

## **ADAPTIVE STRATEGIES AND LOCAL INNOVATIONS OF SMALLHOLDER FARMERS IN SELECTED AGRI-FOOD SYSTEMS OF CENTRAL KENYA**

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*(Received 10 October, 2011; accepted 23 February, 2012)*

### **ABSTRACT**

Food production in Kenya is closely related to smallholder agricultural production. Paradoxically, many smallholders suffer extended periods of food crises. This underscores the importance of understanding the multiple pathways smallholders use to deal with food insecurity. Participatory action research, using both qualitative and quantitative methods was undertaken to identify adaptation strategies and innovations used to address food insecurity vulnerabilities. A sample of 360 households was drawn randomly from 18 farmers' groups living under acute food and livelihood crisis (Mbeere South district); experiencing borderline food insecurity (Kirinyaga West District) and those with low resilience (Nyandarua North District) all in Kenya. Results showed that smallholders in these areas use and perpetuate diverse adaptive strategies and innovations for coping with vulnerability, for risk avoidance and for livelihoods insurance enhancement. These strategies and innovations ought to be recognised by research, development and policy actors and should inform interventions intended to strengthen smallholder agri-food systems in Kenya.

*Key Words:* Food insecurity, resilience, risk, vulnerability

### **RÉSUMÉ**

La production vivrière au Kenya est étroitement liée à la production de petits exploitants agricoles. Paradoxalement, la plupart de ces exploitants souffrent de longues périodes de crises alimentaires. Ceci souligne l'importance de la compréhension de multiples voies et moyens qu'ils utilisent pour faire face à l'insécurité alimentaire. Une action de recherche participative par des méthodes qualitatives et quantitatives était entreprise pour identifier les stratégies d'adaptation et innovations utilisées afin d'adresser les problèmes liés à l'insécurité alimentaire. Un échantillon de 360 ménages était aléatoirement tiré de 18 groupes de fermiers vivant sous une crise alimentaire aigue (Mbeere South district); ceux vivant en situation proche de l'insécurité alimentaire (Kirinyaga West District) ainsi que ceux à faible flexibilité à la situation de famine (Nyandarua North District) au Kenya. Les résultats ont montré que les petits exploitants des régions précitées utilisent et perpétuent diverses stratégies d'adaptation et innovations pour faire face à la vulnérabilité pour éviter le risque et promouvoir l'assurance quant au gagne-pain quotidien. Ces stratégies et innovations devraient être reconnues par la recherche, ainsi que des acteurs politiques et de développement et s'en inspirer pour initier des interventions visant à consolider des systèmes agro-alimentaires de petits exploitants au Kenya.

*Mots Clés:* Insécurité alimentaire, flexibilité, risque, vulnérabilité

## INTRODUCTION

Smallholders use a wide range of strategies and local innovations to manage and respond to ecological and socio-economic challenges (Milton and Obote, 2007). In Kenya, they are the main food producers but paradoxically, they are also the most food insecure (Nyikai, 2003; Omiti *et al.*, 2006; Salasya, *et al.*, 2007; Ogada *et al.*, 2011). Development partners and research systems continue to invest in rural production systems but progress has been slow and at times situations have worsened (Twomlow, *et al.*, 2008).

Community-level adaptive strategies and innovations that enhance resilience of poor rural households to food insecurity need to be explored. In-depth structuring and characterisation of these strategies to better understand how they can interface with research and development (R&D) efforts for added adaptability and enhanced agri-food systems is necessary. Comparison across different socio-economic and agro-ecological contexts to show specific potentials will inform research and policy options. It is also essential to establish whether these strategies and innovations are random or whether they have temporal and spatial differentiation.

Adaptive strategies and innovations intrinsic to communities of rural smallholder farmers are often disregarded by R&D efforts (Fenta and Assefa, 2009; Milton and Obote, 2007). This is, in spite of the growing acknowledgement that local strategies and innovations lead to better understanding of socio-cultural, economic and environmental circumstances of specific communities; support the capacities of farmers to cope with and manage food insecurity situations and encourage linkages with appropriate research and policy options (Brooks and Loevinsohn, 2011). Characterising and structuring the adaptive strategies and innovations allows the experiential knowledge to complement public and private sector engagement in innovation systems (Wolf, 2008).

