Farmers' preferential choice decisions to alternative cassava value chain strands in Morogoro rural district, Tanzania

Sewando, Ponsian T. and Mdoe, N. Y. S. and Mutabazi, K. D. S

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Department of Agricultural Economics and Agribusiness, Sokoine University of Agriculture (SUA), Morogoro, Tanzania.

Abstract: The study was conducted to determine farmers' preferential choice decision of alternative cassava value chain strands and as well as factors behind such decisions in Morogoro rural District, Tanzania. Factor analysis was first used to reduce and identify the factors (variables for further analysis whereby the factors with highest eigen-value were applied to develop factor scores to measure the attitudinal variables. Results indicate that farmers have positive risk attitude towards participation in the alternative cassava value chain strands for commercialization. A count data model known as Poisson model was applied to determine the factors which influenced this attitude. Results indicated that farm size, experience, female-headed households and land-holding had influenced the farmers' preferential choice decision. Recommendations for enhancing farmers' participation in profitable cassava value chain strands are strengthening coordination, provision of improved cassava varieties and introduction of cassava processing technologies.

Key words: *preferential choice decisions, factor analysis, cassava farmers, risk attitude, Poisson model*

INTRODUCTION

Cassava (*Manihot esculenta* Crantz) is a perennial, vegetatively propagated shrub, grown throughout the lowland tropics. It is a drought resistant crop grown mainly in dry areas and contributes significantly to the nutrition and livelihood of many farmers. It is also said to be more productive per unit of land and labour than even the high yielding cereals and the highest producer of carbohydrate (Nweke, 2003).

In some African countries, cassava is being more and more perceived not only as a food security crop, but also as a raw material for various types of industries. Cassava can be converted into a large number of products ranging from traditional and novel food products, to livestock feeds,

ethanol and starch and its numerous derivatives. In such countries, there are concerted efforts on cassava development being initiated, sometimes with strong political support at the highest level (Nang'ayo *et al.,* 2007). For example special presidential initiatives on cassava exist in Nigeria and Ghana to make cassava the engine for economic growth. The New Partnership for African Development (NEPAD) has also recognized cassava as a crops which can reduced poverty in Africa and has recommended a Pan-African Cassava Initiative based on a broad based strategy which emphasizes better markets, better organization of producers for collective action, and better participation by the private sector.

However, in Tanzania cassava is still perceived as a food security crop rather than a raw material for other industries. Cassava contributes to an average of 15% in the national food production basket and is second to maize, which is the leading staple food crop for many Tanzanians (Mtambo, 2007). Moreover, for countries where majority of the people still live below the poverty line as Tanzania (ASDS, 2001), cassava could be used to bridge the income poverty gap.

Van der Land and Uliwa (2007) documented that Tanzania produces about 6.8 million tons of cassava annually, which is 5.5% and 14% of world's and Africa's cassava production, respectively. However, this cassava is predominantly produced by smallholder farmers in many places including Morogoro rural District in Morogoro region. Although differences exist in cassava production, consumption, processing and level of commercialization between areas where cassava is considered as staple food and areas where it is non-staple, it is generally considered as an inferior crop compared with maize and rice. On the other hand the government also recognizes cassava as a food security crop, but little or no effort has been done to commercialize it. As a result cassava production in Tanzania is generally characterized by low yields and low marketable surplus.

Even where there is marketable surplus, we find individual smallholder cassava farmers suffering from inaccessibility of urban markets. Inaccessibility to such markets is mainly due to small producer volumes aggravated by lack of collective marketing and inability to maintain stable supplies and quality standards of cassava products. In this regard, smallholder cassava farmers obtain low returns from raw cassava or traditionally processed cassava chips sold in local spot markets at low prices. Indeed, such reinforcing problems cluster around one major market problem which is lack of efficient integration of farmers in profitable cassava value chains.

A comprehensive market study conducted by IITA in 2005 in Tanzania, estimated the industrial potential demand of starch and starch based adhesives to be 10 500 tons per year, 73 000 tons per year if cassava flour would be blended in wheat flour at 1% rate and 40 000 tons per year of dried chips for animal feed sector (Abass *et al*., 2005) cited by Mutabazi *et al*. (2008). Though best practices indicate that, the high quality cassava flour (HQCF) can substitute wheat in bread and other bakery products at 10% or 20% (Gwera, 2009). In addition to these, literature shows that in the mid 1980s, cassava was utilized in the making of poultry and pig feeds by the Tanzania Feeds Company, a practice that was later discontinued as cassava prices were found high compared with grains (Kapinga *et al.,* 1996). This is an evidence that cassava chips for animal feeds are highly demanded since the maize grains' price is increasing due to world food shortage problem, which is expected to escalate with global challenges of climate change and biofuel production. It is obvious from the above stated situation that there are significant and unmet markets for quality cassava flour, but much of the cassava flour produced in Tanzania is of poor quality due to improper drying, peeling, chipping and milling (URT, 2005).

