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Perception and Use of Climate Forecast Information Amongst Smallholder Farmers in Semi-Arid Kenya

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Abstract: This study investigates perception and use of seasonal forecast and the influence of the 2004 October-December (OND) seasonal forecast on agricultural decision-making amongst smallholder farmers in semi-arid Kenya, in agro-ecological zones UM4 and LM5. Field surveys were conducted before and after the release of OND growing season climate forecast by the Kenya Meteorological Department (KMD) in 2004. Seasonal forecast issued by the KMD indicated that the two agro-ecological zones were to receive normal tending to above normal OND rainfall of 2004. However, observed rainfall show that agro-ecological zone UM4 received near normal rainfall while LM5 received below normal rainfall. Although KMD's prediction of onset was accurate, a poor distribution in LM5 led to crop failure and losses in other farm enterprise. Despite farmers' access to seasonal forecast from KMD, majority made farm-level decisions in the light of what they perceive rather than what actually is. Majority of farmers lack confidence in seasonal climate forecast, but rate it useful, suggesting that there is a vast market for forecast information. This makes it necessary for the climate community, extension and farmers to adopt a collaborative approach to improve utilization of seasonal forecast products. Farm management strategies are not influenced by agro-ecological zones but farmers showed potential to respond to forecasts when they altered planting date and changed crop cultivars. The study demonstrates the effect of generating climate forecast on a large geographic scale and suggests a downscaled forecast product at a local level as a way of improving forecast quality. Although farmers' access forecast information and considers it useful, its integration in farm-level decision-making is still limited, a reason for concern for policy makers.

Key words: Forecast application, agricultural production, semi-arid Kenya

INTRODUCTION

A report by the United Nations (UN, 2005) shows that global poverty rates are falling but the decline in Africa is the lowest. The report further shows that in more than 30 countries, hunger was reduced by at least 25% during the last decade but the decline has slowed due to a slow growth of agricultural production. The decline in agricultural production is attributed to rainfall variability among other factors, especially in the semi-arid lands (Chipanishi *et al.*, 2003; Jones and Thornton, 2003). Effective application of climate forecasts has the potential to contribute to sustainable agricultural production and go a long way to eradicate extreme poverty and hunger. Similarly, given the vulnerability of subsistence societies to climate variability (Sivakumar *et al.*, 2000; Misselhorn, 2005), application of climate forecasts can as well be regarded as an adaptation strategy to environmental vagaries associated with extreme climate events.

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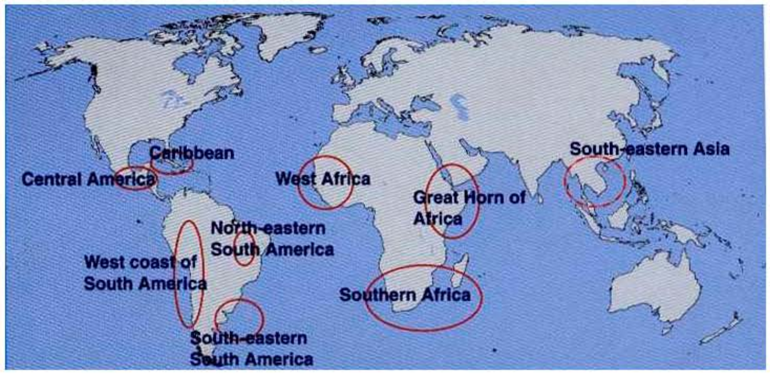

Fig. 1: Some regions in which Regional Climate Outlook Forums (RCOFs) are held in various parts of the world. (Source: WMO, 2001)

Today's interest in climate forecasts has its roots in the close coupling between seasonal rainfall and ENSO teleconnection (Goddard *et al*., 2001; Yasunaka and Hanawa, 2005) and the improved understanding of interactions between the atmosphere and sea and land surfaces (Hansen and Indeje, 2004). This has improved the skill of predicting seasonal rainfall, especially the OND rains of Eastern Africa (Cooper *et al*., 2006), which has a high predictability. Prior to the major 1997/98 El Niño events, the international community established Regional Climate Outlook Forums (RCOFs), particularly in developing countries (Fig. 1) with a view of providing advance information on the likely climate features of the upcoming season. In the Greater Horn of Africa, the IGAD Climate Prediction and Application Center (ICPAC) in conjunction with the National Meteorological Services of member countries provide seasonal climate forecasts for the main rain seasons (Oduor *et al*., 2002). In Kenya, the Kenya Meteorological Department (KMD) downscales and issues forecasts to stakeholders in the months of August and February (Oduor *et al*., 2002), one-month time lead to onset of OND and MAM rainfall seasons, respectively. Dissemination of forecast information is mainly through the print (Newspapers) and electronic (radio and television) media.

