

Full Length Research Paper

Gender and age analysis on factors influencing output market access by smallholder farmers in Machakos County, Kenya

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Output markets are key prerequisite for enhancing agriculture-based economic growth and increasing rural incomes. However majority of smallholder farmers rarely access output markets. The study determined factors influencing smallholder farmers in Yatta district to access output market based on data collected from 160 households. The data was disaggregated in terms of gender and age and analyzed using SPSS and STATA version 10. Descriptive results revealed a gender and age disparity in accessing output market. Tobit model result indicated that households with access to extension, credit, land, own means of transport, and are group members are more likely to access output market. The study recommends policy makers to formulate policies that promote group membership, improve physical infrastructure, and facilitate access to credit (for example free interest loan) as well as extension services especially to women and youths.

Key words: Output market, gender, diversification, age-group, disaggregation.

INTRODUCTION

Agriculture remains the backbone of Kenya's economy, contributing approximately 24.5% of the national GDP and employing 75% of the country's labor force (KNBS, 2012). Many of agricultural producers are smallholder farmers who derive their livelihood from land holdings of less than 5 hectares with a mix of commercial and subsistence production (Omiti et al., 2006). Since farming deals with many risks such as production and price risks, many farmers practice farm enterprise diversification as a way of mitigating these risks. In semi-arid areas, food crops such as maize and beans intercropped with

drought resistance crops (cowpeas, green grams, pigeon peas) are common enterprise diversification. In addition to risk mitigation, crop diversification provides an opportunity to exploit the potential complementary relationships between enterprises through improved utilization of natural resources of the farm and family labor over entire year (Mishra et al., 2004). Crop diversification may be advantageous when local demand exists for specific products that are not competitive with the primary enterprise and earn a profit (Mishra et al., 2004). However, there is a dearth of information on

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whether diversification influences access to output market.

Market access is defined as the ability to acquire farm inputs and farm services, and the capability to deliver agricultural produce to buyers (IFAD, 2010). For the purpose of this study, output market access is defined as the ability of smallholder farmers to produce market surplus and be able to sell in the market. Accessing output markets is a prerequisite for enhancing agriculture-based economic growth and increasing rural incomes in the medium term (IFAD, 2003; Shepherd and Prowse, 2009). Despite this, many smallholder farmers rarely access output markets and their overall market share is very low (Jayne et al., 2005). Consequently, they are among the poorest and most food insecure compared to those who are well integrated into output markets (Minot and Hill, 2007). Ensuring that smallholder farmers in semiarid areas access output market is an important way to improve their livelihoods and ensure food security. This can be enabled by first determining factors that influence these farmers access output markets, or lack thereof. In doing so, this study will determine whether these factors are the same across gender and age-group and this disaggregation will help in promoting strategies that can link these vulnerable farmers to output market.

Past studies on output market have been largely gender blind; and those that attempted to make gender statements based their conclusions on aggregated data (Agbola et al., 2010; Martey et al., 2012; Omiti et al., 2009). Some have assumed men as implementers on the farm although majority of women are the ones predominating in smallholder agriculture (Cheng'ole et al., 2003). In Africa, including Kenya, women contribute about 60 to 80% of the labor input in agricultural production (Adekanye et al., 2009). Despite this, they continue to lack voice, decision making power both in their household and in society at large and their economic opportunities remains very constrained (World Bank, 2008b). Besides, they rarely receive as much agricultural support as men and this constrains them from producing marketable surplus (Mabeza-Chimedza, 2009).

Likewise disparity has been portrayed across age groups. This has made youth (those between 18-35 years old) to be ignored in policies and programs despite them being the future drivers of African social and economic development (International Fund for Agricultural Development [IFAD], 2012). Only few if any policies that cater for needs of youths in developing countries exist and those that exist do not cater for poor rural youth but tend to be biased towards non-poor males living in urban areas (Bennel, 2006). Youths are seen as uninformed and inexperienced and their involvement in agricultural activities has steadily declined in recent years (Adekunle et al., 2009).

This unequal structure across gender (men and women) and across age-group (youth and adults) is proved by gender analysis which examines their

differences; it deals with the reasons for social, economic inequality and aims to provide positive change for women and youth (Davran and Tok, 2011). According to Grace (2004) understanding gender roles involves not only looking at activities specifically done by men and women but also looking at the influences mediated by factors such as age, wealth and marital status in doing these activities across gender.

LITERATURE REVIEW

Microeconomic theory state that, producers behavior in the market varies with the market signals where by selling in the market is guided by price (Narayan and Keshav, 2013). However, according to Omiti et al. (2009), Barret (2008) and Almekinders and Louwaars (1999) price is necessary but not sufficient to influence selling in output market. According to Pender et al. (2006) and Okezie et al. (2012) physical infrastructure, household asset endowments, development of local commodity markets, laws and institutions, cultural and social factors affecting consumption preferences also influence access to output market. In developing countries, agricultural markets are characterized by pervasive imperfections such as inadequate access to timely and accurate information about prices, high transaction costs, and credit constraints (Markelova and Meinzen-Dick, 2009; Giacomo, 2012; and Makhura, 2001). These factors are said to affect output market by altering the conditions of commodity supply and demand (Omiti et al., 2009).

Despite the availability of literature on factors that influence smallholder farmers to access output market, these studies by large have used aggregated data analysis, an approach that can be problematic in setting where there is gender-based market imperfections and significant gender based asymmetries in how resources, rights and responsibility are distributed (Fletschner, 2008). For instance, there exists a gender inequality in accessing land and owning land rights where women often have lower access to land and are restricted in accessing land rights whereby they access these rights through relationship with a male relative (FAO, 2010; Peterman et al., 2009; Fletschner 2006; Doss, 1999). In Africa women are disadvantaged with respect to labor because they have less access to labor-saving technology and to hired labor needed for lucrative, labor-intensive cultivation (Meinzen-Dick et al., 2011). They have less access to education and are less likely to get extension services compared to men (Ragasa et al., 2012). In addition they face difficulties in accessing markets since in many communities their freedom of movement is restricted due to social and cultural prescriptions (USAID, 2005).