Therefore, in order to serve this untapped demand for cassava products much has to be done to increase cassava productivity and changing of policy makers and farmers' (as a crop of great potential of commercialization) mindsets towards cassava. This will encourage public and private investments in the cassava sub-sector also facilitate farmers to actively participate in the value chain effectively. As a result contribute to reducing income poverty among cassava smallholders.

Basing on this information, two main research problems come into sight. The first problem relates to lack of appropriate processing technologies for adding value of cassava and poor farmers' organization and coordination as a result farmers find it difficult to access demand sectors in urban markets, hence farmers end up complaining that there is unreliable and unprofitable market for their unprocessed or locally processed cassava products. The second problem is related to farmers' mindset as far as cassava production is concerned where farmers perceive cassava as a subsistence food crop, and if sold, it is just roots (fresh) or locally processed cassava grits at local market.

Nevertheless, we have little understanding of the farmers' perceptions in participating in cassava value chain in the study area as far as empirical knowledge is concerned. We are also not well informed on how farmers would behave when they are informed of alternative cassava value chain strands and the factors behind this behaviour. Basing on the above information, this research was set to fill knowledge gaps with regards to:

- Farmers' preferential choice decisions of alternative cassava value chain strands and
- Determinants of farmers' preferential choice decisions of potential cassava value chain strands.

Regarding farmers' perceptions in participating in alternative cassava value chain strands, a few studies have been conducted on cassava value chain analysis in Tanzania by Njau *et al.* (2008) in Eastern Zone, Mnenwa *et al.* (2008) in Mkuranga and Land and Uliwa (2007) in Lake Zone, cassava production, utilization, processing and marketing by Silayo *et al.* (2006) in Tongwe, Kabuku, Chanika and Mikongeni villages and livestock feed in Tanzania by Lekule and Sarwat (2004) but still more has to be done as far as farmers' perceptions towards cassava alternative strands is concerned. This study seeks to fill the knowledge gap of inadequate understanding of farmers' preferential choice decisions in situations of alternative cassava value chain strands and how they might behave and act in these situations particularly in case of interventions. Apart from this, the study intended to identify the factors underlying farmers' preferences of choice decisions of novel cassava value chain strands.

The outcome of the above knowledge can provide clues on how farmers can be helped to participate effectively and efficiently in upgrading cassava products and marketing practices to enhance commercialization of cassava that offers significant potential for improving farmers' incomes, food security and reduce poverty in the rural areas.

Methodology

Location of the study area

The study was carried at Morogoro rural district. The area was chosen because cassava is widely cultivated by virtually all the farmers in the district. The area was selected due to the fact that Morogoro rural is the largest area planted with cassava in the region (5 564 hectare, 31%) Moreover, the cassava is one of the major crops cultivated in the district.

3.3 Sampling Procedure

The selection of wards was done systematically in collaboration with district agricultural officers whereby the 25 wards in the district were ranked on a 0 – 10 scores with respect to three criteria, namely; actual production, potential production from farm expansion and physical accessibility of roads. The wards with highest score were selected. From this exercise Mkambarani and Kiroka wards were selected. Thereafter, all villages in the selected wards were numbered and three of them were randomly drawn from the list. These were Mkambarani, Kungwe and Kiroka villages. A simple random sampling was employed to obtain 14 cassava farmers from each village making a total of 42 farmers. The survey involved a small number of respondents due to underdeveloped commercialization of cassava subsector.

Data analysis

The data collected were entered in Ms Excel and then were imported to SPSS version 12.0 and LIMDEP for various analyses. From SPSS factor analysis was used to identify the factors (variables) for further analysis. The factors with highest Eigen-values were applied to develop factor scores (calculated as the sum of products of the factor loadings with the original variables) for measuring the attitudinal variables. As a general rule, the information provided by factors having an Eigen-value less than 1 was considered to be of minor importance in the explanation of the variance.

The determinants for farmer's preferential choice decisions were identified using a count data model known as Poisson model embedded in LIMDEP version 8.0 software.

