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Characterizing Smallholder Maize Farmers' Marketing in Kenya: An Insight into the Intra-Household Gender, Wealth-Status, Educational and Credit Access Dimensions

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Abstract
This paper examines patterns of production and market participation among male-headed households (MHHs) and female-headed households (FHHs), in order to determine the role of gender in accessing agricultural support services in Kenya. Different methods and data sources were used: a survey of 613 maize-producing households was spread over five counties and in-depth farm interviews were carried out; principal component analysis was used to categorize households into wealth categories based on their asset index; descriptive statistics were used to generate means and frequencies; and *t-test* was applied to show significant differences between groups. The results showed that in comparison to MHHs, FHHs produced and marketed fewer kilograms of maize. Moreover, MHHs are more commercialized in comparison with their female counterparts. More than half of the respondents did not sell their produce, and for those who did sell maize, the farm-gate channel was the dominant outlet. Furthermore, over three-quarters of farmers who applied for credit did not receive it. Notably, there are significant differences between MHHs and FHHs in the quantities of maize produced and sold.
Keywords: Market participation, Smallholder farmers, Wealth index, Gender, Kenya.

1. Introduction and Research Context

Maize is one of the staple foods in Kenya and is consumed in different forms by approximately 96% of the population. Maize is produced on about 49% of the arable land. The majority of maize producers in Kenya are smallholders, and the integration of this sector with other sectors of the economy could considerably improve food security and rural incomes, and help to reduce poverty. Macauley (2015) observed that several projects have been designed and implemented in sub-Saharan Africa (SSA) over the last decade to increase farm-level production. For example, the International Maize and Wheat Improvement Center (CIMMYT) has spearheaded the introduction of improved varieties of maize that are drought-tolerant, resistant to pests, and exhibit early maturity. Despite efforts to intensify maize production, there is still low participation of smallholder farmers in output and input markets (Etuk et al., 2013; Osmani and Hossain, 2015). This discourages farmers from increasing the quantity and enhancing the quality of their crops and demotivates them from cultivating marketable produce.

Effective markets can potentially play an important role in ensuring agricultural transformation in SSA by improving rural incomes, enabling efficient allocation of resources, reducing poverty and improving livelihoods (Etuk et al., 2013). In addition, agricultural markets have the potential to foster economic growth and development. Barrett (2007) notes that the presence of markets and increased market access are vital requirements for the integration of rural smallholder farmers in the global commercialized economy and for growth of agrarian societies.

Development corporations and policy makers have emphasized the relevance of agricultural marketing for development (see, for instance, Larson et al., 2015). In order to increase smallholder farmers' output, the focus should be on markets that effectively emphasize greater use of specialized production methods. For smallholder farmers to fully exploit the potential offered by market participation, there is a need to have strong institutional capacity and policies that support market development (Barrett, 2007). Market access and participation are major determinants of productivity (Gebremedhin et al*.,* 2009). It is generally expected that farmers with good market access, specifically, those who are able to sell their surplus output and in turn buy goods and services, will be relatively more willing and incentivized to commercialize their produce than those with poor market access.

Increased population and high rates of urbanization are poised to create huge domestic markets for staple foods. There has been a shift in production from staple foods to other commodities, thus creating a mismatch between supply and demand. In general, there is high domestic demand for food staples but low rates of supply from farmers (Olwande and Mathenge, 2012).

Wealth-status and gender also affect how different producers respond to markets. Wealth is defined as the level of financial and economic resources commanded by a household at a particular point in time (UN, 2007). For instance, the FAO (2011) shows that women and men have unequal access to various productive resources, with women being disadvantaged. Palacious-Lopez and Lopez (2015) observed that restricted access to inputs

affects the productivity of female-owned and/or managed farms more prominently than farms owned and/or operated by men. Therefore, it is important to disaggregate empirical analysis along gender lines so as to effectively inform policy (Gammage et al., 2005).