A summary of the findings of the project implemented by MIJARC (International Movement of Catholic Agricultural and Rural Youth) in collaboration with IFAD

(2010) and FAO in 2011 described challenges with respect to increasing rural youth's participation in agriculture sector. The challenges are; insufficient access to knowledge, information and education. According to FAO (2014) poor and inadequate education limits productivity and the acquisition of skills, while insufficient access to knowledge and information can hinder the development of entrepreneurial ventures. Another challenge was limited access to land. Despite land being one of the factor of production, it can often be difficult for young people to access. Inheritance laws and customs in developing countries often make the transfer of land to young women problematic (FAO, 2014).

Sustainable access to markets is required to guarantee smallholders an increase in income and to lift them out of poverty (FAO, 2014). However access to markets remains difficult for young farmers since market structures often do not favor them. Youths face many challenges (as discussed above), while trying to access markets, even beyond the constraints faced by smallholder farmers in developing countries (MIJARC/IFAD/FAO, 2012). Tracy- white (2005) urges that, there exists large numbers of producers/consumers and only a few market intermediaries in rural markets and these intermediaries are often rich businessmen who also influence the government while drafting market policies. According to her youths are not sufficiently organized and lack experience to counter these strong market actors. Hence they tend to market their produce through these strong market actors, who frequently take a large part of the profit or supply credit for inputs at high interest rates (Tracy- white, 2005).

While most of the world's food is produced by 'ageing' smallholder farmers in developing countries, these farmers are less likely to adopt the new technologies needed to sustainably increase agricultural productivity, and ultimately feed the growing world population, re-engaging the youth in agriculture is paramount (FAO, 2014). According to Gwanya (2008), participation of youth in agriculture programme is vital for land and agrarian reform which will go a long way towards promoting the interest of youth in the agricultural sector of the economy.

Impact of crop diversification on output market access

While there is vast literature on diversification, only few have looked at the influence of crop diversification on output market access (Ellis and Bahiigwa, 2003). Crop diversification has been used as an adaptation strategy to climate change. According to FAO (2014) and Sichoongwe et al. (2014) crop diversification is intended to give a wider choice in the production of a variety of crops in a given area so as to expand production related activities on various crops and also to lessen risk.

It provides better conditions for food security and enables farmers to grow surplus products for sale in the market and thus obtain increased income to meet other needs related to household well-being (Sichoongwe et al., 2014).

Experiences gained in many developing countries suggest that diversification of agriculture towards high-value commodities have helped small landholders to augment their incomes and bail them out of the vicious circle of poverty (Ryan and Spencer, 2001). Diversification into variety of crops helps farmers to increase market surplus. Olarinde et al. (2014) investigated the separate and joint effects of various climate change adaptation strategies on crop yields as well as on the resultant marketed values of crops. They found that, use of climate change adaptation strategies such as altering crop mix, had impacted on expected yield and on marketed crop outcomes. From their study, the more farmers diversified into many crops, the higher were the yield and hence increased income. Whitehead and Kabeer (2001) also takes this position in their study and cite the use of irrigated agriculture in the cultivation of rice and vegetables as a form of on-farm diversification that could yield high levels of return.

Vertical diversification that involves storage, marketing, and processing of agricultural foods increases employment thus alleviating rural poverty (Sati, 2012). Quality processed products, resulting from vertical diversification and integration, enhance the potential for exports which increases foreign exchange earnings. Access to market may trigger smallholder to diversify their crops. Bittinger (2010) revealed that smallholder farmers in Ethiopia do react to changes in the level of market access by altering their production behavior. As market access improves, smallholders are predicted to switch from producing primarily cereals, pulses, fruits, and vegetables, to producing oils, spices, cash crops, and teff that have higher demand in the market (Bittinger (2010).

While diversification may reduce risk by spreading production activities to various enterprises, additional risks are involved in the adoption of new skills and technologies to produce unfamiliar products for foreign markets (World Bank, 2004). According to the World Bank (2004) the greater part of this risk arises due to lack of experience or knowledge on which to base a judgment as to its riskiness. Suitability of natural resources and adequacy of infrastructure for the production and processing of the new product, crop yields and product quality, market prices and competitiveness are all much more uncertain than those relating to the production and marketing of traditional products (World Bank, 2004). The study by Joshi et al. (2006) revealed that, diversification into many crops leads to low volume of marketable surplus, which constrains smallholders from bargaining effectively. According to BIRTHAL et al. (2005) small-sized marketable surplus considerably increases the

transaction cost and reduces bargaining power of smallholders. This shows conflicting information on the influence of diversification on market access. There is need for more research in order to determine whether crop diversification increases market access or otherwise.

METHODOLOGY

Study area

The study was conducted in Yatta district in Machakos County, Kenya. The district covers an estimated area of 2497 km² and its altitude ranges from 500 to 1200 m above sea level (Munyao et al., 2013). It has a population of 424,500 consisting of 48.8% male and 51.2% female, with majority of the population being youth ranging between 20 and 35 years (Kenya Census, 2009). Majority of population are food insecure and relies on relief food and many (87.3%) live below the poverty line (Government of Kenya [GOK], 2002 and Munyao et al., 2013). The climate is semi-arid with a bimodal pattern of rainfall. Long rains fall between April and June while short rains, which are more reliable, fall between October and December. The average annual rainfall is 800 mm/year. The main crops grown are maize and beans, which are staple foods and still remain the dominant food-cum-cash crops. Other crops grown in the districts include cowpeas, pigeon peas, green grams, sorghum and millet but in small quantities. Crops such as water melons, French beans, vegetables and tomatoes are also grown through irrigation. The major output market is at Matuu in Yatta district. The condition of market infrastructure in the district is poor. Roads are made of murrum and are impassable during rainy seasons.

