

**VULNERABILITY TO DROUGHT, ADAPTATION AND COPING STRATEGIES
AMONG AGRO-PASTORAL COMMUNITIES IN BOTSWANA**

KABO MOGOTSI

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF SCIENCE IN RANGE MANAGEMENT

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DEPARTMENT OF LAND RESOURCE MANAGEMENT AND AGRICULTURAL TECHNOLOGY
FACULTY OF AGRICULTURE
COLLEGE OF AGRICULTURE AND VETERINARY SCIENCES
UNIVERSITY OF NAIROBI

SEPTEMBER, 2010

ABSTRACT

Botswana has experienced droughts in the past, continues to do so and will likely be faced with even more frequent and intense dry extremes in future. In a semi-arid country whose two thirds are covered by infertile Kalahari sands and heavily dependent on rain-fed agriculture, this scenario does not bode well for the rural population with limited livelihood options. This study therefore set out to examine the vulnerability of arid and semi-arid agro-pastoral communities in Botswana to droughts and their strategies to cope and adapt against such shocks. A survey of agro-pastoral communities in Kgalagadi North and Bobonong Sub-districts, coupled with soil analyses was carried out during the 2009/10 season. The quadrat and transect techniques were used for collecting data on vegetation parameters.

The soils in Kgalagadi North were significantly lower ($p < 0.05$) in P, CEC, OC and Mg than Bobonong soils-indicating lower fertility. Herbaceous plant cover in Kgalagadi North was higher ($p < 0.05$) than in Bobonong. The important grass species with regard to livestock were *Eragrostis* spp., *Digitaria* spp., *Urochloa* spp. and *Stipagrostis uniplumis*. The total densities for woody species in Bobonong and Kgalagadi North study sites averaged 790 and 345 plants per hectare respectively, which was significantly different ($p < 0.05$). The main woody species in Bobonong were *Grewia* species (28.89%), *Colophospermum mopane* (22.78%), *Acacia tortilis* (13.33%), *Combretum apiculatum* (7.78%), *Dichrostachys cineria* (7.22%) and *Commiphora* species (5.56%). In Kgalagadi North study site, *Grewia* species (37.22%, especially *G. flava*), *Acacia mellifera* (19.44%), *Terminalia sericea* (10.56%), *Acacia erioloba* (10.00%), *Acacia luederitzii* (8.33%) and *Boscia albitrunca* (7.22%) dominated.

Drought affected agro-pastoralists in different ways. In Bobonong Sub-district, some of the high ranking effects included livestock deaths (40%), reduced crop yields (38%), low pasture production (25%) and increased distances travelled by livestock to water points (12%). The same negative effects were advanced by farmers in Kgalagadi-with 34% and 25% mentioning increased livestock mortalities and low pasture quality and quantity, respectively. Low crop production (21%) and long distances trekking livestock to water points (12%) were also singled out.

To cope and adapt to droughts, 15% of the households in Bobonong area enrolled in the government's Labour Intensive Public Works Programme, while 13% harvested larvae of *Imbrasia belina* moth (locally known as *phane*) for consumption and/or sale. Another 11% sought alternative sources of income during droughts. Other strategies included storage of crop harvests from previous seasons (8%), supplementary feeding of livestock (8%), planting of drought tolerant crops (7%) and moving stock to better pastures

within the communal area (6%). In contrast, Kgalagadi North farmers supplemented their livestock (22%), provided water for livestock (17%) and sold their animals (17%) to cope with droughts. Other strategies included moving livestock to better pastures (13%), joining the government's Labor Intensive Public Works Programme (7%) while even less tried seeking an alternative source of income outside agriculture (6%). So no one coping or adaptation strategy totally dominated in either study area. This 'fluidity' and flexibility is key to managing the harsh and unpredictable climate that the farmers operate under.

But despite their efforts to cope and adapt, farmers still experienced some constraints in fully ameliorating the adverse impacts of droughts. In Bobonong area for example, the top-ranked constraints were persistence of droughts, lack of diversified sources of income, limited alternative options and wildlife (especially elephants) damaging crops. In the Kgalagadi North Sub-district, constraints included lack of water or its poor quality (high salinity), followed closely by lack of diversified sources of income, persistence of drought and lastly the land tenure system currently in place. These constraints may act solely or in combination to leave the households vulnerable to drought.

Vulnerability of households to drought varied between the two Sub-districts. In Bobonong, the majority of households (68%) were highly vulnerable compared to only 16% in Kgalagadi. A number of key determinants of vulnerability were identified. In Bobonong Sub-district, vulnerability to drought was significantly ($p < 0.05$) higher among female-headed households, households with less arable land, less crop yield and among those planting less diversity of drought-tolerant crop varieties. In Kgalagadi North the size of arable land available for farming per household and the actions taken by households to buffer upcoming droughts had a significant ($p < 0.05$) and positive relationship to household vulnerability to drought.

In conclusion, subsistence agro-pastoralists in semi-arid Botswana are affected negatively by droughts, and employ a myriad of coping and adaptation strategies in response. This wealth of indigenous knowledge can be strengthened to increase resilience households to lurking climatic shocks like drought.