Data for the count models may be censored or truncated. The data are said censored if a range of values of the dependent variable is collapsed where by responses might be 0, 1, 2, and 3 or more (Zeileis *et al*., 2008; Greene, 2002). Such situation is common in clinical work whereby one often encounters situations where the outcome variable is numeric, but in the form of counts. However, in economics such cases happen too, when response variable is the number of occurrences in a given time frame (outcomes equal to 0,1,2,3,.....) for example number of customers shopping at a store on a given day or number of start-up companies by ex-employees. The aim of regression analysis in such instances is to model the dependent variable Y as the

estimate of outcome using some or all of the explanatory variables (in mathematical terminology estimating the outcome as a function of some explanatory variables).

When the response variable is in the form of a count we face a yet different constraint. Counts are all positive integers and for rare events the Poisson distribution (rather than the Normal) is more appropriate since the Poisson mean is greater than zero. So the logarithm of the response variable is linked to a linear function of explanatory variables such that:

$log_e(Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \ldots$ etc. and so $Y = (e^{\beta 0})\,(e^{\beta 1 X 1})\,(e^{\beta 2 X 2})$ *..etc.* In other words, the typical Poisson regression model expresses the log outcome rate as a linear function of a set of predictors.

Therefore the econometric model states as follows:

$$Log_e(Y) = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_n X_n + \mu \qquad (4)$$

Where,

Y	=	Dependent variable,
β_o	=	Intercept of the regression equation,
$\beta_1 \ldots \beta n$	=	Parameters to be estimated ranging from $i^{th} = 1$ to n^{th},
$X_1 \ldots X_n$	=	independent variables ranging from $i^{th} = 1$ to n^{th},
μ	=	Error term.

The empirical model was specified as:

$$Log_e(Y) = \beta_o + \beta_1 AGERE + \beta_2 GERE + \beta_3 EDURE + \beta_4 EXPRE + \beta_5 AHSIZE + \beta_6 FULTLAB + \beta_7 MAOCHH + \beta_8 CAICONT + \beta_9 ACEUMA + \beta_{10} MAINFO + \beta_{11} FARMSIZE + \beta_{12} GROPART + \mu \qquad (5)$$

Where:

Y	=	Farmers' attitude (counts, scores),
AGERE	=	Age of the respondent in years,
GERE	=	Gender of the respondent expressed as dummy, 1=female, 0=otherwise,

EDURE	=	Education level of the respondent measured in years spent schooling,
EXPRE	=	Experience of household in cassava production expressed in years,
AHSIZE	=	Aggregate household size expressed in total number of family members
FULTLAB	=	Labour force available was expressed in terms of total number of household adults working full time in cassava farm,
MAOCHH	=	Crop production (farm) participation was expressed as a dummy variable whereby all houseold heads who engaged themselves in farm activities were coded '1' and '0' otherwise,
CAICONT	=	Cassava contribution to household income was expressed as dummy variable where insignificant contribution to household income was coded '1' and '0' otherwise,
ACEUMA	=	Physical access to urban markets was expressed as dummy variable whereby all household heads/respondents who reside in remote areas from urban market was coded '1' and '0' otherwise,
MAINFO	=	Access to market information was expressed as dummy variable whereby all respondents who have no access to market information were coded as '1' and '0' otherwise,
FARMSIZE	=	Farm size was expressed as the total amount of land in acres under cassava cultivation for 2007/08 growing season,
GROPART	=	Group participation was expressed as as dummy variable whereby all household heads who were members into different social groups were coded '1 and '0' otherwise,
μ	=	Error term.

Hence we had to run three Poisson models, whose dependent variable for each model was the response (scores) of the interviewed farmers about their risk preferences on participation in farmers groups, engaging in potential alternative strands and attitude towards marketing of the potential cassava products. The scores in the three items were regressed against the predictors presented above.

Results and discussion

Household socio economic characteristics

Table 1 summarizes the socio-economic characteristics of the sampled households such as age, gender, education level and occupation of the household heads. The results show that most of the household heads (68%) were below 60 years of age. It is also shown that more than 67% of the sampled households were males. The results in Table 1 indicate that more than 70% of the sampled households attained formal education. The results generally concurred with the findings of agricultural marketing information needs study (URT, 2004), which found that there is a large number of farmers with primary education and below this level of education. Apart from education, the results in Table 1 indicate that most of the respondents interviewed were involved in crop production (93%), where the rest of the respondents (7%) were involved in government services and business activities. The table also indicates that 64% of the sampled households had a family size between 1 and 4 members.

