Determinants of Farmers' participation in high value crops in Tanzania

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Abstract

This paper is based on a study undertaken to analyze market participation of tomato smallholder famers in three districts of Morogoro region in eastern Tanzania. A multi-stage random sampling procedure was employed to select the sample. Determinants and extent of market participation were estimated using Heckman selection and outcome equations respectively. It was found that characteristics of market participants and non-market participants were not statistically different. The paper recommends that that the government should beef up extension services especially in the aspect of market information to farmers in order to enlighten them on the recommended production techniques, market price and also to improve tomato production. Moreover, rural information centres as well as mobile telephony system should be formed so as to enhance tomato farmers' regular access to information on market dynamics.

Key words: Market participation, smallholders, high value crops, Tanzania.

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1.0 Background information

Farmers' participation in crop marketing in Tanzania is reported to be low. For instance, according to National Sample Census of Agriculture 2007/08 (URT, 2012) in Morogoro region, which is located in high agricultural potential areas, few households reported selling crops. The most active district in the region was Kilosa (26%, 73,730 households) following Kilombero (24%, 67,761 households). In the other districts, participation in crop sales were 20% in Mvomero (58,334 households), Morogoro rural and Ulanga 14% each of them (41,150 households for Ulanga and 40,436 households for Morogoro rural). In Morogoro urban crop sales were at the lowest level (2%, 4,319). This could be also the trend if high value crops were assessed separately.

The world has witnessed a rapid increase in demand and production of high value crops in recent years (de Putter, 2007). These crops contribute to the share of agriculture in national economy and possess a great potential and comparative advantage to compete in the liberalized economy. Demand for high value crops, predominantly, vegetables in Africa including Tanzania is growing with the increasing population particularly due to ever increasing number of people are living in cities (Everaarts *et al*., 2011). This increasing demand is a positive development for the growers because for them vegetable cultivation is an important source of income in both urban and rural areas (Ellis-Jones *et al*., 2008).

Though in the production of high value crops, smallholders are also dominant, few smallholders do participate in nearby markets as well as other distant markets (Everaarts *et al*., 2011 and Everaarts, 2011). The dominance of small-scale farmers in high value crop production presents an opportunity for making an impact on poverty reduction efforts, especially if smallholder farmers participate at all levels of marketing processes. The potential for poverty reduction through high value crop production lies in the fact that it increases income (through high-value crops), and it also generates employment through production and processing (Weinberger and Lumpkin, 2007). The benefits could be higher if smallholder farmers are linked to export markets.

Thus, given that production of high value crops in Tanzania is dominated by small-scale producers, the potential for reducing poverty by enhancing their productivity and incomes is enormous. It is therefore important to understand how small-scale producers of vegetables can increase their productivity and face obstacles constraining demand side to enhance their market participation.

It is believed that the growing of high value crops is likely to contribute more significantly to increased incomes of smallholder farmers in developing countries, including Tanzania. This is because they command higher prices compared to traditional agricultural crops. Also, given a world-wide increase in demand for high value crops, production of vegetables guarantees that farmers will continue enjoying better prices than traditional agricultural crops. The other important factor for significant increased incomes from growing high value crops emanates from its potential for employment creation. Vegetable production is labour-intensive, and it has strong forward and backward linkages; the requirements for organic and inorganic fertilizer, pesticides and seeds in production is huge, as well as the need for further processing for regional markets and supermarkets are opportunities that need to be exploited.

According to FAO data based on imputation methodology for vegetable production, Tanzania ranked from the twentieth in 2000 to fifteenth position in 2009. In fact, during this period, Tanzania remained in the top 20 vegetable producers in the world (FAOSTAT, 2013). The greatest bulk of the vegetables produced in Tanzania tomato is the single most dominant vegetable crop (URT, 2012). It was found that, the area planted with tomatoes in Tanzania is 26,612 ha. Tomato was our reference crop in this paper. Tomatoes contributed the highest percent of harvested quantity (314,986 tons 64%) to the total harvested quantity of vegetables.