Sampling and data collection procedure

The survey was carried out between the months of September and October, 2012. It was conducted at Yatta District in Machakos County. The district was purposively selected because it lies in a semi-arid area and it is highly populated. Further, Yatta Division was purposively selected because it was close to the reference output market (Matuu market). Within the Division, five administrative Locations were randomly selected including Ikombe, Matuu, Katangi, Kithimani and Kinyaata. From this point, a systematic random sampling technique was used to select 40 villages, within which a sample of 160 household heads was drawn. The selection of villages was done by identifying rural access road branching off the main road and every fourth village was selected and the decision-maker on farming activities was interviewed using semi structured questionnaires. Prior to data collection, 10 questionnaires were pretested to find out whether they captured all the variables and if there was any important information missing. The researcher recruited and trained five data enumerators who had good knowledge of the study area and understood the local language spoken. Secondary data was sought from past research findings and from ministry of agriculture and livestock.

Data analysis

Data collected was processed using Statistical Package for Social Sciences (SPSS) and STATA 10 package. Descriptive statistics, Chi-square and t-test were employed to analyze categorical and continuous data respectively.

Econometric model

Household commercialization index was used to measure access to output market. The index was used to measure household-specific level of commercialization by Govereh et al. (1999) and Strasberg et al. (1999). Mathenge et al. (2010) used the index when determining factors influencing participation in agricultural markets. The index spans a continuous range from 0 to 1 (Martey et al., 2012). The value of index for a completely access to output market is 1 while no access to output market has an index of 0.

Access to output market was obtained as follows:

$$HCI = \frac{\text{gross value of marketed output}}{\text{imputed value of marketable output}}$$

Where, *HCI*, is the household commercialization index; marketable output, is the amount a household expect to sell in output market; marketed output is the exact amount sold in output market

The index values then were taken as dependent variable and regressed against various explanatory variables hypothesized to influence access to output market using two-limit Tobit model.

The index is censored because some of its values cluster at the limit; 0 for no access to output market and 1 for complete access to output market. Standard ordinary least squares (OLS) or seemingly unrelated regression (SUR) of the commercialization index will yield biased and inconsistent estimates in this situation (Mesfin et al., 2012). It is not appropriate also to use a classical regression model for this purpose. Hence, opting for other econometric models is inevitable for handling the matter and one such model is Two-limit Tobit model which is a special case of censored regression models that arise when the dependent variable is limited from above and below. It is a non-linear model which employs maximum likelihood estimation technique which estimates the likelihood of output market access and its intensity. Studies such as Ruhangawebare (2010) and Mesfin et al. (2011) have applied the same model in determining the level of agricultural diversification and commercialization. This model is appropriate for the current study since the dependent variable is an index which takes values between 0 and 1 inclusive. Tobit model is able to provide probability of accessing output market in addition to estimating marginal effects of variables.

The Two-limit Tobit model can be specified as:

$$y_i^* = X_i\beta + \varepsilon_i \quad (1)$$

Where: y_i^* is a latent variable (unobserved for values greater than 1 and smaller than 0), X_i is a vector of explanatory variables hypothesized to influence access to output market, β is the vector of coefficients and ε_i is an error term.

Denoting y_i as the observed dependent variable (access to output market), the two-limit Tobit model can be specified as:

$$y_i = \begin{cases} 1 & \text{if } y_i^* > 1 \\ 0 & \text{if } 0 < y_i^* < 1 \\ 0 & \text{if } y_i^* < 0 \end{cases} \quad (2)$$

Description of explanatory variables and their hypothesized effect on access to output market

The following were hypothesized to be explanatory variables influencing access to output market. These variables are identified based on review of the empirical works.

Age

This refers to the age of household head. It was hypothesized to

positively influence output market access. Older and more experienced farmers are able to make better production decisions and have greater contacts which allow trading opportunities to be discovered at lower cost than younger ones (Martey et al., 2012; Omiti et al., 2009).

Household size

This refers to the size of household and is measured by the number of people living with the household head continuously for one year. Household size can positively or negatively influence output market access. One possible explanation is that as household size increases (many youths), the productivity of the land rises due to availability of cheap labor and exceeds subsistence requirements and this can lead to an increase in marketed surplus (Martey et al., 2012). On the other hand, larger household size (many children or many aging people) can be labor-inefficient and produces less output but may see increased demand for food, thus reducing the marketable surplus (Alene et al., 2008; Omiti et al., 2009).

Land size

This refers to the size of land allocated to farming. It is measured in acres. Large farm size, when well-managed, has positive influence on output market access since it enables farmers to generate production surpluses for the market (Martey et al., 2012; Olwande and Mathenge, 2010).

Primary education

This is a dummy variable and is either "1" if a household head attained primary education and "0" if he/she has not attained primary education.

Secondary education

This is a dummy variable and is either "1" if a household head attained secondary education and "0" if he/she has not attained secondary education.

Post-secondary education

This is a dummy variable and is either "1" if a household head attained tertiary education and "0" if he/she has not attained tertiary education. Previous findings indicate that education enables household head to increase the tendency to co-operate with other people and participate in group activities such as marketing their outputs (Martey et al., 2012). Education also helps farmers to understand market dynamics and therefore improve decisions about the amount of output sold (Omiti et al., 2009; Makhura et al., 2001). Higher education (secondary and tertiary level) was expected to positively influence access to output market.

Distance to output market

It refer to the distance from farmers' homesteads to main output markets. It is measured in kilometers. The distance to output markets inversely influences output market access. Longer distances increase travel time and costs, which impact negatively on market participation (Olwande and Mathenge, 2010).

Credit

Access to credit was expected to have a positive relation with access to output market. Access to credit enables farmers to purchase inputs (seeds, chemicals and fertilizer) and invest in agricultural machinery, potentially leading to increased productivity and greater surplus for marketing (Martey et al., 2012).