Despite regular dissemination of forecast, farmer utilization of climate forecast information remains a challenge, especially in developing countries (Patt and Gwata, 2002; International Research Institute for Climate and Society, 2006). Ideally, it is expected that access to a reliable forecast should lead to changes in farm management strategies. Despite efforts by the climate community to routinely issue seasonal forecast, food insecurity persists and cases of crop failure are particularly common in the arid and semi-arid lands (ASALs). This is despite farmers in the semi-arid Kenya being aware of the availability seasonal climate forecast information (Ngugi, 2002). Limited utilization of forecast information raises concerns whether agricultural production problems are a result of a mismatch between the content, scale, format and lead-time of available operational climate forecast. There is need to establish if climate variability simply reveals a plethora of social and economic problems that remain hidden during normal seasons. It is against this background that this study evaluates farmers' perception and use of seasonal climate forecast information in semi-arid southeastern Kenya.

MATERIALS AND METHODS

Study Area

The study was based in Machakos and Makueni districts (Fig. 2), a sub-sector of southeast Kenya and in Eastern Province of Kenya. Several Agro-Ecological Zones (AEZ) are found in the two districts (Jaetzold *et al*., 2007). However, two agro-ecological zones, Upper Midland (UM) 4 and Lower midland (LM) 5 were chosen for this study. This was because the two agro-ecological zones constitute 55% (Jaetzold *et al*., 2007) of the total land area. The choice of the two zones was based on their agricultural potential in which there is a flow of immigrants from the high potential and densely populated areas of the country (Shisanya, 1996; Republic of Kenya, 2002). Agro-ecological zone UM4 is found in Central Division of Machakos district while agro-ecological zone LM5 is in Makindu division of Makueni district. The choice of agro-ecological zones was based on the assumption that variation in physical environment elicits somewhat different farm management options and constraints when forecast information is presented. The study area has two growing seasons related to rainfall distribution: long March-May (MAM) and short October-December (OND) seasons and the amount in each AEZ is as shown in Table 1. The present study used OND rainfall season to achieve its objectives because it's the most preferred growing season by farmers of southeast Kenya (Hansen and Indeje, 2004) and one with a higher degree of predictability (Nyakwada, 1999; Cooper *et al*., 2006).

Table 1: Mean rainfall for MAM and OND growing seasons and 44 year mean annual rainfall

		Rainfall (mm)		
Station	AEZ	MAM	OND	Annual
Katumani	UM4	279.3	298.9	692.5
Makindu	LM5	197.7	334.1	625.8

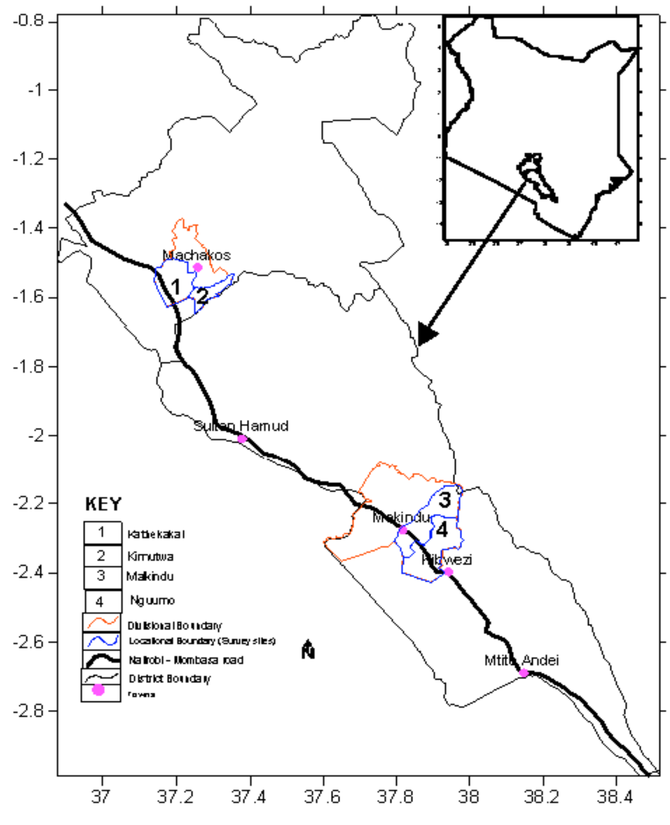

Fig. 2: Map showing position and administrative location of the study sites in Kenya

