

Participation of Smallholder Vegetable Growers in High-Value Market Chains in Arusha, Tanzania

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Abstract- *Despite the huge employment and income benefits from vegetable farming, smallholder growers in developing countries lack the knowledge about high value markets and their requirements. Most of these growers are ignorant have limited knowledge about vegetable contract farming, product standardization and grading of their produce, quality of produce preferred by customers, on delivery times and food safety standards. This study used primary data collected from 200 smallholder vegetable growers in Arumeru District in Arusha Region to identify the determinants of high-value market participation of smallholder vegetable growers in high-value markets. The findings indicated that farmers income, distance from the farm to the main road and yield had a significant influence on smallholder cabbage growers' participation in high-value markets to local markets. While for onion farmers, income, irrigation, extension services, and market information had a positive influence on farmers' market participation. But as for tomato growers, experience, the distance to high-value market, yield, and irrigation had significant influence on growers' participation. These findings demonstrated the urgent need to deliberately improve the factors that increase participation of smallholder growers in high-value markets if they are to get stable incomes and sustain their livelihoods. There is also a need to improve access to market information, develop farmers' business skills and improve rural access roads.*

Index Terms- *Smallholder growers, high-value markets, market participation, vegetables.*

I. INTRODUCTION

Vegetables are the most important ingredients in human diets for the maintenance of good health and prevention of diseases. Besides nutritional value, cultivation of vegetables has been an excellent source of employment for both rural and urban dwellers as it takes place in many rural areas and in the outskirts of towns and cities in the form of backyard gardening, to supply fresh produce to urban markets (Chagomoka, *et al.*, 2014). Thus vegetable farming plays an important socio-economic role for small farmers as well as in diversifying diets to improve their nutrition.

In the last two decades, production and consumption of vegetables in Tanzania has been on the increase especially in peri-urban and urban areas due to increase in consumers' nutritional awareness and disposable income (SCF, 2008). This is due to good climatic conditions that favor the growth of vegetable throughout the year. In Arusha Region, the agro-climatic conditions are suitable for growing various vegetables such as amaranths, cabbage, carrot, chilies, cucumber, eggplant, okra, onion, radish, spinach, tomatoes, and turmeric (Lyatuu *et al.*, 2009). The suitable growing conditions offer a huge opportunity for the development of sustainable vegetable production. In addition, good supply of water for irrigation purposes, good extension services and availability of vegetable seeds from several research institutes in the area support production of different vegetables on a continuous basis (Tenkouano, 2013). Moreover, fast growth of supermarkets, schools and colleges, tourist hotels, and green grocer shops in the area offers smallholder vegetable growers many opportunities to sell their produce and thus generate higher income if these vegetables meet quality and quantity demanded (Irungu *et al.*, 2011). These new growing vegetable outlets are known as high-value markets. High-value markets are markets where simple activities such as grading, sorting, cleaning, chopping, mixing, packing, and labeling are carried out to add value (Chagomoka, 2014).

However, access to market opportunities for the small vegetable growers remains a major problem for small value chain players in the vegetable sub-sector. According to Jones (2015), findings show some issues such as poor infrastructure, grading systems, inadequate storage facilities, insufficient market information and communication between farmers, traders and consumers pose a significant hindrance to market accessibility. Other studies have found out that smallholder vegetable farmers face a limited access to farm credit due to high interest rates attached to these loans (Shute *et al.*, 2011). All these factors in combination limit smallholder farmers to participate effectively in and benefit equitably from high-value chains that serve either the local, regional or international markets.

Despite these problems, the market share of supermarkets in the vegetable and fruit sector is growing rapidly in Tanzania, most of the vegetables that were sold in the local spot markets are now mostly sold through supermarkets (Chagomoka, 2014). Many consumers prefer shopping at supermarkets these days because they are assured of the quality of the product, good customer service, cleanness, food safety, variety of product and good packaging (Irungu *et al.*, 2011). Therefore, improving market access for smallholder growers has a great potential to improve incomes for small vegetable producers and traders (Kuzilwa *et al.*, 2013).

