Factors Affecting Farmers' Market Participation Decision and Amount of Cassava Supplied to the Market in Wolaita Zone, Snnpr, Ethiopia

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Abstract
This study aimed at identifying factors affecting decision of farmers' participation in cassava market and marketable supply of cassava. A survey was carried out on six randomly selected kebele administrations in Gassuba and Kindo Koysha Woreda of wolaita zone. Both primary and secondary sources of data were used to conduct this study. Primary data for this study were collected from 122 farmers, 48 traders and 23 consumers through application of appropriate sampling procedures and secondary data were obtained from written documents. Data were collected by using both close ended and open ended questionnaire through personal interview, group discussion, and key informant interview. Inferential statistics were used to analyze the data. Determinants of intensity of farmers' participation in cassavs market and factors affecting amount of cassavs supplied to the market were identified by applying Heckman two stage models, which are explained by probit model for cassava market participation decision and amount of cassava supplied to the market. The Heckman-two stage model regression showed that variables such cassava production experience, training and improved cassava production inputs affects the market participation and amount of cassava supplied to the market positively and significantly. Therefore, policy initiatives aiming at increasing farmers' access to improved cassava inputs and Production technologies, and training on cost harvest loss, improving marketing information system and extension service provisions are recommended to intervene on the development of cassava value chain in the study area.
Keywords: Marketed supply, marketable supply, participation decision.

INTRODUCTION

Cassava growing has an equally long history in Homa Bay and Busia County as sorghum. Until the mid 1990s cassava was the second most important crop in Western Kenya and the Coastal Region after maize. With the arrival of an unusually severe form of Cassava Mosaic disease (CMD), starting in 1995 the annual yields reduced from an average production of 3 – 5 tons per acre to less than 1 ton per acre, starting in the districts of Teso and Busia, then spreading all over Western Kenya. Many farmers abandoned cassava farming entirely, severely affecting the food security situation in Western Kenya. Until today farmers are cautious to invest into cassava farming. KARI, the Ministry of Agriculture and its development partners have put a lot of energy and money into the research of resistant high yielding varieties in the last 2 decades (IITA, 2009).

Since 1997 about 30 new varieties have been released, Migyera and SS4 being the first to be introduced in 1996 (Nhassico, et al.,2008). The impact of CMD was still felt during the interviews with farmers and traders of cassava. Many told us about the good times before the disease and the current challenges with cassava growing. Availability of disease free planting material, more than 15 years after the release of the first high yielding CMD resistant varieties, is still a challenge for many farmers.

In Ethiopia, cassava grows in vast areas mainly in Southern Region. According to Feleke (1997), cassava was introduced by some NGOs to drought prone areas of southern part of the country such as Amaro, Gamogoffa, Sidama, Wolayta, Gedeo primarily to fill the gap for subsistence farmers due to failure of other crops as a result of drought. In these areas, farmers usually grow cassava in small irregular scattered plots either sole or intercropped mainly with taro, enset, maize, haricot bean and sweet potato. The average total coverage and production of cassava per annum in Southern region of Ethiopia is 4942 hectars with the yield of 53036.2 tonnes (SNNPR, BoA, 2000). Although its first introduction in to the country is not yet known, the crop had been growing in south, south west and western part of Ethiopia for several years (Mesele et.al., 2004). Its use as a potential food crop in Ethiopia has been appreciated since 1984 famine (Amsalu, 2006).

Cassava is one of the most important food crops that constitute a considerable portion of the daily diet of the people and also serves as a major source of carbohydrate in Southern Ethiopia. Despite its importance cassava production in Ethiopia has different constraints and opportunities. It is mainly cultivated by small resource poor farmers on smallholding plots of land. It is both a food security crop and a source of household income. It is increasingly becoming a source of industrial raw material for production of starch, ethanol, waxy starch, bio-plastics, glucose, bakery and confectionery products, glue among others to (Feleke, 1997).