Data Collection

Household Survey

This study was part of the wider study that sought to evaluate potential to enhance the utility of seasonal forecast information to farmers (International Research Institute forclimate and Society, 2005). In this study, questionnaires were completed for about forty farmers (N = 40) split evenly between agro-ecological zones UM4 (Katumani) and LM5 (Makindu). The study targeted farmers who access forecast information through the existing media channel. Household surveys were conducted before (August, 2004) and after (November, 2004) the release of OND seasonal forecast, returning to the same set of farmers in the two agro-ecological zones. The first survey (hereafter referred to as pre-climate survey) sought to document farmers' plan for the growing season while the objective of the second survey (hereafter referred to as post-climate survey) was to document adjustments in farm management and perception towards forecast.

Rainfall Data

Monthly rainfall data for Katumani Agricultural Research Station and Makindu Meteorological Station for the period 1961-2004 was acquired from the Kenya Meteorological Department. October-December rainfall of 2004 was compared to the forty-four year mean for each site to establish accuracy of 2004 forecast. The 2004 OND seasonal forecast was acquired from KMD and used to evaluate its quality and dissemination channels and assess the extent to which individual farmers factored the information in decision-making.

RESULTS AND DISCUSSION

The 2004 Meteorological OND Forecast and Advisory

In September 2004, KMD issued a forecast for both rainfall amount and onset that divided Kenya into two segments as shown in Fig. 3. The forecast for southeast Kenya was for a slight increase in

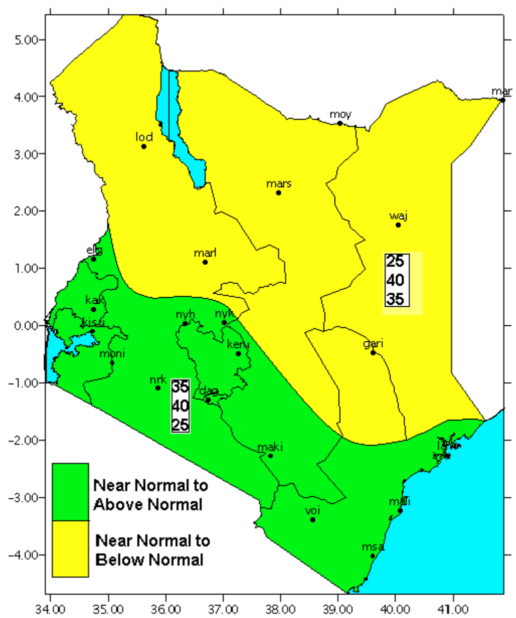

Fig. 3: October to December 2004 rainfall outlook (Source: Kenya Meteorological Department, 2004)

likelihood of normal (40%) to above normal (35%) rainfall. According to KMD advertisement, much of the Eastern province (within which the study areas is found) was expected to realize onset during the 3rd and 4th week of October. Southern parts of Eastern Province were to realize onset in the 4th week of October. The advisory further stated that much of Eastern Province would expect cessation in the 2nd week December and the Southern parts of Eastern Province was expected to realize cessation in January. The wording used in the forecast issued by KMD was not explicit regarding much and southern. Lack of clarity of language can be a limitation towards using climate information. According to Elsayem (2003), forecast language should be simplified and comprehensive in order to address the various levels of users. In addition to dates of onset and cessation, farmers in Southeast Kenya were among those advised by KMD to take advantage of the forecast and maximize crop yields through appropriate land use management. KMD gave a general outlook of the forecast that might not have taken cognisance of the local rainfall.

