Research Application Summary

Enhancing farmers' adaptation to climate change by integrating traditional and conventional drought prediction and preparedness techniques in Kenyan Central Highlands

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Abstract

Climate change has been recognised as the most complex and challenging environmental problem facing crop production among most small holder farms today. Drought, a condition that has a negative impact on crop productivity is an indicator of climate change and is recognised as a prolonged, abnormally dry period when there is inadequate water for users' daily needs, resulting in extensive damage to crops and the eventual loss of yields. Small scale farmers in the Central Highlands of Kenya are faced with these constraints and have consequently made efforts at local level to utilise traditional strategies to assist in adjusting. With this background, the study aims to assess and document farmers' knowledge on traditional strategies and preparedness techniques employed in coping with climate change and variability. The study will be conducted in Mbeere South district, Embu County and Meru South district, Tharaka-Nithi County in the Central Highlands of Kenya. The study will use a sociological approach and household survey. Data to be collected include: (i) Household demographic and socio-economic characteristics, (ii) Impact of climate change and farmers' strategies to cope with drought, (iii) Food security, and (iv) Indigenous drought preparedness approaches. The information will be used to determine the effectiveness of integrating traditional practices and modern/ scientific knowledge systems in adapting to climate change.

Keywords: Climate change, climate variability, drought, drought prediction, indigenous approaches, Kenya

Résumé

Le changement climatique a été reconnu actuellement comme le problème environnemental le plus complexe et sérieux faisant face à la production agricole au sein de la plupart de petites exploitations agricoles. La sécheresse, une situation physique qui a un impact négatif sur la productivité agricole, est un indicateur du changement climatique et est reconnue comme une période prolongée et anormalement sèche lorsqu'il y a de l'eau en quantité insuffisante pour répondre aux besoins

quotidiens des utilisateurs, causant des dommages importants aux cultures et la perte éventuelle de rendements. Les petits agriculteurs dans les montagnes au centre du Kenya sont confrontés à ces contraintes et ont conséquemment fourni des efforts au niveau local pour utiliser les stratégies traditionnelles afin d'aider à l'ajustement. Dans ce contexte, l'étude vise à évaluer et à documenter les connaissances des agriculteurs sur les stratégies traditionnelles et les techniques de préparation employées pour faire face à la variabilité et aux changements climatiques. L'étude sera menée dans le district Sud de Mbeere, le comté d'Embu et le district Sud de Meru, le Comté de Tharaka- Nithi dans les montagnes centrales du Kenya. L'étude utilisera une approche sociologique et une enquête auprès des ménages. Les données devant être recueillies comprennent: (i) les caractéristiques démographiques et socio-économiques des ménages, (ii) l'impact du changement climatique et les stratégies des agriculteurs pour faire face à la sécheresse, (iii) la sécurité alimentaire et (iv) les approches autochtones de préparation à la sécheresse. L'information sera utilisée pour déterminer l'efficacité d'intégration des pratiques traditionnelles et des systèmes de connaissance modernes / scientifiques dans l'adaptation au changement climatique.

Mots-clés: Changement climatique, variabilité climatique, sécheresse, prévision de la sécheresse, approches autochtones, Kenya

Background

Climate change is the most complex and challenging environmental problem facing the world today. Currently, the intriguing questions include weather uncertainties, persistent climatic variability, rampant environmental degradation and imminent food insecurity. During the last few decades, cyclic patterns between drought and flooding have become more frequent while the intensity and spatial distributions have also changed with severe impacts (IPCC, 2007). The impacts of these changes have been manifested in decreased crop yields. Adaptation to climate change includes all adjustments in socio-economic structure that reduce the vulnerability of farmers to changes in the climate system (Smith *et al*., 1996).

Drought is a condition brought about by climate change and refers to a prolonged, abnormally dry period when there is inadequate water for users' daily needs, resulting in extensive damage to crops and the eventual loss of yields (Wilhite, 2000). IPCC (2007) states that, the world indeed has been more

drought-prone during the past 25 years and that climate projections for the 21st century indicate increased frequency of severe droughts in many parts of the world. In Kenya, recurrent droughts and poor distribution of rainfall both spatially and temporally have negatively affected crop productivity. Consequently, small scale farmers have tried to put mechanisms in place to adapt to such calamities through the use of traditional methods of drought prediction and preparedness. The study seeks to enhance farmers' benefits from integrated drought prediction and preparedness techniques in the central highlands of Kenya by documenting and mainstreaming indigenous adaptation measures into scientific adaptation strategies.

