IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 9, Issue 7 Ver. II (July 2016), PP 59-69
www.iosrjournals.org

Cassava – Heartbeat of Food Security: A Socio-Economic Analysis of Cassava Production in Kwale County, Kenya

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Abstract: *Agriculture remains the key driver of the Kenyan economy and Vision 2030 singles out agriculture as one of the key sectors to deliver sustainable economic growth and improved livelihoods for the poor in the rural areas. However, the sector faces challenges in production due to frequent and prolonged droughts. This calls for farmers to adopt more drought-tolerant crops like cassava. It gives the third highest yield of carbohydrates per cultivated area among crop plants and is unique in its ability to produce under a wide array of harsh environmental conditions compared to other crops. Cassava farmers face a number of socio-economic factors that influence their production decisions and their main challenge is the mass supply of tuber roots that can satisfy human needs, and stimulate good demand in animal and industrial use. Underlying factors associated with lack of response to emerging trends in cassava production therefore needed to be determined and analyzed for effective promotion of the crop. This study highlights of the socio-economic factors influencing smallholder farmers' participation in cassava production in Kwale County. Data were collected from 186 farmers selected proportionately from three wards (Vanga, Kikoneni/Pongwe and Dzombo) in Msambweni using face-to-face interviews. Descriptive statistics and the Heckman model were used to analyze the data. The Statistical Package for Social Scientists (SPSS), Excel and STATA programs were used to process and summarize the data. Among the Socio-Economic factors, farm size positively influenced participation in cassava production whereas schooling years (education level) and age negatively influence participation in cassava production. Only gender of household head was statistically significant in influencing extent of cassava production and had a negative influence. It was recommended that the government and other policy makers consider policies that encourage the following socio-economic aspects: affirmative action for gender awareness by empowering more women, middle-income groups and younger people to engage in cassava production.*

Keywords: *Kwale County, Cassava Production, affirmative action, food security, development*

I. Introduction

Kenya's economic growth has for a long time depended on agriculture. As such, the country's long-term development blueprint, Vision 2030 singles out agriculture as one of the key sectors to deliver sustainable economic growth and improved livelihoods for the poor in the rural areas. However, the sector faces several endemic and emerging constraints at the global, regional and national levels that require special attention. In the first two decades after independence, Kenya's economy grew at an average rate of 6 percent per year substantially driven by a robust agricultural sector (Ministry of Agriculture, 2009). However, until about six years ago, the overall economy barely grew, partly as a result of a decline in agricultural activities. Despite experiencing mixed growth results over the years, agriculture still remains the mainstay of the Kenyan economy, its share of the Gross Domestic Product (GDP) declining from 23% in 2007 to 22% of real GDP in 2010 (KNBS, 2010). The current share is 26% (KNBS, 2012). The agricultural sector however continues to face challenges in production due to frequent and prolonged droughts both regionally and globally. The drastic effects of drought and the resultant food insecurity can be overcome by growing crops that are drought tolerant like cassava.

Utility of Cassava as a Tuber Crop

Cassava (*Manihot esculenta crantz*) is one of the most popular root crops grown in Africa. It is relatively easy to cultivate, needing very little cultural attention. Many soils are used for growing cassava but high tuber yield can only be obtained in friable and light soils. The soils should be deep, not stony nor water-logged. Cassava is exhaustive of potassium (Ministry of Agriculture, 2012). Cassava value chain is promising with many business opportunities; the main challenge is the mass supply of tuber roots that can satisfy human, animal and industrial needs. Cassava, as well as the rest of agriculture faces production and marketing limitations that significantly impede the country's overall economic growth and development (Elise, 2012). Cassava has many uses but largely, it is used for three main purposes – human food, animal feed and starch

making (FAO, 1995). Some of its products are; boiled cassava, cassava crisps, cassava *chapati*, *Kimanga*, cassava porridge, cassava *ugali*, cassava *mandazi* and cassava cake (Ministry of Agriculture, 2012). Cassava stalks are used as seed, wood fuel and as fencing materials while the leaves may be used as vegetables and hay. Industrial uses of cassava include use in animal feed making and making of industrial starch. Its consumption closely follows the global pattern of output, since most of it is consumed in the countries where it is grown. Furthermore, FAO (1995) indicates that while total food consumption of all crops has risen considerably during the past 40 years, world consumption of cassava as food has remained stagnant, mainly because it is regarded in many countries as a poor man's food, though it can go a long way in relieving the consumption pressure on cereal crops like maize and rice.

Cassava production in Kwale County

Cassava is the most important root and tuber crop in former Coast (30%), Eastern (10%), Western/Nyanza (60%) and some parts of Rift Valley and Central Provinces.

