Potential and Limitations of Dryland Communities in Adapting to Climate Change in Mwanga District

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Abstract

In order to document the potential and limitations in adapting dryland communities to climate change in Mwanga district a study was carried out in late March 2012. Because the project focused on crops production and livestock production and natural resources management (beekeeping in particular), potential and constraints of these three sectors were identified. The data were collected from households situated in four proposed project villages of Kiruru Ibwejewa, Kirya, Kwakoa and Kileo and a structured questionnaire was used in this regard. The questionnaire was administered to 64 respondents, 16 for each study village. Along with the survey, other methods used were observation transect walks, key-informant interview and literature review. The main identified constraints in crops production were unreliable rainfall, high costs of inputs, unavailability of the improved seeds and prevalence of pests and diseases. Marketing constraints for crops included low price, lack of buyer within the village, and market inaccessibility. Regarding livestock production, the main constraints were bush encroachment, poor vegetative cover and shortage of water. On the other side, beekeeping had large but unexploited potential because of lack of improved beekeeping and honey processing knowledge, and ineffective organization. Also, theft of honey and beehives was among the reported constraints. It is recommended that the understanding of contextual realities is important before implementing any climate change adaptation interventions because such understanding will provide a pointer on the appropriate and feasible interventions based on the field realities. From such understanding it will be possible to plan appropriate use of scarce financial, social and human resources in a profitable way.

Keywords: constraints, opportunities, dryland communities, climate change

Introduction

Climate change and climate variability are a challenge experienced by various socio-economic sectors in various agro-ecological zones of Tanzania. Dryland areas are among the zones which are affected by changes in rainfall and temperature patterns (climate variables), and by climate-related events such as floods, drought, and cyclones. These changes affect livelihood activities at individual and household levels. As a result, various strategies have to be devised to enable internal (at the community level) reorganization with facilitation of external development partners. These strategies aim at building the capacity, reducing vulnerability and enhancing the resilience of the dryland communities.

Diversification is among the key strategies to enhance the resilience and adaptive capacity of the dryland communities (Culas, 2006). It

aims at ensuring that the potential opportunities from different socio-economic sectors are tapped in a profitable and environmental friendly way. The dryland areas have significant potential in terms of being suitable for livestock keeping, optimizing the short rains using drought resistant crop varieties that require limited rainfall to realize the harvests. Also, these areas have unique vegetation including *Acacia* spp which is favourable for beekeeping to provide the dryland communities with diverse sources of food stuff and improve their income.

However, because of various reasons including the lack of knowledge and capacity, there has been the problem of using existing opportunities in suboptimal and unsustainable way. While interventions that can improve the knowledge and capacity of the dryland communities to use the existing potential effectively are imperative, any strategies to enhance the resilience of these communities need to understand existing limitations and potential in the first place (Runtala, *et al.,* 2011). Such knowledge is important to enable planning and implementing interventions which are socio-economically feasible and environmentally sustainable.

This article highlights challenges and limitations faced by dryland communities in Mwanga district, Kilimanjaro region. It focuses on three sectors namely livestock and crop production, and natural resources management, beekeeping in particular. The data were collected using a survey, key informant interview, observation, transect walks, and literature review with the aim of understanding the situation prior to implementing an intervention for adapting dryland communities to climate change. The findings presented in this paper, therefore, serve as a baseline upon which changes that may occur after intervention can be measured.

Description of the study area

The study was conducted in Mwanga district located in Kilimanjaro region. Most of the Mwanga district is classified as semi-arid with a rainfall range of 300 and 600 mm. Rainfall patterns in the district are unpredictable and subject to great fluctuations. Like other semi-arid areas, the district is characterized with land degradation, unreliable rainfall, repeated water shortage, periodic famine, overgrazing, dry land cultivation in the marginal areas and heavy competition for limited biomass between farmers and cattle. Vulnerability is high due to unreliability of weather. The people of Mwanga are dependent on agriculture and livestock keeping for their livelihood. However agriculture is difficult in the area due to inadequate rainfall (Mvungi *et al.,* 2005).

Methodology used

The study used various field survey, observation, transect walks, key-informant interview and literature review. Data collection followed the introduction of the project at the selected project villages in May 2012. The purpose of the project is to promote adaptation of the dryland communities to climate change. The aim of the study was to understand socio-economic, agricultural, livestock and natural resource management settings in relation to climate change before the intervention was made so as in the future to be able to compare the project achievements or performance with

the status/situation observed at the beginning of the project.