2.0 Theoretical review on market participation

The theoretical underpinnings of why farm households participate in agricultural markets can be found in the trade theory as postulated by Ricardo. According to the theory farmers are essentially driven to enter into trade or markets so that they can enjoy a diverse consumption bundle. They can exploit welfare gains from trading by concentration in the production of goods they have comparative advantage and exchange for those they have no comparative advantage mostly manufactures. The trade theory though it explains the primary motive for farmers to participate in markets. One sound theoretical model explaining the household's market participation behaviour is provided by Barret (2008).

Barret (2008) used a stylised non-separable household model to understand the theoretical foundations of the market participation behaviour. The model assumes that a household faces a decision to maximize utility defined over a consumption of agricultural commodities and other tradables. The household earns income from production and sale of any or all of the agricultural crops. It is also assumed that each crop is produced using technology that represents the flow of services provided by privately held assets such as land, labour, livestock, machinery, etc. and public goods and services such as roads and extension services. Farm households face market price for each crop and household specific transaction cost per unit that depends on public goods and services such as radio broadcast of prices that affect search costs, road accessibility to market and; household specific characteristics such as educational attainment, gender and age, which affect search cost, negotiation skills, among others.

2.1 Review of Empirical Literature
2.1.1 Market participation approach

The typical approach divides the market-participation decision into two stages. In the first stage, households that produce a particular commodity decide whether to be net buyers, net sellers, or autarkic in the market for that commodity. In the second stage, net buyers and net sellers determine the extent of market participation. This two-stage conceptual model of market participation lends itself to econometric models that address sample selection, such as Heckman's two-stage approach (Heckman 1979). For applications to agricultural market participation in developing-country settings, such approach has been employed by Goetz (1992); Holloway et al. (2000); Holloway *et al*, (2005); and Bellemare and Barret (2008).

However, some literature ignores an important stage of the household marketing decision, as well as a second source of potential sample selection; namely, the decision to produce a commodity in the first place. Some studies observe only those households that produce the (potentially) marketed commodity. For example, studies that address participation in dairy markets sample only households that own livestock (Holloway *et al*, 2005; Bellemare and Barret 2006). However, livestock ownership is the result of an economic decision

made by households; that is, livestock owners are self-selected. As a result, existing estimates of the determinants of market participation may be biased. Moreover, even if this potential source of sample selection is not an issue; which is an empirical question, inference from the existing research is necessarily limited to producing households, and thus are not of use for informing the design and evaluation of, for example, development projects aimed at increasing market participation by encouraging livestock ownership.

2.1.2 Determinants of market participation
In a study of smallholder market participation in Mozambique Heltberg and Tarp (2002) used Goetz's approach to estimate reduced form equations for market participation and value sold of food crops (as a group), cash crops (as a group), and total value of crops sales. Factors significantly affecting market participation included farm size per household worker, animal traction, mean maize yield, age of household head, climatic risk, transport ownership and infrastructure. Explaining variation in the value of sales for food crops or cash crops was much less conclusive, and the authors recognized that aggregation of sales into food or cash crop groups may mask underlying causal mechanisms related to individual crop decisions. Benfica *et al*. (2006) used the same approach to investigate the determinants of participation of cotton and tobacco contract farmers in the Zambezi valley of Mozambique, and tested for the existence of threshold effect in land holdings and educational attainment on smallholder earnings from tobacco. Participation in contract farming schemes was statistically significantly linked to household factor endowments and alternative income opportunities.