In Kwale County, there is poorly organized formal production and marketing structures in place for cassava. A large proportion of the farm households aim basically to produce enough tubers to meet household requirements and many often fail to meet this basic goal. A growing proportion of farmers are beginning to adopt new varieties because of increased yield. However, they are less willing to allocate more resources to increase production because of the perception of higher returns from alternative farm and non-farm enterprises whereas cassava could do much better in the prevailing circumstances. Moreover, there has been increased interest by the Government and private investors in animal feed making and starch manufacturers to promote cassava production (Ministry of Agriculture, 2012). The common improved varieties grown in Kwale County include Karembo, Shibe, Tajirika, Karibuni, Nzalauka, Siri and local types like Kibandameno and Guzo (Ministry of Agriculture, 2012).

In the recent past the demand for cassava has gradually increased following increase in population and its industrial use particularly in feed and industrial starch-making. There has also been increased interest by the Government and private investors in animal feed making and starch manufacturing to promote cassava production. The Ministry of Agriculture through KARI (now KALRO) and Eastern Africa Agricultural Productivity Project (EAAPP) has been working to increase cassava production. However, as much as cassava is an important table and income generating crop, farm households in the study area have been faced with critical challenges which include poor access to quality seed, serious pests and disease challenges of the local varieties and low yields. In response to these challenges, KARI under its regional research mandate developed the six cassava varieties (mentioned earlier) to mitigate the afore-mentioned challenges (including aspects of early maturity) along with incorporation of eating/consumption and other market preferences that respond to industrial needs that cassava also has potential in. In spite of these concerted efforts, the main challenge remains the mass supply of tuber roots that can satisfy human, animal and industrial needs. Cassava still faces production limitations that significantly impede the country's overall economic growth and development.

Kwale County is among the high potential areas for cassava production but indications are that only a few farmers engage in production that spares some cassava for sale. The current status of cassava cultivation in the County is not clear. Underlying factors associated with lack of response to emerging trends in cassava production therefore need to be determined and analyzed for effective promotion of the crop. There has been scarcity of research with regard to the socio-economic factors and characteristics of cassava producers in Kwale County and how these factors affect production decisions. There was therefore need to analyze how these factors influence participation in cassava production in the County.

II. Methodology

Study area

The study was carried out in Vanga, Kikoneni/Pongwe and Dzombo Wards of Msambweni Sub-County of Kwale County, Kenya. Kwale County is located in the South-eastern corner of Kenya and borders Mombasa County to the North, Kilifi County to the North-west, Taita-Taveta County to the West and the Republic of Tanzania to the South. The County hugs the Indian Ocean on its eastern side forming a stretch of coastline covering approximately 250 km. The County covers an area of 8,270.2 Km^2 (of which 62 Km^2 is under water), lying between Latitudes 3^o 3'and 4^o 45'south and Longitudes 38^o 31'and 39^o 31'East with a population of 649,931 people (Kwale CIDP, 2013). It has an altitude ranging from 0 m and 462 m above sea level. Kwale County is divided into four administrative Sub-counties namely Matuga, Kinango, Lungalunga and Msambweni.

Kwale County has four major topographic features namely the Coastal Plain, the Foot Plateau, the Coastal Uplands and the Nyika Plateau. The Foot Plateau, which is behind the Coastal Plain, lies at an altitude of between 60 and 135 meters above sea level. The plateau has a flat plain surface with high potential permeable sand hills and loamy soils. This zone is composed of Jurassic rocks and sandy hills consisting of Magarini

sands, ideal for sugar cane growing (ibid). The Coastal Uplands is an area of medium to high agricultural potential while in the Nyika Plateau the main activity is livestock rearing.

Msambweni Sub-County is located to the south of the County and its geographical coordinates are 4° 28' 0" South and 39° 29' 0" East (ibid). The land surface is characterized by a number of undulating flatlands and hills as part of the Coastal Lowlands. Msambweni Sub-county also lies between the Shimba Hills and the Indian Ocean, providing diverse climatic and agro-ecological conditions due to its range of altitudes (from 0 to 462 Meters above Sea Level). Main types of soils are clay, clay-loam, sand and sandy-loam. In the lower flat lands, closer to the shores, alkaline/saline soils predominate.

More than 80% of the population of Msambweni Sub-county live in the rural areas and depend on agriculture, fisheries and livestock for their livelihood. Mixed crop-livestock, mostly maize-based systems are widely found in the Sub-county that are intercropped with varying species, such as common beans, cowpeas and green grams, according to altitude and rainfall availability. Cassava is also widely grown. In the lowlands, paddy rice is cultivated where irrigation is available. Cash crops grown include mangoes, Oranges, coconut, sugarcane, cashew nuts and bixa to a lesser extent.

It is important to note that not many areas of Kwale County are of high agricultural potential. Rains are erratic, soils are light and of low fertility hence conducive for production of cassava in much of these marginal areas. Msambweni Sub-county has five Agro-Ecological zones as follows: Coastal Lowlands (CL) 2 – this is the lowland sugarcane zone. It is ideal for production of grain, pulses, tubers, oil crops and vegetables. Tropical fruits, coconuts, bixa, rice, sugarcane, cashew nuts, pasture and forage for animals are available in this zone. Generally, it is a high potential zone. Coastal Lowlands (CL) 3 – this is the Coconut-cassava zone. This zone is also suitable for grain, tubers, pulses, tropical fruits, oil crops, vegetables and Coconuts. The Coastal Lowlands (CL) 4 is the Cashew nut-cassava zone. The zone is marked by high potential for production of cashew nuts, cassava and sisal; medium potential for grain, pulses, oil crops, pasture and forage. Coastal Lowlands (CL) 5 – this is the Livestock-millet zone: It is suitable for sorghum, millet, green grams, and cassava. Livestock rearing is the predominant activity. Finally, Coastal Lowlands (CL) 6, the Ranching zone is good for livestock rearing (cattle, sheep and goats). The study area particulars are shown in Figure 1.