Membership

This refers to participation of household head in groups. Group membership positively influences access to output market because it affords the advantage of spreading fixed transaction costs. Many groups also engage in marketing as well as credit provision for their members (Agbola et al., 2010; Olwande and Mathenge, 2010).

Ownership of means of transport

This is a dummy variable whereby 'one' indicates household has a mean of transport such as; motorcycle, bicycle, vehicle or animal cart and 'zero' indicates otherwise. It was hypothesized to have a positive influence on access to output market. Ownership of means of transport reduces transaction cost that arises due to transportation of output from the farm to the market (Mathenge et al., 2010).

Extension

Farmers who access extension services are more likely to access output market because they can easily access market information and be linked to buyers. This helps to remove fixed transaction costs that face farmers in entering output markets (Lapar et al., 2003).

Diversification

It denotes crop diversification whereby if a farmer has additional crop apart from maize and beans is regarded as diversified. crop diversification improve biodiversity and reduce production risks associated with droughts and pest infestations and also reduces marketing risks associated with unexpected decline in the price of any one enterprise (world Bank, 2005). It was anticipated to positively influence access to output market.

Selling point

This is a dummy variable where 'one' indicates distant market and 'zero' indicates farm outputs are sold at farm gate. Selling at a distant market is more profitable than selling at farm gate. According to Fafchamps and Vargas Hills (2005) selling at farm gate is less profitable although it might be the only option for farmers who are too poor to transport their produce to distant market. Selling point was anticipated to positively influence access to output market.

Marital status

This is a dummy variable where one' indicates married and 'zero' indicates single. Married household head is expected to have a higher probability of accessing output market than a single household head. This is because duties can be easily shared where one can deal with production activity and the other deal with

Table 1. Gender and age distribution of household heads in Yatta district.

Farmer characteristic	Overall		Male		Female		Chi-Square test	
	Count	%	Count	%	Count	%	Value	Sig.
Sex								
Male	108	67.5	108	100	-	-		
Female	52	32.5	-	-	52	100		
Age								
<35 years old	40	25	28	25.9	12	23.1	0.152	0.697
>35 years old	120	75	80	74.1	40	76.9		

P<0.05 means 5% significant level.

marketing.

RESULTS AND DISCUSSION

Descriptive result

Understanding the demographic, socio-economic and institutional characteristics of household-heads can provide an insight about why the households are constrained in accessing output market. Table 1 presents the gender distribution of sampled households. The result indicates farming in the study area is dominated by male-headed households (MHH) and adult-headed households (AHH). Majority of households are married (74. 4%) as shown in Table 2 and the mean household size among all sampled households is 5.6. This is slightly higher than the national average household size which is 4.4 according to 2009 Kenyan population and housing census (KNBS, 2010). There is a significant difference in the size of household between youth and adult-headed households with the latter having higher household size. The possible explanation is that majority of adult heads in the study area live with their grandchildren.

Socio-economic, demographic and institutional characteristic are shown in Table 2. In terms of education, MHH are more educated than FHH and the difference is significant at 1% significant level. This shows a gender disparity in respect to accessing education. On the other hand, youths are more educated compared to their counterparts. This could be due to existence of free primary and secondary education that has enabled poor people to educate their children. The average land size among all sampled households is 4.47 acres (1.808 ha). This is slightly lower than the average national land size which is 4.596 (1.86 ha) according to Egerton University's national wide surveys from 1977-2010 (Jayne and Milu, 2012). At disaggregated level, male-heads and adult-heads own larger size of land compared to their counterparts. This shows a clear disadvantage on female and youth-heads with respect to accessing land and this could limit production since land

is one of the basic factors of production. In terms of institutional characteristic, gender inequality is portrayed in accessing market information, extension services and group membership. On the other hand, age disparity exists where youth-headed households (YHH) are more constrained in accessing credit compared to their counterparts (Table 2). Perhaps because youths do not have a lot of asset for example land that may be used as collateral to access credit and sometimes lending institution are reluctant in giving loans to youth.

Access to the output market by household heads

Access to output market was estimated using the market access index discussed earlier and the results are shown in Table 3. From the result, MHH have higher market access index than FHH. Indicating FHH are more constrained in accessing output market compared to male heads. On the other hand AHH have higher output market access index compared to their YHH although the difference is statistically insignificant. A further analysis is performed using regression technique.

Econometric result

Factors that influenced access to output market were analyzed using two limit Tobit model and the results are presented in Table 4. Ownership of means of transport, access to extension services and size of land significantly influences access to output market among all households at aggregated level. At disaggregated level, ownership of means of transport increases access to output market by 2.8 and 2.3% among AHH and MHH, respectively. Ownership of means of transport reduces transport cost of taking the produce from farm to market leading to increased access to output market (Mathenge et al., 2010; Randela et al. 2008).

Access to land increases output market access by 1.8% among all households at aggregated level. After disaggregation, access to land increases output market

Table 2. Demographic, socio-economic and institutional characteristic of household heads.

Demographic characteristic	Overall	Male	Female	χ^2	t-value	Youth	Adult	χ^2	t-value
Size of household	5.6(2.91)	4.44(2.154)	8.00(2.835)		8.794***	2.55(1.921)	6.28(2.873)		5.607***
Marital status	74.4	80.6	61.5	6.66***		47.5	83.3	20.21***	
Socio-economic characteristic									
Size of land (Acres)	4.47(2.66)	4.3(2.565)	3.5(2.620)		-3.297***	4.33(2.480)	4.87(3.145)		-1.111
Education									
Primary	48.8	27.8	92.3			30.0	55.0		
Secondary	28.1	39.8	3.8	58.51***		32.5	26.7	8.975**	
Tertiary	23.1	32.4	3.8			37.5	18.3		
Diversified									
Point of sale (market)	61.9	65.7	53.8	2.105		65.0	60.8	0.221	
Transport means	32.5	46.3	3.8	28.832***		45.0	28.3	3.799**	
	53.1	75.9	5.8	69.375***		47.0	70.5	6.099**	
Institutional characteristic									
Membership	45.6	51.9	32.7	9.634***		42.5	46.7	0.210	
Access to credit	42.5	40.7	46.2	0.421		22.5	49.2	8.73**	
Access extension	36.9	50.9	7.7	28.189***		35	37.5	0.081	
Information	35.6	48.1	9.6	22.725***		40	34.2	0.445	

***P<0.01; ** P<0.05 *P<0.10 means significant at 1, 5 and 10% probability levels, respectively. Figures in parenthesis are standard deviation.