The study was conducted in Kwakoa, Kirya, Kileo and Kiruru-Ibwejewa villages. It was preceded by pre-testing of the questionnaire among the project team members, and also training of enumerators at the Mwanga district council; these were part of the team which participated in the baseline survey. At the village levels, the technical staff (agricultural, livestock and natural resource extension officers coordinated the process and linked the researchers (interviewers) with farmer/livestock keeper respondents.

Results and discussion

Main agricultural production and marketing constraints

The main identified constraints in crops production were unreliable rainfall (71%), high costs of inputs (24.9%), unavailability of the improved seeds and prevalence of pests and diseases (24.9%). Marketing constraints for crops included low price (64.7%), lack of buyer within the village (35.3%), and market inaccessibility (23.5%) (Figure 1). Figure 2 presents the rainfall data for one of weather stations installed in an area surrounding Kiruru Ibwejewa and Kirya project villages; for most of the years, rainfall was less than 400 mm.

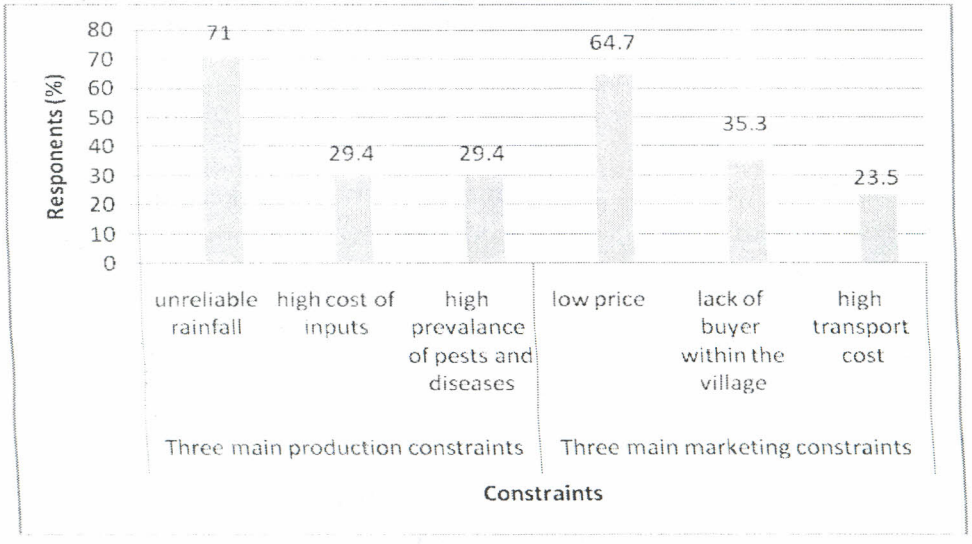

Figure 1: Production and marketing constraints

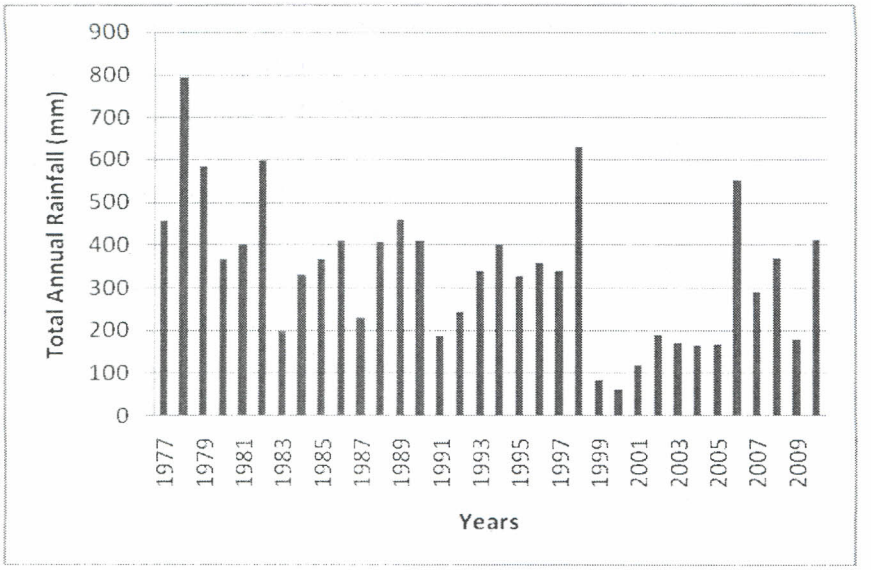

Figure 2: Rainfall data for lowland plains of Mwanga district surrounding Nyumba ya Mungu dam