Material And Method
Description Of The Study Area
Wolaita zone is located 390km southwest of Addis Ababa following the tarmac road that passes through *Shashamane* to *Arbaminch*. Alternatively, it is located 330km southwest of Addis Ababa following the tarmac road that passes through *Hosanna to Arbaminch*. *Wolaita Sodo* is the town of the zone. It has a total area of 4,541km2 and is composed of 12 *woredas* and 3 registered towns. It is approximately 2000 meters above sea level and its altitude ranges from 700-2900 meters. The population of *Wolaita* zone is about 1,527,908 million of which 49.3% are male and 51.7% are female (WZFED, 2013). Out of these, 11.7% live in towns and the rest 88.3% live in rural areas.

Sampling Techniques
Two Potentially cassava producing woredas was purposively selected out of the total 12 woreds in wolaita zone based mainly on their maximum area of land allocated for cassava. Similarly kebels was selected from respective woreds. Then, producers from a complete and separate list of cassava producers in each kebeles was prepared. Finally, based on proportional probability sampling the total number of respondents was determined by using the formula, as indicated in (Gujarati, 2007).
The following formula was used to calculate sample size:

$$n = \frac{N}{1 + Ne^2}$$

Where; n: designates the sample size the researcher uses;
N: designates total number of households in six Kebeles =9286
e: designates maximum variability or margin of error =0.09
1:designates the probability of the event occurring

Data Gathering Tools
To gather data for the research, semi-structured and structured questionnaire, interview, group discussion and reviewing documents (for secondary data) was used.

Data Gathering Procedure
A pre-tested and semi-structured schedule or questionnaire were designed to collect data on marketing channels, costs, price of cassava, and constraints or problems of cassava value chain. Enumerators with education level of diploma and degree were recruited and trained mainly concerning technique of interviewing. Key informants survey was made to identify the prospects and constraints on cassava production, the effectiveness of production, marketing constraints, credit facilities, availability of extension services, access to and availability of market information and marketing cost. Moreover, secondary data related to market fees, facilities and services were collected from the Woredas' and Wolaita Zone Office of Agriculture and other relevant sources.

Method of Data Analysis
The Heckman two stage estimation procedures was employed in this study to examine Cassava market participation decision and to identify factors affect the amount of Cassava supplied to the market. Heckman sample selection model where a probit model for the participation or selection equation is estimated and a regression model, which is corrected for selectivity bias is specified to account for the level of the amount of Cassava marketed. From Heckman two stage models, the first stage in this study was market participation equation, which helps to identify factors affecting Cassava market participation decision using probit. Then in the second stage, OLS regression was fitted along with the probit estimated inverse Mill's Ratio in order to identify factors that affect the marketed supply of Cassava.

According to Heckman (1979), the inverse mills ratio is a variable for controlling bias due to sample selection. Then, Heckman second stage account the mills ratio to the amount cassava supplied to the market equation or 'outcome' equation through ordinary least square equation.

The Heckman two stage models, which are explained by Probit model for Cassava market participation decision and amount of Cassava supplied to the market are specified as follows:

Probit model: Market participation is expressed as:

$Y_i = X_i' \beta_i + \varepsilon_i \qquad i=1\ldots, n$

Where: Y_i is a dummy variable indicating the market participation that is related to it as $Y_i=1$ if $Y_i>0$, otherwise $Y_i=o$

β_i are the variable determining participations in the Probit model.
X_i is the unknown parameter to be estimated in the Probit regression model.
ε_i is random error term.

The amount of marketed supply is expressed as:

The parameters can consistently be estimated by ordinary least square over the given observations including values Y_i by including an estimate of the Inverse Mill's Ratio, denoting by λ_j.

$Y_i = X_i'\beta_i + \mu\lambda_i + \eta_i$

Where, Y_i is the volume of supply in the second step,

β_i are the explanatory variables determining the quantity supply

X_i is unknown parameters to be estimated in the quantity supply

μ is a parameter that shows the impact of participation on the Quantity supply

η_i is the error term

The Heckman-two stage model will be estimated provided that there will be sufficient observations that produce cassava and do not participate in the market. If not, then, OLS regression model will be estimated. For identifying factors that influence cassava supply, the main task is to analyze which factor influences and how? As a result, potential variables, which are supposed to influence cassava market participation and quantity of cassava supplied will be explained.

RESULTS AND DISCUSSION

This section presents the results of the analysis. The descriptive analysis describes the general characteristics of the sampled farm households and cassava traders, structure ,conduct and performance of cassava market in the study area.