Table 3. Measure of output market access of household heads.

	Overall	Male	Female	T test		Youth	Adults	T test	
	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	T	Sig. (2-tailed)	Mean (Std. Dev)	Mean (Std. Dev)	T	Sig. (2-tailed)
Market Access	0.538(0.293)	0.642(0.218)	0.321 (0.314)	-7.546	0.000	0.529(0.300)	0.566 (0.276)	-0.679	0.336

P<0.01, P<0.05, P<0.10 means 1, 5 and 10% significant level, respectively.

access by 1.7 and 2.2% among the AHH and MHH respectively. Large size of land enables households to generate market surpluses if well managed (Martey et al., 2012; Olwande and Mathenge, 2010). This implies that FHH and YHH who have small or no land are less likely to

access market. Access to extension service among MHH and AHH lead to increased access to output market compared to their counterpart who rarely access this service. Extension agents facilitate market entry through facilitating farmers' linkages with buyers and also provide farmers

with marketing information (Mesfin et al. 2011).

Both secondary and post-secondary education reveals a negative and significant relationship with the probability of output market access in the whole sample as well as in MHH and AHH. This is contrary to *priori* expectation. However the results

Table 4. Tobit result on factors influencing access to output market.

Market access	Overall		Adults		Youth		Female		Male	
	Coef.	Std.Err	coef.	Std.Err	coef.	Std.Err	coef.	Std.Err	coef.	Std.Err
Transport	0.274***	0.071	0.28***	0.077	0.025	0.056	0.458	0.419	0.234***	0.053
Credit	0.12	0.041	0.877	0.045	0.029	0.098	0.234*	0.137	-0.058	0.036
Post-secondary	-0.256**	0.113	-0.294**	0.131	0.156	0.226	-0.445	0.912	-0.216**	0.089
Secondary	-0.277***	0.081	-0.316***	0.096	-0.003	0.214	-0.623	1.192	-0.213***	0.064
Household size	-0.018	0.011	-0.032**	0.013	-0.002	0.035	-0.082**	0.039	0.004	0.018
Information	0.017	0.061	0.013	0.071	0.007	0.166	0.253	0.773	0.468	0.044
Extension	0.132*	0.069	0.168**	0.078	-0.152	0.197	0.153	0.624	0.197***	0.053
Point of sale	0.031	0.071	-0.031	0.78	0.223	0.166	0.621	0.622	-0.013	0.053
Sex	0.098	0.061	0.036	0.067	0.189	0.212				
Age	0.004*	0.002	0.713**	0.283	0.017*	0.009	-0.402	0.456	0.005***	0.002
Marital status	0.701	0.005	-0.055	0.065	0.006	0.199	-0.037	0.032	-0.085*	0.046
Land farming	0.018**	0.007	0.017*	0.009	0.003	0.014	0.044	0.028	0.022***	0.006
Distance to market	-0.093*	0.504	-0.013*	0.007	0.001	0.008	-0.316*	0.166	-0.007*	0.004
Membership	0.097***	0.021	0.108***	0.025	0.072*	0.041	0.056	0.079	0.083***	0.018
Diversification	-0.105**	0.041	-0.102	0.048	-0.066	0.088	-0.122	0.135	-0.109***	0.035
_cons	0.556***	0.199	0.831***	0.245	0.656	0.442	0.582	1.473	0.675***	0.173
/sigma	0.233	0.014	0.22	0.016	0.217	0.02	0.366	0.051	0.162	0.011
Observation	160		120		40		52		108	
LR Chi²(15)	120.30		107.40		27.09		26.27		72.26	
Prob>Chi²	0.000		0.000		0.018		0.024			
Log likelihood	-21.192		-11.689		-1.624		-26.67		32.71	
Left censored	27		22		5		21		6	
Uncensored	133		98		35		31		102	
Right censored	0		0		0		0		0	

***, **, * indicates statistically significant at 1, 5 and 10% significant level respectively. Primary education is a base variable.

are in line with the findings of Chirwa and Matita (2012). The possible explanation is that households who obtain past primary level education tend to look for other off-farm jobs and this reduces the time spent in farm. Besides, Lapar et al. (2003) and Randela et al. (2008) states that the influence of education on output market can be either positive or negative when there is competing and more remunerative employment opportunities available in the area that require skills that are enhanced by more education.

Being a member of a group significantly increases access to output market by 9.7% in the aggregate sample. At disaggregation level, it significantly increases access to output market by 8.3, 7.2 and 10.8% among MHH, YHH and AHH. This implies that marketing group serves as incentive to link farmers to output market. The result is in consistent to the findings of Agbola et al. (2010) and Mathenge et al. (2010).

Access to credit at aggregate level increases access to output market. At disaggregated level, access to credit lead to increases access to output market by 2.3% among FHH. This imply that if FHH can be provided with credit services, their chances of accessing output market

will increase significantly. Perhaps because female headed household who access credit direct all of it to farming.

Household size has a negative and significant influence among AHH. The result indicates that, an addition of one member in the household decreases access to output market by 3.2%. The possible explanation is that, AHH may have many dependants and when household has many children below working age and/or many older members above working age may not contribute to labor but significantly may increase household consumption leaving little or nothing for market (Omiti et al., 2009).

