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Challenges and Opportunities in Cassava Production among the Rural Households in Kilifi County in the Coastal Region of Kenya

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Abstract
In Kenya, food security and poverty alleviation are some of the most important factors that the country must address in order to achieve the vision 2030. Cassava has potential not only as food for humans, but also as feed for livestock and as a substrate for biofuel production. Although various constraints have been reported to afflict farmers in cassava production, a base line survey in the study sites (Kilifi and Kaloleni) was necessary to identify specific constraints facing farmers in this region so as to identify areas of intervention in production and utilization. Lack of disease free planting materials was identified as one of the major constraints since cassava mosaic disease (CMD) and the cassava brown streak disease (CBSD) pose serious threats in yield losses. The two diseases are transmitted by vectors and by diseased planting materials and almost all the farmers obtain their planting materials from their neighbours thus aiding in disease dissemination and compounding the problem. There is need to enable the community produce quality cassava seed and operate sustained cassava business, integrate legumes into cassava cropping systems and create an innovative value addition chain for utilization of cassava. Eighty percent of Kenya is marginal area and cassava being drought tolerant can enable the potential of these areas to be tapped thus helping to deal with the persistent food insecurity which is a common feature in these areas.
Key words: Cassava, cowpeas, cultivars, production constraints, utilization

Introduction

Cassava, *Manihot esculenta* Grantz (Euphorbiaceae), is an important perennial crop whose roots serve as an important source of carbohydrates to over 800 million people in the World (Nassar et al., 2002; Mbanzibwa et al., 2011). Cassava provides over 500 calories daily to over 70 million people (Westby, 2008). It is the third most important source of carbohydrates in Africa and the second most important food crop after maize in the western and coastal regions of Kenya (Karuri et al., 2001).

Cassava, is an important staple food crop of marginal and semi-arid areas of Kenya and it is grown on approximately 77,502 ha with an annual production of 841,196 tons (FAO, 2001). It is cultivated mainly in the semi arid regions and it has the potential to serve as a food security crop owing to its drought tolerance. Cassava is able to withstand prolonged periods of drought and pest attacks by reducing biomass production and later re-mobilizing photosynthate reserves in the stems and roots (Cock, 1979; Mbanzibwa et al., 2011). The young leaves of the plants are an important source of proteins and vitamins. In addition, the roots and leaves are available all year round (Ntawuruhunga et al., 2007), thus cassava is an important food security crop, especially in drought-prone areas (Westby, 2008). The semi-arid agro-ecological zones of Kenya constitute 80% of the country's land mass and support 95% of the poor population.

In western and coastal regions of Kenya cassava is the second most important food crop after maize and it is an important source of income and food security for many communities and has potential for use in animal feed, starch and confectionery industries (Were et al., 2004). Cassava productivity in Kenya is 11 t ha^{-1} below the potential yield of 90 t ha^{-1} due to low yield potential of popular varieties, susceptibility to pests and diseases particularly mosaic disease (CMD) and brown streak disease (CBSD) and poor crop management practices among other constraints (Mware et al., 2009). At the Kenyan coast, cassava is cultivated on small farms in mixed cropping systems together with cereal crops such as maize or grain legumes such as cowpea, beans or green-grams.

Despite the enormous potential of cassava as a food security crop, the production and utilization is far much low and this study was conducted to establish the status of the crop in Kilifi county with a view of designing intervention measures to promote production and utilization. The study focused on identifying the farmers' knowledge on production systems, dietary habits, farmer resources, source of planting materials, land use trends, constraints in production and status of cowpea which has the potential to be used in intercropping. Since lack of clean planting materials has been one of the major constraints, this study aimed at looking at the existing varieties and the farmers' preferences to aid in decision making during the scaling up of production of disease free planting materials.

Materials and methods

Study area

The study was conducted in Kaloleni and Kilifi districts in Kilifi county. Both districts are in the coast province of Kenya and they are characterized by warm temperatures over 25^0C throughout the year with two seasons of moderate rainfall (about 800-1000mm). The long rains start around March and last up to July, while the short rains that start around October last until December. The study focused on seven women groups six from Kilifi and one from Kaloleni district. These women groups are Amani Farmers Field School from Kaloleni, the other six women groups namely Jaza ulole, Kaloleni, Jiuzeni, Sife moyo, Kuluhiro and Basi Mwangaza were all from Kilifi district.