The 2004 OND forecast was released to the press on September 8th 2004. Most of the leading media broadcasts and print reported that most parts of the country would receive low rainfall in the October to December season. A case in point is the report carried in the Daily Nation of September 9, 2004, which read in part:

- **Poor rains to Worsen Food Crisis:** Hopes of alleviating hunger dashed as weather experts predict doom (Mwaniki, 2004)

The media associated short rains forecast with dry spell of the previous long rains (March- May) season of 2004. The above citation demonstrates that the media lived to its tradition of negative reporting (Phillips *et al*., 2002; Luganda, 2003) by drawing reference to the impact of the poor performance of the March to May 2004 long rains instead of focusing on the potential benefits of the OND season. This might have discouraged farmers of southeast Kenya and undermined effective utilization of OND forecast information. Nonetheless, the release of the forecast early September is laudable on the part of KMD since it gives farmers of southeast Kenya a one-month time lead to plan for the forthcoming growing season that begins mid-October.

Seasonal Rainfall and Access Seasonal Climate Forecast Information

Figure 4 show a comparison of the 2004 and average OND monthly rainfall. Katumani (UM4) received near normal OND rainfall of 298 mm with 35 rainy days compared to the mean of 298 mm and 32 rainy days. At the time of the second survey, farmers at Katumani were weeding their crops, an indication that their farming activities were well within their timing. While at Makindu (LM5), total OND rainfall received was 149 mm, far below the seasonal mean of 334 mm (1.0 standard deviation below normal). Rainfall distribution was poor and the season had 25 rainy days compared to the long-term mean of 30 rainy days. Rainfall records from KMD show that both Katumani and Makindu realized onset during the 2nd dekad (11-20th) of October. However, when compared, Makindu experienced a poor distribution of daily rainfall than Katumani. For instance, between October 14th and November 15th, Makindu had a total of 9 rainy days (>0.1 mm) (separated on average with 3 days of dry spell) compared to Katumani's 16 rainy days. Farmers who dry planted before onset and perhaps those who respond to KMD advisory, started planting in mid October. For the majority at Makindu, poor distribution of seasonal rainfall led crop failure and loses in other farm enterprises. It can therefore be observed that the forecast from KMD was accurate at Katumani while Makindu received poorly distributed rains earlier than predicted. Farmers who received forecast at Makindu suffered from the effect of a forecast that covered a large geographical scale that did not take cognizance of the local ramifications.

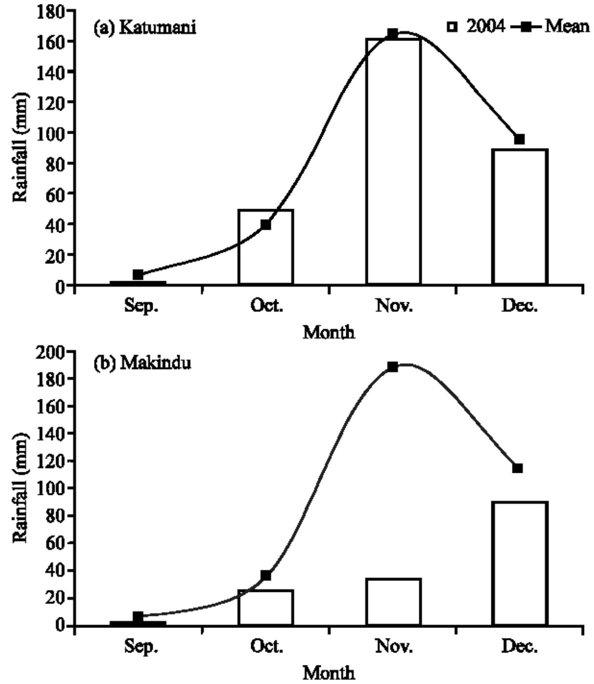

Fig. 4: September-December (SOND) rainfall distribution at Katumani and Makindu

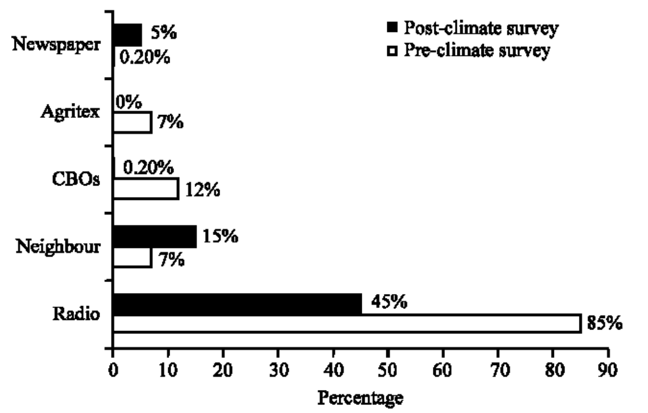

Fig. 5: Sources of meteorological forecast before and after release of forecast information