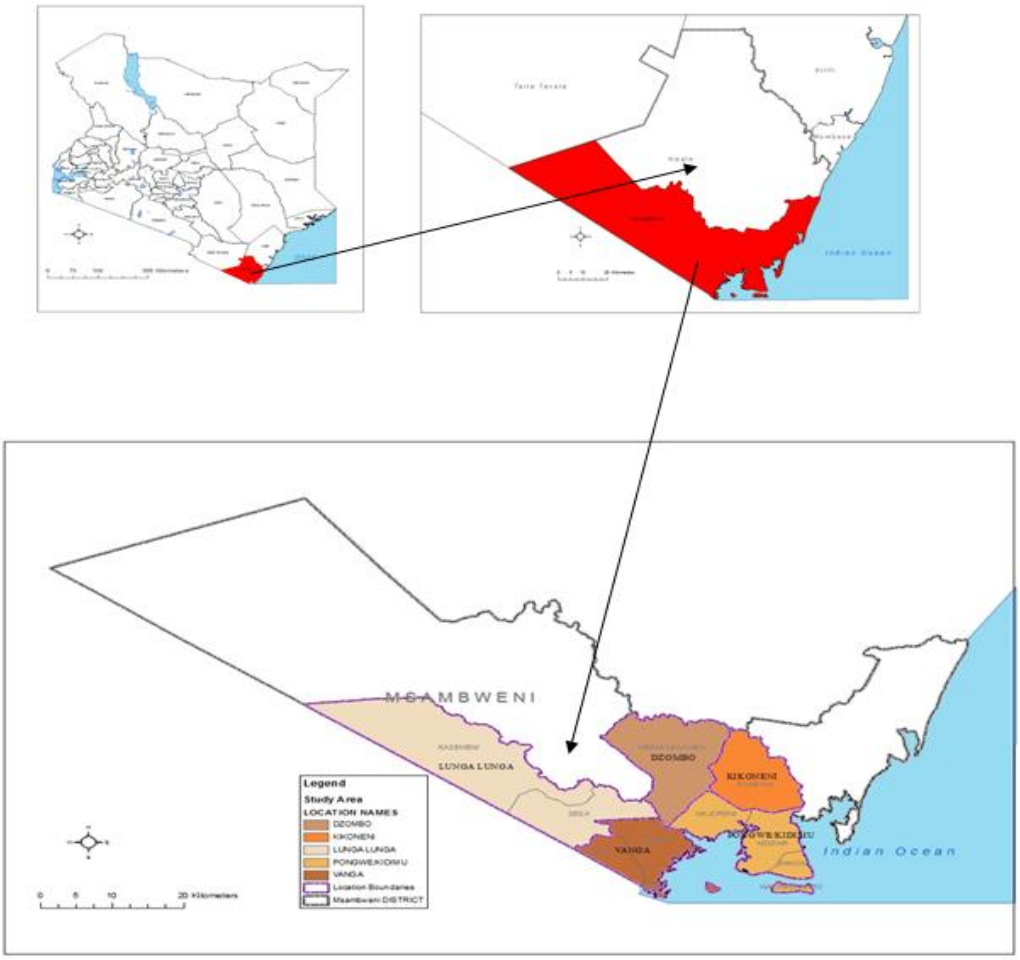

Figure 1: The study area particulars

Data collection

The study targeted both cassava and non-cassava farmers. The samples were drawn from Vanga, Kikoneni/Pongwe, and Dzombo wards in Msambweni Sub-county. As per the 2009 population census the three wards have population of 36,119, 51,842 and 41,509 people respectively. They were purposively selected because of the large number of cassava farmers. The population of farmers in the three wards was stratified into cassava producers and non-cassava producers. Systematic/linear random sampling was applied in order to choose a sample for cassava producers (113) from sample frames that were provided by the Sub-county Agricultural Office. Simple random sampling was used to select the sample of non-cassava producers (73) by the use of the table of random numbers. Because of low literacy levels in Msambweni and to ease the work of analyzing, primary data were collected using interview schedules. Face-to-face interviews with the household heads were done.

Secondary data were collected from the Sub-County Agricultural office, Government publications, district statistical (DDO's) office and other data bases. Observation method was also used.