The majority of studies that have analyzed the effect of gender in agriculture have found unequal access to resources between male and female farmers. For instance, Farnworth and Colverson (2015) acknowledge that women have less access to education as compared to men; this has massive economic effects. One major manifestation of this disparity in access to education is seen in technology adoption, where lower education levels among women have translated into poor adoption of technology (Peterman et al., 2011). Moreover, the FAO (2011) illustrates that less access to education and extension services among women limits their ability to utilize other productive resources. Access to financial services such as credit is also important for commercialization. However, the literature shows that women are less likely to access credit as opposed to their male counterparts. This could be linked to limited ownership of the assets that are necessary as collateral in accessing credit. Awotide et al. (2015) and Muriithi (2015) found that MHHs had greater access to credit as opposed to FHHs in Nigeria and Kenya, respectively.

Gender disparities are also exhibited in terms of market access. According to the World Bank (2009), women are highly concentrated in rural and less-developed markets due to their limited access to productive resources. As already highlighted, access to technology significantly contributes to commercialized agriculture. However, the gendered nature of access to and use of agricultural technologies may further impair the ability of women to participate in markets. Access to markets by female farmers may be limited by both economic and cultural factors. Similarly, women have a higher opportunity cost for marketing time in relation to other household responsibilities, and hence this limits their ability to participate in markets. Djurfeldt et al. (2013) showed that commercialization of grain among smallholder farmers is engendered, with increased commercialization skewed towards male farmers. According to Kirimi et al. (2011), maize in Kenya is marketed through six major channels: brokers; wholesalers; posho millers; large scale millers; retailers; and the National Cereals and Produce Board (NCPB). The choice of marketing channel depends on numerous factors. For example, Bor et al. (2011) observed that smallholder farmers prefer to sell their maize to private buyers because of on-the-spot payment. Women may prefer informal markets because of low transaction costs. The gendered nature of access to and utilization of resources may also affect the type of market channel used by farmers. (Me-Nsope and Larkins, 2016).

Oseni et al. (2014) show that female farmers have low yields in comparison to male farmers. They further observe that women are constrained at every point in the production chain. Empirical evidence shows that ownership of communication equipment, a mode of transport, access to information, and ownership of a large plot of land positively affect market participation (Etuk et al., 2013; Siziba et al., 2011). Farmers who are poorly endowed with resources tend to have low levels of commercialization (Drafor, 2014). This shows that wealth status affects household access to and participation in the market (Barret, 2007).

Though market failure is a general constraint for many smallholder farmers, it is more evident in marginalized groups of women, the poor, and households in low-yielding areas (Place et al., 2013). In order to contribute towards agricultural growth and possibly reduce household poverty levels, there is a need to focus on challenges facing marginalized groups (women, the poor and youth) in the area of market access. Incorporating gender analysis into planning is important for better targeting of policies so that there are equal benefits for both male and female farmers. Additionally, understanding how a household's wealth status affects the commercialization of staples will be beneficial to organizations that prioritize selling of staples by farmers. This information will also be important for institutions that offer training to farmers, especially in designing targeted content that is context-specific to different farmer typologies, resource endowments and livelihood priorities.

Characterization of the market participation of smallholder farmers by gender, wealth and education dimensions is thus envisaged to offer relevant insights for targeted policy interventions. Most previous studies on market participation focus on high-value food commodities and analyze producers in general without disaggregating them along gender lines. For instance, there is a higher integration into markets of horticultural producers (of vegetables and fruit) compared to staple crop producers (Temu and Temu, 2006). This leaves a dearth of literature concerning trends in the production and commercialization of staples. This study disaggregates results on access to support services by gender of household head. This will be beneficial in formulating gender-sensitive policies. Knowledge of gender differences in terms of agricultural production and marketing and access to institutional support services is important, mainly because of the engendered nature of agriculture. Although trends in the production and marketing of cash crops have been widely documented, there remains a huge paucity of data on the gendered nature of the production and marketing of staples. Additionally, past research has neglected the disaggregated analysis of access to support services by gender, especially at the household level. This study contributes to literature by documenting gendered production and commercialization trends in staples. We further seek to discover gender differences in terms of market participation, marketing channels, education level and credit access. Unlike past studies that analyzed these differences at the respondent

level, the current study contributes to literature by engendering the analysis at the head-of-household level.