The aim of this study was to determine factors that could increase smallholder vegetable growers' participation in high-value market opportunities in Arusha Region. According to the National Bureau of Statistics census conducted in 2008, the three highest ranked grown vegetables were tomatoes, onions, and cabbage respectively. Therefore this study generated information that could help smallholder growers along the three (tomatoes, onions, and cabbages) vegetable value chains to adopt an attitude of producing what they can sell for premium prices, rather than merely sell whatever they were used to grow often getting lower prices for their produce like any other fellow growers.

II. METHODOLOGY

Study area

The study population was vegetable farmers in Arumeru Districts in Arusha Region, Tanzania. Using a cross sectional approach, primary data was collected at one point in time through formal survey to get an in-depth understanding of factors influencing smallholder vegetable growers' participation to high-value market opportunity. A sample of 200 vegetable farmers growing vegetables were interviewed (110 tomato, 50 cabbage and 40 onions). The main criteria for selection of the district and the villages were based on growers' involvement in a project called "Improving Incomes and Nutrition in Eastern and Southern Africa by Enhancing Vegetable-based Farming and Food Systems in Peri-urban Corridors" (VINESA). This project is managed by the World Vegetable Center and funded by the Australian Centre for International Agricultural Research (ACIAR). VINESA was established in June 2013 and has equipped over 500 youth with skills to generate employment and income opportunities for peri-urban vegetable growers and their families in Ethiopia, Malawi, Mozambique and Tanzania.