Table 1: Household socio economic characteristics

Variable	**Category**	**Location**		**Total**
		Near Urban	**Remote area**	
Age	- 30	0	2	2 (5%)
	30 - 39	3	7	10 (23%)
	40 - 49	3	4	7 (17%)
	50 - 59	4	6	10 (23%)
	60 - 69	6	2	8 (19%)
	70 +	5	0	5 (13%)
	Total	**21**	**21**	**42 (100%)**
Gender	Male	16	12	28 (67%)

	Female	5	9	14 (33%)
	Total	**21**	**21**	**42 (100%)**
Formal schooling	Illiterate	5	4	9 (21%)
	Primary	15	14	29 (69%)
	Secondary	1	1	2 (5%)
	Tertiary	0	2	2 (5%)
	Total	**21**	**21**	**42 (100%)**
Main occupation	Crop production	21	18	39 (93%)
	Government employee	0	2	2 (5%)
	Business	0	1	1 (2%)
	Total	**21**	**21**	**42 (100%)**
Household size	1- 4	16	11	27 (64%)
	5-9	3	8	11 (26%)
	10-14	2	2	4 (10%)
	Total	**21**	**21**	**42 (100%)**

Farmers Preferential Choice Decisions

As pointed out in the methodology, farmers in the sub-sample were asked to indicate their agreement or disagreement on each item using five-point Likert-type scale ranging from strongly agree to strongly disagree. The construct validity of the selected scales was assessed using factor analysis.

Farmers' attitude towards being in farmers associations (groups)

Attitude towards being in farmers' associations (groups) comprised attitudinal statements which classified risky decisions within the control of the respondents. Among the statements loaded on the attitude of farmers towards working in farmers' groups or associations, items G2 and G8 were different from the researcher's assumptions (Table 2). According to statement G2 the

researcher hypothesized that farmers will disagree with the statement that they will join and work in farmers' association at any cost because of the past history of cooperatives. But the farmers agreed that they are ready to work in groups at any cost. The researcher postulated that farmers would not see the prospects of participating in groups due to failure of cooperatives to reduce poverty (G8) therefore they will not agree to work in farmers' associations. However, the respondents disagreed with this proposition, which means that despite the history of failure of cooperatives and some farmers associations, still the respondents were ready to participate in farmers' groups (production and marketing). The researcher's assumptions on attitude towards working in farmer's groups which matched with the farmers' response were G1, G3, G4, G5, G6 and G7.

Table 2: Measurement of attitude towards participation in farmers' groups

Item	Researcher's hypothesis	Farmer's outcome	Factor loading
G1-I prefer working in groups	Agree	Agree	0.698
G2-I will join and work in groups at any cost	Disagree	Agree*	0.829
G3-Working in group helps to access various services to the group members	Agree	Agree	0.522
G4-Farmers group enable me to acquire new knowledge and technology for agricultural development	Agree	Agree	0.606
G5-Farmers group enable me to improve my agricultural produce.	Agree	Agree	0.736
G6-When I work in groups, it becomes easy to access market for our produce	Agree	Agree	0.469
G7-Farmers' group increases our bargaining power for our Products	Agree	Agree	0.776
G8-I do not see prospects of participating in groups when there is failure of cooperatives to reduce poverty	Agree	Disagree*	-0.568

** means that there is a difference between researcher's expectations and farmers' responses*

Source: Own survey (2009)

Table 3 compares attitude towards the risk between farmers in remote village and villages near urban markets. Results indicates that only 5% of the respondents were risk averse while 95% were risk takers as far as the risk of participation in farmers' association is concerned. The overall difference between the two locations (near and remote from the urban markets) was insignificant. Moreover, the preference of farmers towards participating in farmers groups was the smallest among the other items where the village near urban market (Mkambarani) prefer being more in group (90.5%) than the remote areas (Kiroka and Kungwe) which had 85.7%.

Table 3: Respondents indicating positive attitude towards group participation

Location/item	Near urban market (n=21)	Remote area (to urban market) (n=21)	Overall (n=42)
	% of respondents		
G1	90.5	85.7	88.1
G2	95.2	90.5	92,9
G3	95.2	100	97.6
G4	100	100	100
G5	95.2	100	97.6
G6	90.5	100	95.2
G7	100	95.2	97.6
G8	100	81	90.5
0verall	**95.8**	**94**	**94.9**

Source: Own survey (2009)

Farmers' attitude towards participation in alternative potential cassava strands

Items used to measure the farmers' attitude towards risk of involving themselves in alternative potential cassava strands and their hypothetical signs are as shown in Table 4. The Table also indicates that three researcher's hypotheses (two on HQCF strand and one concerning HQCC) were contrary to the farmers' opinions. For R1 the researcher assumed that due to farmers' being sensitive to loss of their money (as far as adoption of new technology is concerned) they will not

be ready to produce cassava for HQCF despite good price offered by the potential customer. Nevertheless farmers showed that they were ready to produce cassava for HQCF, implying that they were ready to take risk. The same was also applicable for the statement R6 on readiness of producing cassava chips for animal feed. Farmers' response was also different from the researcher's hypothesis for hypothesis R3. Here the assumption relied on the cost for acquiring new cassava processing technology.