Analytical Technique

The main econometric specification used for exploring the factors that influence household participation and level of participation in cassava production was the Heckman model. The Heckman type models deal with sample selection problems by computing a selection term from the first equation (selection model) and including it as a regressor to correct for self selection in the second stage regression involving observations from the selected sample (Heckman, 1979). It models non-participation, participation and potential for participation. In that case it is a 2-step decision model. The two-steps include; first a Probit model for participation or selection equation is estimated. This step estimates the probability of farmer participation as shown in the equation below:

Step 1: Participation decision to produce or decision not to produce

$$P_i = \gamma_1 + \gamma_i Q_i + \mu_i,\ E\left(\mu_i / Q\right) = 0$$

Where, P_i is a dummy for participation in cassava production while Q_i is a vector of variables that affect participation decision.

Step 2: Level of participation in cassava production:

Step 2 applies if $P>0$. Here, conditional on participation, the level of participation function is given as;

$$Y_i = \beta_1 + \beta_i X_i + e_i,\ E\left(e_i / X\right) = 0$$

Where Y_i indicates the level of participation measured in terms of area under cassava by a farmer, X_i is a vector of variables that explain the levels of participation, μ_i and e_i are the error terms.

The model assumes that Q and X are observable exogenous variables and X is a subset of Q. Correlation between μ_i and e_i if not zero will bring about the selection bias problem. Upon estimation of the selection equation a non selection bias is computed using equation (3) below,

$$E\left(\mu_i / P_i, Q_i\right)$$

This is called the Inverse Mills Ratio (IMR), $\lambda(\delta Q_i)$ when $P_i=1$.

Then the lambda is used in the outcome equation (2) as an explanatory variable. The new equation for the second stage regression therefore becomes:

$$E(Y_i = Q_i, P_i = 1) = \beta_1 + \beta_i X_i + \rho\lambda(\delta Q_i)$$

This equation gives the expected area under cassava, Y_i given vectors of observable factors Q_i and given that the household has already made the decision to participate in cassava production. This is explained by a vector of observable characteristics X_i and the Inverse Mills Ratio evaluated as, $\lambda(\delta Q_i)$. There is no evidence of the selection bias if $P_i=0$ and therefore the regression reverts to Ordinary Least Square (OLS). However, if $Pi \neq 0$ then there were omitted variables in the initial model correlated with X_i which is corrected by including IMR in the second regression. The coefficients measure the expected change in the model for a unit change in each independent variable, holding all other independent variables constant (Gujarati, 2004 and Pallant, 2007). The sign of the coefficients shows the direction of influence of the variable and it therefore follows that in this

study, a positive value in stage 2 indicates an increase in the likelihood that a household will put more land under cassava production and a positive value in stage 1 indicates an increase in the likelihood that the household will participate in cassava production and vice versa.

The P-values (significance values) show whether a change in the independent variable significantly influences dependent variable at a given level. In this study, the variables were tested at the 1%, 5% and 10% significance levels. Thus, if the significance value was greater than 0.1, then it showed that there was insufficient evidence to support that the independent variable influenced the dependent variable. If the significance value was equal to or less than 0.1, then there was enough evidence to support a claim presented by the coefficient value. If the significance value was less than or equal to 0.01, then the variable was significant at 1% significance level. If the significance value was between 0.01 and 0.05, then the variable was significant at 5% significance level. If the significance value was greater than 0.05 but less than or equal to 0.1, the variable was significant at 10% significance level. The standard error measures the standard deviation of the error in the value of a given variable (Hill *et al*, 2001). The major limitation to this model is the assumption that a variable affecting the decision to participate in cassava production can sequentially lead to reduced level of participation to zero acreage under cassava. The socio-economic variables under consideration are age, gender, education, household size, farm size and household income.

III. Results And Discussion

Socio-Economic Characteristics of Cassava Farmers

Age distribution of the farmers

Age of the household head has a bearing in agriculture because it determines experience one has in a certain type of farming. Household head's experience further influences household members' farming activities since they usually provide guidance (Ngqangweni and Delgado, 2003). The results showed that only 5.4% of the respondents were less than 30 years whereas 20.4%, 23.7% and 37.7% were in the age brackets of 30-39, 40-49 and 50-59 years respectively. Only 12.9% of the respondents were above 60 years of age. The average age was 48.7 years. The results therefore imply majority of the respondents were above the youth age bracket as shown in Table 1 below. This also implies an aging farmer population which might lead to diminishing production.

Table 1: Age Categories of Farmers

Age category		Frequency	Percent	Cumulative Percent
	<30	10	5.4	5.4
	30-39	38	20.4	25.8
	40-49	44	23.7	49.5
	50-59	70	37.6	87.1
	≥60	24	12.9	100.0
	Total	**186**	**100.0**	

The results of the study further revealed that there was a positive relationship between age and the possibility of participation in cassava production as shown in Figure 2 below. The results show that participation in cassava production increased with increase in the age of farmers. This is in agreement with Itam *el al*, 2014 which found a positive relationship between age and cassava production where chances of producing cassava increased as farmers grew older.