Distance to output market negatively and significantly influence access to output market among all households. Longer distances increase travel time and travel costs, which impact negatively on market access (Olwande and Mathenge, 2010). Diversification carries a negative and significant coefficient in the overall sample. At disaggregated level it is only significant on MHH. The results show that diversified male household decreases the probability to access output market by 10.9% unlike the undiversified households. The result was contrary to prior expectation. The possible explanation is that the

study area is semi-arid and many farmers in the area diversify to mitigate weather related risk and with food security mentality (World Bank, 2005). Besides many households diversify into maize, beans and cowpeas with few of them diversifying into high-value crops (vegetables and fruits) which are highly demanded in the market.

CONCLUSION AND RECOMMENDATION

The aim of the study was to identify factors influencing output market access among smallholder farmers in Yatta district. Descriptive and econometric analysis was carried out on both aggregate and disaggregated data in order to have a depth understanding on social-economic, demographic and institutional characteristic of household heads and the factors that influence their access to output market. From descriptive analysis, gender inequality was demonstrated in regard to accessing output market. Female-headed households were much constrained in accessing credit, land, extension services, market information and education. In addition many female-headed households did not own means of transport and majority sold their output at farm gate compared to their counterparts. Across age-group, adult-headed household dominated farming compared to youth-headed households. Youth headed households were constrained in accessing extension services, land, group membership and credit.

From econometric analysis factors that influenced access to output market on aggregate include; access to extension services, size of land, group membership, enterprise diversification, education level (secondary and post-secondary education), ownership of transport means, distance to output market and age of household head. However more factors were revealed after disaggregation analysis was carried out. Access to credit was found significant among female heads, marital status was significant among male heads and size of household was significant among the adult headed household. This shows that with disaggregation analysis more factors influencing households' access to output market can be uncovered.

Based on empirical evidence, the following recommendations are suggested to enable smallholder farmers to access output market. The government and stakeholders should:

1. Ensure free interest loans for youths and women (UWEZO fund) are available and accessible. UWEZO capacity building should be offered to all youths and women to enable them understand its importance and this will enhance economic growth by empowering women and youths.
2. Ensure the number of extension agents is enough to visit farmers located in remote areas. This can also be done by supporting Media services to have programs

which broadcasts matters on farming and marketing either through television or radios and this will help reach many farmers of different gender or age-group.

3. Promoting group membership especially among female-headed and youth-headed households will enhance access to output markets. This is because some finance institution offers credit easily to farmers in groups instead of an individual farmer (for example UWEZO youth and women fund and 'C-Yes Rausha loan' which is a Constituency based loan for youth in Kenya both targets women and youth in groups).

4. Enterprise diversification should not only aim at reducing weather related risks but also should aim at accessing output market. The negative relation between diversification and output market access urges that market-oriented diversification should be the aim of every diversifying farmer. The stakeholders should promote market-oriented diversification such as diversification into high-value crops and this will enable households benefit from high value market opportunities. This can be achieved by encouraging youths to register for 'Agri-Vijana loan' which targets youths undertaking Greenhouse farming in Kenya. Youth farmers are assisted in acquiring green house with agricultural inputs and this assist them to shift from tradition farming to market-oriented farming.

5. Invest in public infrastructures such as rural roads, storage facilities and create ready output markets close to farmers reach as this will reduce transaction cost incurred due to transportation cost. In addition, it will enable remote residents especially those who don't own any means of transport (bicycles, motorcycles or vehicle) to access output markets.

Conflict of Interest

The authors have not declared any conflict of interest.

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REFERENCES

- Adekanye T, Otitolaiye J, Opaluwa H (2009). Food and Agricultural Production in Nigeria: Some Empirical Considerations for Engendering Economic Policy for Africa. Conference Paper presented at the IAFFE Conference on Feminist Economics, Boston,