2. Methodology

Data for this study were drawn from the Sustainable Intensification of Maize and Legumes in Eastern and Southern Africa (SIMLESA) project cross-sectional dataset collected by CIMMYT in partnership with Kenya Agricultural Research Institute (KARI) in 2011. The data comprised 613 households in eastern and western Kenya. These two regions were selected because of their good agricultural potential and well-drained soil. Additionally, these regions have two cropping seasons, coupled with a bimodal rainfall pattern. After cleaning the data for analysis, a total of 594 maize-producing households remained.

Prior to the actual survey, a pilot study led by the lead scientist was conducted in both study regions, during which data were collected so as to better understand the farming systems, redesign the questionnaire and develop an adequate sampling mechanism. Discussions with key informants and farmers were also held during this reconnaissance visit. Data on basic socioeconomic characteristics, crop production, livestock ownership and information about both input and output markets were collected from development organizations that worked in the study areas as well as from the Ministry of Agriculture.

The sampling strategy involved two stages: in the first stage, a total of five districts in the two study areas were selected, namely Bungoma, Siaya, Embu, Meru South and Imenti South districts. These districts were selected based on their potential for maize-legume production. The eastern and western regions were allocated an equal number of households. The sample households to be surveyed in each district were distributed proportionate to the total number of farming households in the district. So as to select the lower sampling clusters from division to village level, a multi-stage sampling procedure was used. A total of 17 and 13 divisions were selected in western and eastern Kenya, respectively. In order to ensure representativeness of the sample, proportionate random sampling was used to select households in the different sampling clusters.

Both qualitative and quantitative methods were used in the data analysis. Descriptive statistics were used to generate the information given in Table 1 and 2, and frequencies and means of different variables were calculated. A *t-test* was used to check for significant statistical differences as shown in Tables 3 and 4. In order to generate Figures 1 through 5, frequencies of different variables were represented in charts. The Principal Component Analysis (PCA) method was applied for household classification according to wealth status, namely poor, averagely-wealthy and rich categories. The PCA approach was used in calculating the asset index for households according to asset ownership; the asset index of each household was then compared to the mean index for all households, to classify the households into wealth categories. In order to achieve positive livelihood outcomes, people require a range of assets. Farmers, for instance, need physical, natural, financial and social capital to achieve their goals. The PCA method helps to create a factor score, which is used for calculating the asset index for each household asset. The study follows the Filmer and Pritchett (2001) formula in calculating the asset index as follows:

$$A_i = \sum_k f_k \frac{a_{ik} - a_k}{s_k} \qquad (1)$$

Where:
A_i = value of asset index for the ith household
f_k = factor score coefficient for the kth asset obtained from PCA
a_{ik} = value of the kth asset for the ith household
a_k = the mean of the kth asset over all households
s_k = the standard deviation of the kth asset over all households

Running the above procedure gave a mean asset index of **0.147** and a standard deviation of **4.817**. Following Filmer and Prichett (2001), if the asset index for a particular household was less than the mean for all households (**A_i < 0.147**), that household was classified as "poor"; if the asset index for a particular household was between the mean and mean plus one standard deviation (**$0.147 \leq A_i \leq 4.964$**), that household was classified as "averagely wealthy", and if the asset index for a particular household was greater than the mean and mean plus one standard deviation(**A_i > 4.964**), that household was classified as "relatively wealthy/rich". In terms of education level, primary education refers to respondents who have attained the primary level certificate after spending 7 or 8 years in primary school. Secondary education refers to respondents who have completed primary level and have attained a certificate for secondary education; and finally, tertiary education refers to respondents who have attained both primary and secondary education and have at least obtained a certificate from a tertiary institution such as a college, university or training centre.

3. Results and Discussion

3.1 Demographic Characteristics

Of the 613 households in the SIMLESA survey, 119 were FHHs and 494 were MHHs. On average, MHHs had a significantly larger household size, more years of education, a higher Tropical Livestock Unit (TLU) equivalent and more farm hectares than FHHs. Females household heads were on average four years older than male household heads.