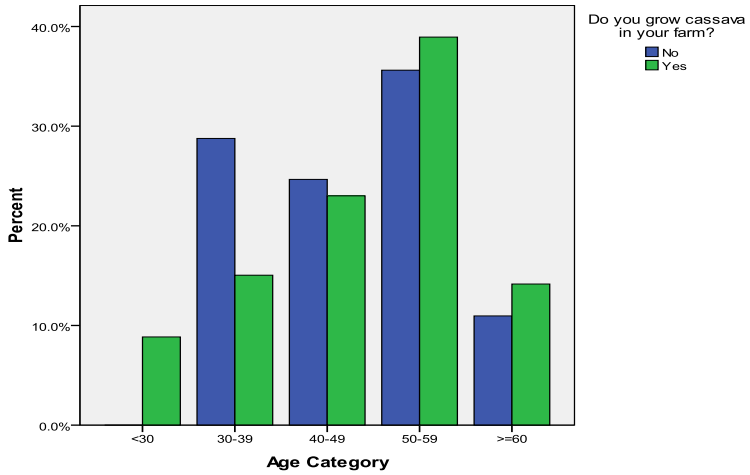

Figure 2: Age of farmer and cassava production

Gender of the household head

The results on demographic characteristics showed that there were a larger proportion of males (63.4%) as opposed to females (36.6%) as shown in Table 2. This was as expected given that farming in the region is dominated by men who are involved in such enterprises as cassava which is grown in the region both for subsistence and incidental commercial purposes. This was however, in disagreement with findings of Doss, (1999) which indicate that women were more involved in subsistence crop production unlike men.

Table 2: Gender of Household Head

Gender of farmer		Frequency	Percent	Cumulative Percent
	Female	68	36.6	36.6
	Male	118	63.4	100.0
	Total	**186**	**100.0**	

The results further indicate that more male (66.4%) were producing cassava as compared to only 33.6% of the women who were producing cassava as shown in Figure 3. This is also in disagreement with Ogunley, 2008 who found out that women are more involved in cassava production and processing than men and women are likely to gain proportionally more if the investment and development efforts are shifted in their favor.

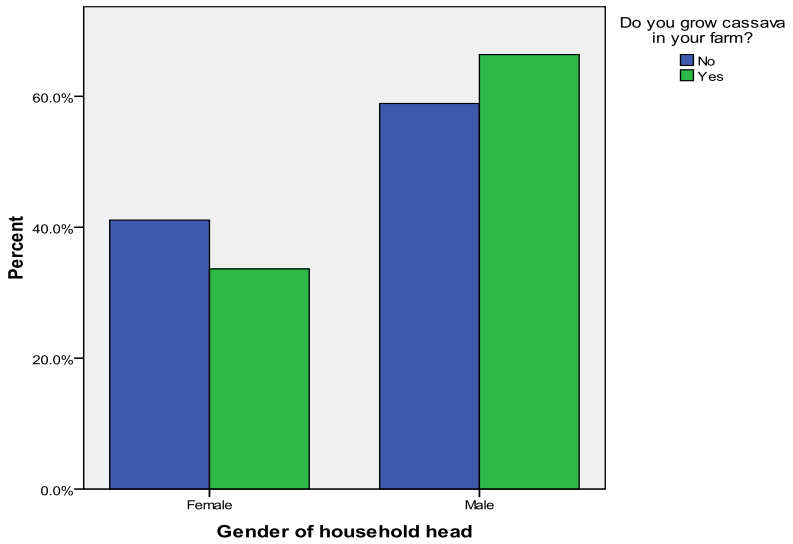

Figure 1: Participation in Cassava Production by Gender

Education level of the farmers

The results showed that 38.2%, 51.1% and 3.8% of the respondents had primary, secondary and tertiary level of education respectively. Only 7.0% of the respondents reported to have no formal education. Majority of the farmers in the study area had primary and secondary education as shown in table 3 below. This generally means that most of the respondents were literate.

Table 3: Educational Level of Farmers

Educational level attained	Do you grow cassava in your farm?		Total
	No	Yes	
None at all	0.5%	6.5%	7.0%
Primary level	13.4%	24.7%	38.2%
Secondary level	22.6%	28.5%	51.1%
Tertiary level	2.7%	1.1%	3.8%
Total	**39.2%**	**60.8%**	**100.0%**

It was also noted that majority of the farmers with little or no education participated in cassava production than those more educated. From Table 3 above, all farmers without education except one were producing cassava unlike those with tertiary education where out of those farmers only 22.2% were producing cassava. Also, majority of those with middle level education were also producing cassava as shown in Figure 4 below. This indicates that as farmers' education levels increased, chances of participating in cassava production reduced. This could be because farmers with higher education tend to look for off-farm employment and therefore they would usually have diverse income sources. However, these results disagree with Itam *et al*

(2014), who found a positive relationship between education and farmer participation in cassava production implying that as the level of education increased, chances of producing cassava also increased.