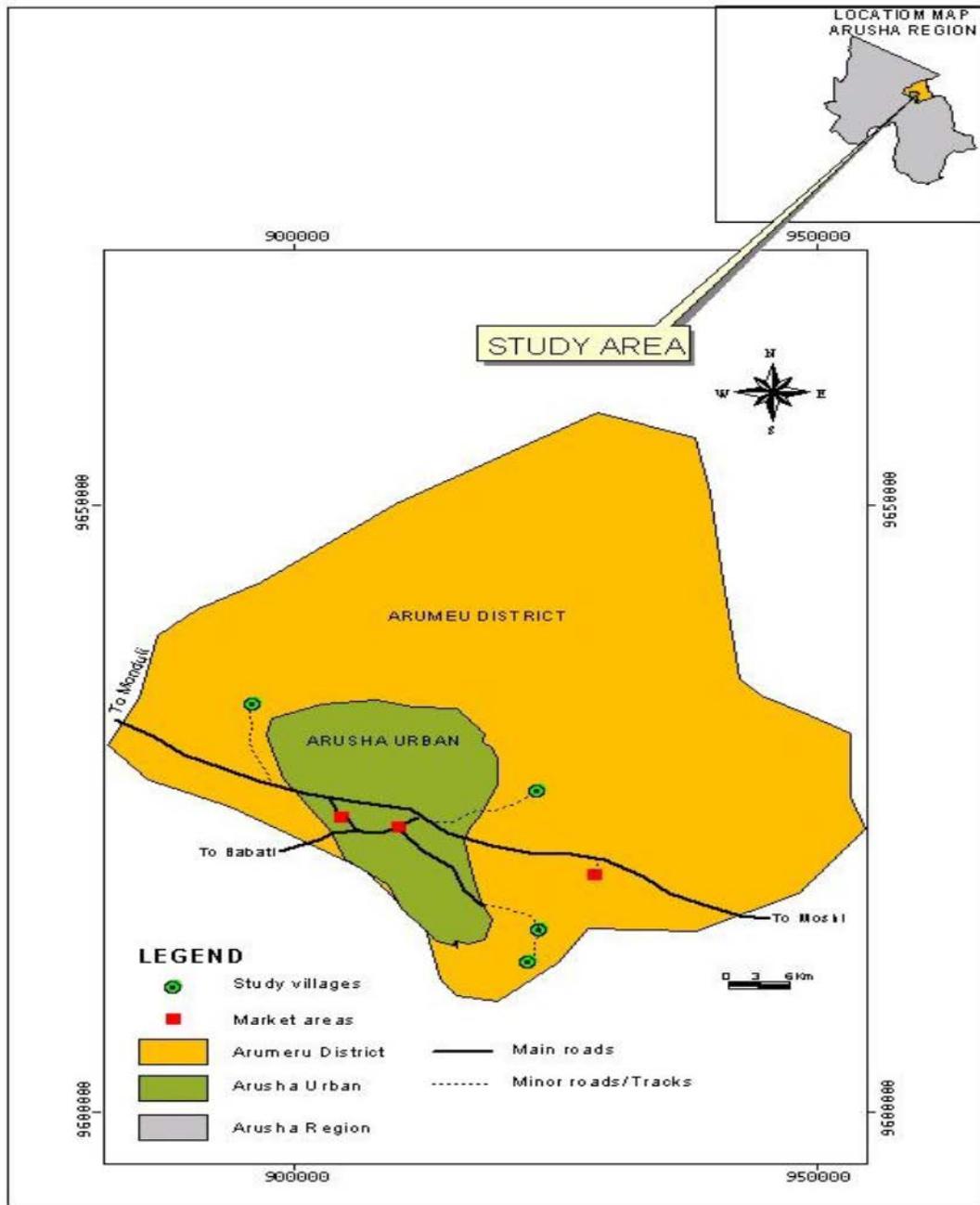


Figure 1: Map of Arusha Region illustrating the locations of this study (Source: ESRI (1991-1996))

Analytical Approach

The study used binary logistic regression model to determine factors that influence smallholder vegetable grower’ to participate in high-value market opportunities. The participation in the high-value vegetable market was analyzed as a dichotomous response variable where a farmer either willingly chooses to participate in high-value vegetable markets or local markets.

The utility maximization of smallholder growers was explained as follows;

The function was specified as:

$$\text{Max}(U) = U(FC_{ji}, TA_{ji}) \dots \dots \dots (1)$$

Where U_i is the non-observable utility function that ranks the preference of the i^{th} farmer for the j^{th} market ($\forall j = 1, 0$); 1 for high-value vegetable markets and 0 for local vegetable market. FC is defined as farm and farmer specific attributes and TA is defined as other attributes of the innovation that may be unobserved to the analyst but observed and acted upon by the decision markers. The basic assumption in Equation (1) is that farmers perceive high-value as an optimal course of action to maximize their expected utility

and decision is made in situation where the decision maker is full aware of this high-value markets and its attribute. Therefore, the utility derived from j^{th} market is a function of FC, TA and a disturbance term with zero mean. Equation (2) can be presented as:

$$U_{ji} = \alpha_j F_i(M_i, A_i) + e_{ji} \forall (j = 1, 0; i = 1, 2, \dots, n) \dots \dots \dots (2)$$

Since the utilities U_{ji} are random, the i^{th} farmer was selected the alternative $j = 1$ when $U_{1i} > U_{0i}$ or the non-observable (latent) random variable $Y^* = U_{1i} - U_{0i} > 0$ the probability that $Y_i = 1$ (Thus, farmer opts for participating in high-value market) is a function of the independent variables and is represented as:

$$\begin{aligned} P_i &= P_r(Y_i = 1) = P_r(U_{1i} > U_{0i}) \\ &= P_r[\alpha_1 F_i(M_i, A_i) + e_{1i} > \alpha_0 F_i(M_i, A_i) + e_{0i}] \\ &= P_r[e_{1i} - e_{0i} > F_i(M_i, A_i)(\alpha_0 - \alpha_1)] \\ &= P_r[\mu_i > F_i(M_i, A_i)\beta] \\ &= F(X_i\beta) \dots \dots \dots (3) \end{aligned}$$

Where X is the $n \times k$ matrix of the explanatory variables and β is a $k \times 1$ vector of parameters to be estimated $P_r(.)$ is a probability function, μ_i is an error term following logistic distribution, and $F(X_i\beta)$ is the cumulative distribution function for μ_i evaluated at $\chi_i \beta$. The specification in Equation (3) indicates that the probability that a farmer participated in high-value vegetable market is a function of the vector of explanatory variables, unknown parameters, and the error, term. However, the specification in equation (3) cannot be estimated directly unless the functional form of F and the distribution of μ_i are known.