Sixty-three percent of the respondents (n = 40) said they received climate forecast for the 2004 OND growing season when interviewed in November. Figure 5 shows sources of climate forecast before and after release of forecast. During the pre-climate survey, 85% of the respondents said they access seasonal climate forecast through radio with 12% saying they access forecasts through Chief's baraza (meeting) and community-based organisations. Newspapers were the least important sources of forecast despite being the channel that provides detailed forecast information in the paid-up adverts by KMD. But during the second survey, 45% of the respondents had heard the forecast through radio with 16% saying they had received the forecast through word of mouth (neighbours). The difference

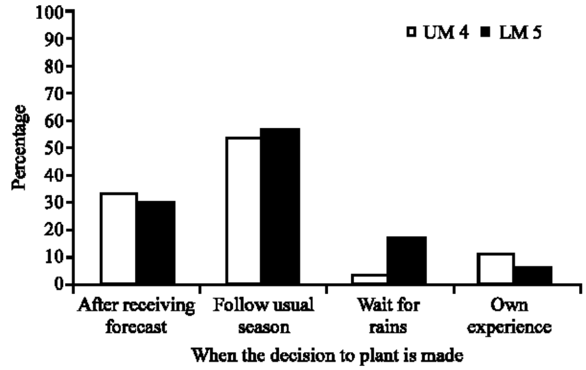

Fig. 6: When the decision to plant is made

can be attributed to some of the farmers making the decision to plant by following usual season or getting the information from their neighbours. It thus reflects that farmers are usually not keen to get meteorological forecast but decide to make farm-level decisions based on their own experience.

Sixty-eight percent of respondents said they use traditional forecasting schemes to predict onset of growing season, similar to the findings of Ngugi (2002) and DMCN (2004). When farmers were asked their perception of meteorological forecast, just 37% said had confidence in meteorological forecast. Eight-three percent of the respondents said they prefer to use traditional schemes of forecasting to make planting decisions. Farmers who do not have confidence in meteorological forecast attributed it to inaccuracy. About a third of the respondents (Fig. 6) of the farmers interviewed said they use climate forecasts from KMD to decide when to start planting, with a slight majority of 33% coming from UM 4 (Katumani). The higher percentage of farmer in UM4 can be attributed to the higher literacy level of the respondents compared to those in LM5 (Recha, 2007). More than half of the respondents take the risk to plant by following the usual season which is usually between mid and late October. Analysis of dates of onset shows that onset at the study sites is most common in the 1st dekad of November and the 3rd dekad of October (Recha, 2007). This indicates that farmers have developed an intrinsic understanding of their environment and climate. However, with rainfall onset in southeast Kenya being as variable as seasonal rainfall amount, failure to use forecasts can lead to severe impacts on assets and livelihoods. According to Phillips *et al.* (2001), failure by farmers to use forecast information clearly illustrates farmers lack of experience. Thus, there is need to adopt a collaborative approach (Johnson *et al.*, 2003) between farmers, extension and scientists in disseminating forecasts as away of improving use of climate information in agricultural decision-making. At least 10% of the farmers interviewed at Katumani insisted that they wait for rainfall onset to avoid the risk of a failed germination. While 17% of the farmers at Makindu use their ‘own experience’ to determine rainfall onset before setting out to plant. Farmers using own knowledge to determine onset are likely to dependent on traditional rainfall indicators (DMCN, 2004). Seventeen percent of the farmers disapproved traditional schemes of predicting forecast, claiming it was short term. This is because a traditional forecast is thought to be reliable in predicting onset but not the distribution and cessation of rainfall (Benjamin Masila, personal comm.). Despite 63% of farmers’ lacking confidence in meteorological forecast, 75% of the farmers consider forecast to be very useful to fairly useful, a pointer that climate forecast products have a vast market.