Through joint researcher-farmer reflection and analysis, this paper draws lessons from and compares adaptation and innovation strategies employed in pursuit of food security goals by

communities in three sites with different socio-economic and agro-ecological contexts. The strategies and innovations for surviving vulnerability, risk avoidance and enhancing insurance are structured and characterised. The study also attempts to clarify whether the strategies and innovations are random or whether they have temporal or spatial differentiation.

**Conceptual framework.** The innovation system concept in agriculture is the product of interactions of diverse agricultural stakeholders and their combined knowledge types (Anandajayasekaram and Gebremedhin, 2009). This hybridisation of knowledge is shaped and mediated by individual and collective attitudes and by the environment (Callon, 1992; Ploeg and Long, 1994; World Bank, 2006). The approach emphasises nurturing of back and forth flow of knowledge and information between actors. This approach, combined with the agri-food systems approach (Ericksen, 2006), addressed the food security issues raised in the different project site areas.

**Interactions between farmers' agri-food systems and R&D.** This paper postulates that households experience, covariate shocks including weather shocks, macroeconomic shocks, and technological shocks, as well as idiosyncratic shocks in the form of illness, deaths, births, unemployment, divorce and so on (Ezemenari *et al.*, 2002). The different shocks elicit survival strategies in crises situations (Sutherland, *et al.*, 1999) and at other times, households will endeavour to improve their livelihoods in the medium term, through informal experimentation activities (Brooks and Loevinsohn, 2011). The indigenous knowledge and skills inherent in communities mediate all livelihood activities (Milton and Obote, 2007). R&D processes add value when informed by the varied circumstances among smallholder households in specific communities at particular times, and should result in positive impacts upon the various types of strategies and innovations being pursued. This system of dynamic interactions is schematically represented in Figure 1.

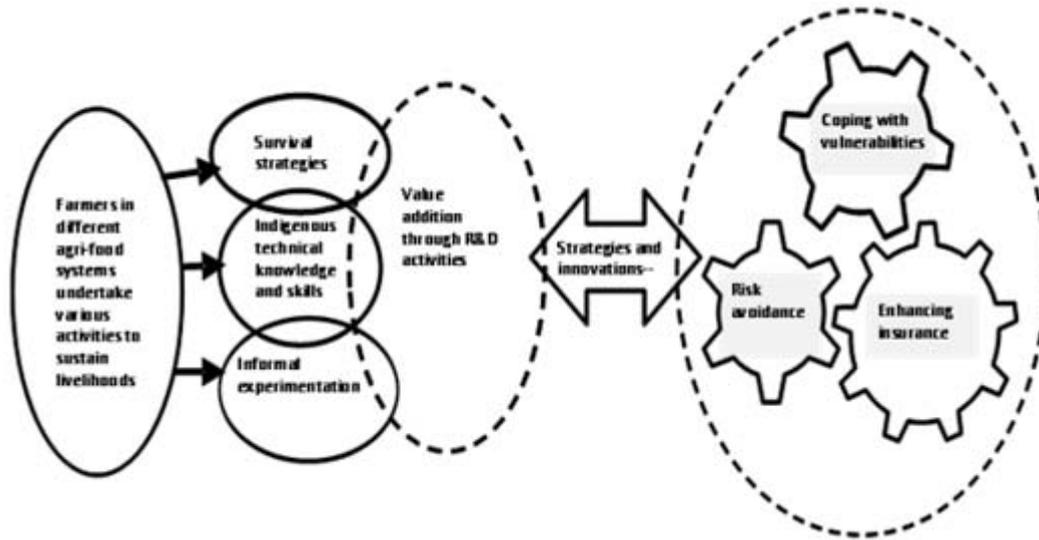


Figure 1. Dynamic interactions between farmers' agri-food systems and R&D.