Baseline survey

A baseline survey tool (questionnaire) was developed in consultation with statistician/biometrician on the techniques to be used to gather detailed information from the wider farming community in the two districts (Kaloleni and Kilifi), on the current situation on production, utilization processing and marketing of cassava in the project districts. Pre-testing of the questionnaire was done prior to administering and the questionnaires revised accordingly to ensure accuracy of the information corrected. The questionnaire was administered to 200 farmers 100 from Kaloleni and 100 from Kilifi district.

Administering the questionnaires

In Kaloleni, out of the 100 farmers interviewed 42 farmers were from the women group whereas out of the 100 farmers interviewed from Kilifi 72 were from the women groups. The 58 and 28 respondents from Kaloleni and Kilifi respectively who were interviewed and were not members of women groups were randomly picked from cassava growing farmers in the two areas. The administration of the questionnaires was done by field assistants with knowledge of the local language so that information was collected as accurately and precisely as possible. Before visiting the farmers for the administering of the questionnaires, the group leaders had already informed their members on the ongoing exercise. The field assistants only needed to book appointments with farmers prior to the day of the interview to ensure that the farmers were available on the material day. In this respect, use of mobile phones came in very handy since over 70% of the community members own mobile phones.

Focused group discussions

Focused groups' discussion sessions were organized for a whole day for each of the two groups at Kaloleni and Kilifi. Discussions involved over thirty farmers in both locations sampled purposively by invitation, and the scientists from CAVS and KARI-Mtwapa (Pate 1). The discussions were carried out with help of structured discussant questions, with the help of identified facilitators from attending scientists.


Plate 1: Focused group discussion sessions between the farmers and researchers from the University of Nairobi and Kenya Agricultural Research Institute (KARI).

Data analysis

The questionnaires were coded appropriately by the biometricians before inputting them into SPSS programme Ver. 12 for the analysis.

Results

Majority of the respondents interviewed were women (69%) compared to men who comprised 31% of the respondents. This is because women are the ones who are more involved in farming activities and men engage in off farm employment and besides the study had targeted the women groups. Average age of the respondents was 41 and 49 years respectively for female and male respondents. Many relatively young people are engaging in farming as chances of securing paid employment has been dwindling. Majority (52.5%) of the respondents had not attained primary level of education, while 34.5% of the respondents had completed primary level of education. The poverty level in these areas is quite high resulting to pupils dropping out of schools before completion.

Maize is the most popular crop in these areas with all farmers cultivating the crop. This was followed by cowpeas and cassava at 95% and 68% respectively. This agrees with the focused group discussions where maize was ranked first in importance followed by cassava and cowpeas. This explains why most of the land under cultivation is under maize and cassava. These three crops i.e. maize, cowpeas and cassava also comprise the greater part of the communities regular diet with utilization being at 100%, 95.5% and 68% respectively. Although some farmers (16.5%) indicated reducing the area under cassava production, there was a net increase in area under cassava production as 26.2% of the farmers indicated increasing area under cultivation. Lack of planting materials was the major reason behind declining area under cassava cultivation as indicated by 64.7% of the respondents.

Kibanda Meno and Tajirika were the most common cassava varieties grown by the farmers in the two districts. Only 2% of the famers were growing the variety Shibe while Karembo is a bitter variety and it is used for alcohol production. Kibanda Meno was the most popular with over 45.5% of the farmers cultivating the variety. Figure 1, below shows the attributes that renders these two varieties to be the most popular.