From equation (4), the regression model was specified as follows:

$$P_r(Y_i = 1) = F(X_i\beta) = \frac{\exp(X_i\beta)}{1 + \exp(X_i\beta)} \dots \dots \dots (4)$$

Where, parameter β were estimated by maximum likelihood estimator MLE. Therefore the logit equation will be

$$\text{Logit}(P_i) = \ln\left(\frac{P_i}{1 - P_i}\right) = \beta_0 + \sum_{i=1}^{12} \beta_i \chi_i + \varepsilon$$

Whereby;

$$\ln\left(\frac{P_i}{1 - P_i}\right) = \text{logit for market participation}$$

P_i = participating in high-value markets

$1 - P_i$ = not participating in high-value markets

χ_i = independent variables

β_i = parameters to be estimated

ε = error term

The specification of variables used in the binary logit model for market participation by vegetable growers (Table 1).

Table 1: Specification of variables included in binary logit model for market participation

Variables	Description of Variables	Expected Sign
Dependent variable (P _i)	1 if farmer participates in high-value market; "0" Otherwise	
Sex (X ₁)	Sex (0=female, 1=male)	

Education level (X_2)	Education level (0=no formal education, 1=formal education)	+
Income (X_3)	Growers income earned per month	+
Access to credit (X_4)	Access to credit (0= do not have access, 1= have access)	-
experience(X_5)	Experience in growing cabbage, onion, and tomato (in years)	+
Distance to the main road (X_6)	Distance from the farm to the main road (km)	+/-
Distance to the main market (X_7)	Distance to the main market	
Distance to high-value (X_8)	Distance to the high-value market	+
Total yield (X_9)	Total yield cabbage, onion and tomato (kg)	+
Irrigation (X_{10})	Irrigation (0= do not irrigate, 1= irrigate)	+
Extension service (X_{11})	Extension service (0= have no access to extension service, 1= have access to extension services)	+
Market information (X_{12})	Market information (0= no access to market information, 1= have access to market information)	+
β_{ij}	Vector of parameters to be estimated	
ε_{ij}	Random error terms or disturbance terms	

III. RESULTS RESULTS AND DISCUSSION

Social-Economic Characteristics of the Respondent

The age of respondents ranged from 18 years to 60 years. 46.5% of all vegetable farmers were aged between 31 and 45 years (Table 2). The size of this active age group holds promise for vegetable cultivation in the study area because most farmers at this age are mature, they have a source of income for inputs and they have strength to work on their farms. This age profile is similar to that found by Makarau *et al.* (2013). Most of the respondents were males (Table 2). Since the bulk of the respondents (60.5%) are heads of household, therefore, vegetable production in the study areas are male dominated.

Table 2: The Age of Respondents in Response to Their Sex

Sex	Age of farmers in %			Total
	18-30 years	31-45 years	46-60 years	
female	12.5	17.5	9.5	39.5
male	14	29	17.5	60.5

Total	26.5	46.5	27	100
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About 55% of vegetable farmers in the area planted tomatoes (Figure 2). 25% and 20% of the vegetable farmers grew cabbage and onion respectively. Tomato vegetable is the most used vegetable in cooking and preparation of salads at homes, school cafeterias, restaurants and hotels on a daily basis. For onions, farmers could store their produce for up to three month before selling, hence giving them enough time to seek for good markets before selling their produce. This is not possible for tomatoes and cabbage due to their high perishability nature.

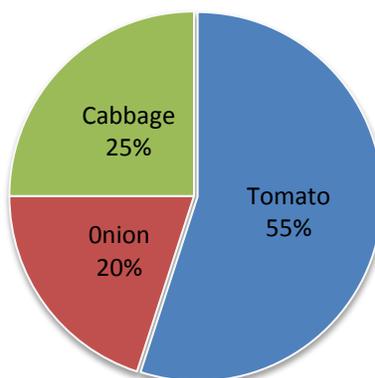


Figure 2: The percentage growth of vegetables grown by farmers in the study area.

For smallholder tomato farmers only 15 % out of 55% of all tomato farmers sold their vegetables in high-value market while 40% sold their produce to the local markets (Figure 3). These farmers fail to meet conditions that were set by high-value markets such as grades, quality, timely and consistent supply, safety, packaging, and cleanness. Hence farmers find it easier to sell their tomatoes to local markets where no criteria are required to be met but they end up fetching a lower price for their produce. For the case of cabbage farmers it was different because out of 25% of all interviewed cabbage farmers 14% sold their produce to high-value markets and only 11% sold their produce to local markets (Figure 3). These farmers who sold their cabbage to high-value markets mostly sold it to secondary schools cafeterias and few sold them to supermarkets and hotels. For onion farmers 12.5% out of their total 20% sold their onions to the local markets near due to lack of storage facilities and poor market information. Only 7.5% of these onion farmers sell their onion to the high-value markets where they received good prices for their produce (Figure 4).