Table 4: Measurements of attitude towards risk participation in alternative strands

Item	Researcher's hypothesis	Farmer's outcome	Factor loading
R1-I am ready to produce cassava so as to adhere the above stated customer of HQCF even if I lose money.	Disagree	Agree*	0.825
R2-Without taking the adding value of cassava for HQCF in the recent competition, cassava farming is not worthwhile.	Agree	Agree	0.616
R3-We need to look for means of processing cassava for HQCF at any cost.	Disagree	Agree*	0.799
R4-I am satisfied with producing and selling fresh cassava, therefore I do not prefer HQCF	Disagree	Disagree	0.701
R5-I can acquire more land for cassava cultivation n order to meet the HQCF customer needs.	Agree	Agree	0.745
R6-I am ready to produce cassava so as to adhere the above stated customer of animal feed even if I lose money.	Disagree	Agree*	0.805
R7-Without taking the adding value of cassava for animal feed in the recent competition, cassava farming is not worthwhile	Agree	Agree	0.706
R8-We need to look for means of processing cassava for animal feed at any cost	Disagree	Disagree	-0.645
R9-I am satisfied with producing and selling fresh cassava, therefore I do not prefer animal feed.	Disagree	Disagree	0.687
R10-I can acquire more land for cassava cultivation in order to meet the animal feed customer needs	Agree	Agree	0.768

** means that there is a difference between researcher's expectations and farmers' responses*

Source: Own survey (2009)

Moreover, some farmers would be ready to look for a technology once they concretize it; hence the researcher assumed that the farmers will not agree to search for such technology. The farmers nevertheless, agreed to look for means of processing cassava at any cost, implying that they need policy and guidelines to direct them to the right target. The rest of the items (R2, R4, R5, R6, R7 and R8) have the same signs as expected.

Table 5 compares the attitude towards risk in participating in alternative potential cassava strands between farmers in remote villages and village near urban market. The attitude towards risk of participating in alternative potential cassava strands was a bit low compared to other scenarios in this section with the overall average of 88% of the respondents showing a positive attitude towards the two strands (HQCF and chips for human consumption and animal feeds respectively).

Table 5: Measurement of attitude towards risk participating in alternative strands

Location/item	**Near urban market (n=21)**	**Remote from urban market (n=21)**	**Overall (n=42)**
HQCF	**% respondents**		
R1	90.5	100	95.2
R2	85.7	100	92.9
R3	90.5	95.2	92.9
R4	71.4	81.0	76.2
R5	85.7	100	92.9
Overall Chips (for animals)	**84.7**	**95.2**	**89.9**
R6	85.7	95.2	90.5
R7	85.7	95.2	90.5
R8	85.7	81.0	83.3
R9	81.0	66.7	73.8

R10	85.7	100	92.9
Overall	84.8	87.6	86.2
Overall	**84.8**	**91.4**	**88.1**

Source: Own survey (2009)

However, when compared; farmers' positivity towards HQCF for human consumption was more (overall 89.9%) than that of chips for animal feeds (86.2%) of the respondents. This implies that farmers were highly motivated by the potential customers of the two cassava products. With regard to location, farmers from remote area were more risk takers than those near the urban market with 91.4% and 84.8%, respectively (Table 5). This suggests that the poor market outlets and road infrastructures worsen the cassava production hence farmers complain that they do not have a reliable market for the fresh cassava roots. However, farmers who were near the urban market had a good market outlets as well as good road infrastructure therefore they were sure of selling their fresh cassava at an attractive price.

Farmers' attitude towards marketing through potential cassava strands

Eight items were used in measuring the attitude towards marketing through potential cassava products. The results of the factor analysis in Table 6 indicate that only two statements of the researcher did not tally with the outcome from the farmers, that is M7 and M8 whereby the researcher postulated that with the present well known market of fresh and local processed cassava, farmers cannot prefer producing cassava for HQCF and animal feeds (chips) respectively, because farmers sometimes are lagging behind in adopting new technologies, and most of the time find it difficult to abandon practices/customers they are familiar with. They want to witness what is promoted works in practice otherwise they will not adopt or take risk to produce cassava for potential products (as HQCF, chips for animal feed, and for industrial uses).