## MATERIALS AND METHODS

**Study sites.** A study was conducted in three districts of Kenya. These districts represent the semi-arid lands (LM4/5) under acute food and livelihood crises (Mbeere South District), the medium to high potential areas (UM3/4) depicting borderline food security (Kirinyaga West District) and the unexploited high potential areas (UH3/LH2) with low resilience (Nyandarua North district). The agro-ecological zonings are as outlined in Jaetzold *et al.* (2007a, b).

**Research design and data collection.** This study employed the action research approach (Oja and Smulyan, 1989; Jum *et al.*, 2009) in which researchers, the community and other stakeholders start with the identification of major issues and concerns, initiate research, originate action, learn about this action and through critical reflections proceed to plan the next cycle of research and action.

The formal household survey used a structured questionnaire and involved 360 sample units: 36% male and 64% female, proportionate to the total number of men and women in all sampled farmers' groups. The sampling frame constituted members of farmers' groups (Hussein, 2001; Amudavi, 2005). Three focus group discussions with 9 female and 12 male participants

were held for in-depth investigation of food security issues. The participants were selected by community members for their ability to articulate issues.

**Data analysis.** Descriptive statistics using the Scientific Package for the Social Sciences (SPSS) version 17 provided the basic scenarios of the various socio-economic aspects of the study. Analysis of qualitative data involved use of NVivo statistical package from which clusters of strategies and innovations were derived.

## RESULTS AND DISCUSSION

### Households' socio-economic characteristics.

The 360 sampled households had a total of 1840 members with an average household size of 5 people. Of all the household members, 49.6% were female and 50.4% male. The marital status was single (56.6%); monogamously married (40.1%), with the remaining 3.8% divorced, widowed, separated or polygamously married. The levels of education were 61% primary level; 27% secondary level; 5% college level; and 0.5% with university education. Those that had not attended school were 6.6%. More than a third of the population (36%) was engaged in informal employment, while 16.8% were in formal employment. The remaining 47.2% were

TABLE 1. Household strategies and innovations for food security and wellbeing in Central Kenya in Kenya

Strategies and innovations	Study sites		
	Mbeere South District	Kirinyaga West District	Nyandarua North District
Strategies and innovations to cope with vulnerability	<ul style="list-style-type: none"> <li>• Selling livestock for food</li> <li>• Casual work</li> <li>• Selling water</li> <li>• Charcoal burning and sale</li> <li>• Selling land</li> </ul>	<ul style="list-style-type: none"> <li>• Casual labour</li> <li>• Serving vegetables as a meal</li> <li>• Selling firewood and charcoal to buy food</li> <li>• Selling livestock</li> <li>• Getting food on credit from shops and other individuals</li> <li>• No lunch for children</li> <li>• Collecting and selling ballast</li> <li>• Selling sand</li> <li>• Selling grass</li> <li>• Selling land</li> <li>• Selling household assets</li> </ul>	<ul style="list-style-type: none"> <li>• Selling labour in neighbouring communities</li> <li>• Remittances</li> <li>• Borrow food from relatives</li> <li>• Relief food from government and churches</li> <li>• Cooking white porridge more often</li> </ul>
Selling household goods	<ul style="list-style-type: none"> <li>• Selling water</li> <li>• Reducing the house size and selling the iron sheets</li> <li>• Hunting for wild meats</li> <li>• Consuming cooked papwap</li> <li>• Eating wild fruits</li> <li>• Change of food patterns to eat food bought from shops</li> <li>• Fishing and sale of fish</li> </ul>	<ul style="list-style-type: none"> <li>• No lunch for children</li> <li>• Collecting and selling ballast</li> <li>• Selling sand</li> <li>• Selling grass</li> <li>• Selling land</li> <li>• Selling household assets</li> </ul>	<ul style="list-style-type: none"> <li>• Small meals for all family members</li> <li>• Renting out land</li> </ul>
Strategies and innovations for risk avoidance	<ul style="list-style-type: none"> <li>• Store some food and sell only a little</li> <li>• Selling only what is not commonly consumed at home e.g. green grams</li> <li>• Planting early maturing crop varieties</li> <li>• Planting crops that do well in the area</li> <li>• Early planting/dry planting of crops</li> </ul>	<ul style="list-style-type: none"> <li>• Growing vegetables along water benches near streams</li> <li>• Planting different varieties of crops/crop diversification</li> <li>• Avoiding selling food but stocking it for future use</li> <li>• Preparing land early</li> <li>• Use of irrigation when rain fails</li> <li>• Refusal to sell immediately, after harvest but waiting until prices improve</li> <li>• Paying casual labour in kind, rather than selling farm produce to pay labour costs</li> </ul>	<ul style="list-style-type: none"> <li>• Renting of land</li> <li>• Planting root crops like sweet potatoes and yams</li> <li>• Grazing animals in the highland areas</li> <li>• Irrigation farming for those near water resources</li> <li>• Renting out land for grazing animals</li> <li>• Selling of produce only when necessary</li> <li>• Growing short term crops</li> <li>• Drying of vegetables (stinging nettle, pumpkin leaves) and sweet potatoes</li> </ul>