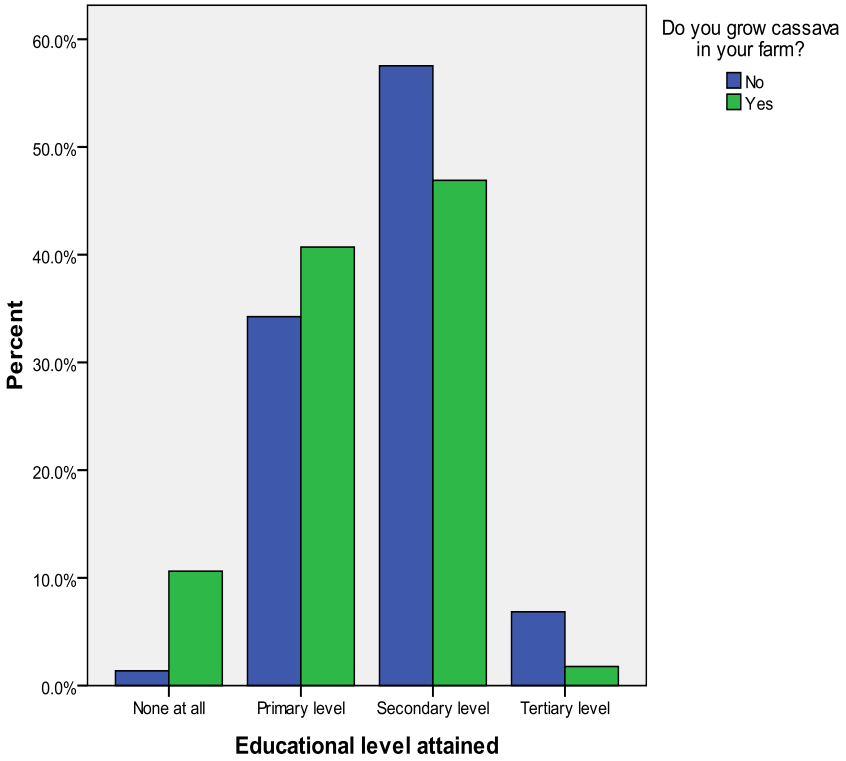

Figure 4: Education Level of Farmer and Cassava Production

Household size

The household is the major source of farm labour in small-scale agriculture. Ng'ang'a (2009) attributes large household sizes to the desire to have enough family labour and hence farmers keen on using family labour instead of hired labour will in most cases have more children. In his study, the use of free child labour was also positively associated with family size implying that families that rely on child labour tend to have more children. This is especially true for women who use older children as baby-sitters as they perform other chores both inside and outside the household.

The findings of this study showed that 59.7% of the farmers had between 4 and 6 members in their household, while 38.7% of the farmers had between 7 to 9 persons in their households. Only 1.6% had less than 4 persons in their household. The average household size was 6.08 (approximately 7) persons and this was higher than Kenya's mean household size of 5.1 persons (GOK, 2006). This means that majority of the farmers in the study area generally have large household sizes which means higher demand for food and household income.

Table 4: Farm Household Sizes

Household size		Frequency	Percent	Cumulative Percent
	<4	3	1.6	1.6
	4-6	111	59.7	61.3
	7-9	72	38.7	100.0
	Total	**186**	**100.0**	

The results in Table 5 further show that 33.3% of the farm households with less than 4 family members were producing cassava whereas 57.7% of the farmers with household sizes of between 4 and 6 family members were producing cassava. About 66.7% of the farmers who had between 7 and 9 family members were producing cassava. The results show that the percentage of those producing cassava increased as the household sizes increased as shown in Table 5. These results give an implication that the likelihood of farmers in the study area of participating in cassava production increased as the household sizes increased. As household size increases, the demand for various household items increases which in turn reduces the disposable income for production.

This means little income being available for purchase of farm inputs and this could lead to production of cassava by majority of the big households since cassava requires very little input investment.

Table 5: Cassava Production as Influenced by Household Size

Household Size Category	Do you grow cassava in your farm?		Total
	No	Yes	
<4	66.7%	33.3%	100.0%
4-6	42.3%	57.7%	100.0%
7-9	33.3%	66.7%	100.0%
Total	**39.2%**	**60.8%**	**100.0%**

4.1.6 Farm Size

Farm size plays an important role for farmers in deciding what enterprises farmers undertake and the area to be put under each of those enterprises. The results show that majority (54.8%) of the respondents owned between 2 and 4 acres of land. Only 24.2%, 12.4%, 8.1% and 0.5% of the respondents owned between 4.1-6acres, 6.1-8 acres, 8.1-10 acres and more than 10 acres respectively as shown in table 6. The results generally indicate that land size is a limiting factor in the study area.

Table 6: Ranges of Farm Size

Farm size (acres)		Frequency	Percent	Cumulative Percent
	2-4	102	54.8	54.8
	4.1-6	45	24.2	79.0
	6.1-8	23	12.4	91.4
	8.1-10	15	8.1	99.5
	>10	1	.5	100.0
	Total	**186**	**100.0**	

The findings further indicated that out of the 102 farmers with between 2 and 4 acres of land, 54.9% participated in cassava production and 66.7% of the 45 farmers with 4.1-6 acres produced cassava as shown in Figure 5. On the other hand, 60.9% of the farmers holding between 6.1 and 8 acres participate in cassava production while 80% of the farmers with between 8.1 and 10 acres produce cassava. However, the only farmer with over 10 acres of land was producing cassava. The results indicate that farmers with more acres of land are participating more in cassava production as compared with those with few acres. This could be occasioned by the fact that as land size increases, it gives room for expansion of the enterprises.