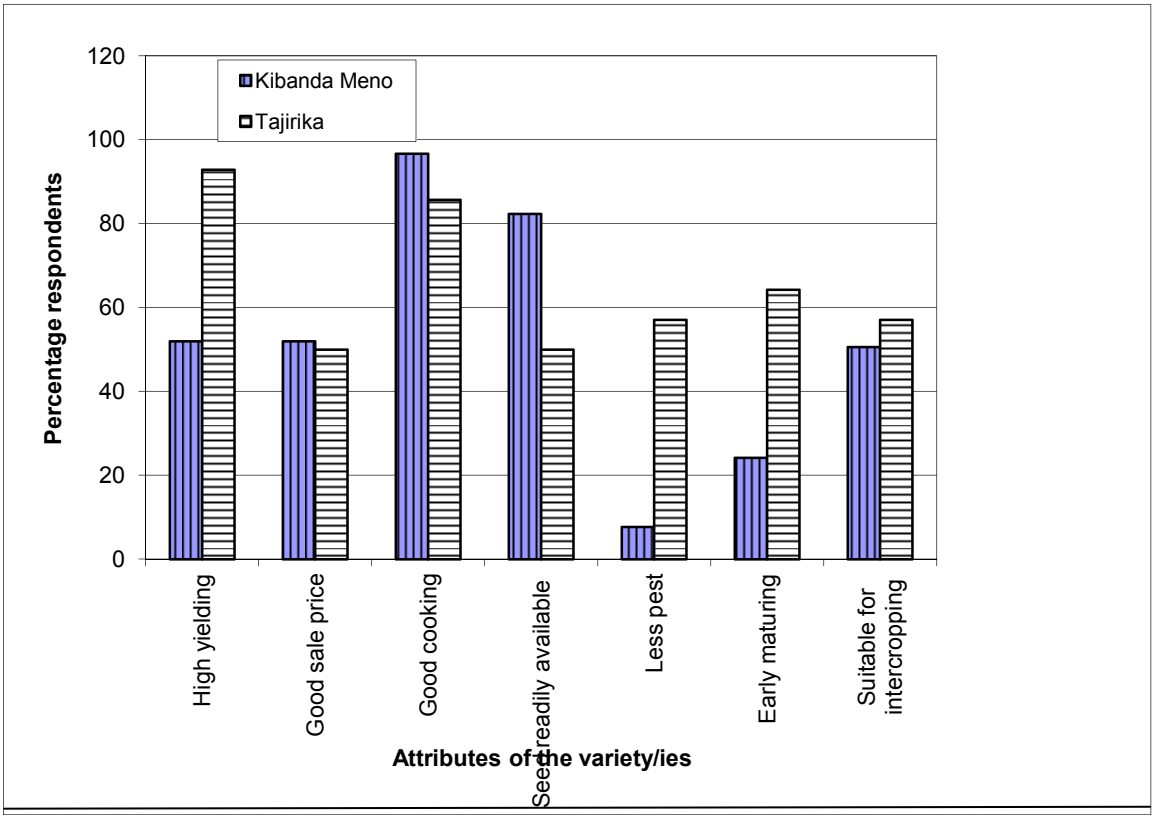

Figure 1: Attributes of cassava that were major determinants in varietal selection

Various insect pests and diseases were reported to be a problem in cassava production for both Kibanda Meno and Tajirika (Table 1). White flies was the major insect pest reported and only 5.2% of the farmers spray against it while 87.9% of the farmers do not apply any management strategy. Failure of the farmers in correlating the white flies to the cassava mosaic disease explains why most of the farmers don't manage the pest. To the farmers the perceived level of damage is low and therefore do not warrant any control. Majority of the farmers perceived CMD to be a very important disease but 90.6% of the respondents do not do anything about the disease. This could be explained by the lack of knowledge in the appropriate disease management strategies.

Table 1: Percentage of respondents on the incidence of pests and diseases on the cassava varieties

	Insect pests		Diseases	
	White flies incidence	Perceived level of damage	Cassava mosaic disease incidence	Perceived level of damage
Kibanda Meno	98.3	34.5	100	45.3
Tajirika	100	100	85.7	33.3

Over 79% of the respondents prepares the land for planting before the onset of the rains whereas the remaining farmers prepares the land after the onset of the rains. Cowpea is the second most important crop after maize and

farmers do intercrop cowpea with maize and cassava. Over 56% of the farmers intercrop cassava with cowpeas. Majority (84%) of the famers cultivates local cowpea varieties since they are superior to new varieties in terms of cooking qualities, yields, seeds availability, early maturing and suitability for intercropping. Although land under cowpea production has remained unaffected as indicated by 71% of the respondents, 17.5% of them had increased the area and 11.2% had reduced the acreage under the crop. Majority (52%) of those who had increased area under cultivation was due to availability of high yielding varieties while 33% of those who had reduced the area under cultivation was due to pests and diseases. Despite the numerous challenges facing these farmers, 50% of them did not have an idea on how to address these constraints. Leaf borers was the most common (95.7%) pest reported, however 78% of the farmers do not do anything about it while 14.3% spray using insecticides. Leaf rust was reported to be the major disease on cowpeas by all the respondents interviewed. Septoria leaf spot was also reported on cowpeas but at low incidence. Insect pests were reported to be the most (84%) limiting constraint in production followed by unreliable rainfall (75%) (Figure 2).