In a study of participation of smallholders in staple food markets in Sub Saharan Africa, Jayne *et al*. (2005) found that their overall market share is very low. Jayne *et al*. (2005) found that the top 2% of commercial farmers sold about 50% of observed marketed maize in Kenya, Mozambique and Zambia. Ellis (2005) also shows that farmers in semi-arid areas of Africa have very low proportions of output marketed. Further complicating the picture is evidence of growing participation of smallholders in horticulture and dairy; and a shifting away from staple food production as farm sizes shrink (Olwande and Mathenge, 2012). This is due to the low prices received for staple foods and farmers' desires to increase their returns. Thus there appears to be divergent trends on the demand and supply side: demand trends which may be creating greater opportunities for staple foods in domestic markets and supply trends which suggest an interest of farmers to diversify away from lower value staple food crops (Bellemare and Barret, 2006). Jayne *et al*. (2005) and Jayne *et al*. (2004) investigated relationships between land holdings, market participation, and incomes. They found that most smallholders did not sell cereals and in fact were net buyers of cereals. The size of land holding was also found to be highly correlated with income, including crop income and livestock income. This shows that the land-poor are not benefitting from markets as much as those with more resources. Yet, an interesting finding is that even the land poor households count on crop production for a sizeable amount of their household income. They do not largely turn their backs on agriculture and seek predominantly off-farm livelihoods.

In terms of understanding the constraints to market participation and the types of interventions that can overcome these constraints, some studies have been done. Barrett (2008) stresses the importance of distinguishing location level constraints that tend to influence participation from community level to household level constraints that influence participation across households within a given location. Among the types of constraints, others have differentiated between transactions costs, risks, and resources such as skills, land,

capital which all may manifest themselves at a household level (Bijman *et al*., 2007, Poulton *et al*., 2006).

One key point is that interventions may be different for different types of commodity market chains. For example, investments required in vegetables or fruits are different from those in cereals, due to differences in perishability, potential for value adding, and standards, inter alia. Identifying which agricultural commodities offer the best opportunities for sales and income in the market is thus a critical step in the process of making profitable investments in high value crops.

3.0 Methodology
3.1 The study approach and design
Quantitative methods were deployed in this study. Quantitative methods focused on the quantification of constructs and analysis of variables in the research process. This research operated within the cross-sectional design as data was collected from the selected sample and on more than one case using structured questionnaires for the survey. Mvomero and Morogoro Rural and Urban districts were purposively selected as study areas. The study districts were selected to represent diverse agro-ecological zones, socio-economic environment, cultural diversity and varying production systems. For example, Mvomero district is considered a high potential area growing most of vegetable crops. Morogoro rural district on the other hand grew mainly maize and vegetables while Morogoro Urban is considered to have low crop production since inhabitants mostly do engage in off-farm activities. The three districts were chosen on the basis of their proximity to urban market and degrees of commercialization (URT, 2012). Thus, it was expected that the choice of the districts was designed to present differing levels of crop sales due to varying distances to crop market.

3.2 Sampling procedure
A field survey was carried out in three districts (Mvomero and Morogoro Urban and Rural districts) of Morogoro region representing rural, urban and peri-urban settings of high potential agricultural areas of Tanzania. A multi-stage random sampling method was used to select the sample of farmers. Sampling procedure was done in three stages. First, the three districts were purposely selected. Second, in each of the district, villages were randomly identified. A list of all farm households which defines the distribution of vegetable farmers, villages and their vicinity and name of vegetable producers was then drawn with the help of local administration and local agricultural extension officers. Third, the farmers were then systematically sampled from the lists. The heads of the households were interviewed. In the absence of the household head (husband), the wife or the second member was interviewed. The main respondent would provide most of the information. A total of 204 farmers were interviewed in this study. The data collected included household characteristics, socio-economic indicators, household assets and resources, production, access to services and marketing aspects, among others.

3.3 Data collection and analysis techniques
Data was collected from various agents participating in the high value crop marketing channels. It was anticipated that farmers and traders alike do not keep records. Therefore, data collection involved a combination of methods, which rely on memory recall for basic information such as producer selling price and marketing costs, retail and wholesale price and

quantity handled by traders. Data collected through interviews were coded and entered into the Statistical Package for Social Sciences (SPSS) for windows versions 16.0. Data cleaning was done by performing the procedures as described by Chapman (2005) and Little and Rubin (1987). Some cleaned data were later exported to other software packages such as STATA for windows Version 9 for further analysis. Descriptive statistics techniques were used to analyse the data. This analysis was based on frequencies, cross-tabulations, and correlation coefficients. These statistics were used to determine the characteristics of farmers in relation market participation.

