

Research Application Summary

Vulnerability to drought, adaptation and coping strategies among agro-pastoral communities in Botswana

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Abstract

With the increased threat of climate change effects on the African continent, this study was carried out to document the coping mechanisms against the rampant droughts by the agro-pastoral communities in Botswana. The study was carried out in Kgalagadi North and Bobonong. Effects of drought in these areas included livestock death, reduced crop yields, low pasture production and increased distances to water livestock. Coping measures included enrolling into government's labour intensive Public Works Programme, harvesting larvae of *Imbrasia belina* with food or turning to other sources of income, and storage of crops during good harvests. Other means were planting drought resistant crops, supplemental livestock feeding, transferring livestock to better areas, and selling off animals. These methods however did not ameliorate farmers' problems. There is therefore need to have more holistic research efforts to tackle the effects of drought in Botswana and elsewhere in Africa.

Key words: Climate change, desert, *Imbrasia belina*, livestock, pastoralism

Résumé

Avec la menace accrue d'effets du changement climatique sur le continent africain, cette étude a été réalisée afin de documenter les mécanismes d'adaptation contre la sécheresse rampante que vivent les communautés agro-pastorales au Botswana. L'étude a été réalisée dans le Nord Kgalagadi Bobonong. Les effets de la sécheresse dans ces domaines incluent la mort du bétail, la réduction des rendements des cultures, la faible production de pâturage et l'augmentation des distances pour abreuver le bétail. Les mesures d'adaptation comprennent l'inscription dans le travail intensif du programme du gouvernement dans les travaux publics, la récolte des larves de *Imbrasia belina* avec de la nourriture ou se tourner vers d'autres sources de revenu, et le stockage des cultures au cours de bonnes récoltes. D'autres moyens ont été la semence des cultures résistant à la sécheresse, l'alimentation supplémentaire

du bétail, le transfert du bétail dans les meilleures zones, et en vendant des animaux. Ces méthodes n'ont toutefois réduit les problèmes des agriculteurs. Il y a donc besoin de fournir des efforts de recherche plus globale de lutte contre les effets de la sécheresse au Botswana et ailleurs en Afrique.

Mots clés: Changement climatique, le désert, *Imbrasia belina*, l'élevage, le pastoralisme

Background

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. But how have agro-pastoral communities coped/adapted and even thrived in the past despite devastating droughts? What are some of the main determinants of household vulnerability to drought? Only after addressing this knowledge gap can communities' resilience to current and future climatic shocks be enhanced. 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.

Literature Summary

Future climate predictions (IPCC, 2001) indicate increased frequency and severity of droughts. With the majority of rural communities in Africa dependent on rain-fed subsistence agriculture, there is increased likelihood of disruption to their production systems. Some of the effects of drought in Botswana for example, include crop failure/low yields and reduced productivity of livestock pastures. These resultant production shortfalls immediately render households food insecure. Vulnerability varies among households and even communities depending on a number of factors such as poverty (Dube and Pickup, 2001) and experience with previous droughts. The poor natural resource base and aridity of most parts of Botswana are also cited as reasons for poverty and thus vulnerability (GoB, 2008). Some of these factors, according to Adger (2003) can determine the extent to which communities can successfully adapt or fail to adapt to climate-related risks. So, under which circumstances are agro-pastoralists affected by moisture deficits in drought-prone Botswana and how do they cope?

Study Description

The study was conducted in two areas of Botswana during the 2009/10 season. Kgalagadi North is part of Kgalagadi (Kalahari)

desert ecosystem, the driest district in western Botswana. Rainfall follows a uni-modal pattern and is generally highly variable and erratic. The soils of the area are arenosols. The vegetation type is southern Kalahari bush savanna. The other study site was in the Bobonong region in the wetter and more fertile eastern region. The main soil type in this region is Eutric Regosols and in some areas petric calcisols/chromic luvisols. The vegetation consists of *Colophospermum mopane*/*Combretum apiculatum* tree savanna.

In each study site, top soil samples (0-7.5cm) were collected in a representative grazing area. The same transects were used to collect data on vegetation parameters (frequency, density and cover). Standard questionnaires were administered to randomly chosen households from a representative sample of the respective communities. Data were analysed using SPSS. Where significant differences existed ($p < 0.05$), Tukey's HSD was used for means separation. Vulnerability to drought was modelled using the Ordinary Least Squares (OLS) regression.

Research Application

The soils in Kgalagadi North were significantly lower ($p < 0.05$) in P, CEC, OC and Mg than Bobonong soils. The total densities of 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 *Colophospermum mopane* (22.78%), *Grewia* species (28.89%), *Acacia* species (18.33%, especially *A. tortilis*), *Dichrostachys cineria* (7.22%), *Combretum apiculatum* (7.78%) 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% mentioning increased livestock mortalities and 25% mentioning low pasture quality and quantity as another adverse effect of drought. 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 harvesting of larvae of *Imbrasia belina* moth (locally known as *phane*) for consumption and sale came in a close second at 13%. Another 11% sought alternative sources of income during droughts. Other strategies included storage of crop harvests from good 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 livestock during droughts (22%), provided water for their livestock (17%) and sold their animals (17%). Other strategies included moving livestock to better pastures (13%), joining the government's Labour 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. This 'fluidity' and flexibility is key to managing the harsh and unpredictable climate that 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 the negative condition (drought) and lastly the land tenure system currently in place. These constraints may act solely or in combination to leave the households likely to be vulnerable to drought.

There were more households in Bobonong Sub-district experiencing high vulnerability to droughts than in Kgalagadi North Sub-district. Vulnerability was influenced by a number of variables, among which were; gender of the household head, size of arable land under cultivation, the number of drought-tolerant crops used as well as the overall yield of such crops. Other factors included preparedness of households to deal with upcoming droughts and lastly sale of part of the livestock owned by households.

Recommendation

- Rural agro-pastoral communities are not entirely 'helpless' during droughts-the majority employ diverse strategies to

cope and adapt. This accumulated experience of indigenous knowledge, which has been refined for decades, should be explored and strengthened where necessary to enhance resilience to future climatic shocks.

- There are differences between the two Sub-districts in terms of the main determinants of household vulnerability to drought. As such, 'blanket' aid programmes which might be appropriate in one Sub-district may not necessarily reduce households' vulnerability to drought in another area and might instead, reinforce the negative effects of drought.
- Vulnerability of rural agro-pastoralists is not solely caused by climate variability and droughts, but other underlying stressors like poverty, under development, health and unemployment play a role. Thus a more holistic research effort is needed to understand and tackle the multifaceted causes of vulnerability in Botswana.

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