Table 1: Differences in demographic characteristics between male- and female-headed households

Variable	Total (N=594)	Male (N=486)	Female (N=108)	Mean diff	t-value	p-value
Household size (Adult equivalent)	4.86	5.06	4.03	-1.03	-4.50	0.00
Education of the household head (years completed)	6.97	7.57	4.45	-3.13	-4.38	0.00
Age of the household head (years)	50.31	49.39	54.15	4.76	3.18	0.00
Tropical Livestock Equivalent (TLU)	2.22	2.35	1.69	-0.66	-2.56	0.01
Total farm size in long rain season (ha)	1.18	1.26	0.83	-0.42	-1.25	0.21

Source: Survey Data (2011).

3.2 Maize Production and Marketing Patterns

The overall production pattern indicates that rich households, as per the classification derived from the PCA asset index, produce more maize per annum than averagely-wealthy or poor households (Table 2). The differences in production may be attributed to differences in access to resources and affordability of production complements such as fertilizer and improved seed varieties (Olwande and Mathenge, 2012).

Table 2: Maize production and marketing patterns along the gender dimension

Volume produced (kilograms)				**Quantity sold in kilograms**			**Market participation (Percent of farmers who sell)**		
Farmer category	**MHH**	**FHH**	**Pooled sample**	**MHH**	**FHH**	**Pooled sample**	**MHH**	**FHH**	**Pooled sample**
Poor	1311	1016	1253	686 (52.3)	386 (38)	636 (50.8)	55.2	52.2	54.7
Average	1015	685	947	417 (41.4)	261 (38.1)	386 (40.8)	57.9	55.6	57.4
Rich	1516	728	1356	834 (55)	297 (40.8)	736 (54.3)	54.2	60	55.4
Pooled sample	1249	878	1175	633 (50.7)	337 (38.4)	574 (48.9)	55.6	54.2	55.6

Note: proportion of output sold relative to production quantities is in parentheses
Sample size (n): FHHs = 476; MHHs = 118; Pooled = 594.
Source: Survey Data (2011).

Similarly, MHHs produce greater volumes of maize than FHHs. On average, MHHs produced 1249 kilograms compared to their FHH counterparts who produced 878 kilograms. These patterns, in which MHHs exhibit higher production levels compared to FHHs, are consistent with those revealed in Palacios-Lopez and Lopez (2015), which show wide gaps in gender productivity. Palacios-Lopez and Lopez (2015) further specify that the gender productivity gap ranges between 4 and 40%, depending on the type of crop, country and empirical method used. Some of the structural and institutional drivers attributed to such productivity gaps are differences in tenure security and access to inputs, market and credit (Peterman et al., 2011).

The results in Table 2 indicate that there are very slight differences in the overall sample in the percentages of farmers who sell some of their maize. This is the same even for poor, averagely-wealthy and rich households. In terms of volume, MHHs sell more maize than FHHs. This could be attributed to observations in the literature which show that women often have access to small land holdings, therefore most of their produce is sold at the community level (Ngodoo and Idisi, 2014). Oseni et al. (2014) also found that women produce less than men by 28%. Furthermore, women's access to extension services and technology is often limited compared to men's, and this contributes to low productivity (IFPRI, 2014).

The results show that more than half of the maize-producing households do not sell their maize. However, if the households are categorized according to wealth status, rich households participate more in the market relative to other wealth groups. This could be attributed to the fact that commercializing agriculture depends on access to resources (financial, capital, labor), and poor access to these resources affects the goods marketed by farmers both in quality and quantity (Sandal, 2007). Also, irrespective of gender, poorer farmers may sell more if they

critically require cash to offset other pressing needs such as water, medical bills, school fees and housing. Alternatively, the results on wealth-status and market participation may not show many differences if poorer households are so deprived that they cannot afford to sell food due to lack of alternative support mechanisms.

FHHs sell only a small proportion of their produce. From the results, it is evident that most FHHs reserve three-fifths of their produce for home consumption, which is encouraging in terms of enhancing household nutrition and ensuring self-sufficiency in food. Women are known to be more concerned about the well-being of their household than men, hence they are more reluctant to sell much of the maize output and would rather focus on food security. According to Habtezion (2012), women play a key role in the distribution of food at the household level, hence women are naturally expected to manage the food stocks from the current harvest efficiently, so that they last until the next harvest.