Climate variability implications on crop production

The farmer respondents were asked to compare the area harvested versus area planted per acre for various crops. It generally shows in Figure 3 that, for all the project villages, the area planted was larger than the area harvested. However, while all villages were situated in semi-arid areas of Mwanga district, they indicated micro-site variations as reported by respondents. Taking example of maize, which was the first preferred food crop for all the four villages, average planted acreages for Kwakoa and Kiruru villages were higher than those of Kirya and Kileo villages. In terms of average harvested acreages, larger areas were harvested for Kwakoa village (72% of the planted area) and Kileo village (82% of the planted area) villages than for Kirya village (71% of the planted area) and Kiruru village (30% of the planted area) villages. Therefore, of the four project villages the least harvested area was reported in Kiruru village.

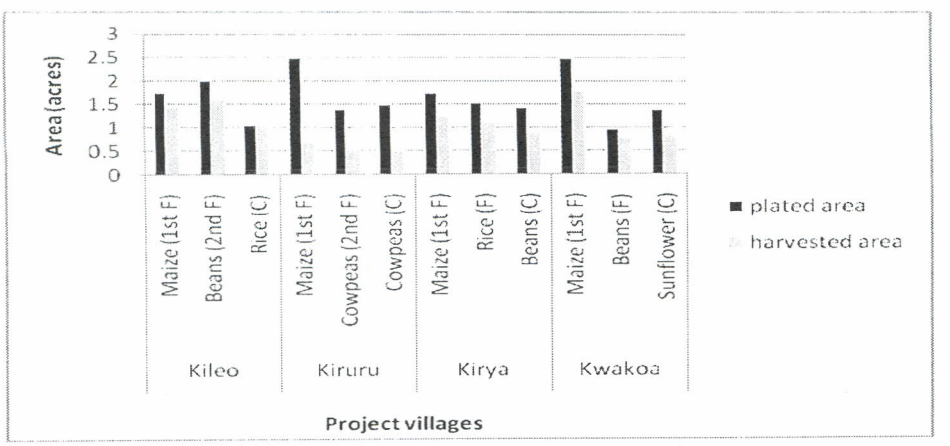

Figure 3: Comparison of area planted versus area harvested for project villages in Mwanga district

The Kiruru village represents areas in Mwanga district with severely low rainfall, and that frequently experience critical food shortage. For example, through field observation and interview with the village executive officer (VEO), this study revealed that in 2012 the Kiruru Ibwejewa village received food relief (maize flour) thrice (in January, 3600 kg; August, 12300 kg; and December, 3600kg), from the Regional Prime Minister's Office situated in Arusha (Table 1). According to VEO, this support was supposed to be given to the abjectly poor households but it was not possible. Instead, the food relief rendered leaders vulnerable to conflict because almost all 347 households of Kiruru Ibwejewa village demanded a portion because, they argued, there was poor harvest and therefore all villagers suffered from food shortage. The VEO also reported that for the past 10 years, Kiruru Ibwejewa village managed to realize some little harvest for two years indicating that the village is seriously and frequently impacted by drought.

Table 1: Food relief provided to Kiruru Ibwejewa village in 2012 under the government food relief programme

Household number	Food Relief (Kgs)			Amount per household (Kgs)		
	Jan	Aug	Dec	Jan	Aug	Dec
347	3600	12300	3600	10.37464	35.44669	10.37464

Climate variability renders poor the performance of certain crops which require adequate rainfall for an extended duration. For Kiruru Ibwejewa village, for example, while the performance of maize has been observed to be poor from one year to another, farmers still prioritize the cultivation of maize over drought resistant crops such as sorghum which are traditionally not preferred by the people. According to VEO, it is not uncommon to find previously observed good maize crop drying up completely at the mid growth stage because of shortage of rains. However, while farmers in Kiruru Ibwejewa village are frequently provided with food relief, they do not adopt the cultivation of sorghum though this option is accessible. The food preference culture acts as a stumbling block towards feasible adaptation to the effects of climate variability.