3.4 Analysis of market participation
Various studies on small holder market participation have mainly modeled both/either output and/or input market decisions as a two-step decision process. This is based on the assumption that households make two separate decisions; one involves the decision to participate in the market or not and secondly the level of participation. These studies have used either the sample selection model of Heckman (1979) (Makhura, *et al.*, 2001; Boughton, *et al.*, 2007; Alene *et al.*, 2008) or the two tier/ hurdle models (Omiti, *et al.*, 2009, Goetz, 1992; Key *et al.*, 2000; and Bellemare and Barret, 2006).

The sample selection model is ideally used to deal with non-random samples as a result of survey design, non-response on survey questions, sample attrition or the specific attributes of the variable being analyzed. In sample selection problems, and more precisely in cases of incidental truncation, some part of the dependent variable is not observed as a result of the outcome of another variable. In this case, it is erroneous to infer a zero for non-participation and any estimation based on the selected sample would be biased unless we account for those agents who never participated or whose data is missing through the correction term as described above. The two tier/hurdle models are a type of corner solution outcome (sometimes referred to as censored regression model). These models define an initial discrete probability of participation model. Conditional on participation, a second decision is made on the intensity of participation.

The decision to participate in tomato market or not is a binary choice. This is because of the dichotomous nature of the dependent variables, that is, to participate or not to participate in tomato market. The decision on whether or not to participate is considered under the general framework of utility or profit maximization (Norris and Batie, 1987; Pryanishnikov and Katarina, 2003). Within this framework, economic agents, in this case, small-scale tomato farmers will decide to participate if the perceived utility or net benefit from this option is significantly greater than in the case without participation. Although utility is not directly observed, the actions of economic agents are observed through the choices they make.

STATA was used to process and analyze the data. The Heckman two-stage selection model was used to determine the market participation and extent of participation. Heckman two-step selection model involved estimation of two equations: First, is whether a household participated in the tomato market or not, and second is the extent of market participation (proportion of tomato sales). The proportion of tomato sales were conditional on the decision to participate in the market. Heckman procedure is a relatively simple procedure for correcting sample selectivity bias (Hoffman and Kassouf, 2005). It consists of two steps. First, a selection equation estimated using a Probit model. This model predicts the probability that an individual household participate or does not in the tomato market as shown in equation 1 and 2.

$$P(Y_1 = 1) = P(Q_i > 0) = X_1\alpha + \varepsilon \qquad \text{(Market participation model)} \qquad (1)$$
$$Q_1 = Z_1\beta + \mu \qquad \text{(Intensity model)} \qquad (2)$$

Equation 1 defines the market participation model where Y_1 takes the value of one if a household made any positive sales to the market and zero if no sales were made. Q_1 is the proportion of quantity sold (or alternatively might represent the quantity sold or value sold) and X_1 and Z_1 define factors that affect the discrete probability of participation and intensity of participation respectively. The specific variables to be estimated in the model are described in Table 1.

Table 1: Exogenous variables used in Heckman two-stage regression models

S/no	Variable	Description	Measurement	Expected sign
1	Age	Age of the household head	Years	+-
2	Gender	Gender of the household head	1=Male, 0=Female	+-
3	Education	Education level of the household head	Years in formal schooling	+
4	Household size	Number of people in the household	Numbers	+
5	Farm size	Area under tomato crop	Acres	+
6	Household income status	Total household income	TZS	+-
7	Non-farm income	Proportional of non-farm income in total annual income	Ratio	+-
8	Distance to market	Average time used from farm to main point of sale	Hours	+
9	Quantity of tomato produce	Total quantity of tomato output produced per season	Buckets (1 Bucket =17 kg of tomato)	+
10	Price information	Availability of formal price information	1=Yes, 0=No	+-
11	Unit price	Average Price of each unit output sold	TZS	+
12	Marketing experience	Time period a farmer has been selling tomato to market	Years	+-
13	Credit	Access to credit	1=Yes, 0=No	+
14	Extension service	Visits in previous season	Numbers	+

Source: Adapted from various studies by the Researcher (2014)