3.3 Market Participation

As noted earlier in Table 2, MHHs participate more in markets than FHHs (Figure 1). These findings are consistent with those of Marenya et al. (2015) where it is explained that in accordance with the gender-based division of labor in many societies, women are placed in such a way that, unlike men, they spend much of their time doing household duties. Their study further notes that the longer hours spent by women at home reduce their ability to participate in income-generating activities.

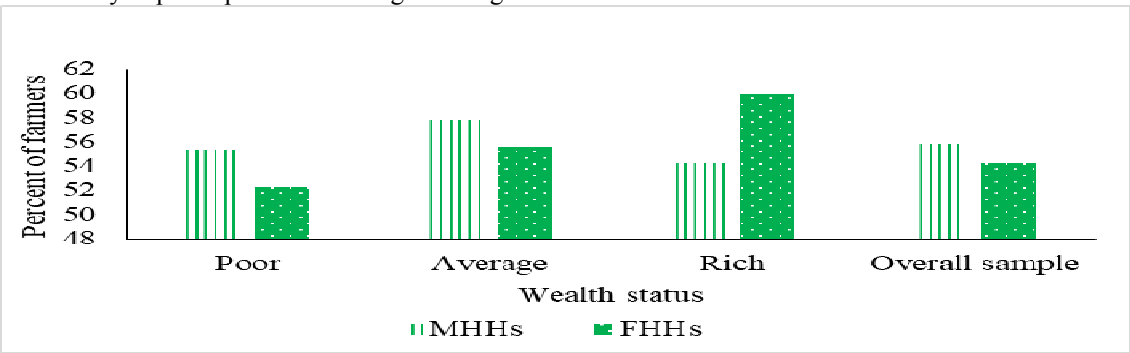

Figure 1: Household Market Participation by Gender and Wealth Status

Source: Authors' compilation from survey data.

Rich FHHs have a higher frequency of market participation compared to their male counterparts. Women are better farmers and agro-entrepreneurs if they have access to required inputs (FAO, 2011). According to Quisumbing et al. (2015), women's access to and control and use of assets are still low, and this limits their ability to participate in profitable ventures such as commercialized agriculture.

Figure 2 shows that MHHs dominate in terms of participation in different types of market channels. Generally, more than half of the households did not participate in all the respective market channels; this is a clear indication that the rate of commercialization of food staples is still very low. Notably, the majority of the farmers participated in farm-gate marketing; this could be due to the fact that accessing the other market channels is associated with high transaction costs and non-monetary barriers to entry. Mutayoba (2015) shows that farmers have a preference for shorter marketing channels where high returns are based on the quantities sold and not on prices.

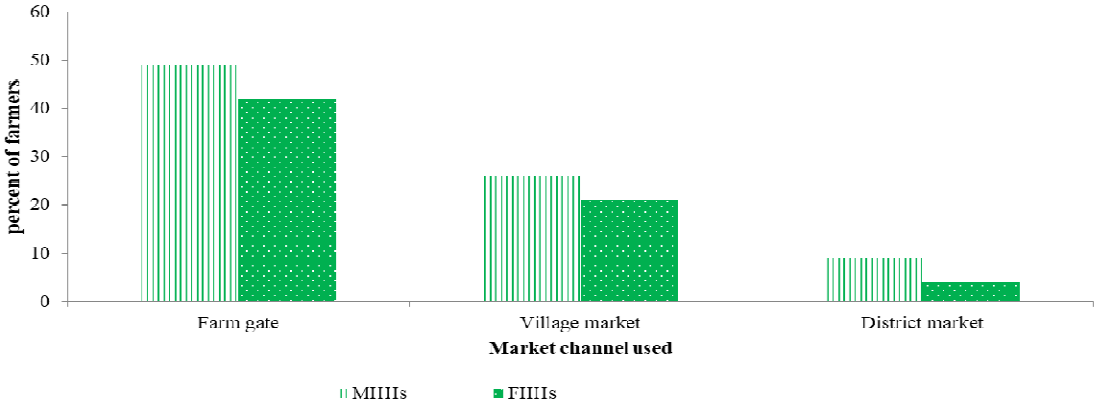

Figure 2: Distribution of Market Channels by Gender

Source: Authors' compilation from survey data.