Livestock production

Main constraints in livestock production

Livestock production faces various constraints. The three main challenges are: bush encroachment (Figure 5), poor vegetative cover and shortage of water. Through transect walks across reserved grazing areas it was observed that the three villages of Kwakoa, Kiruru Ibwejewa and Kirya had large reserved grazing areas, but these areas had been encroached by bush, and had poor vegetative cover. It appeared, therefore, that livestock keepers in these villages lacked knowledge on appropriate management strategies to improve the reserved grazing areas. Furthermore, the results from household survey (Figure 4) indicated that most of households (58.8%) were not aware of availability of water sources within reserved grazing areas which implied that there was shortage of water for

the livestock. On the other hand, about one-third of the respondents (29.4%) stated that water sources were available within reserved grazing areas while some of them (11.8%) were not sure whether or not water sources existed in the reserved grazing areas.

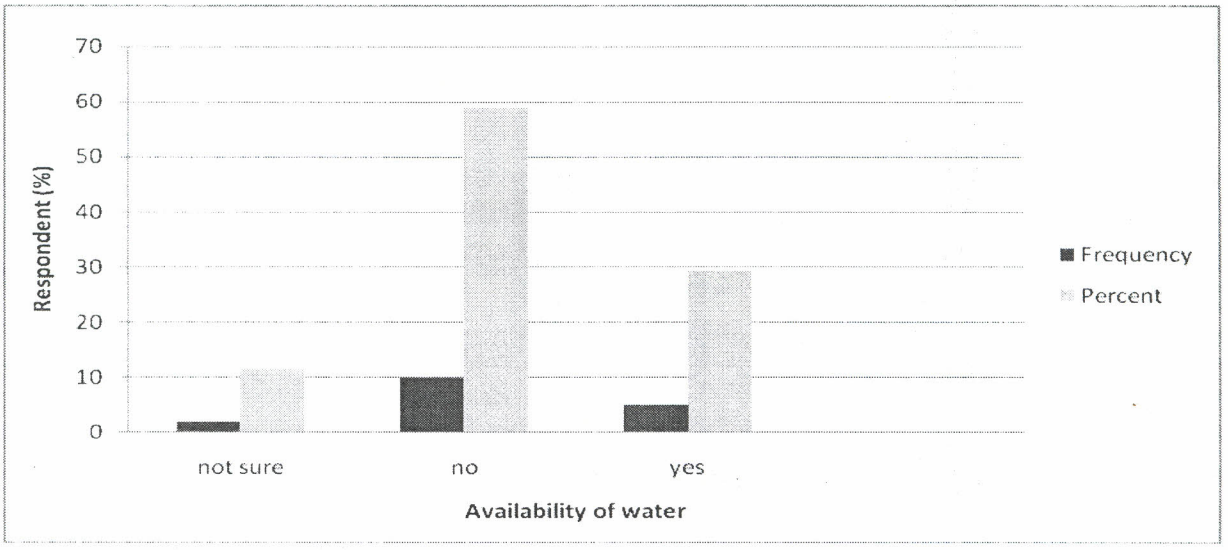

Figure 4: Respondents awareness on the existence of water source within reserved grazing areas