However, the outcome from the farmers disagreed with these hypotheses. This signifies their claim that they are discontented with the existing market of cassava, may be because of the tendency of selling fresh cassava to small traders who pay low prices for the products and use of unstandardized unit of measurement like *kiroba* (bags). Items/statements M1, M2, M3, M4, M5 and M6 signs were as hypothesized by the researcher in conformity to the farmer's response.

Table 6: Measurement of attitude towards marketing through potential cassava strands

Item	Researcher's hypothesis	Farmer's outcome	Factor loading
M1-If there is an opportunity to make money by processing cassava for HQCF I will utilize it.	Agree	Agree	0.912
M2-If there is an opportunity to make money by processing cassava for animal feed I will utilize it.	Agree	Agree	0.850
M3-Growing more cassava for HQCF is the best way I can expand market opportunities.	Agree	Agree	0.819
M4-Growing more cassava for animal feed is the best way I can expand market opportunities.	Agree	Agree	0.852
M5-Correct information on price facilitates me to decide to invest for HQCF	Agree	Agree	0.507
M6-Correct information on price facilitates me to decide to invest for animal feeds	Agree	Agree	0.784
M7-With the present known market of fresh and local processed cassava, I cannot prefer producing cassava for HQCF	Agree	Disagree *	-0.928
M8-With the present known market of fresh and local processed cassava, I annot prefer producing cassava for animal feeds	Agree	Disagree *	-0.928

** means that there is a difference between researcher's expectations and farmers' responses*

Source: Own survey (2009)

Table 7 compares farmers' attitude towards risk of marketing through potential cassava strands. The table reveals that for all items except M7 and M8 more than 95% of the respondents had

positive attitudes toward risk. The statements M7 and M8 registered positive attitudes too, although farmers in remote areas from the urban market had a more positive attitude to risk with respect to all the eight axioms of market for the potential cassava strands which is more than 95% as compared to the area near urban market. This entails the same problems of remote areas as was elaborated in the above section (attitude towards potential strands). The village (Mkambarani) near to urban area had 52.4% of the respondents in M7 and M8 items as risk averse.

Table 7: Positive attitude towards market of the potential cassava strands

Location/items	Near urban market (n=21)	Remote from urban market (n=21)	Overall (n=42)
	% of respondents		
M1	95.2	100	97.6
M2	90.5	100	95.2
M3	90.5	100	95.2
M4	95.2	100	97.6
M5	100	100	100
M6	95.2	100	97.6
M7	47.6	95.2	71.4
M8	47.6	95.2	71.4
Overall	**82.7**	**98.8**	**90.8**

Source: Own survey (2009)

Determinants of risk attitude towards alternative potential cassava strands

The results from Table 8 indicate that the goodness of fit of the model is relatively high as measured G^2 which is 78.8%. This implies that the variables included in the model explain about 78% of the variation in the probability of risk preference towards alternative cassava strands. The table shows that access to urban market, gender of the respondent farm size, main occupation of

the household head and total land owned by the household were significant. Access to urban market (ACEUMA) appeared to have a strong significance ($p<0.01$) and positively relationship with risk towards participating in potential cassava strands (POTESCOR). This suggests that smallholder farmers living far from urban market demonstrate higher risk preference than those who reside near urban market.

Table 8 indicates that the level of risk attitude towards potential cassava strands tended to decrease significantly ($p<0.1$) amongst crop production respondents as their main occupation (MAOCHH). This confirms the expected sign. The level of attitude towards risk (potential cassava strands) tended to decrease significantly ($p<0.01$) among female respondents (GENRE) as opposed to male counterparts. This conforms to the expected sign, that females expressed high risk aversion in the potential cassava strands compared to male respondents.

Table 8: Poisson model results of risk towards engaging in potential cassava strands

Variables	Coefficient	Expected sign	β/std Error	Probability
Constant	3.247		10.669	0.000
ACEUMA	0.274	+ve/-ve	2.635	0.008***
GENRE	-0.277	-ve	-2.748	0.006***
AGERE	-0.001		-0.409	0.683
EDURE	-0.006		-0.487	0.626
MAOCHH	-0.388	-ve	-1.836	0.066*
AHSIZE	-0.007		-0.465	0.642
EXPHH	0.007		1.141	0.254
FARMSIZE	0.024	+ve	1.793	0.073*
GROPART	-0.008		-0.093	0.926
CAICONT	0.120		1.378	0.168
LAHOLD	-0.032	+ve	-2.265	0.024**
FULTLAB	-0.050		-1.437	0.151

*Likelihood ratio -153.649, G^2 = 78.752, *significant at (p<0.1), **significant at (p<0.05), ***significant at (p<0.01)*

Source: Own survey (2009)

Farm size had a significant ($p<0.1$) positive influence on risk attitude towards HQCF and HQCC as potential strands (Table 8). This means that risk preference increases among farmers with large size cassava farms compared to farmers with small farms. Nevertheless, the level of attitude towards risk on the potential cassava strands declines significantly ($p<0.05$) with increasing amount of land holding owned by the household head. The direction of causality between the land holding of the household head for other crops (cassava excusive) and risk attitude was positive.