In terms of participation in high-value markets (district markets in this study), farmers with tertiary education seem to prefer to use the district market more than farmers with a lower level of education (Figure 3).

This may be attributed to the fact that due to their level of education, they are more aware of the benefits offered by participating in high-value markets, such as high prices offered for the produce. Literate households have better skills and access to information, hence are highly market-orientated. In addition, they have good farm-management skills that positively translate into increased production.

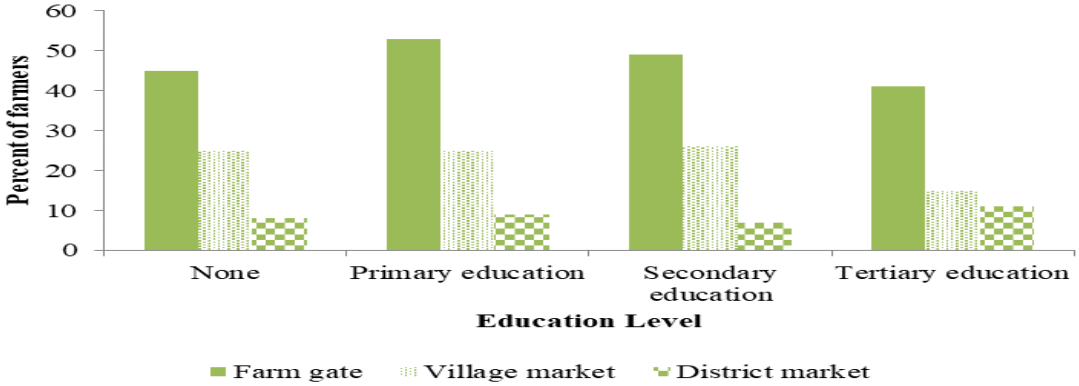

Figure 3: Distribution of Market Channels Used, by Level of Education
Source: Authors' compilation from survey data.

A general conclusion that can also be drawn from these results is that the majority of households selling maize prefer to use the farm-gate as their main marketing channel. The reasons behind this observation may be the high transaction costs of participating in other market channels, and/or having smaller quantities that are exhausted at their farm gate.

There is not much difference in terms of choice of market channel relative to the wealth status of the household (Figure 4). Contrary to expectation, very few rich farm households participated in the district/main market channel. Rich farmers may be well-endowed with resources, hence they might prefer to commercialize cash crops that fetch higher prices compared to food staples.

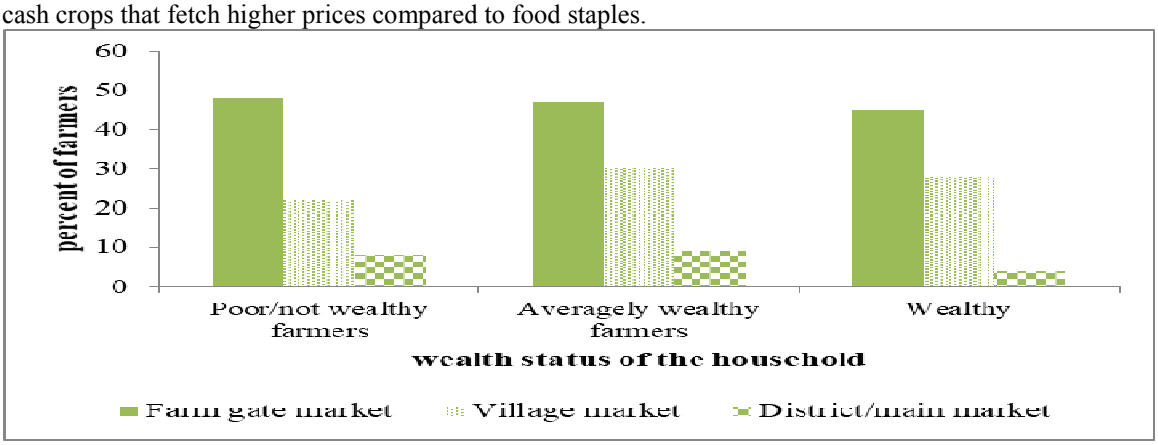

Figure 4: Distribution of Market Channel by Households' Wealth Status
Source: Authors' compilation from survey data.