Farm management strategies and forecast needs: Farm management strategies that could potentially be adjusted to reflect use of a seasonal forecast include (i) choice of cultivar (ii) area planted, (iii) planting date and (iv) use of fertilizer and (v) change in source of seed. Farmers in both sites made alterations in management, often in more than one strategy. Study results showed that maize and beans are the main crops grown in the study area by nearly all the households, a fact also acknowledged by Hansen and Indeje (2004) and Tiffen *et al.* (1994). In addition to maize and beans, cowpeas, pigeon peas green grams, millet, sorghum, vegetables and fruits are grown, albeit on varying land acreage and preferences in the two agro-ecological zones. For instance, 65% of farmers in LM 5 zone plant green grams compared to 5% in UM 4, indicating that agro-ecological zones influence crops planted. According to Hornetz *et al*. (2001), green grams are well adapted to semi-arid and hot tropical lowlands and more productive in the farming system of southeast Kenya. It was notable that farmers had no preferred variety for green grams, cowpeas, pigeon peas, sorghum and millet; mainly because they had no knowledge of the existing varieties or alternatives cultivars. However, all the farmers were particular on maize and bean cultivars to plant. The study further established that the number of farmers interviewed who changed crop cultivars was the same in both AEZs. Most of the farmers who changed or added crops in UM 4 planted fruits and vegetables, while those in LM 5 planted sorghum, green grams, cassava and millet. The study examines choice of maize and bean cultivars during the 2004 OND growing season.

There are three main maize cultivars in both UM 4 and LM5. These are *Pioneer*, *Katumani* Composite and local variety (*Kinyanya*). *Pioneer* maize variety is high yielding and requires reliable rainfall while *Katumani* composite variety has a shorter growing period adapted better to semi-arid condition of southeast Kenya. *Katumani* composites are however unpopular among the local community despite having been available since the 1950s (Tiffen *et al*., 1994). *Kinyanya* is a drought resistant variety grown locally and part of the harvest is preserved for planting in the following season. This reduces the farmer's burden of purchasing maize seed for the season. Table 2 shows farmers plan and actual decision made on preferred maize cultivars for the season. The percentage of farmers who planted *Pioneer* maize variety decreased in AEZ LM5 but increased in UM4 relative to what they had indicated before the forecast was released. There was no change in percentage of farmers who planned and planted local variety (*Kinyanya*). Farmers in the semi-arid, especially those in the drier LM 5 opt not to take risk by planting hybrid varieties given the frequent rainfall failure in the region (Republic of Kenya, 2002). Nonetheless, farmers trained on benefits of forecast information can plant the high yielding hybrid varieties when an above normal rainfall is forecast. The normal rains were an opportunity to farmers in UM4 to maximize the forecast and increase yield by planting *Pioneer* maize variety.

There are several bean varieties planted in both sites and the choice of beans for the up-coming season varied from one farmer to another. These are bean varieties such as: rose coco, *mwezi moja*, *kathika*, *katumbuka*, *nyayo* and *kitui* (local names). According to Shisanya (1998), *mwezi moja* and rose coco (*Phaseolus vulgaris*, var. GLP-1004 and var. GLP-2, respectively) have a lower leaf water potential, an indication of their unsuitability for the semi-arid environment of Kenya, particularly when the season is deficient in rainfall. Kathika (*Phaseolus vulgaris* L.) too is a bean variety susceptible to drought and heat and therefore suitable for cultivation in the cooler and wetter areas of the highlands (Hornetz *et al*., 2001). Although studies show rose coco, *mwezi moja* and *kathika* to be unsuitable cultivars in the semi arid, forecast sensitive farmers can plant these varieties when an above normal rainfall is predicted. Farmers in the relatively higher altitude Katumani (1600 m a.s.l) can plant *kathika* bean variety when a good forecast is expected. Indeed, 58% of the farmers interviewed in UM 4 zone showed preference for *kathika* compared to 45% in LM 5.

