), access to loans for small and medium enterprises (5.5%) and drought tolerant crops promotion (1.9%).

Key words: Adaptation, coping, domestic water, drought mitigation, livelihood. strategies, semi-arid.

INTRODUCTION

Drought is considered one of the most severe and costly natural hazards, and it is the most important severe factor affecting world food security (Tallaksen, 2012). The most severe human consequences of drought are often found in arid and or semi-arid regions such as the Lowveld of Swaziland, where Lonhluphelo is located. This is evident where water availability is already low under normal conditions, and demand is close to, or exceeds natural availability, and society lacks the capacity to mitigate or adapt to drought. Drought is a direct effect of climate change (Kumwenda, 2012). Climate change has caused extreme weather events such as frequent droughts, floods, heat and cold waves (Mwase et al., 2012). Farmers and communities lack contextualized information on adaptation in order to cope with the effects of climate change.

Swaziland is a small country in southern Africa, covering an area of 17,364 km^2. It has a population of

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about 1,120,000. About 77% of the population lives in the rural areas, with 23% in urban areas. A large proportion of the rural population practice subsistence farming (Government of Swaziland, 2007). According to Manyatsi and Mwendera (2007), about 69% of the population lives below the poverty line of US$1 per day.

Maize dominates the fields of small holder farmers in Swaziland. Drought tolerant crops such as cassava and sorghum are infrequently grown. The country, which once was self-sufficient in food production and exported surpluses regionally, now imports 60% of its food requirements even in non-drought years. The total cereal requirement for the 2009/2010 season was 166,000 tons, while the local production was 82,000 tons (Shongwe, 2010). The government of Swaziland has encouraged sugarcane production on irrigated land in order to improve its foreign exchange earnings through exports of sugar-based products. Meanwhile, the production of maize remains mostly on non-irrigated land. Livestock are an important component of the agricultural industry in Swaziland, as about 60% of the total area is used for livestock grazing.

Swaziland is prone to climatic variability, and it manifests itself in a number of hydrological disasters including change in rainfall regime as well as extreme weather conditions. The most severe droughts in the country occurred in 1983, 1992, 2001, 2007 and 2008 (Manyatsi et al., 2010). It was reported that over 500 people lost their lives due to the drought of 1983. In 1992, about 90 000 cattle died in the country due to drought. The production of maize dropped by 70% in 2000 to 2005 due to the large arable land that was not cultivated due to delayed rains and a shortage of seeds and other farming inputs (IRIN, 2007).

Adaptation involves longer-term shifts in livelihood strategies to respond to change in the environment, while coping on the other hand involves temporary adjustment to respond to change or a short-term modification of livelihood activities in the face of a shock or stress (Mogotsi et al., 2011). The range of drought coping options available to a given household depends on the resources available to them. The coping strategies to drought may include selling of assets for food, reduced meals, limiting food portions, skipping entire meals, adults eating less, labour for food, consuming more than usual amounts of wild food, credit and reliance on relief support (Pandey and Bhandari, 2009; Tideman and Khatana, 2004).

The adaptation measures in the agriculture and food security sector in developing countries may include dam construction for irrigation, introduction of new crops, changes in planting and harvesting times, and educational and outreach programs on soil and water management (United Nations Framework Convention on Climate Change (UNFCCC), 2011).

The future of the global area equipped for irrigation could change putting more pressure on the water resources, though bringing the much needed relief against drought in arid and semi-arid regions of the world. In this regard, work by

Valipour (2014a) revealed that the changes of area equipped for irrigation in the world are 12.1 to 70.0% and 29.0 to 99.9% from 2011 to 2035 and 2060, respectively. Work by Valipour (2014b) also concluded that the trend of permanent crops per cultivated area (with the exception of Northern America), human development index, irrigation water requirement, percentage of total cultivated area drained was increasing in Americas.

The capacity to cope and adapt to new environments including those brought about by climate change embodies community survival and by extension sustainability. Failure on the other hand could bring untold human suffering with costly interventions if addressed later than on the onset, hence this study.

Objective

The objective of the study was to determine the drought coping strategies employed by households at Lonhlupheko, a semi-arid rural area in Swaziland.

METHODOLOGY

Study area and research design

Lonhlupheko is located 15 km west of Siteki in the Lowveld region of Swaziland (Figure 1). The community has about 150 households with a population of approximately 1290 people. The area has a good road network making it easily accessible to all the major towns and cities.

Lonhlupheko is a semi-arid area that was heavily affected by the drought of 2006/2007. It is a small rural area with no formal source of employment. Community facilities include a primary school, a high school, public clinic and three grocery shops. The natural dominant vegetation type is a combination of mixed savanna and Acacia savanna. However, there is some evidence of deforestation and vegetation degradation, as there are very few trees and bush in the communal land, compared to privately owned land that is fenced and well managed, adjacent to the study area. There is a pipe transporting water from a reservoir 15 km north-west of Lonhlupheko to Siteki which passes through.