Determinants of risk attitude towards marketing through potential cassava strands

The results from Table 9 indicate that the goodness of fit of the model is moderately high as measured G^2 which is 59.8%. This implies that the variables included in the model explain about 60% of the variation in the probability of risk preference towards marketing through potential cassava strands. Risk attitude towards marketing through potential cassava strands (MARSCORE) had a strong significant ($p<0.01$) positive relationship for farmers in remote areas (Table 9). This means that risk towards marketing through potential strands increased among farmers in remote areas. Hence the farmers become less risk averse.

The level of risk altitude towards marketing through potential cassava strands declined significantly at ($p<0.01$) with increasing experience in farming amongst cassava farmers. According to Nkonya and Featherstone (2001) as cited by Abele *et al.* (2007) if farming experience is viewed in terms of accumulation of knowledge, then it stimulates improved technology use. Older farmers may have had the opportunity to experiment with other improved varieties of cassava and observed their superiority over local ones. They may also know better methods of seed selection than the relatively young farmers. Consequently, they will be quicker to accept new cassava technologies than younger farmers.

Table 9: Poisson model results of risk towards participation in marketing through potential cassava strands

Variables	Coefficient	Expected sign	β/std Error	Probability
Constant	3.401		10.529	0.000
ACEUMA	0.495	+ve/-ve	4.962	0.000***
GENRE	0.127		1.293	0.196
AGERE	0.114		0.417	0.676
EDURE	-0.137		-0.105	0.916
MAOCHH	0.073		0.299	0.765
AHSIZE	-0.008		0.586	0.558
EXPHH	-0.029	+ve/-ve	-5.014	0.000***
FARMSIZE	0.014		1.112	0.266
GROPART	-0.049		-0.541	0.589
CAICONT	0.110		1.295	0.196
LAHOLD	-0.034	+ve	-2.577	0.01**
FULTLAB	-0.350		-0.963	0.335

*Likelihood ratio = -129.4092, G^2 = 59.787, **significant at (p<0.05), ***significant at (p<0.01)*

Source: Own survey (2009)

Moreover, the risk attitude towards marketing through potential strands was found to decline significantly ($p<0.05$) with an increase in size of the land for other crops – LAHOLD (Table 9). The negative correlation is different from the expected sign. It was expected that farmers who are largely diversifying into other crops are less risk takers than those who are less diversifying. In addition to what is explained above the marketability of upgraded cassava products is still unknown to farmers in the study area. Farmers are not aware that their cassava roots can be transformed into various products which are highly demanded in the urban market. Such products have been reported by Silayo *et al.* (2006) as *Kababu*, ban (*maandazi*), chapatti, chips and bread/cakes.

Conclusion and recommendation

The analysis of farmers' preferential choice decisions of alternative cassava value chain strands has shown that smallholder farmers had positive risk attitude towards potential cassava value chain strands (HQCF and chips for animal feeding) despite the fact that they have little knowledge on how to process cassava roots into such products and the underlying demand requirements. Based on the results of the Poisson regression models it can be concluded that education of the household, farm area under cassava in 2007/08 growing season and the total land owned by the household are significant factors that negatively influenced probability of group participation in cassava production, while access to urban markets and farm size are important factors that increased the probability of preferring risk towards alternative cassava strands. On the other hand, female headed households and total land owned by the household are significant factors that affect negatively the probability of farmers to prefer alternative cassava strands in the study area. Furthermore, access to urban markets and experience of the household in cassava production are essential factors that can increase the probability of farmers to take risk to produce cassava for marketing through potential cassava strands, meanwhile total land owned by the farmer reduces the probability the household to produce cassava for this potential market (alternative cassava strands) in the study area.