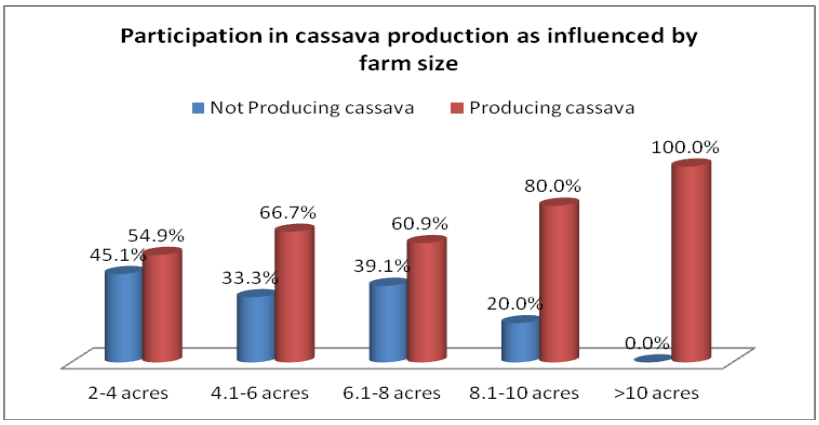

Figure 5: Participation in Cassava Production as Per Farm Size

Household Income

From the study findings there were two main sources of income namely farm income and off-farm income. Out of the 186 respondents who gave a response, 18.3% dependent on on-farm income while 11.3% depended on off-farm income. However, 70.4% of the respondents depended on both on-farm and off-farm sources of income.

The study further revealed that out of the 186 respondents, 18.8% had incomes ranging from Kshs 20,000 to Kshs 39,999 per month while 36%, 39.2%and 5.9% of the respondents had incomes ranging from Kshs. 40,000- 59,999, 60,000-79,999 and over Kshs 80,000 per month respectively. This implies that majority of the farmers in the study area have access to fairly adequate disposable income for farm investment

About 31.4% of the farmers with income of between Kshs 20,000-39,999 were producing cassava whereas in the income category of between Kshs 40,000 and Kshs 59,999, 82.1% of the farmers were producing

cassava. There were 56.2% of the farmers with income of between Kshs 60,000 and Kshs 79,999 who were producing cassava while 54.5% of farmers with income over Kshs 80,000 were producing cassava. The results imply that fewer farmers with low incomes participate in cassava production as compared to those with high incomes. However, the results show that a very high number of those in middle income groups were participating in cassava production than those at both low and very high income groups.

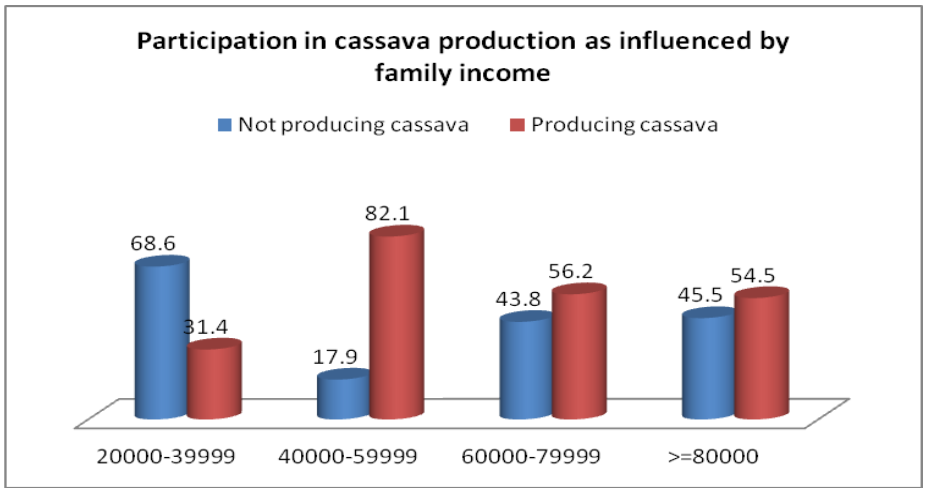

Figure 6: Participation in Cassava Production as Per Category of Household Income.

IV. Model Empirical Results

The main objective was to determine the socio-economic factors that influence participation and extent of participation in cassava production among smallholder farmers in Kwale County. The Heckman two stage model results of participation and the extent of participation in cassava production are presented in Tables 7 and 8. The tables show the estimated coefficients (β value), standard error and significance values of independent variables in the model. As indicated in Tables 7 and 8, some predictor variables significantly influenced decisions in participation in and extent of cassava production in stage 1 and 2 respectively. Out of the 6 independent variables in stage 1, age of household head was statistically significant at 5% whereas schooling years and farm size were statistically significant at 1% as shown in Table 7. Out of the 6 independent variables used in the model in stage 2, only gender of household head was significant at 1% as shown in Table 8.