Main Findings
Marketing characteristics of farmers in relation to market participation
Table 2 presents marketing characteristics of farmers in relation to market participation. Unlike in socio-economic characteristics of market participants and non participants, we had only continuous variables of marketing characteristics which were relevant to market participation. The difference in marketing experience in years is statistically highly significant between market participants and non market participants. Market participants are more experienced in tomato marketing. The marketing experience has direct relationship with the farmer's level in bargaining power and marketing network. This means that farmers with more years in marketing have higher ability to participate and sell more in the market. The

finding concurs with that of Geoffrey *et al*. (2013) who found an increase in farmer's experience resulted in the increases of pineapple being supplied to the market.

Mean unit price differ significantly between market participants and non market participants. Market participants experienced much higher price than in non participants. In accordance with the present results, previous studies by Tomek and Robinson (1985) and Omiti *et al*. (2009) have demonstrated that the product price has direct relationship with marketable supply and hence increase market participation.

There is significant difference of fraction of tomato sold between market participants and non participants. Unlike other food crop such as maize and rice, tomato is mainly used as a vegetable where it is consumed in small quantities in the household. It is found that when prices are very low the unsold produce is left unharvested in the farm. This is because the farmers participate in market when prices are major incentive. This result is in agreement with Key *et al*. (2000) findings which extended Goetz's analysis by focusing on participation in maize markets in Mexico where proportional produce sold play a significant role in explaining household behaviour of market participation.

Distance to nearest market was expressed in walking time in minutes. There is slight difference of time used to walk to the nearest market. The produce is transported mainly on push carts and pushed bicycles. Key *et al*. (2000) and Makhura *et al*. (2001) found that distance to the market influences both the decision to participate in markets and the proportion of output sold. Also, Lwezaura and Ngaruko (2013) in assessing determinants of transaction costs to farmers' participation in groups and distance had significantly positive effect.

Table 2: Marketing characteristics in relation to market participation

Variable	Market participants (n=128)			Non market participants (n=76)			p-Value
	Mean	Std. Deviation	Std. Error Mean	Mean	Std. Deviation	Std. Error Mean	
Experience in marketing in years	10.63	8.663	0.766	0.03	0.229	0.026	-10.660
Price per unit bucket in TZS	5,109.3	2,905.2	2,56.7	2,157.8	3,061.8	3,51.2	-6.784
Fraction sold in 2012	0.85	0.11	0.01	0.36	0.43	20.534	-11.821
Distance to the nearest market in walking time in minutes	55	56.19	4.96	53.09	46.11	5.28	-2.250

p<0.05: Significant at 5% level

Determinants of market participation of tomato farmers
Tables 3 and 4 present the Heckman two-step selection and outcome results. The determinants of market participation of tomato farmers were estimated using Heckman's two step estimation technique by using STATA for windows Version 9. Variables used in the selection equation (Participate or not) were; age, household size, education, quantity of tomato produced, total income and sex of the head of the household. On the other hand, variables used in outcome equation (fraction of quantity sold) were age, household size, education, quantity produced, total income, sex, unit price of tomato sold, price information and time used to go to the nearby market as a proxy to market access.

Wald test indicates the correlation is very significant (p=0.0005). Hence we should use Heckman's technique. The Mills lambda term is significant with positive sign which suggests that the error terms in the selection and outcome equations are positively correlated. So factors that make participation more likely tend to be associated with higher quantity sold. Regarding rho, (rho=0.3603391) in the STATA output represents the estimated correlation coefficient between the error terms in the two equations. There is much information we can use to distinguish between those two error terms when rho is not so close to 1 or -1. Furthermore, sigma in the results represents the estimated standard deviation of the error term in the quantity sold equation.