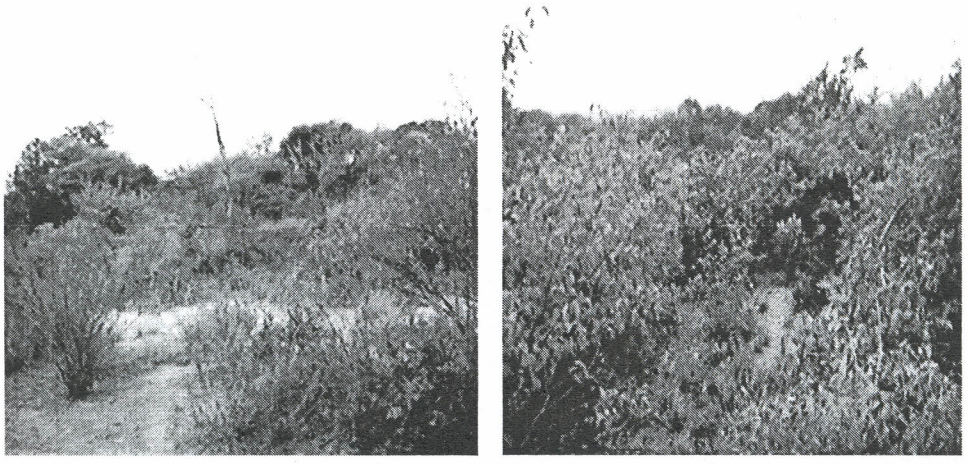

Figure 5: Bush encroachment in Kirya village grazing area in Mwanga district

Beekeeping

In three project villages of Kwakoa, Kileo and Kirya, beekeeping had large potential in terms of existence of plant biodiversity including woodland of diverse *Acacia* species. Mwanga district is one of districts in Kilimanjaro region with high beekeeping potential (Kilimanjaro Regional Profile, undated). Beekeeping is among the non-destructive uses of natural resources that would enhance peoples' income especially in areas where land is infertile and rainfall is very low to be suitable for agricultural production (ESF, 2005). However, this potential was not effectively utilized because of lack of improved beekeeping and honey processing knowledge, and ineffective organization of beekeepers. Out of 65 respondents interviewed, 18 percent practiced beekeeping whereas the remaining

82 percent did not practice beekeeping (Figure 6). Also, theft of honey and beehives was among the reported constraints.

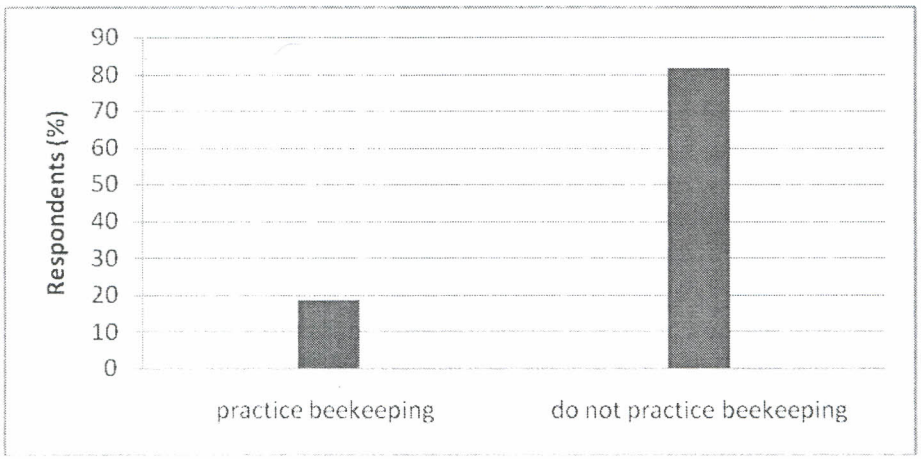

Figure 6: involvement in beekeeping activities (n=65)

There is a great potential, for example, for organic beekeeping. Under climate triggered vulnerability farmers in the study villages may be capacitated to engage in improved organic honey production both in quantity and quality by using improved beehives and other equipment and observing technical advice. Such capacity building can carried out in terms of training beekeepers about appropriate honey harvesting, and processing and packaging of honey and beeswax to avoid wastage and ensure quality. This will enable securing and maintaining reliable markets for honey and by-products (Mwanga district profile, undated).

Figure 7: *Acacia* apiary with traditional beehives on it, and *Grewia* species an important plant for beekeeping.

Conclusions and Recommendations

It is concluded that the studied villages experienced limitations that can be categorized as natural (weather constraints), socio-economic (market constraint and knowledge capacity) and socio-cultural (non-preference of sorghum, a drought resistant crop) barriers. On the other hand, there were

untapped or underutilized opportunities that could be used to enhance resilience of dryland communities to climate variability for all the studied sectors of agricultural and livestock production, and beekeeping. However, the villages showed spatial and temporal differences in potential and limitations among them.

It is recommended that the understanding of contextual realities should precede any climate change adaptive interventions because such understanding will provide a pointer on the appropriate and feasible interventions based on field realities. Following such knowledge, capacity building through learning by doing (intervention) can be implemented to enhance the power of farmers to use existing potential and face the limitations. Such capacity building arrangements should consider diverse potentials and limitations to avoid generalized solutions. And more in-depth investigation needs to be underscored on how barriers may be broken to enhance the adaptation to adverse impacts of climate change.

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