Age of household head has a negative β coefficient of 0.038 and a significance value of 0.033. The results imply that ceteris paribus, if the age of the household head increases by one unit, chances of participation in cassava production decreases by 0.038 units. This means that as the age of the household head increases the likelihood of participation in cassava production decreases an indication of a negative relationship between participation and age of household head. This could be as a result of shifting from cassava production to other high value crops due to more experience in farming as one grows older. However, this is in disagreement with Itam et al (2014), who found a positive relationship between farming experience and cassava production.

Table 7: Heckman Two-Step Selection Equation Results

CassProd	Coef.	Std. Err.	P>IzI
AgeHH	-0.0381	0.0179	0.033**
SizeHH	-0.1255	0.1089	0.249
GendHH	0.2877	0.2851	0.313
SchlgYer	-0.2152	0.0473	0.000***
FarmSiz	0.2481	0.0809	0.002***
IncomTotCat	-0.0153	0.1921	0.937
_cons	1.5546	1.7090	0.363
Mills Lambda	-1.2615	0.6926	0.0690*
rho	-1		
lambda	-1.2615	0.6926	

***: significant at 1% level; **: significant at 5% level; *: significant at 10% level.

The number of schooling years which in this case referred to the educational level of the household head has a negative β coefficient of 0.215 and a significance value of 0.000. The results indicate that ceteris paribus, if the educational levels of the household heads increases by one unit, the chances of participation in cassava production decreases by 0.215 units. This implies that as the educational level of the household head increases the likelihood of producing cassava decreases. More educated farmers have the ability to engage in

farming as a business than farmers with low education levels. They are also able to compare between enterprises and carry out enterprise selection based on profitability. This means therefore that, farmers could be opting for more profitable enterprises at the expense of cassava. However, this is in disagreement with Omokore *et al* (2012) and Itam *et al* (2014) who found a positive relationship between cassava production and education.

Farm size has a positive β coefficient of 0.248 and a significance value of 0.002. The results indicate that ceteris paribus, if farm size increases by one unit, chances of participation in cassava production increase by 0.248 units. The positive sign indicates a positive relationship between farm size and participation in cassava production in the study area. Farm size influences a farmer's decision on enterprise selection such as growing cassava. In the study, cassava is not a major cereal or cash crop and farmers will more likely participate in cassava production if the available arable land is enough for both preferred crops and this alternative crop. This is because as farm size increases, more enterprises can be undertaken simultaneously. Farmers with larger farm sizes are also more likely to adopt modern varieties of cassava for higher returns which is in agreement with Omokore *et al* (2012) who found that cassava production is positively correlated to farm size. The desire to participate in cassava production therefore is thus promoted with ownership of large farm sizes as reflected in the analysis results.

Table 8: Heckman Two-Step Outcome Equation Results

CasLanSize	Coef.	Std. Err.	P>|z|
AgeHH	0.0248	0.0171	0.147
SizeHH	-0.0575	0.1104	0.602
GendHH	-0.6554	0.2658	0.014***
SchlgYer	0.1070	0.0681	0.116
FarmSiz	-0.0498	0.0876	0.57
IncomTotCat	0.1559	0.1946	0.423
_cons	0.6051	1.8201	0.74

***: significant at 1% level; **: significant at 5% level; *: significant at 10% level.

Gender of household head had a β coefficient of -0.66 with a significance value of 0.014. All other factors held constant, if the number of male farmers increased by one unit, acreage of land under cassava production decreases by 0.66 units. The results also imply that other factors held constant, there is a very strong negative relationship between gender of household head and cassava production in the study area. This is because in the study area, it was found that there were more men in agriculture than women. However, most studies have found a positive relationship between gender and cassava production but only when more women were involved in agriculture than men. For example, Itam *et al*, 2014 and Ovwigho and Ifie (no date), found a positive relationship between gender and cassava production. But in their study, the number of women sampled was more than men. This therefore gives an implication that women produce cassava than men do.

V. Conclusion And Recommendations

It was concluded that among the Socio-Economic factors, farm size positively influences participation in cassava production whereas schooling years (education level) and age negatively influence participation in cassava production. In addition, only gender of household head was statistically significant in influencing the extent of cassava production and had a negative influence. This therefore gives an implication that women would produce cassava more than men do. To fully tap on the potential of increased participation in cassava production in Kwale County, it is important that the government and other policy makers consider policies that encourage the following socio-economic aspects: affirmative action for gender awareness by empowering more women, middle-income groups and younger people to engage in cassava production. The main intention of the study was to determine the socio-economic factors influencing participation and extent of participation in cassava production. Nevertheless, there is need for further research on factors that influence the choice of cassava varieties grown by farmers and factors that influence the marketing of cassava and cassava products and choice of markets.

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