The study was descriptive in nature. It utilized schedule questionnaire survey procedures and personal interviews for collecting primary data, while secondary data was collected through desk search.

Sampling procedure and data analysis

The target population was the 150 households obtained from a household list provided by the Chiefdom headman for Lonhlupheko. The sample size was 108 households determined from the sampling tables developed by Krejcie and Morgan (1970). These households were randomly selected from the list provided. The data collected was both qualitative and quantitative in nature. The quantitative data set were presented as percentages following analysis by Statistical Package for Social Sciences (SPSS) computer software. Qualitative data was described and summarized.

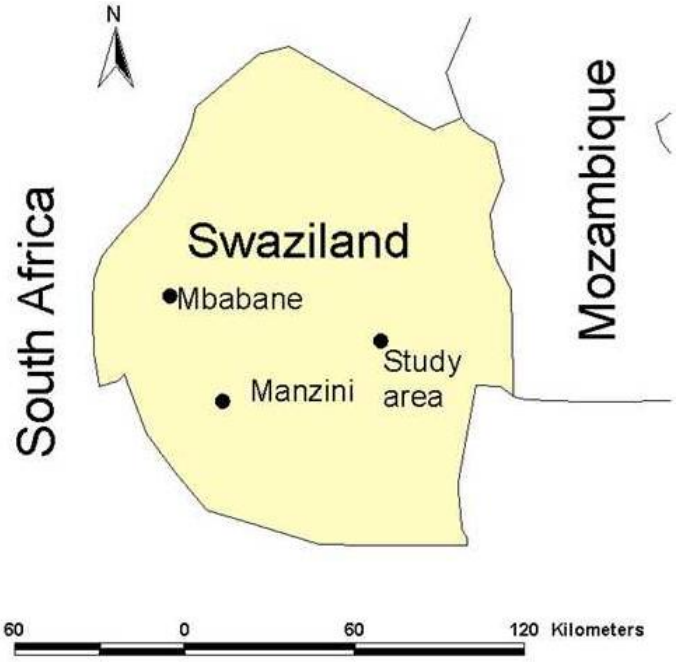

Figure 1. Map showing the location of Swaziland, major towns and the study area.

Table 1. Sources of domestic water used by households (N = 108).

Water source	N	%
Rooftop rainwater harvesting	49	45.4
Communal borehole	36	33.3
Communal tap	20	18.5
Dam	03	02.8
Total	**108**	**100**

RESULTS AND DISCUSSION

Water sources

The households identified rooftop rainwater harvesting, communal boreholes, communal taps and dams as their sources of water (Table 1). About 33% of the households used boreholes as their main source of water. The boreholes were drilled by the Ministry of Natural Resources and Energy to provide domestic water.

Most (45.4%) of the households used rooftop rainwater harvesting techniques for the collection of rainwater through gutters and downpipes from roof catchments to storage devices that ranged from 200 L containers to 10000 L water tanks. The rainwater was used to supplement water obtained from other water sources. The proportion of households practicing rooftop rainwater harvesting were higher (45.4%) than the national average of 1.3% (WHO and UNICEF, 2010), and the 8% reported by Singwane and Kunene (2010) for a community in the same ecological zone as the study area.

Communal borehole and communal tap were utilized by 33.3% (36) and 18.5% (20) households, respectively. The water from communal boreholes was abstracted by the use of hand pumps or electric pumps. Each household that accessed water from boreholes that used electric pumps paid about US$5 per month to cover the costs of electricity. The communal taps and stand pipes were installed by the Swaziland Water Services Corporation, a public enterprise that has the responsibility of supplying domestic water to urban areas and some designated rural areas (Swaziland Water Services Corporation, 2010). This water was potable as it was treated. The remaining 2.8% (3) households used dams as sources of domestic water. The water from the dam was not potable as it was not treated and thus likely to be contaminated. It is worth noting that the study area had no river or stream.

Table 2 reflected that a few (9.3%) households had running water inside their houses, while 28% had standpipes within their yards. Twenty-one (19.4%) of the households had to travel for over 200 m to collect their domestic water, with eight (7.4%) having to travel for over a kilometer to collect water from communal boreholes and dams.

Drought coping strategies utilized by households

The drought coping strategies employed at household level included marketing and selling vegetables, brewing and selling traditional brew, providing labour for food and money, dressmaking, selling second hand clothes, carpentry, collecting and selling thatching grass, cutting and selling of building timber, and other strategies (Table 3).

