

# Gender and Age Analysis on Factors Influencing Output Market Access by Smallholder Farmers in Machakos County, Kenya

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## Abstract

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 members in groups are more likely to access output market. Nevertheless access to output market was reduced by enterprise diversification, higher education level, household size, age and marital status of household head. To enable farmers to access output market, there is need for 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.

**Keywords:** output market, gender, age-group, disaggregation,

## 1.0 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, beans and cowpeas) are common enterprise diversification. In addition to risk mitigation, farm 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). Enterprise 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 whether diversification influences access to output 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 are very low (Jayne *et al.*, 2005). Smallholder farmers especially those in semi arid areas, often face a number of constraints that impede their ability of accessing output markets (Poulton *et al.*, 2006). 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 also determines 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.*, 2008). In Africa, including Kenya, Women contribute about 60 – 80% of the labor input in agricultural production (Adekanye *et al.*, 2009). They play key roles in managing farms, raising animals, harvesting, processing livestock products for both home consumption and for sale. Despite this, women 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).

There exist also age disparity which has made youth to be ignored in policies and programs despite them being the future drivers of African social and economic development (IFAD, 2012). Only few if any policies that cater for needs of youths in developing countries exist and those that exist they do not cater for poor

rural youth but tend to be biased towards non-poor males living in urban area (Bennel, 2006). Youths are seen as uninformed and inexperienced compared to adults and their involvement in agricultural activities has steadily declined in recent years due to lack of initial capital, poor basic farming knowledge, insufficient land, inadequate credit facilities and lack of production inputs (Adekunle et al., 2009).

This unequal structure across gender (male and female) 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.

## 2.0 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), Baret (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. These factors are said to affect output market by altering the conditions of commodity supply and demand (Omiti *et al.*, 2009).

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 & Meinzen-Dick, 2009; Giacomo, 2012; and Makhura, 2001). This makes smallholder farmers to either stop participating in marketing or resort to other means of marketing such as spot markets (Demissie, 2011; Makhura, 2001; Jari and Fraser, 2009).

Organization for Economic Co-operation and Development (OECD) (2004) indicated that, elements such as education, farming experience, skills, age, rural or urban location, language, and physical well-being also influence output market access. However, even in a situation where a farming community is exposed to a favorable environment that facilitates access to these markets, all community members may not have the same level of access. Some individuals may have better skills to do the implicit cost–benefit analyses required and apply their talents to quickly adapt to as well as exploit new opportunities while others may not be able to exploit these output market opportunities (OECD, *ibid*).

Despite the availability of literature on factors that influence smallholder farmers to access output market, these studies have not looked at the influence of enterprise diversification on output market access. In addition, 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). Rural women in developing countries are more disadvantaged in access to as well as control over land and capital than men (Peterman *et al.*, 2009 and Fletschner 2006). In Africa women are disadvantaged with respect to labour because they have less access to labour-saving technology and to hired labour needed for lucrative, labour-intensive cultivation (Meinzen-Dick *et al.*, 2011). In addition women have less access to education and are less likely to get extension services compared to men (Ragasa *et al.*, 2012). Women access to output market may be difficult compared to men (World Bank, 2012). According to OECD (2004) there exists several constraints that impede women from access and/or increases cost of entry to output markets making them sell at farm gates. These includes; mobility constraints that limit their ability to travel as well as sell at distant output markets, lack of certification to trade in certain markets thus limiting their entry to output market and lack of market information. Women participation in market-oriented activities is also reduced because of combination of activity-regulating social norms and reduced mobility due to their domestic responsibilities (Fletschner, 2008).

Disparity is also portrayed in age-groups where studies done shows that majority of youths are more constrained in accessing markets compared to adults. A summary of the findings of the project implemented by MIJARC in collaboration with IFAD and FAO indicated that access to markets remains difficult for young farmers since market structures often do not favor young people. Young farmers are the future of agricultural sector as they play an important role in ensuring food security for future generations but they face many challenges such as; little or no access to land, lack of youth-inclusive in policy making, lack of capital and finance (IFAD, 2012). Tracy- white, 2005 states 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. They lack required knowledge of how markets work and they lack information on prices (Tracy- white, 2005). More so the youth especially women face additional difficulties in accessing markets since in many communities their freedom of movement is restricted due to social and cultural prescriptions (USAID, 2005).

If gender is not accounted for in agricultural research and developments, it will be impossible to achieve food security for future generation (Meinzen-Dick *et al.*, 2011). Rationing mechanisms that limit youth and women's access to resources is suggested to have substantial economic consequences for their households (Fletschner, 2008). This will be enabled by use of disaggregated analysis. Using disaggregated data helps to uncover important information and also brings to light problems as well as issues that might otherwise remain invisible (Grace, 2004).

### 3.0 Research Methodology

#### 3.1 Study Area

The study was conducted in Yatta district in Machakos County, Kenya. The district covers an estimated area of 2497 km<sup>2</sup> 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 20-35 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/yr. The main crops grown are maize and beans, which are staple foods and still remain the dominant food-cum-cash crops, occupying about 70 percent of the cultivated land. 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, which lead to high transportation cost and this impedes access to output markets.

#### 3.2 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 whether 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.

#### 3.3 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.

#### 3.4 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 Govere *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:

$$y_i^* = X_i\beta + \varepsilon_i \dots\dots\dots\text{equation 1}$$

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,  $\beta$  is the vector of coefficients and  $\varepsilon_i$  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:

$$y_i = \begin{cases} 0 & \text{if } y_i^* \leq 0 \\ y_i^* & \text{if } 0 < y_i^* < 1 \\ 1 & \text{if } y_i^* > 1 \end{cases} \dots\dots\dots\text{equation 2}$$

### 3.5 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 and 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 and 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 and 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 and Makhura *et al.*, 2001). Higher education (secondary and tertiary level) was expected to positively influence access to output market.