TABLE 1. Contd.

Strategies and innovations	Study sites		
Strategies and innovations for enhancing livelihood insurance	Mbeere South District	Kirinyaga West District	Nyandarua North District
	<ul style="list-style-type: none"> <li>• Establishing small businesses to provide income during times of food insecurity</li> </ul>	<ul style="list-style-type: none"> <li>• Harvesting water by blocking river flow and using it for irrigation</li> <li>• Investing in education for their children to secure jobs</li> <li>• Saving money made from sell of crops in the bank to use in times of food insecurity</li> <li>• Growing drought resistance crops</li> <li>• Planting of different crops to avoid wholesale crop failure (avoid mono-cropping)</li> </ul>	<ul style="list-style-type: none"> <li>• Planting fruit trees</li> <li>• Improved food storage facilities and practices, especially for maize</li> <li>• Undertaking irrigated agriculture</li> <li>• Knowledge acquisition and capacity building</li> <li>• Increasing crop variety or diversification</li> <li>• Developing water harvesting facilities</li> </ul>

unemployed. Land ownership was such that 18% had less than 1 hectares; 44% had up to 3 hectares; 25% had up to 2.2 hectares, while 13% owned more than 2.2 hectares of land.

**Smallholder strategies and innovations.** An in-depth analysis of the strategies and innovations used by smallholder farmers to deal with food insecurity yielded the structuring and characterisation shown in Table 1.

**Differentiation of smallholder strategies and innovations.** The results from the three study sites showed that households engaged in three different types of strategies and innovations. These included those geared towards surviving vulnerability, those for risk avoidance and those used to enhance household insurance. Those geared towards surviving vulnerability were mainly concerned with immediate and short-term consumption needs. Some of these were destructive of the natural resource base; they led to loss of household assets, increased work burden and others compromised household nutrition. Households applying these coping strategies required social protection or even aid. However, external or public sector long-term development interventions, coupled with participatory agricultural research eased food insecurity and broaden the livelihood base (Sutherland, *et al.*, 1999).

The strategies and innovations geared towards risk avoidance showed tendencies towards building resilience and reducing sensitivity to shocks (Alinovi *et al.*, 2008). The strategies for enhancing household insurance demonstrated mechanisms for increasing adaptive capacity in the long term. They presented a wealth of opportunities for R&D interventions including building capacity for sustainable livelihoods (Sutherland *et al.*, 1999).