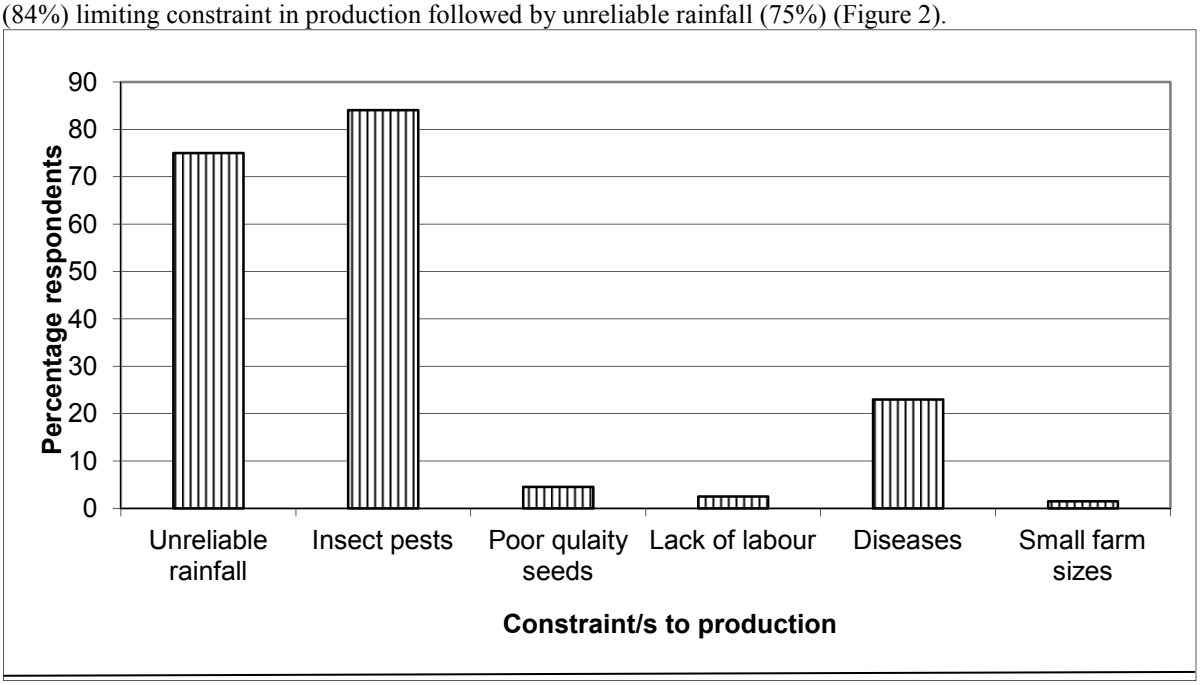

Figure 2: Major constraints in cowpea production

Extension service and the NGOs were the main source of new agricultral technologies for the farmers in these areas. World Vision was the main NGO operating in the area and they had introduced technologies on water conservation, goat rearing and general crop husbandry practices. In addition, farmers also get to acquire information on new technologies from their neighbours. For instance most (71.4%) of the farmers normally get the information about new varieties from their neighbours with 81% of them acquiring planting materials from their neighbours. This acquisition of planting materials from the neighbours has contributed to the spread of the disease as most of these planting materials are diseased and disease indexing is not done.

The pests identified in cowpeas were whiteflies (*Bemisia tabaci*), semi-lopper (*Plusia orechalcea*, bean flies *(Ophiomyia phaseoli),* black bean aphids *(Aphis fabae),* leaf beetles *(Medythia quarterna)*, bean webworm *(Lamprosema indica)*, systates weevil *(Systates pollinos)*

Discussion

The study identified the major factors that hinder cassava's production potential to be unavailability of clean disease free planting material, lack of a sustained seed propagation system, low soil fertility, inappropriate cropping systems and lack of a viable functional value addition chain linking farmers to both local and international markets. These findings are in consistent with those of several other researchers (Karuri et al., 2001; Ntawuruhunga and Legg, 2007; Wesby, 2008).