Factors determining cassava market participation decision

The econometric analysis for the Heckman two-step estimation procedures was performed using STATA soft ware. In the first stage of the Heckman's model the decision of Cassava Producers to participate in the cassava market was estimated by Probit Maximum Likelihood estimates. The Probit model was significant with a χ^2 value of 68.4 and correctly predicted 89% of the observed outcomes.

As one can see from Table 1, as of 15 hypothesized variables (6 dummy and 9 continuous), three variables were found to determine the probability of cassava market participation decision of Producers. These are: Cassava Production experience (EXP), access to Cassava Production training (CASS-TRN), and access to improved varieties of cassava steam (USE-INPU).

Cassava Production experience (EXP): The variable had positive effect on market participation decision of Cassava Producers and significant at 1% probability level. The marginal effect of the variable also emphasizes that as Cassava Producers are more experienced in Cassava Production activity the probability of cassava market participation decision of Cassava Producers increases by 16.3%. or one year increase in cassava production experience results 16.3% increase in market participation decision of cassava producers.

Table 1. Maximum likelihood estimates of Probit model

Variables	Coefficients	t-ratio	Marginal effect
Constant	0.788	0.45	0.061
AGE	-0.6341	-0.867	-1.015E-05
SEX	0.0008	0.078	4.307E-08
FAM-SIZE	0.0388	0.097	2.067E-06
OXEN	-0.4552	-0.896	-8.546E-05
MKT-DIS	0.0026	0.246	1.330E-01
EXP	0.2056	1.73 ***	0.163
SEX	-0.1959	-0.754	-1.004E-05
EXT-CON	0.4788	1.218	2.556E-05
HOR-PRICE	-0.1022	-0.720	-5.242E-06
CASS-TRN	0.125	2.59 **	0.159
USE-INPU	0.116	2.435 *	0.0421
EDU-LEV	0.0123	0.024	0.2346
MKT-INF	-0.0319	-0.658	-1.637E-06
CRE-ACC	0.0113	0.073	5.801E-07

Log-likely hood function = -27.45 significance level = 0.000000 Chi-square=68.418 Restricted log likely hood = -84.350 predicted success = 89% N=121

Note: ***, ** and * indicates statistically significant at 1%, 5% and 10% significance level respectively.

Source: own computation, 2015

Cassava Production training (CASS-TRN): Cassava Production training had positive effect on the probability of cassava market participation decision by Cassava Producers and it is significant at 5% probability level. This is due to the fact that as Cassava Producers get training on activities of cassava production and marketing system they are more aware to participate on market to get adequate value from cassava they produce at right time. And as expected training given to Cassava Producers motivate Cassava Producers to increase productivity as well as market participation decision. Otherwise the quantity and quality loss of cassava may exist due to storage conditions. The marginal effect of the variable also confirms that as Cassava Producers get more access of training on Cassava Production activity, then the probability of Cassava Producers market participation rises by 15.9%.

Use of improved production inputs (USE_INPU): The variable had positive relationship with market participation decision of producers and significant at 5% probability level. From this positive relationship one can understand that as producers get additional unit of improved cassava production inputs the probability of cassava market participation decision of the producers' increases by 4.2%.

Factors affecting quantity of cassava sold/supplied to the maket/

The second stage estimation is summarized in Table 2 and it indicates that the decision of how much households sell. Each decision has been studied by using a selection model which included the inverse Mill's Ratio calculated from a Probit estimation of the decision to sellers into the supply equations. There are 15 potential explanatory variables (9 continuous and 6 dummy) including inverse Mill's Ratio (LAMBDA). Out of these 5 variables, production of cassava (QTY), non farming income (TOT-LAND), extension contact (EXT-CON), Number of oxen owned (OXEN)and inverse Mill's Ratio (LMBDA), had significant effect on quantity of cassava supplied. The F-test value 5.11 for the selection model was highly significant and the adjusted R^2 was 99.07%.

Land Holding (TOT-Land): As hypothesized, Number of land owned by the household heads positively affected quantity supplied. On average, if a cassava producer gets more access to land causes a 4.54 kgs increase in the quantity of cassava supply. This may be explained by the fact that farmers who have more land will tend to produce more cassava and get more cash from sell off.