Table 3 shows the Heckman selection equation results. Age, education, quantity produced and sex significantly influence the market participation among the tomato smallholder farmers. Age of the household head significantly and negatively influenced market participation. An increase in the age of household head by one year decreases the probability of participating in tomato market by 0.07 percentage points, all other factors held constant. It is believed that younger people are more enthusiastic to participate in tomato market than the older people. In the same vein, Barret *et al*. (2007), Azam *et al* (2012), Salvucci (2010) and Geoffrey *et al*. (2013) concluded that younger people participated more in the market of agricultural crops because they are more receptive to new ideas and are less risk averse than the older people. The finding concurs with that of Chalwe (2011), who found younger people to participate more than older people in marketing of beans in Zambia. Also, Gebremedhin and Hoekstra (2007) their study showed that there is a U-shaped relation between age of household head and market participation of household in the cereal crops.

However, this finding has contrasted the views held by Tekana and Oledele (2011), Bogale *et al*. (2006), Heltberg and Tarp (2002) and Asfaw *et al*. (2012) where it is expected that the influence of age to be positive taking the presumption that as farmers get older they could acquire skills and hence produce much and develop skills to participate to a market. In other words, it is a proxy measure of experience.

Education level of the household head significantly and positively influences market participation. One year increases in household head's education increase the probability of participating in tomato market by 0.06 percentage points, all other factors held constant. This can be explained by the fact that as an individual access more education he/she is empowered with the marketing skill and knowledge that will spur individual to participate in the market. This is in line with Astewel, (2010) and Geoffrey *et al*. (2013) who illustrated the positive influence of education level to the amount of supplied crops to the market. This suggests that higher level of education provides a greater opportunity for the farmers to participate in

tomato market as was hypothesized by Omiti *et al*., (2009), Gebremedhin and Jaleta, (2010); and Khanal and Maharjani, (2013) that education level variable of the household head affects marketable supply positively.

Quantity produced significantly and positively influences market participation. An increase by one unit of quantity produced increases the probability of participating in tomato market by 91 percentage points, all other factors held constant. This implies that as the tomato quantity produced increases, market participation also increases. This is in line with the findings of Geoffrey *et al.* (2013) who found that an increase in amount of pineapple yield increased the marketable supply of the commodity significantly. Moreover, the study by Chauhan and Singh (2002) also showed that, marketed surplus of paddy is positively related to the volume of production as well as with area under crop.

Sex of the household head significantly and positively influences market participation. Being male-headed household increases the probability of participating in the tomato market by 11.9 percentage points, all other factors held constant. This suggests that the male-headed households are more market oriented than female, hence they participate more in the market for cash crops like tomato. This finding is in line with argument by Doss (2001) and Geoffrey *et al.* (2013) who argued that men are responsible for providing cash income to the household and to accomplish this they grow high value crops like vegetables. Male headed households, due to their potential crop production efficiency advantages over female headed households, are expected to have higher participation in output and input markets (Omiti *et al.,* 2009; and Gebremedhin and Jaleta, 2010). Male headed households are more likely to be resource rich compared with female headed households and relatively more likely to engage in labor demanding crops like tomato (Gebremedhin and Hoekstra (2007).

Table 3: The Heckman two-step selection equation results

Variable	Coef.	Std.Err.	z	P>|z|	[95% Conf. Interval]	
Age	-0.072945***	0.0077086	-0.95	0.004	-0.022403	0.0078139
Household size	0.031184	0.0487972	0.65	0.523	-0.0644567	0.1268246
Education	0.05954**	0.0282203	0.21	0.033	-0.0493609	0.0612608
Quantity produced	0.91368***	0.0005075	2.70	0.007	0.0003733	0.0023626
Total income	0.0000037	0.0000009	-0.06	0.952	-0.000019	0.0000018
Sex	0.1190956***	0.2114949	-0.56	0.003	0.5336179	0.2954268
Constant	0.3722291	0.5597709	0.66	0.506	-0.7249016	1.46936
Mills lambda	1.60689***	10.608881	-0.15	0.008	-22.39977	19.18599
Rho	0.3603391					
Sigma	1.6068904					
Lambda	0.579025	10.60881				

Note: ***=p<0.01, **=p<0.05

    Number of observations=204, Censored observations=76, Uncensored observations=128, Wald chi2 (1)=9.77 and Prob>chi2=0.0005