More than half (52.8%) of the households studied used coping strategies besides the ones specified. Marketing and selling of vegetables was the mostly (19.4%) employed drought coping strategy. Groceries such as sweets and biscuits were purchased in bulk from shops in town, and sold to the local community in small quantities, at higher prices. Vegetables were also bought in bulk and sold in small quantities at higher prices to make profit, a coping strategy reported by 19.4% households. Ten (9.3%) households indicated that they brewed and sold traditional brew to cope with the effects of drought. The sale of traditional brew without a permit is however illegal in Swaziland.

The female members of the households played a major role in drought coping strategies as they were involved in the majority of the strategies. Several livelihood strategies that were reported in other parts of Swaziland were not practiced in the study area, probably because the area lacked the natural resources to do so. These strategies included collection and sale of firewood, collection and sale of wild fruits, and traditional medicinal plants, and weaving handicraft from traditional plants (Manyatsi and Hlophe, 2010).

Table 2. Distance travelled to collect water for domestic use (N = 108).

Distance to water source	N	%
Inside the house	10	9.3
Within the homestead yard	30	27.8
Outside yard, less than 50 m	03	2.8
50 m - 99 m	08	7.4
100 - 199 m	11	10.2
200 - 499 m	21	19.4
500 - 1000 m	17	15.7
More than 1000 m	08	7.4
Total	**108**	**100**

Table 3. Drought coping strategies employed at household level (N=108).

Adaptation strategy	N	%
Marketing and selling vegetables	21	19.4
Brewing and selling traditional brew	10	9.3
Providing labour for food and money	06	5.6
Dressmaking	04	3.7
Selling second hand clothes	04	3.7
Carpentry	02	1.9
Collecting and selling thatching grass	02	1.9
Cutting and selling of building timber	02	1.9
Other (Strategies besides the ones above)	57	52.8
Total	**108**	**100**

Table 4. External and institutional support received to cope with drought (N = 108).

External and institutional support	N	%
Receiving food rations and farming inputs from NGOs	35	32.4
Benefiting from feeding schemes	21	19.4
Receiving crop seeds and fertilizer	15	13.9
Benefit from government paying school fees for OVC	13	12.0
Benefit from free primary education	09	8.3
Benefit from forming cooperatives	05	4.6
Benefit from government subsidized tractor service	04	3.7
Benefit from water delivered by the DMA	04	3.7
Benefit from government veterinary service	02	1.9
Total	**108**	**100**

OVC – Orphaned and vulnerable children; **DMA –** Disaster Management Agency.

External and institutional support to cope with drought

Table 4 shows the external and institutional support received by households to cope with drought. The majority of the households (32.4%) received food rations from non governmental organizations during drought years. The food rations consisted of maize, beans and cooking oil. The Non Governmental Organizations that distributed them were World Vision International and Swaziland Red Cross. They were made available through funds from the World Food Programme and the government of Swaziland. Fifteen (13.9%) of the household received seeds and fertilizer. The seeds supplied were those for sorghum, maize and beans to plant about half a hectare of land. Another 19.4% households benefited from school feeding schemes. Food in the form of soup, beans, and porridge was provided to school going children in order to improve their nutritional status. The elderly people (60 years and above) received monthly social grants of E200 (about US$ 25). They used the grants to purchase food and other household requirements.

The government of Swaziland paid fees in public schools for orphaned and vulnerable children, and 12.0% of the households benefited from that. The scheme has been operational since January 2007. Prior to that, guardians of orphaned and vulnerable children who did not have any sources of income had to sell their livestock, food and other assets in order to pay school fees. Free primary education in public schools was introduced in 2010, and nine (8.3%) households benefited from it. Currently government pays for children in years one to three under the free primary education program. In 2015 it will be rolled over to year seven, which is the last year for primary education. The government also operated a subsidized tractor hire scheme that ploughed for farmers in communal areas at subsidized cost. Four (3.7%) households were reported to have benefited from this service. The service charged for a commercial tractor is E200 (US$25) per hour, while the subsidized government tractor cost was E120 (US$15) per hour.

The Disaster Management Agency (DMA) under the Deputy Prime Minister's Office provided relief assistance to disaster victims, including those affected by drought. Four (3.7%) of the households studied stated that they benefited from potable water that was distributed by the agency during the drought of 2007/2008. The water was distributed by mobile water tankers to the affected communities.

The Ministry of Agriculture provided a free veterinary service to the rural community. The Veterinary Assistants advised the community on livestock production and health. They also gave advice on management of livestock and grazing areas. Two (1.9%) households reportedly benefited from the services provided by the Veterinary Assistants. Communities formed cooperatives through which they pooled financial resources and purchased farm inputs in bulk at reduced costs. Members of the cooperatives were also able to get soft loans from the cooperatives when they needed some finance. Five (4.6%) households indicated that they benefited from the

Table 5. Drought adaptation strategies proposed by households (N = 108).

