

Conceptualisation and measurement challenges in modelling pastoralists' risk and vulnerability instigated by droughts in the group ranches of Kenya

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Abstract

This on-going study is assessing and modeling vulnerability and risks faced by pastoral communities in the dry areas of Lakipia in Kenya. Preliminary results from participatory rural appraisal indicate that poverty is widespread and the area suffers from frequent drought, water shortage, shortage of pasture, livestock diseases and predation and animal human conflicts. More in-depth analysis and modeling are still to be done.

Key words: Climate change and vulnerability, drylands, Kenya, Lakipia, pastoralists

Résumé

Cette étude en cours est d'évaluer la vulnérabilité, la modélisation et les risques rencontrés par les communautés pastorales dans les régions sèches de Lakipia au Kenya. Les résultats préliminaires de l'évaluation rurale participative indiquent que la pauvreté est généralisée et la région souffre de sécheresses fréquentes, la pénurie d'eau, la pénurie de pâturages, les maladies du bétail et la prédation des animaux et les conflits humains. Une analyse plus approfondie et la modélisation sont encore à faire.

Mots clés: Changement climatique et la vulnérabilité, les terres arides du Kenya, Lakipia, les pasteurs

Background

Pastoral livelihoods have increasingly become more vulnerable due to recurrent shocks of drought, resource conflicts and livestock epidemic within the drylands (Birch and Grahn, 2000; McPeak and Barret, 2001). Within the eastern Africa region, a higher percentage of pastoralists live below the poverty line compared with other population groups. Their livelihoods depend on livestock and livestock products, and on the value of indigenous systems of production and management that are climate based. Possible key factors heightening poverty include ineffective representation, misunderstanding about and discrimination against pastoralists as reflected in inappropriate policies, development approaches and limited media reporting. Others include reduced access to health, education and

veterinary services, inappropriate and inadequate development of livestock and human water supplies, and lack of basic infrastructure including poor communication in pastoral areas. Increased incidences of drought and reduced capacity of pastoralists to cope with its effects, widespread conflict in pastoral areas and global policies negate pastoral productivity. These in turn aggravate poverty. At the macro level, growing human populations, declining livestock population, increased climate variability (and ultimately change), increase vulnerability to livelihood shocks. Without significant intervention asset losses are likely to grow in future years and livelihoods will be further eroded leading to rising destitution.

To alleviate poverty, there is need to conceptualize and quantitatively measure pastoralist vulnerability. The challenge is how to conceptualize and build appropriate models for analyzing and predicting pastoralist vulnerability that incorporate causal interactions. The identification and availability of relevant datasets based on suitable variables and indicators that adequately identify pastoralists risks and vulnerability is also challenging. This study is exploring models that can be used to monitor and assess vulnerability and risk of pastoral communities to climate change and variability.

Literature Summary

Various vulnerability definitions and methodologies have been used based on researchers' disciplines. Hogan and Marandola (2005) broadly identified two themes used to conceptualize vulnerability, namely poverty, exclusion and marginalization on the one hand, and society–environment interactions on the other hand. Social disadvantages in form of assets and opportunities lead to socioeconomic vulnerability and sociodemographic vulnerability. Vulnerability associated with restrictions on access to the 'goods' of citizenship relates to the theories of the economist Amartya Sen who conceived human life to be a combination of various functionings and capacities for self-realisation, and understanding human freedom as the central characteristic of life (Sen, 1993). While empowerment and entitlement enhances a person's capacity to exercise freedom and to expand capacities, vulnerability reduces one's capacities and 'power' of action and realisation.

Following Sen's concepts on empowerment, Watts and Bohle (1993) defined vulnerability in terms of exposure, capacity and potentiality. Thus, response to vulnerability is to reduce exposure, enhance coping capacity, and strengthen recovery potential while

minimizing destructive consequences. Risks are defined as the uncertain events pertaining to the occurrence, timing and magnitude of the negative event that can damage wellbeing. Vulnerability therefore denotes the lack of resilience to the occurrence of these risks, including long-term and seasonal trends.

By bridging the risks people face and the reasons for their vulnerability to hazards, Blaikie *et al.* (1994) focused on the social, economic and political production of the environment in determining who is vulnerable to these events. Vulnerability was defined as the characteristics of individual's capacity to anticipate, cope with, resist and recover from the impact of a natural hazard. Based on these definitions, this study is an attempt to conceptualize pastoralists' vulnerability by integrating the interdisciplinary themes to understand vulnerability in face of environmental and social threats, in particularly droughts and climate change. Since vulnerability is related to a combination of factors which determine the degree to which someone's life and livelihood is put at risk, quantifying vulnerability and its causes can help alleviate poverty.

Study Description

The study focuses on pastoralists residing within group ranches in drylands of Likipia District of Kenya. In order to conceptualize and eventually measure pastoralist vulnerability, a Participatory Rural Appraisal (PRA) involving 10 group ranches in the district was carried out. To conceptualize vulnerability a problem-causes matrix was used to assess the factors perceived by the pastoralists to influence vulnerability. This enabled drawing of a path diagram that was used to develop questionnaire and subsequently enhance modeling once a household's survey data are available. Since vulnerability is a forward-looking ex-ante measure of say household's well-being predicting future household state, historical datasets such as Demographic Household Survey based on poverty index and health determinants will be considered in the final analysis.

Research Application

Based on the preliminary PRA results, the pastoralist communities identified major problems, their perceive causes, coping mechanisms and means of solving. Problems identified included drought, poverty, inadequate water, unreliable rainfall, poor pastures, livestock disease and predation, poor infrastructure, unemployment, high food prices, and disorganized market. Other problems included human-wildlife conflict, cattle rustling, insecurity, lack of school fees or educational institutions,

malaria and HIV-Aids, marginalization and inadequate political representation. From the results of cause-problem matrix drought, poverty, inadequate water, unreliable rainfall, and poor pastures were identified as the main contributor to the problems experienced. Thus vulnerability was considered as the susceptibility by pastoralist households to achieve food/livelihood security with respect to their livestock as the major livelihood in face of droughts and climate change phenomenon.

The path diagram implies that ‘vulnerability’ is unobservable (latent) and a number of vulnerability-related variables are interdependent, interacting not only among them but also with some external element (social, cultural, economic, ecological, political, etc.), making the relationships to be two-directional. Thus the appropriate model suggested for is the qualitative response model (QRM) (also known as the structural simultaneous equation model). This model assumes that vulnerability represents latent/unobservable variables manifesting themselves through a set of observed indicator variables. This leads to a simultaneous nature of vulnerability in the regression analysis. Thus, there are feedback effects; some external factors are themselves potentially endogenous. For other factors like individual characteristics, traditions, culture, the causal link may only operate in one direction. This suggests that they are (likely) purely exogenous. The conceptual framework leads to a general mixed (latent and observed) simultaneous equation:

$$AY^* + BZ + CX + u = 0 \dots\dots\dots (1)$$

$$g(Y) = h(Y^*;W) + v \dots\dots\dots (2)$$

Equations (1) represent the structural simultaneous equation model (SEM) which jointly explains (Y*;Z) in terms of X, with A, B, C being the corresponding coefficient matrices of appropriate dimensions. Equations (2) form the measurement model or the qualitative response model (QRM) where it is specified how the latent variables are related to the observed responses through functions *g* (.) and *h* (.). Once household questionnaire data become available, several special cases of SEM for equations (1) and (2) will be considered in modeling as suggested by Krishnakumar (2004).

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