- Massachusetts, USA.
- Adekunle OA, Oladipo LL, Adisa FO, Fatoye AD (2009). Constraints to Youth's involvement in agricultural production in Kwake state, Nigeria. *J. Agric. Ext.* 13(1):102-108.
- Agbola P, Adenaike T, Babalola A (2010). Determinants of farmers' access to output markets and the effects on income: A case study of Ikenne local government area, Nigeria. *acta SATECH*, 3(2):33-39.
- Alene A, Manyong M, Omanyua G, Mignouna D, Bokanga M, Odhiambo G (2008). Smallholder market participation under transactions costs: Maize supply and fertilizer demand in Kenya. *Food Policy* 33:318-328.
- Almekinders C, Louwaars N (1999). *Farmer's seed production: New approaches and practices* Intermediate Technology Publications, London.
- Barett CB (2008). Smallholder Market Participation: Concept and evidence from Eastern and Southern Africa, *Food Policy*. 33:299-317.
- Bennel P (2006). Promoting livelihood opportunities for rural youth, IFAD, February 2007; WORLD BANK, World Development Report 2007: Development and the next generation, World Bank.
- Birthal PS, Joshi PK, Gulati A (2005). Vertical coordination in high-value food commodities: Implications for smallholders. MTID Discussion Paper 81, International Food Policy Research Institute, Washington DC, USA.
- Bittinger AK (2010). Crop diversification and technology adoption: The role of market isolation in Ethiopia Thesis.
- Cheng'ole J, Kimenyi K, Mbogoh S (2003). Engendered Analysis of the Socioeconomic Factors Affecting Smallholder Dairy Productivity: Experience from Kenya: *J. Sustain. Agric.* 22:111-123.
- Chirwa W, Matita M (2012). From subsistence to Smallholder commercial farming in Malawi: A case of NASFAM commercialization initiatives. Working paper 037.
- Davran M, Tok N (2011). Gender analysis in agricultural enterprises producing early potatoes in the Adana province of Turkey: *Afr. J. Agric. Res.* 6(2):376-381.
- Doss CR (1999). Twenty-Five Years of Research on Women Farmers in Africa: Lessons and Implications for Agricultural Research Institutions; with an Annotated Bibliography. CIMMYT Economics Program Paper No. 99-02. Mexico D.F.: CIMMYT.
- Ellis F, Bahigwa G (2003). Livelihoods and Rural Poverty Reduction in Uganda. *World Dev.* 31(6):1495-1510.
- Fafchamps M, Vargas Hill R (2005). "Selling at the Farmgate or Traveling to Market." *Am. J. Agric. Econ.* 87:717-734.
- FAO (2010). Gender and Land Rights Data Base. Accessed on 2nd June, 2014 from <http://www.fao.org/docrep/012/al059e/al059e00.pdf>.
- FAO (2014). FAO, private and public partnership model for youth employment in agriculture Experiences from Malawi, Tanzania Mainland and Zanzibar archipelago. Accessed from <http://www.fao.org/3/a-i4118e.pdf>
- Fletschner D (2006). Rural women access to credit: Market imperfections and intra-household dynamics. Working paper 2006-14, Evans school of public Affairs, University of Washington, Seattle
- Fletschner D (2008). Women's access to credit: Does it matter for household efficiency? *Am. J. Agric. Econ.* 90(3):669-683
- Giacomo Z (2012). Mobile phones and Radios: Effect on transaction costs and market participation for households in Northern Ghana: *J. Agric. Econ.* 63(3):694-714.
- GOK (2002). Effective management for sustainable growth and poverty reduction. Machakos District Development Plan 2002-2008.
- Govereh J, Jayne T, Nyoro J (1999). Smallholder commercialization, interlinked markets and food crop productivity: Cross-country evidence in eastern and southern Africa. Department of Agricultural Economics and the Department of Economics, Michigan State University (MSU).
- Grace J (2004). Gender Roles in Agriculture; Case studies of five villages: The Afghanistan Research and Evaluation Unit (AREU). Accessed on 14th July 2012 from <http://www.areu.org.af/Uploads/EditionPdfs/408E-Gender%20Roles%20in%20Agriculture%20CS.pdf>
- Gwanya T (2008). Address by the Director General at the launch of Youth in Agriculture and Rural Development on 20th June 2008, Goudini Spa, Western Cape Department of Land Affairs, Republic of South Africa.
- IFAD (2010). Summary of the findings of the project implemented by MIJARC in collaboration with FAO and IFAD: Facilitating access of rural youth to agricultural activities: Farmers Forum Youth Session.
- IFAD (2012). Summary of the findings of the project implemented by MIJARC in collaboration with IFAD and FAO: 'Facilitating access of rural youth to agricultural activities'. Accessed from <http://www.ifad.org/farmer/2012/youth/report.pdf>
- IFAD (International Fund for Agricultural Development) (2003). The challenge of ending rural poverty: Rural Poverty Report. Oxford University Press, Oxford. ISSN 2222-1700 (Paper) ISSN 2222-2855, Accessed on 1st July 2012 from <http://www.ifad.org/poverty/ch.cont.pdf>
- IFAD (International Fund for Agricultural Development) (2010). Rural poverty report 2011: New realities, new challenges: new opportunities for tomorrow's generation. Overview. Rome.
- Jayne TS, Milu M (2012). Land constraints in Kenya's densely populated rural areas: Implication for food policy and institutional reform.
- Jayne T, Mukumbu M, Duncan J, Staatz J, Howard J, Lundberg M, Aldridge K, Nakaponda B, Ferris J, Keita F, Sanankoua A (2005). Trends in real food prices in six sub-Saharan African countries. Policy Synthesis No. 2, US Agency for International Development (USAID), Washington, DC.
- Joshi PK, Joshi L, Birtha PS (2006). Diversification and Its Impact on Smallholders: Evidence from a Study on Vegetable Production. *Agric. Econ. Res. Rev.* 19:219-236.
- Kenya National Bureau of Statistics (KNBS) (2012). Kenya Facts and Figures.
- KNBS (2010). 2009 population and housing census results.
- Lapar M, Holloway G, Ehui S (2003). Policy Options Promoting Market Participation among Smallholder Livestock Producers: A Case Study from the Phillipines. *Food Policy*, 28:187-211.
- Mabeza-Chimedza R (2009). Improving food security. Accessed on 29th January, 2013 from [tilz.tearfund.org/publications/footsteps+71-80/Improving+food+security.htm](http://www.tilz.tearfund.org/publications/footsteps+71-80/Improving+food+security.htm)
- Makhura M (2001). Overcoming Transaction Costs Barriers to Market Participation of Smallholder Farmers in the northern province of South Africa. PhD Thesis Submitted in Partial Fulfilment of The Requirements For The Degree of Doctorate in the Department of Agricultural Economics, Extension And Rural Development Faculty of Natural and Agricultural Sciences, University of Pretoria.
- Markelova H, Meinzen-Dick R (2009). Collective Action and Market Access for Smallholders: A Summary of Findings Research Workshop on Collective Action and Market Access for Smallholders 2-5 October 2006, Cali, Colombia http://www.capri.cgiar.org/pdf/CA-Market_WksReport.pdf
- Martey E, Al-Hassan R, Kuwornu J (2012). Commercialization of smallholder agriculture in Ghana: A Tobit regression analysis: *Afr. J. Agric. Res.* 7(14):2131-2141.
- Mathenge M, Place F, Olwande J, Mithoefer D (2010). Participation in Agricultural Markets among the Poor and Marginalized: Analysis of Factors Influencing Participation and impacts on income and Poverty in Kenya .Study report.
- Meinzen-Dick R, Quisumbing A, Behrman J, Biermay-Jenzano P, Wilde V, Noordeloos M, Ragasa C, Beintema N (2011). Engendering Agricultural Research, Development, and Extension: IFPRI.
- Mesfin W, Fufa B, Haji J (2011). Pattern, Trend and Determinants of Crop Diversification: Empirical Evidence from Smallholders in Eastern Ethiopia: *J. Econ. Sustain. Dev.* 2(8).
- MIJARC/IFAD/FAO (2012). The Farmers' Forum Youth Session 18 February 2012. Summary of the findings of the project implemented by MIJARC in collaboration with FAO and IFAD: Facilitating access of rural youth to agricultural activities. Rome. <http://www.ifad.org/farmer/2012/youth/report.pdf>
- Minot N, Hill V (2007). Developing and Connecting Markets for Poor Farmers: 2020 Focus Brief on the World's Poor and Hungry People. International Food Policy Research Institute. Accessed on 25th June 2012 from http://conferences.ifpri.org/2020Chinaconference/pdf/beijingbrief_minot.pdf
- Mishra A, El-Osta H, Sandretto C (2004). Factors Affecting Farm Enterprise Diversification: Agriculture Finance review.