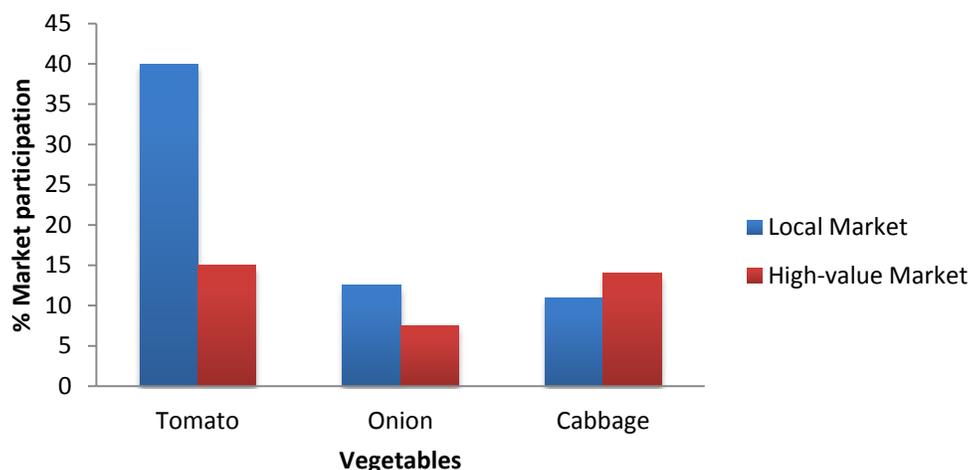


Figure 3: Smallholder vegetable farmer's market participation

The Determinant Factor to Market Participation

The determination of factors that influencing smallholder growers to participate in high-value markets were estimated by using binary logistic regression model to establish which factors were significantly influential to smallholder growers "participation in high-value markets". The model was statistically significant at ($p < 0.05$) with entered variables in Table 3.

Table 3: Binary logit regression results

Variable	Cabbage Growers (n=50)		Onion Growers (n=40)		Tomato Growers (n=110)	
	B	Sig	β	Sig	B	Sig
Sex	-0.904559	0.17	-0.9577485	0.567	0.192242	0.135
Education	0.9805321	0.593	0.540729	0.298	0.1736052	0.831
Income	0.0000118**	0.031	4.79E-06***	0.009	-1.36E-06	0.331
Credit	0.210943	0.876	-0.162751	0.158	0.6969844	0.319
Experience	0.012643	0.862	0.0784212	0.61	0.0890367*	0.093
Dist_mainroad	-0.63247**	0.02	0.5369563	0.399	-0.6372521	0.1
Dist_localmkt	0.4197783	0.199	0.295872	0.115	0.1115624	0.138
Dist_hvm	-0.946779	0.192	-0.3517437	0.166	-0.0924765**	0.037
Yield	0.0014439**	0.04	-0.0368661	0.157	0.0147061***	0.000
Irrigation	0.8999083	0.414	-0.597099**	0.043	0.369579*	0.071
Ext_service	-0.164172	0.341	0.997531**	0.037	-0.1694	0.207
Mkt_info	0.456493	0.304	0.706696	0.095	-0.8608552	0.285
_cons	-0.579375	0.729	-0.704932	0.039	-0.007029	0.004
	Log likelihood = -19.355503 Pseudo R ² = 43.9		Log likelihood = -10.811212 Pseudo R ² = 59.15		Log likelihood = -33.972787 Pseudo R ² = 47.55	

* means significant at ***=1%, **= 5%, * = 10% level of significance

The binary logit regression estimation in Table 3 shows that the estimated coefficients of the Logit regression revealed that the explanatory variables 'income', and 'yield' positively and significantly influence the cabbage farmers' decision to participate in the high-value market, while 'distance to the main road' has a negative influence on cabbage farmers high-value market participation. On the other hand, 'income' and 'extension service' has significant positive impact on the decision of the smallholder onion farmers to participate in the high-value market, while 'irrigation' had a negative effect. For the case of tomato farmers, 'experience', 'yield', and 'irrigation' influenced positively smallholder tomato farmers participation in high-value market, while, 'distance to the high-value market' had a negative significant effect to farmers market participation.