Table 2: Percentage of respondents and maize variety planted by Agro-ecological zones

	Local variety		*Katumani* composite		*Pioneer* (PANA)	
AEZ	Before forecast	After forecast	Before forecast	After forecast	Before forecast	After forecast
UM4	75%	75%	15%	13%	16%	25%
LM5	95%	95%	4%	0%	10%	5%

Table 3: Distribution of planting dates by agro-ecological zone (%) (N = 40)

AEZ	Before onset		Prior to onset		After onset	
	Planned date	Actual date	Planned date	Actual date	Planned date	Actual date
UM4	52	50	32	25	16	30
LM5	45	20	15	20	40	57

Sixty-one percent of the respondents made no adjustment to the maize area compared to 41% who made no adjustment to bean area. Reluctance to make adjustment in maize area can be attributed to the normal rainfall season farmers were expecting. Of the farmers who changed size of area planted for all crops, 56% decreased area planted at Katumani and 63% at Makindu changed to intercropping (most of who had said they would plant crops on separate plots during the pre-climate survey). Farmers in Katumani area attributed the decrease in area planted to lack of inputs, particularly seeds and not forecast. Farmers who intercropped said they wanted to intensify land use and maximise on production. Only 11% of the surveyed population increased area planted in anticipation of a normal rainfall season, with majority coming from Katumani.

Nearly half of the respondents changed planting dates for maize and 63% of these were from LM5. Table 3 shows that the number of farmers in LM 5 who planned to plant before onset (late September/early October) decreased from 45 to 20%, with the number of those who planted after onset (late November) increasing from 40 to 57%. Farmers in zone LM5 who planted before and prior to onset (1 week before onset of rains) reported widespread crop failure and had to replant after the onset proper in late November. On the other hand, there was no significant change in the number of farmers who altered planting date before onset at Katumani. However, the number of farmers who altered planting date prior to onset and before onset slightly changed. It is suspected that some farmers who had planned to plant prior to onset finally decided to plant after onset at Katumani.

The ability by farmers to combine strategies (alteration of planting dates, crop varieties, area planted) is an indication that farmers of the semi-arid southeast Kenya are flexible and apply a number of strategies to avert risk. For instance, farmers in the drier LM 5 zone appeared to practice diversity in planting crops as away of cushioning themselves against complete crop failure in times of unreliable rainfall than those in Katumani. (Phillips *et al*., 2002; Vasquez-Leon *et al*., 2003; Wehbe *et al*., 2005) have reported similar findings.

Farmers were asked to state the most useful climate information needed for decision-making (Fig. 7). The response of adequacy of rains was rated most important in UM4 (33%) and 3rd most important in LM 5. The most important forecast information in LM5 was date of onset (33%) and rainfall distribution (27%). The responses may have been elicited by a false onset that was followed by a dry spell and irregular daily rainfall. A review of meteorological forecast issued by KMD shows that with the exception of 'rainfall distribution', all the information needs cited by farmers usually accompany forecast. It is therefore suggestive that farmers do not access the detailed advisory that usually accompanies seasonal forecast information issued by KMD. According to Hansen (2002), effective use of seasonal climate prediction requires that the right audience receives and correctly interprets the right information at the right time. Variation in farmer needs imply that the newspaper, which usually has details of the forecast, is not an effective means of communication, mainly because it not easily accessible to smallholder farmers.

Constraints in the Application of Forecast Information

A number of socio-economic factors were found to affect adoption and use of seasonal climate forecast as shown in Fig. 8. An overwhelming majority (85%) of the respondents said lack of capital was a leading constraint to the application of forecast information. Majority of the farmers rely on farming and wages for income, both of which they said are unreliable due to rainfall variability and lack