**Distance to output market:** It refers 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 and Olwande, 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 farm enterprise diversification whereby if a farmer has additional crop apart from maize and beans is regarded as diversified. Farm enterprise 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) . Enterprise diversification 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 Fachamps 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 marketing.

## 4.0 Results and Discussion

### 4.1. 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. Table1 presents the gender distribution of sampled households. The result indicates farming in the study area is dominated by male-headed and adult-headed households. 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. Across gender, female headed households have more persons compared to their counterparts. This could imply more food and time consumption as the household head may spend more time taking care of its members.

As far as socio-economic characteristic is concerned, households in study area are constrained as shown in Table 2. For instance in overall, only small percentage of household heads in the study area sells at output market. This might be related to the fact that, only small percent of households (53.1%) own means of transport such as motorcycle or bicycle and this translates to higher transportation cost. Across gender, majority of female-headed and adult-headed households have no means of transport and don't sell at output market compared to their counterparts. In terms of education, male-headed households are more educated than female-headed households 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 hectares). This is slightly lower than the average national land size which is 4.596 (1.86 hectares) 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 are more constrained in accessing credit compared to their counterparts (see table 2). Perhaps because youths do not have a lot of asset for example land that may be used as collateral to access credit.

#### **4.1.2: 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, male-headed households have higher market access index than female-headed households. Indicating female-headed households are more constrained in accessing output market compared to male heads. On the other hand youth-headed households have higher output market access index although statistically insignificant. This shows youths despite being constrained in accessing land, credit and extension services have higher chances of accessing output market. A further analysis is performed using regression technique.

### **4.2 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. However after disaggregation, only male headed and adult-headed households are significantly influenced. Ownership of means of transport reduces transport cost of taking the produce from farm to market leading to increased access to output market compared to those who haven't any means of transport. The possible explanation is due to high cost of hiring a motorcycle or a vehicle in the study area, forcing many households especially females to sell at farm gate (see table 4). The result is consistent to that of (Mathenge *et al.* 2010 and Randela *et al.* 2008). Large size of land enables households to generate market surpluses and it can be used as collateral to access credit (Martey *et al.*, 2012 and Olwande & Mathenge, 2010). This implies that female-headed and youth headed household who have small or no land are less likely to access market. Access to extension service among male and adult-headed households 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. The result coincides with the findings of (Mesfin *et al.* 2011).

Both secondary and post-secondary education reveal a negative and significant relationship with the probability of output market access in the whole sample as well as in male-headed and adult headed households. This is contrary to *priori* expectation. However the results 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 (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 male, youth and adult-headed households. This implies that marketing group serves as incentive to link farmers to output market and farmers who are not members of group especially female farmers are less likely to access output market. The result is in consistent to the findings of (Agbola *et al.* 2010 and Mathenge *et al.*, 2010).

Age of the household head has a negative influence on access to output market among all household heads except among the adult-headed households. An increase in age of household head by one year decreased output market access by 1.7% and 0.5% among the youth and male-headed households. The possible explanation is that young farmers are more progressive, more receptive to new ideas and have better understanding of the benefits of commercialization (Mathenge *et al.*, 2010; Randela *et al.*, 2008). On the other hand an increase in age by one year leads to an increase in access to output market by 7.1%. Perhaps because 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 (Martey *et al.*, 2012 and Omiti *et al.*, 2009).

Access to credit significantly increases access to output market by 2.3% among female-headed households. Perhaps because female headed household who access credit direct all of it to farming while may be male heads direct some of it to other non-farm activities.

Household size has a negative and significant influence among adult-headed households only. 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, adult-headed households may have many grandchildren depending on them 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 and

these results concur with that of Omit *et al.* (2009).

Distance to output market negatively and significantly influence access to output market among all households except among youth-headed households. Longer distances increase travel time and travel costs, which impact negatively on market access (Olwande and Mathenge, 2010). Distance to output market is insignificant among youth households possibly because youths are very aggressive and energetic and can travel for longer distance where markets offer better prices.

Diversification carries a negative and significant coefficient in the overall sample. At disaggregated level it is only significant on male-headed households. 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 male-headed households than female-headed households 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.

## 5.0 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:

- 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.
- 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.
- 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).
- 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.
- 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.

## Acknowledgement

This research work was carried out with the aid of a grant from the International Development Research Centre,

Ottawa, Canada, and with the financial support of the Government of Canada provided through the Canadian International Development Agency (CIDA). The author declares no competing financial interest.

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**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		

**Note:** P<0.05 means 5% significant level. Source: Author's calculation

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

	Overall	Male	Female	$\chi^2$	t-value	Youth	Adult	$\chi^2$	t-value
Demographic Characteristic									
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:	48.8	27.8	92.3			30.0	55.0		
Primary				58.51***				8.975**	
Secondary	28.1	39.8	3.8			32.5	26.7		
Tertiary	23.1	32.4	3.8			37.5	18.3		
Diversified	61.9	65.7	53.8	2.105		65.0	60.8	0.221	
Point of sale (market)	32.5	46.3	3.8	28.832***		45.0	28.3	3.799**	
Transport means	53.1	75.9	5.8	69.375***		70.0	47.5	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	

**Note:** \*\*\* P<0.01 \*\* P<0.05 \* P<0.10 means significant at 1%, 5% and 10% probability levels, respectively. Source: Author's calculation.

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	0.566 (0.276)	0.529 (0.300)	-0.679	0.336

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

Source: Author's calculation

**Table 4: Tobit result on factors influencing access to output market**

MRKTACCESS	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	

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

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