Income for cabbage farmers, and yield were positive and statistically significant at ($p < 0.05$) related to the farmers participation in high-value market. This implies that a unit increase in income and a unit increase in yield increases the probability of these vegetable growers to participate in high-value market by 0.0000118% and 0.0014439% respectively keeping all other factors constant. While the distance from the farm to the main road had a negative relationship to high-value market access by smallholder vegetable growers, and was statistically significant at ($p < 0.05$). This implies that a unit increase in distance decreased the probability of cabbage growers to participate in high-value market by 0.63247% keeping all other factors constant.

Growers with more income and high yield were more likely to participate in high-value market opportunities found in Arusha Region than their counter parts. High-value markets need a constant supply of quality produce of vegetables (Chagomoka, *et al.*, 2014). Nevertheless distance from the farm to the main road has a negative relationship, meaning growers whose farms are far from the main road are less likely to participate in high-value market opportunities than growers whose farms are near to the main road. This is due to poor infrastructure and high transportation cost for farmers.

Table 3 results shows that, income, extension service and market information were positive and statistically significant at ($p < 0.001$), ($p < 0.05$), and ($p < 0.1$) respectively related to smallholder onion growers participation in high-value market. This implies that a unit increase in income, extension service and market information, increases the probability of smallholder onion growers participation in high-value market by 0.00000479%, 0.997531%, and 0.706696% respectively. Irrigation for onion growers had a negative relationship and significant at ($p < 0.05$) related to smallholder growers participation in high-value market. This implies that a unit increase in irrigation decreased the probability of smallholder onion growers' participation to high-value market by 0.597099% holding all other factors constant.

Smallholder growers who irrigated their onions were less likely to get more yields and participate in high-value market. Many smallholder growers who practice irrigation they practice it in a small area of land that has access to irrigation water compared to growers who wait for the rainfall to cultivate their onions. While an increase in extension service increases smallholder onion growers participation to high-value markets. Extension

Services helped growers to be aware of the use of inputs and even how to grow their produce and protect them from pest and diseases so that they can harvest more quality produce compared to growers with no extension services. Growers with market information were more likely to participate in high-value markets than growers with no market information. Market information included where to sell, price, and quantity required. Therefore a farmer is free to make decision of where to sell his produce so as to fetch higher prices.

However, for the case of tomatoes table 3 results indicated that experience was positive and statistically significant at 10% ($p = 0.1$) to growers participation in high-value market. A unit increase in experience increased the probability of participating in high-value market by 0.0890367% holding other factors constant. Experienced growers have more market information, and product information compared to unexperienced growers.

Distance to the high-value market for smallholder tomato growers was negative and statistically significant at 5% ($p = 0.037$) to growers participation in high-value market. This implies that a unit increase in distance from the farm to the high-value market decreased smallholder growers participation to high-value market by 0.0924765% holding other factors constant. The more the distance to the high-value market the less tomato growers are going to sell their produce to those markets. This is due to poor infrastructure, high transportation cost and the perishability nature of vegetables.

Tomato yield and irrigation were positive and statistically significant at 1% ($p = 0.000$) and 10% ($p = 0.071$) respectively. A unit increase in tomato yield increase smallholder growers participation to high-value market by 0.0147061% holding all other factors constant. This finding is consistent with Reyes *et al.* (2012) and underscores the importance of increased output by smallholders' farmers to enhance their chances of stepping out of poverty and improving their livelihood through increased income from increased participation in the market. While a unit increase in irrigation by smallholder vegetable growers increases smallholder growers participation in high-value market by 0.369579% holding all other factors constant. Growers who irrigate their tomatoes are more likely to increase their yield and they are free to cultivate even when it is off season. These growers are more likely to participate in high-value markets because they are assured of constant supply of tomatoes to these high-value markets than growers who do not irrigate.