Proposed adaptation strategy	N	%
Provision of water for irrigation	61	56.5
Construction of dams and structures for rainwater harvesting	25	23.1
Revival of agricultural extension services	14	13.0
Access to loans for small and medium enterprises	06	5.5
Promotion of drought tolerant crops	02	1.9
Total	**108**	**100**

cooperatives.

Drought adaptation measures proposed by households

The households proposed several drought adaptation measures that they believed would lead to sustainable development in the area, and improve their capacity to withstand the effects of drought. These included the provision of water for irrigation (56.5%), construction of dams and other structures to harvest and store rainwater (23.1%), revival of agricultural extension services (13.0%), access to loans for small and medium enterprises (5.5%), and promotion of drought tolerant crops (Table 5).

The terrain of the study area is flat and the soils are mostly suitable for irrigated agriculture (Murdoch, 1968). However, there was no source of surface water within the study area. The provision of water for large scale irrigation may not be technically and financially feasible, as it would require transfer of water from rivers and dams that are far away. Rainwater harvesting is not well developed in Swaziland and there is a potential to do so in the study area. The harvested water could be used to irrigate household or community vegetable gardens that could be a source of income.

The Ministry of Agriculture has an extension service that is responsible for giving advice to farmers on crop husbandry and the crops to grow under different climatic and environmental conditions. However, the service has not been functioning properly for over ten years due to a number of factors that include shortage of extension officers and lack of transport for the officers. Commercial banks and other financial institutions were reluctant to give credit to farmers and other rural dwellers because they lack collateral security. Six (5.5%) households indicated that the government should create a special fund that could avail loans to them for small developmental projects. Planting material for drought tolerant crops such as cassava, sorghum and sweet potatoes was not readily available in many parts of the country where they are required. One respondent suggested that the Ministry of Agriculture should ensure that the planting material is made available.

Conclusions

The drought coping strategies were identified by the 108 households studied as marketing and selling vegetables (19.4%), brewing and selling traditional brew (9.3%), providing labour for food and money (5.6%), dressmaking (3.7%), selling second hand clothes (3.7%), carpentry (1.9%), collecting and selling thatching grass (1.9%), cutting and selling of building timber (1.9%), and other strategies besides the ones above (52.8%).

The drought adaptation measures proposed by households included provision of water for irrigation (56.5%), construction of dams and other structures to harvest and store rainwater (23.1%), revival of agricultural extension services (13.0%), access to loans for small and medium enterprises (5.5%), and promotion of drought tolerant crops (1.9%).

The external and institutional support that were received to cope with drought were identified by the households as; receiving food rations (32.4%), benefiting from feeding schemes (19.4%), receiving crop seeds and fertilizer (13.9%), benefit from government paying school fees for OVC (12.0%), benefit from free primary education (8.3%), benefit from forming cooperatives (4.6%), benefit from government subsidized tractor service (3.7%), benefit from water delivered by the Disaster Management Agency (3.7), and benefit from government veterinary service (1.9%).

RECOMMENDATIONS

According to climate change predictions, temperatures in Swaziland will increase by 2.5oC and annual rainfall will decrease by about 100 mm by the year 2050. The frequency of drought and its intensity is likely to increase in the future. The occurrence of drought cannot be divorced from the effects of climate change. However, the country does not have a climate change policy, and it needs to develop one. The government may request for assistance in the form of funds and experts from international organizations such as UNDP (United Nations Development Programme) and UNFCCC. The National Meteorological Services department should produce simplified versions of seasonal weather forecast reports in order to benefit farmers.

The agricultural extension services need to be revitalized so that the officers could advise farmers on crop and livestock production. The officers should be sensitized and trained on subjects of climate change and drought, as well as interpretation of seasonal weather reports. The government should consider up-scaling the construction of small dams for rainwater harvesting in the semi-arid region of the country. The communities could use water from the small dams to produce crops and vegetables in order to improve their livelihoods. Maize is currently the staple food in Swaziland. Climate variability and drought has made the production of maize in the

semi-arid region not viable. Local people may have to change their eating habits and preferences, and consume drought tolerant crops such as cassava as a source of starch instead of maize. By extension, farmers should be encouraged to grow drought tolerant crops that could withstand the expected high temperatures. This should be complemented by crop breeding activities to avail the drought tolerant seed cultivars, an initiative that is lacking in the country as evident by the seed importations from South Africa, Zambia and Zimbabwe.

Conflict of Interest

The authors have not declared any conflict of interests.

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