Literature Summary

Sub-Saharan Africa (SSA) is the region that is most vulnerable to the negative impacts of climate change. The impact is predicted to be particular severe in the East African region because most of its agriculture is rain-fed (Thorton *et al*., 2009). Although the region is faced by low adaptive capacity to this constraint, people particularly at the local level are making efforts to adjust to the changes they observe.Kenya has experienced the adverse effects of climate change which include drastic changes in rainfall patterns leading to poor agricultural output. Drought-prone areas are some of the most important types of marginal environments and this is due to the fact that drought is a principal direct cause of crop failure and economic losses to farmers (Fuglie, 2007). Small holder farmers in marginal environments have characteristically adopted livelihood strategies which have evolved over time to help mitigate the effects of climate shocks. These include various traditional techniques in which prediction of future events can be foretold. The use of these indicators in response to early warning systems ranges from the simplest traditional methods to the more complex scientific methods. Traditional methods are still in use at local levels and circulate amongst members of a community (Kosina *et al*., 2007). However, the indicators are not quantified on any scale, hence comparisons between the years or amongst different communities is not possible. In addition, this information is normally subjective, the events are never recorded and no institutional or communication mechanism is available for its transmission and exchange.

Study Description

The study will be conducted in Mbeere South district, Embu County and Meru South district, Tharaka-Nithi County in the Central Highlands of Kenya. The major agro-ecological zones in Mbeere district are Upper Midland 3 and 4 (UM 3 and 4);

Lower Midland 3, 4, and 5 (LM 3, 4, and 5) and Inner Lowland 5 (IL 5). The predominant soils are the highly weathered and leached acid infertile soils (Oxisols and Ultisols) (Jaetzold *et al*., 2006). The average population density is 82 persons/ km^2 and an average farm size of less than 5 ha with large tracts of this being left uncleared due to its marginal nature thus absence of optimal land utilisation. It lies between 500 m to 1200 m above sea level with an average annual rainfall and annual mean temperature ranging from 700- 900 mm per annum and 21.7-22.5^oC respectively. The area experiences a bi-modal pattern of rainfall. The rains are erratic and ill-distributed temporally and spatially. Consequently, the area experience periods of dry spells and drought conditions are not uncommon, eventually leading to frequent crop failures.

Meru South district covers an area of 804.7 km^2 with a population of 128,107 (GOK, 2010). The major agro-ecological zones are LH1, LM3, LM4 and UM2 (Jaetzold *et al*., 2006) with an altitude of 1500 m above sea level, annual rainfall ranging from 1200-1400 mm per annum and annual mean temperature of 20^oC. The rainfall is bi-modal with long rains (LR) occurring from March to June and short rains (SR) from October to December. The soils are mainly deep, well weathered Humic Nitisols (Jaetzold *et al*., 2006) with declining moderate to high inherent fertility. The major cash crops are tea and coffee with maize and beans representing the most important and dominant annual crops.

A non-probabilistic, purposive sampling will be used in combination with snow balling technique to preferentially select the required sample. The research design for data gathering will involve a descriptive survey and triangulation approach to simultaneously collect both quantitative and qualitative data, merge the data and use the results to enable an in-depth investigation into the subject under study. Specifically, this will involve the use of direct observations, interview schedule, key informant interviews, questionnaires and focus group discussions. To ensure spatial distribution and eliminate biasness during sampling, Global Positioning System (GPS) will be used. The gathered data will be entered and analysed using descriptive statistics (mean, standard deviation and cross tabulations). Karl Pearson's and Kendal's tau correlation coefficients will be used to test the magnitude of the relationship between dependent and independent variables. In addition, multiple linear regression analysis will be used to analyse the influence among variables

while ex-ante analysis will be used to determine the direction of future trends in respect to drought prediction and preparedness using SPSS.

Research Application

It is anticipated that this study will enrich the knowledge of extension service providers and farmers through brochures and pamphlets and the knowledge is envisaged to eventually provide a better adaptation to climate change.

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