IV. CONCLUSION AND RECOMMENDATIONS AND POLICY RECOMMENDATIONS

In this study, male participated more in vegetable production than female farmers because vegetable is a high income crop that has a short maturity compared to most of staple crops. Also male farmers have more contacts that are social with both vegetable buyers and their agents whom they often meet in trading centers. Female farmers lack such contacts and are in most cases excluded from direct transactional negotiations with buyers. Thompson (2013), found that male farmer positively and significantly influenced farmer's volume of vegetable sales in the market. The author stated that the reason is that women spend much of their time doing domestic work and allocate less time to other matters like market transactions.

Moreover, for cabbage growers' income, distance from the farm to the main road and yield, were found to significantly affect smallholder vegetable growers' participation in high-value markets such as supermarkets, tourist hotels and greengrocer shops. While for onion income, irrigation, extension services and market information were significant. And for tomato, experience, distance to the high-value market, yield, and irrigation were significant. Experienced growers benefited from their skills on producing vegetable products that meets the needs of their target customers as compared to the less experienced growers. Similarly, smallholder vegetable growers whose produce travel shorter distance from the farm to nearby high-value markets are more likely to sell their produce to these markets. Other close by market outlets includes schools and hotels that are surrounding local growers thus offering bulk purchase opportunities and therefore more income. Finally, growers with more yields are more likely to participate in high-value market opportunities as compared to those smallholder growers with lower yields for these crops since they can meet the market demand.

There is a need to deliberately improve the numbers of smallholder growers participating in and benefiting from the high-value markets in order to facilitate stable incomes and sustainable livelihoods. To achieve this, the following preconditions are recommended (i) strengthening of extension services by the government and other stakeholders especially to cabbage and tomato vegetable growers in order increase growers' access to improved production technologies and practices, (ii) smallholder vegetable growers should be educated about value addition, standardization, grading, proper cleaning, packaging, and the advantages of producing quality produce in order to win the available high-value markets in their areas. Research and development programmers should be geared towards solving production and marketing constraints facing many small vegetables growers today such as good seeds, fertilizers, training and market information. In addition, improving rural infrastructure (e.g., access roads) would facilitate faster delivery of farm produce (especially perishable commodities such as vegetables) to reach consumers in fresh state.

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REFERENCES

- [1] Chagomoka, T., Afari-Sefa, V. and Pitoro, R. (2014). Value chain analysis of traditional vegetables from Malawi and Mozambique. *Int. Food and Agrib. Manag. Rev.* 17(4), 57-83.
- [2] Irungu C, Mburu JMP, Hoeschle-Zeledon I (2011). The Effect of Market Development On-farm Conservation of Diversity of African Leafy Vegetables around Nairobi. *Int. J. Hum. Soc. Sci.* 1(8):198-207.
- [3] Jones, N. (2015). Some marketing problems faced by agroforestry farmers in Asia. [<http://www.fao.org/docrep/v7540e/V7540e21.htm>] site visited on 5/8/2015.
- [4] Kuzilwa, J. A. (2013). Productivity, market access and incomes for small farming businesses through contracts in Tanzania. [www.ddrn.dk/filer/forum/File/4_Contract_farming_intro_Mzumbe.pdf] site visited on 5/8/2015.
- [5] SCF (2008). Fresh fruit & vegetable sub sector / value chain analysis Tanzania. Study commissioned by SME competitiveness facility and conducted by MATCH MAKER ASSOCIATES LIMITED (MMA). PP 33.
- [6] Shute, L. L. (2011). *Building a Future With Farmers: Challenges Faced by Young, American Farmers and a National Strategy to Help Them Succeed*. National Young Farmers' Coalition, Tivoli, New York. Pp 15.
- [7] Tenkouano, A. (2013). Improving Incomes and Nutrition in Eastern and Southern Africa by Enhancing Vegetable-based Farming and Food Systems in Peri-urban Corridors (VINESA), Project Document, AVRDC-The World Vegetable Center, Shanhua, Taiwan, pp 7-9.
- [8] Thompson D, Agbugba IK (2013). Marketing of tropical vegetable in Aba area of Abia State, Nigeria. *Journal of Agricultural Economics and Development. Acad. Res. J.* 2(7):272-279.

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