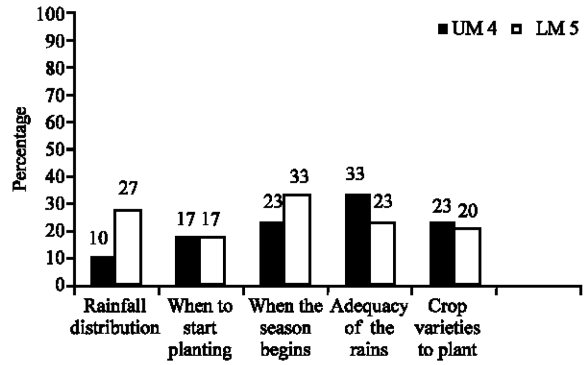

Fig. 7: Forecast information most useful to farmers

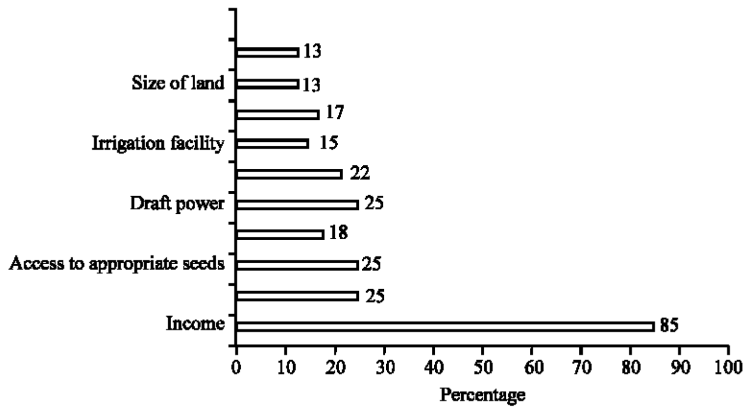

Fig. 8: Leading socio-economic constraints in the adoption of seasonal climate forecasts in South- East Kenya

of employment opportunities. In such a case therefore, farmers are unlikely to respond to forecast information, especially if they have to purchase farm inputs. Indeed, some farmers at Katumani reportedly reduced the size of area planted for lack of seeds, limiting optimisation of the normal rainfall that was expected. Labour, draft power and inaccessibility to forecast information emerged as the second most critical constraints (15%) to the application of forecast. Most of the farmers who mentioned draft-power were from the drier zone LM5. Thus at least 25% of the respondents had to wait for their neighbours or friends to plough before they would hire and where capital to hire or assistance was unavailable, farmers are forced to use hand hoes to prepare land.

Many farmers experience shortage of farm labour particularly just after onset of the growing season. In this era of free primary education in Kenya where most children are now going to school, parents have to seek alternative sources of labour or work round the clock to prepare land for planting. Shortage of labour is particularly true for farmers in the drier Makindu where over 50% of the farmers wait for onset before planting. This is a time when almost every body is engaged in his/her farm and therefore not easy to get assistance from neighbours. At least 25% of the respondents considered inaccessibility to seeds as a constraint, most of them from Makindu. Farmers at Katumani are in the proximity of Katumani Agricultural Research Station and occasionally get free seeds for trials (personal comm. with farmers) although in small quantities. On the other hand, farmers in Makindu are in the interior and not easily accessible to certified seeds. Many a time, they purchase seeds from neighbours and for those who decide to walk the long distance to Makindu town, purchase seeds and other farm inputs from the open-air market instead of stockists. Farmers who cannot access appropriate seeds at the time of planting, end-up using the local varieties (*Kinyanya*) that are not high yielding and this denies them the opportunity to benefit from a good rainfall season.

Contrary to expectations, only 22% of the farmers interviewed considered inaccuracy of meteorological forecast as a constraint. Other forecast related factors such as access and interpretation did not emerge as critical constraints, a fact that can be attributed to the already existing awareness of seasonal climate forecast (Ngugi, 2002). Meteorologists and extension officers can therefore take advantage of this to educate farmers on the benefits of forecast and how to use it since awareness does not translate to use.

CONCLUSION

Results show that within-season rainfall variability is a constraint to sustainable agriculture and effective application of forecast products and therefore a challenge to the climate community. It is evident that short rains of OND do not only show variability in inter annual and intra annual rainfall amounts, but also in dates of onset. Within-season rainfall variability leads to loss of farm enterprises and elicits discontent among farmers towards climate forecast products and erodes forecast credibility. Results further put into focus the role of media in reporting forecasts accurately and the need to move away from its traditional negative reporting. There is a need to review the existing channels of communicating forecast information and adopt a more holistic information up-take promotion. Although majority farmers in southeast Kenya access climate forecast products through radio, there is potential in using chief's meetings and community-based organizations as avenues to disseminate climate forecast. Awareness of and access to forecast are yet to translate into farm-level decision-making. Farmers still employ conservative strategies such as under-use of fertilizer, crop diversification and delay in planting dates. Although these adjustments are a reflection of farmers' flexibility and degree of risk aversion, the adjustments need to be mediated by institutional factors to reduce vulnerability to climate variability. Effective application of climate forecast call for the need to adopt a partnership between climate scientists and climate consumers. In addition, it is prudent to identify social vulnerabilities to climate variability from a local perspective if the gap of integrating climate into policy is to be addressed.

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