Lack of clean planting materials and use of CSD and CBSD infected planting materials has been the major constraints to cassava production in the area. The community needs also to be empowered to have a self sustaining clean seed production system. As reported by Ntawuruhunga & Legg, (2007) most of the cassava germplasm resistant to CMD has been found to be highly susceptible to CBSD and these are materials that were being promoted for the management of the CMD pandemic.

Poor soil fertility which characterizes marginal areas due to overexploitation of soil resources without replenishing nutrients calls for development of cassava/cowpeas intercropping aimed at taking advantage of the proven integrated soil fertility management interventions (ISFM), by intercropping with legumes and application of bio-inoculants in the improvement of cassava productivity as also reported by Howeler (1991).

Pests and diseases also came out strongly as a serious constraint in cassava production. Most farmers don't manage the pests since they dont know that some of the pests such as whiteflies transmit diseases like cassava mosaic. This finding agrees with those of Mware et al., (2009). Farmers lack knowledge on pest identification and were regarding any insect pest as "worms". The study identified insect pests such as mealy bugs, cassava green mites and white flies on cassava. A significant number of farmers could identify cassava mosaic disease since the disease is endemic in the area and the extension staff had been training the farmers on identification and management as also observed by Njenga et al., (2005). However, cassava brown streak disease is a recent disease and farmers are unaware of the disease until the time of harvesting where farmers note the disease on opening the tubers.

Due to the inability of the farmers in identifying the disease and susceptibility of the planting materials, the disease is taking a big toll on the farmers cassava production thus threatening the gains achieved over the years. These observations agrees with Alicai et al.,, (2007) who also reported that mosaic symptoms of CBSD are less conspicuous and farmers are often unaware of the problem until the roots are harvested and the corky, yellow-brown necrotic rot becomes evident. CBSD may be latent where some infected plants may be symptomless and some varieties express symptoms in roots but not on leaves Ntawuruhunga & Legg, (2007). This makes the detection of the disease on planting materials impossible resulting to distribution of such materials to unsuspecting growers.

Cassava has many other uses for instance in animal feeds where it leads to increased milk production in dairy cattle and reducing the cost of feeding animals as also reported by Westby (2008). However farmers should be trained on the cassava use in animal feeds to avoid poisoning their animals as it happens when it is given in excess especially cassava peels. Farmers were processing cassava and using it for crisps and chips, baking bread, porridge, and making "mandazi and chapatis". Processed cassava products usually have a longer shelf life as compared to fresh cassava, which does not last long and spoils faster. Inappropriate storage facilities for both raw and dried cassava products and lack of technological knowhow and equipments have been hampering their efforts in cassava processing. These findings agree with those of Karuri et al., (2001).

The source of planting materials is critical as demonstrated by the Shibe variety that respondents rated highly in terms of high yielding, resistance to pests and diseases and good cooking qualities but very few farmers were planting it due to lack of planting materials since the source of planting materials was from the extension staff through the Ministry of Agriculture. The other two popular varieties farmers were readily acquiring the planting materials from their neighbours thus fueling the spread of the viral diseases also observed by Alicai et al., (2007).

Conclusions and recommendations

To deal with the issue of diseased planting materials which is responsible for significant reduction in cassava production by the farmers in these areas, there is need to avail smallholder cassava farmers with disease-free planting materials for purposes of improving productivity.

The study also identified the need of up-scaling the existing cassava value addition mechanisms through processing of cassava products and fostering and strengthening linkages between cassava production by smallholders on one hand and food markets.

To address the pest and disease problem, there is need to educate farmers on identification and proper management of the same and avail or build capacity for them to produce clean planting materials. Breeders should deploy genes for resistance to the pests and diseases while at the same time ensuring good agronomic traits are retained in the new varieties.

Majority of the farmers prepares their land after the onset of the rains. Farmers should be advised to prepare the land before the onset of the rains so that they can be able to plant immediately after the rains thereby be able to maximize on the rains since these are marginal areas with inadequate rainfall.

Acknowledgements

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