The findings of the study also show that *Msenene* variety was a largely grown cassava variety in the study area. However, yields for this variety in the study area were found to be low averaging about 1.1 tons of cassava roots per acre. Though susceptible to diseases, the variety can yield up to 4 tons per acre. Therefore the low yield reported by farmers in the study area suggests improvement of husbandry practices to exploit the yield potential of this variety. Improvement of husbandry practices should go hand in hand with introduction of high yielding disease resistant varieties. Since the International Institute of Tropical Agriculture (IITA) is willing to join the Government and its partners in the design and implementation of a new strategy and programs for cassava to play its role as an engine for economic growth, job creation, and food security, there is a need of working with the institute for the provision of new cassava varieties that have yield potentials as high as 35 tons of fresh roots per hectare such as *Kiroba*. Working together with development partners (NGOs, farmers' organizations and the private sector) would facilitate the spread of new varieties that are disease resistant. In addition to provision of improved cassava varieties there is a need of improving agronomic practices among cassava growers.

The findings of the study indicate that cassava was sold in fresh form without adding value. At the same time there are markets of value added products like cassava flour and cassava chips for animal feed. Moreover, the results indicate that farmers have positive attitude towards the alternative cassava strands such as HQCF and chips for animal feeds. In order to exploit these markets there is a need to promote appropriate cassava processing technologies such as grating, chipping and crashing by educating farmers on these technologies and facilitate acquisition of processing equipment. As farmers become knowledgeable and realize the importance of these technologies in reducing income poverty, they can be motivated to organise themselves through their farmers associations to purchase simple cassava processing equipments.

REFERENCES

Abele, S., Twine E., Ntawuruhunga P., Baguma Y., Kanobe C. and Bua, A. (2007). Development and dissemination of improved cassava varieties in Uganda: Analysis of adoption rates, variety attributes and speed of adoption, AAAE Conference proceedings (2007) 479-482.

ASDS, (2001). Agricultural Sector Development Strategy. Taking account of rural development in public expenditure management – the case of Tanzania. United Republic of Tanzania. 97pp.

Lekule, F.P and Sarwatt, S.V. (2004). Processing and utilization of cassava for livestock feed in Tanzania. [http://www.fao.org/Wairdos/ILRI/x5458E/x5458eOh.htm]. Site visited on 11/10/2008.

Mtambo, K. B. (2007). Status and potential of cassava and sorghum in food blending. In: *Proceedings of the National Stakeholder's Workshop on Blending Technologies for Cassava/Sorghum with other cereal and tubers.* Held at Kibaha from 13 -14 December 2007.

Mutabazi, K., Mdoe, N., Ndabikunze, B., Mhando,D., Peter, N. and Kikoka,L., (2008). Unlocking market opportunities for small scale cassava farmers in Tanzania. In: *Proceedings of the Cassava value chain and mapping workshop*, 9th October, 2008, SUA, Morogoro, Tanzania.

Nang'ayo F, Omanya G, Bokanga M, Odera M, Muchiri N, Ali Z and Werehire P. (eds), (2007). A strategy for industrialisation of cassava in Africa. In: *Proceedings of a small group meeting*, 14–18 November 2005, Ibadan, Nigeria. Nairobi, Kenya: African Agricultural Technology Foundation, 25pp.

Nweke F.I. (2003). New challenges in cassava transformation in Nigeria and Ghana. In Went, IFPRI, NEPAD, CTA Conference. Success of African agriculture, Pretoria 1-3, December 2003. 166pp.

Silayo, V.C.K., Mpagalile, J.J., Laswai, H.S., Balegu W.R., Mtunda, K., Chilosa, D. Nyborg, I. and Makungu, P.J. (2004). Processing and utilization of cassava. Swahili monograph. TAPRII-SUA project. 33pp.

Silayo, V.C.K., Laswai, H.S., Mpagalile, J.J., Lazaro, E.L., Balegu W.R., Kadigi, R., Muhama, M., Nyborg, I., Wetlessen, A., and Wickland, T., (2006). "The status of cassava production, utilization, processing and marketing in Tongwe, Kabuku, Chanika and Mikongeni villages.

In: *Proceedings of the First Annual PANTIL research workshop*. (Edited by Kinabo, L.D.B. and Abel, W.S.), 25-27 September 2006, Morogoro, Tanzania. 220-226pp.

URT (2005). Crop and Livestock Private Sector Development (Mainland). NEPAD–CAADP Bankable Investment Profile. [ftp://ftp.fao.org/docrep/fao/008/ae727e/ae727e00.pdf]. Site visited on 7/02/2009.

Van der Land and Uliwa, (2007). Cassava Sub Sector/Value Chain Analysis, Match Maker Associates. [http://www.thekilimotrust.org/option.com_docman&doc_view&gid=11] site visited 20/09/2008.

Zeileis, A., Kleiber, C and Jackman, S. (2008). Regression models for count Data. *Journal of Statistical Software* 27(8): 1-25.