**Spatial and temporal differences.** The study sites showed spatial and temporal differences in the food security situations (Fig. 2). These differences dictated the strategies and innovations undertaken by the households in support of their livelihoods at different times of the year. In Mbeere South District, acute food shortages occurred between June and December. Smallholder

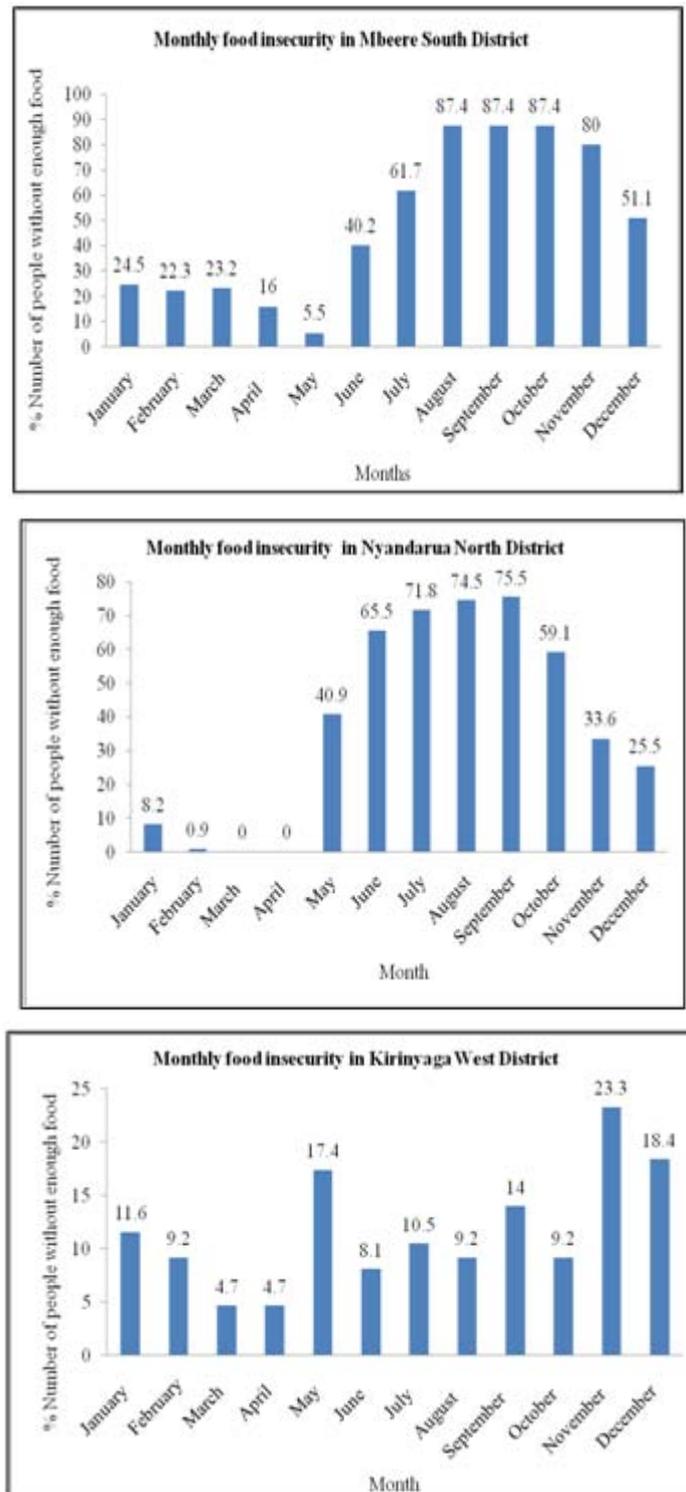


Figure 2. Spatial and temporal differences in the food security situations in the three Districts.

households employed strategies for surviving vulnerability. Kirinyaga West District was generally food secure; however, between November and January and in the month of May, the resilience of the households deteriorated. This means that households in this study site were mainly engaged in strategies for risk avoidance most of the year. Nyandarua North District experienced food insecurity for about half of the year and between the months of May and October. This was especially dire when there was failure of short term crops while the high altitude varieties of maize planted in the area and that took upto nine months to mature, were still in the growth stage.

#### ACKNOWLEDGEMENT

We are grateful to the Director Kenya Agricultural Research Institute (KARI) for supporting this project. We thank the International Development Research Cooperation (IDRC) funding through IDRC Grant Number 105790-003.

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