- Munyao CM, Musiu F, Mbego J, Mburu F, Sirmah P (2013). Influence of land size on adoption of *Jatropha Curcas* in Yatta District, Kenya: *J. Nat. Res.* 3:4.
- Narayan PK, Keshav LM (2013). Factors influencing farmers behavior in rice seed selling in the market: A case study in the Tarai region of Nepal: *Agric. Food Econ.* 1:14.
- Okezie C, Sulaiman J, Nwosu A (2012). Farm – level determinants of agricultural commercialization. *Int. J. Agric. For.* 2(2):1-5.
- Olarinde L, Adepoju A, Jabaru M (2014). Climate Change, farm level adaption measures and Impacts on Crop productivity and market participation: Implications for sustainable synergy between African and European Agriculture. Paper prepared for presentation at the 88th Annual Conference of the Agricultural Economics Society, AgroParisTech, Paris, France 9-11 April.
- Olwande J, Mathenge M (2010). Market participation among poor rural households in Kenya. Tegemeo Institute of Agricultural Policy and Development. Accessed on 28th July 2012 from <http://www.tegemeo.org/documents/work/WP42-Market-Participation-among-Poor-Rural-Households-in-Kenya.pdf>
- Omiti J, Nyanamba T, Cullough E (2009). Factors influencing the intensity of market participation by smallholder farmers: A case study of rural and Peri-urban areas of Kenya: *The Afr. J. Agric. Resour. Econ.* 3(1):67-72.
- Omiti J, McCullough E, Otieno D, Madelon M, Nyanamba T, Murage A (2006). Participatory Prioritization of Issues in Smallholder Agricultural Commercialization in Kenya: KIPPRA Discussion Paper No. 64.
- Pender J, Ehui S, Place F (2006). Conceptual framework and hypotheses. In Pender, J, Place, F & Ehui, S (Eds), *Strategies for sustainable land management in the East African Highlands*. World Bank and International Food Policy Research Institute (IFPRI), Washington, DC. Accessed on 15th June 2012 from <http://www.ifpri.org/sites/default/files/pubs/pubs/books/oc53/oc53.pdf>
- Peterman A, Behrman J, Quisumbing AR (2009). A review of empirical Evidence on Gender Differences in Non-land Agricultural Inputs, Technology and services in Developing Countries. IFPRI Discussion Paper 975. Washington D.C: International Food policy Research Institute.
- Ragasa C, Berhane G, Tadesse F, Taffese A (2012). Gender difference in access to Extension Services and Agricultural Productivity. International Food Policy Research Institute. Working Paper 49.
- Randela R, Alemu G, Groenewald (2008). Factors enhancing market participation by small-scale cotton farmers: *Agrekon* 47:4.
- Ruhangawebare G (2010). Factors Affecting the Level of Commercialization among Cattle Keepers in the Pastoral Areas of Uganda. A Thesis Submitted to the School of Graduate Studies in Partial Fulfillment of the Award of the Degree of Master of Science in Agriculture and Applied Economics of Makerere University, Uganda.
- Ryan JG, Spencer DC (2001). Future Challenges and Opportunities for Agricultural R&D in the Semi-arid Tropics, International Crops Research Institute for the Semi-Arid Tropics, Patancheru (Andhra Pradesh).
- Sati P (2012). Agricultural Diversification in the Himalaya, India: A Spatio-Temporal Analysis: *Sustain. Agric. Res.* 1(1):77.
- Shepherd A, Prowse M (2009). Agricultural growth, poverty dynamics and markets: Background Paper for the Chronic Poverty Report.
- Sichoongwe K, Mapemba L, Tembo G, Ng'ong'ola D (2014). The Determinants and Extent of Crop Diversification among Smallholder Farmers: A Case Study of Southern Province Zambia. *J. Agric. Sci.* 6(11).
- Strasberg P, Jayne T, Yamano T, Nyoro J, Karanja D, Strauss J (1999). Effects of agricultural commercialization on food crop input use and productivity in Kenya. Michigan State University International Development Working Papers No. 71. Michigan, USA.
- Tracy-White J (2005). Rural-urban market linkages: an infrastructure identification and survey guide, FAO.
- USAID (2005). Enhancing women's market access and promoting pro-poor growth.
- Whitehead A, Kabeer N (2001). *Living With Uncertainty: Gender, Livelihoods and Pro-Poor Growth in Rural Sub-Saharan Africa*. IDS Working Paper Number 134. Brighton: Institute of Development Studies.
- World Bank (2004). *Agricultural Diversification for the Poor: Agriculture and Rural Development Discussion Paper 1*.
- World Bank (2005). *Managing agricultural production risk: innovations in developing countries*. Agriculture and Rural development: Washington DC.
- World Bank (2008a). Millennium Development Goals. Retrieved on 22rd Nov, 2012 from www.worldBank.org/mdgs/poverty-hunger.html
- World Bank (2008b). *Gender and Development*. Retrieved on 22rd Nov, 2012 from www.worldBank.org/WBSITE/External/Topics/EXTGender...html