To test whether there was any difference between the amount of maize produced by those who participated in the market and those who did not, a *t-test* was carried out on the quantity of maize produced and the results are presented below.

Table 3: *T-test* on the Quantity of Maize Produced by Market Participants and Non-participants

	Levene's Test for Equality of Variances		T-test for Equality of Means			
	F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference
Equal variances assumed	19.751	.000	5.467	592	.000	1050.734
Equal variances not assumed			6.066	358.101	.000	1050.734

Source: Survey Data (2011).

From the table above, the *Levene test* shows that we have a smaller p-value (0.0001), meaning variances between the two groups are not equal, hence we focus on the second row for interpretation. Variance of the quantity of maize produced by households that participated in the market is significantly different from those

that did not participate (Table 3). The *t-test* results show that ($^{t}592$ = 6.066, p = 0.0001) households that participated in the market produced 1050 kilograms more than households that did not participate. This clearly demonstrates what has been explained in the first part of this paper, specifically, that commercialization will increase productivity.

Table 4: *T-test* on Differences in the Average Quantity of Maize Sold Along the Gender Dimension

	Levene's test for equality of variances		T-test for equality of means			
	F	*Sig*	*t*	*df*	*Sig.(2-tailed)*	*Mean Difference*
Equal variance Assumed	3.848	0.050	1.434	587	0.152	296.72
Equal variance not assumed			2.585	587	0.010	296.72

Source: Survey Data (2011).

The *Levene test* in Table 4 shows that the variance in the quantity of maize sold by MHHs was significantly different from that sold by FHHs, hence to analyze the *t-test* we focus on the row of equal variances not assumed. There was a significant difference in the mean quantity of maize sold between MHHs and FHHs ($^{t}587 = 2.585$, p = 0.050). The average quantity of maize sold by MHHs was 296.72 kilograms more than the average quantity of maize sold by FHHs

3.4 Access to Credit

Figure 5 shows that there is a large discrepancy between households seeking cash credit and those that actually got the credit applied for. Close to three-quarters of households that sought credit did not get the requested amounts. In terms of gender and access to credit, it is evident that more MHHs received the amounts applied for compared to FHHs. Ogunlela and Mukhtar (2009) also found similar results in Burkina Faso, where female farmers were only able to access as little as 5% of all agricultural loans. Muzari (2016) also notes that women are less likely to receive credit and other financial services compared to men. Difficulties in accessing credit, mainly associated with collateral requirements are more of a challenge for female farmers, partly due to the imbalance in the dynamics of resource- and power control in Africa that favor men (Meinzen-Dick et al., 2011).

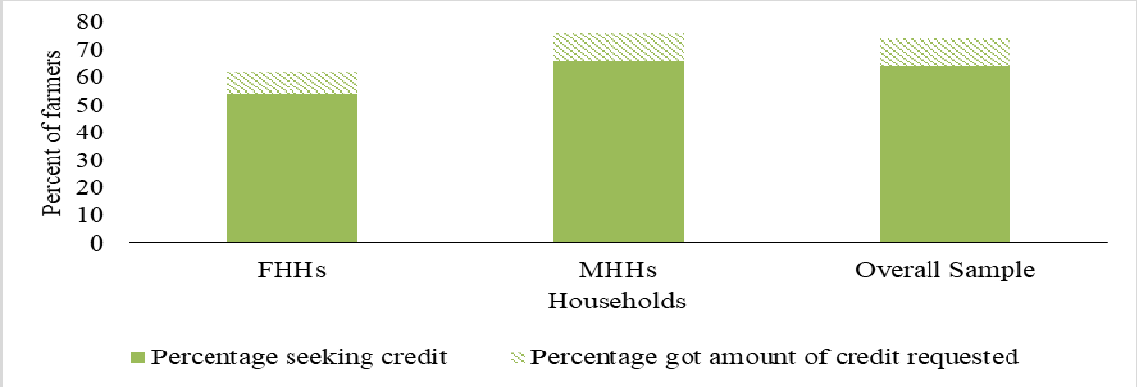

Figure 5: Percentage of Households Seeking and Receiving Credit

Source: Authors' compilation from survey data.