Determinants of the extent of market participation
Table 4 shows Heckman outcome equation results. Age, quantity produced, sex and marketing experience significantly influence the extent of market participation in tomato marketing. The age of the head of the household has a statistically significant positive impact on the volume of seed sold in the market. However, its impact on market participation is not

significant. This finding is consistent with that of Khanal and Maharjan (2013), Olusola and Daramola (2013) and Geoffrey et al. (2013). There was a positive relationship between the quantity of produced tomato and the fraction of tomato sold in the market. The reason for this could be attributed to the low rate of tomato consumption by the household members, which makes large quantity of the produced tomato available for sale in the market. This is possible as the more the produced tomato the more the proportion the farmers offer for sale in the market. This result matches with earlier findings by Chauhan and Singh (2002) and Olusola and Daramola (2013) who showed that, marketed surplus of crops is positively related to the volume of production as well as with area under crop.

Sex of the household head significantly and positively influences the extent of market participation. A unit of increase by one male increase the proportion of tomato sale by 12.8 percentage points. The male-headed households are believed to have strong bargaining power which in turn increases the proportion of tomato sales (Geoffrey *at al*. 2013). The results is consistent with that of Cunningham *et al*. (2008) who argued that men are likely to sell more due to their acumen in bargaining, negotiating and enforcing contracts.

Marketing experience positively and significantly influences the extent of market participation. An increase in a farmer's marketing experience by one year increases the proportion of tomato fraction sold by 34.4 percentage points. The marketing experience has direct relationship with the farmer's level in bargaining power and marketing network. This means that the farmers with more years in marketing have higher ability to sell more tomato produce in the market. The finding concurs with that of Geoffrey *et al*., (2013) who found an increase in farmer's experience resulted in the increase of pineapple being supplied to the market.

However, the findings of the current study do not support the previous research. For instance, Olusola and Daramola (2013) found a negative relationship between the dependent variable (proportion of maize sold in the market) and the experience of the household head. This could be traced to the diversification of most of the farmers' resources to non-farming activities probably due to the poor revenue being realized from farming activities in the past.

Table 4: The Heckman two-step outcome equation results

Variable	Coef.	Std.Err.	z	P>|z|	[95% Conf. Interval]	
Age	0.0061618[***]	0.0437121	0.14	0.008	-0.0795124	0.091836
Household size	-0.0371193	0.1933406	-0.19	0.848	-0.41606	0.3418213
Education	0.13399	0.0548037	0.02	0.448	-0.1060734	0.1087533
Quantity produced	0.0949[***]	0.007335	-0.13	0.007	-0.0153252	0.0134273
Total income	0.0000004	0.0000001	0.03	0.975	0.0000002	0.0000002
Sex	0.1280631[***]	0.7038002	0.18	0.006	-1.25136	1.507486
Price	0.5256	0.0000352	0.15	0.03	-0.0000638	0.0000742
Information type	0.0281911	0.208958	0.13	0.893	-0.3813591	0.4377413
Marketing experience	0.34467[**]	0.0116355	0.30	0.017	-0.0193584	0.0262518
Time taken to nearby market	0.305995	0.0018964	0.05	0.958	-0.0036174	0.0038163

Note: ***=p<0.01, **=p<0.05

Conclusion

From the evidence gathered in this study, it can be concluded that market participation of tomato smallholder farmers of high value crop in high potential agricultural areas of

Tanzania has been influenced by many factors as expounded in the conceptual framework of this study. Variables related to marketing such as unit price, distance to nearest market and experience in tomato production and marketing were important in market participation. Unit price suggests that higher investment costs by tomato farmers and experience confirms the strong managerial skills required by tomato farmers. Distance is relevant because small proportion of tomato produce is consumed locally. In addition, tomato production technology employed suggests the intensive nature of sustained and profitable production of the crop. Lack of inputs such as seeds, pesticides and fertilizers could constrain tomato production.

In this study, it was found that market participation is determined by age, education, quantity produced and sex of the tomato farmer. Likewise the extent of market participation of tomato farmers was determined by age, quantity produced, sex and marketing experience. These factors are directly associated with the behaviour of farmers to increase their tomato marketable quantities and volume of sales.

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