Production of cassava (QTY): As hypothesized the regression coefficient of cassava production variable was positively related with quantity supplied and significantly at 1% probability level which is the similar significance level. The result shows that a one kg increase in the cassava production causes a 0.97 kgs increase in the amount of marketed supply. Total cassava production influenced the amount of marketed supply of cassava positively showing that farmers who produce more also sell more, which is consistent with the general expectation.

Table 2. Estimates of selection model

Variables	Coefficient	Standard deviation	t-ratio	Marginal effect
Constant	-5.5281	8.2933	-0.667	-5.5281
EXP	0.867	0.126	0.51	0.867
SEX	0.023	0.088	1.427	0.023
AGE	0.062	0.066	0.931	0.062
EDU_LEV	3.496	0.071	5.759	3.496
TOT-LAND	4.5428	2.5851	1.757*	4.5428
CRED -ASS	3.496	0.071	5.759	3.496
QTY	0.9710	0.0072	135.078***	0.9710
EXT-CON	4.8113	1.7743	2.712***	4.8113
MKT-INF	-0.067	0.097	-0.69	-0.067
FAM_SIZE	-10.167	6.534	-1.56	-10.167
OXEN	-0.4932	0.2070	-2.383**	-0.4932
CASS-TRN	-0.135	0.568	-0.24	-0.135
HOR-PRICE	5.958	4.842	1.23	5.958
MKT-DIS	-0.2137	0.1898	-1.126	-0.2137
USE-INPU	0.0892	0.8135	0.110	0.0892
LAMBDA	7.7730	3.7503**	2.073**	7.7730

R-squared = 0. 99074 Adjusted R-squared = 0. 9901 Rho = 0.61003
Probability value = 0.00000 F-value 5.11 *** Number of observations 121
Log-L = -973.9455 Restricted (b=0) log-L = -1565.333
***, ** and * show the values statistically significant at 1%, 5% and 10% respectively
Source: Own computation, 2015

Extension contact (EXT-CON): the other significant variable was extension contact, which affected positively the marketed supply of cassava. On average, if a cassava producer gets extension contact the amount of cassava supplied to the market increases by 4.81kgs. This suggests that access to get extension service avails information regarding technology which improves production that affects the marketable surplus.

Number of oxen owned (OXEN): This variable influenced the quantity of cassava supply negatively. This is mainly due to the fact that farmers with more TLU tend to specialize in livestock production reducing the importance of cassava production as means of cash generation. The result shows that a unit increase in the livestock causes 0.4932 kgs decrease in the amount of marketed supply.

Inverse Mill's Ratio (LMBDA): The inverse Mill's Ratio affects the quantity supplied positively with 5% significance level and it indicates that in Heckman two-stage model, the correction for selectivity bias is significant.

CONCLUSION AND RECOMMENDATION

The study has duly focused on the factors affecting decision of farmers' participation in cassava market and amount of marketable supply of cassava in wolaita zone.

Based on the Heckman two-stage model, the study had identified the determinants of participation decision on cassava market and its effect on the quantity supply.

Cassava production is the most important and significant variable influencing the decision to participate in cassava market positively.

Moreover, cassava production and extension contacts are the significant determinant factors of the quantity of cassava supplied positively. The coefficient associated with the inverse Mill's ratio was significant, indicating that the influence of unobservable factors in the farmers' decisions to participate was significant.

Findings based on the results of the study (Heckman two- stage model), to promote cassava market participation in a sustainable way, some policy implication are suggested to be addressed by those stakeholders (extension agents, NGOs and spice extraction factories). The most important variables influencing the decision to participate in cassava market are cassava production (positively). Consequently, extension workers advertising are to be designed to encourage farmers to participate in cassava market. Keeping households specialization and social role in cassava production potential areas is necessary.

Moreover, cassava production and extension contacts are the positive determinant factors of the quantity of cassava supplied. Therefore, policies that would improve cassava production capacity by identifying new technologies and the causes of diseases problems. Creating stable demand for surplus production would enhance farmers' decisions on cassava production. Agricultural extension services are the major institutions operating in the rural areas. To obtain this advantage there is a need to improve extension system, and technical supervision and follow up must be strong. Strengthening of market extension.

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