4. Conclusions

This study characterized marketing patterns among smallholder maize farmers in Kenya, focusing specifically on gender, wealth-status, level of education and access to credit. The results showed clear-cut differences between FHHs and MHHs: FHHs are more likely to be disadvantaged in terms of production, marketing, access to credit and education. Maize farmers in the data set reported on their production and marketing patterns, access to and use of support services and ownership of assets. This enabled us to characterize smallholder maize producers using different dimensions. Both descriptive statistics and *t-test* results showed that FHHs had low rates of production and marketing, as well as poor access to institutional support services. The results also showed that MHHs produced and marketed more kilograms of maize in comparison to their female counterparts. The former produced and marketed 1249 and 633 kilograms of maize, respectively, whereas the latter produced and marketed 878 and 337 kilograms of maize, respectively. About 56% of MHHs commercialized their produce compared to 54% of FHHs. Although access to and use of credit was generally low among all farmers, when disaggregated by gender, approximately 54% of FHHs had access to credit compared to 66% of MHHs.

The *t-test* results showed that there were significant differences in the quantities of maize produced by market and non-market participants, as well as in the quantities of maize sold by MHHs and FHHs. More specifically, commercialized households produced an extra 1050 kilograms of maize per year compared to non-

commercial households. In terms of gender, MHHs sold 296.7 kilograms more maize per year than FHHs. This shows that commercialization rates in staples are highly gendered.

The findings from this study call for various interventions to reduce gaps in production and marketing. Previous studies (see for instance FAO, 2011; Hill and Vigneri, 2014; Quisumbing et al., 2014) acknowledge that having gender-sensitive policies and development interventions that are up-to-date and contextual will help reduce this gap. It is, however, important to note that although policy plays a fundamental role in addressing gender differences in agriculture, some core differences defined by social norms and the way society treats male and female farmers still remain. Nonetheless, this study reveals different gaps that efficient policy could fill in terms of addressing gender imbalances. Investment in the formation and coordination of groups will encourage collective action among female farmers that would help to reduce transaction costs during market participation. The presence of collective action would help to increase FHHs' access to inputs and other support services. Furthermore, when FHHs are organized in groups it is easier to organize capacity-building meetings, in order to give training on intensive production methods which will increase their productivity.

The results on market participation relative to education level point out the need to improve the technical capacity of farmers on the benefits of high-value markets and on how to access them. Information Communication and Technology (ICT) offers avenues for improving farmers' knowledge about different farming-related topics. For instance, the County Governments could incorporate marketing information into radio programs, so that farmers are informed about ways to access high-value markets. Farmers could use their phones as a platform to seek other, better markets if they were guided by these radio programs.

Access to credit by smallholder farmers was found to be very low; there is a need to increase access to credit information for farmers and also to link farmers to lending institutions. This could be done through credit-targeting smallholder farmers. Financial institutions could structure loans for smallholder farmers in such a way that the farmers only required household assets (e.g. livestock) as collateral. The loans could also be tailored to be seasonal in terms of repayment and not continuous; this would enable farmers to repay the loans, since most agricultural produce is seasonal. The results also show that female farmers are more disadvantaged in terms of credit access compared to male farmers. This calls for increasing awareness among female farmers on the use of social capital to access loans; female farmers could collectively apply to access credit so as to benefit from joint liability. Social capital also provides an avenue for female farmers to access training. Furthermore, farmer groups could help FHHs to access productive inputs and markets through reducing transaction costs.

Finally, there is a need to quantitatively analyze the effects of support services on production and marketing trends among farmers. So as to make gender-sensitive recommendations, future studies should focus on quantifying access to different support services into one index, and using this for econometric analysis. There is also a need for future analysis to use panel data, in order to observe how the patterns of production and commercialization among MHHs and FHHs vary over time.

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