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Determinants of smallholders farmers' participation in collective marketing of maize in the central highlands of Kenya

J. MUGWE[1], D. AYIEKO[1], E. BETT[1] and H. MOGAKA[2]
[1] Kenyatta University, P.O. Box 43844-0100, Nairobi, Kenya
[2]University of Embu, P.O. Box 60600, Embu, Kenya
Corresponding Author: jaynemugwe@yahoo.com

ABSTRACT
Collective marketing has been proposed as a solution to the problem of poor access to markets in developing nations. However, smallholders' market participation is still limited. This study assessed farmers' perception of the benefits and challenges in collective marketing, and identified the determinants of smallholder farmers' participation in collective marketing of maize from 126 households in the central highlands of Kenya. Logistic regression model was used to analyze factors explaining farmers' participation in collective marketing. The key benefits of collective marketing were better prices and low cost of inputs, while the main challenges were poor infrastructure, disagreement among members and lack of credit. Gender of household head, years of farming experience, training on market information search, keeping records, ability to search market information, marketing group size, extension contact frequency and group meeting frequency were significantly associated with farmers participation in collective marketing. Participation in collective marketing could be improved by targeting women already organized in groups, offering training to households on record keeping, enhanced extension contacts, improving marketing group operations and searching for markets.

Key words: Gender, Kenya, Logistic regression, market information, market trends, poor infrastructure, record keeping

RÉSUMÉ
Le marketing collectif a été proposé comme solution au problème du mauvais accès aux marchés des pays en développement. Cependant, la participation des petits exploitants au marché est encore limitée. Cette étude a évalué la perception qu'ont les agriculteurs des avantages et défis liés du marketing collectif et a identifié les déterminants de la participation des petits exploitants au marketing collectif du maïs de 126 ménages dans les régions montagneuses du centre du Kenya. Un modèle de régression logistique a été utilisé pour analyser les facteurs expliquant la participation des agriculteurs au marketing collectif. Les principaux avantages du marketing collectif étaient les bons prix et un faible coût des intrants, tandis que les principaux défis étaient la mauvaise infrastructure, les désaccords entre les membres et le manque de crédit. Le genre du chef de ménage, les années d'expérience en agriculture, la formation sur la recherche d'informations sur le marché, la tenue de registres, la capacité de rechercher des informations sur le marché, la

taille du groupe de commercialisation, la fréquence des contacts d'extension et la fréquence des réunions de groupe étaient significativement associés à la participation des agriculteurs au marketing collectif. La participation au marketing collectif pourrait être améliorée en ciblant les femmes déjà organisées en groupes, en offrant une formation aux ménages sur la tenue des registres, en améliorant les contacts de vulgarisation, en améliorant les opérations du groupe de marketing et en recherchant des marchés.

Mots-clés: genre, régression logistique, informations sur le marché, tendances du marché, mauvaise infrastructure, tenue de registres

INTRODUCTION

The structural adjustment programmes (SAPs) in the 1980s and 1990s led to market liberalization in the developing countries (Salifu *et al.*, 2010). These SAPs constrained smallholder farmers' gains from the liberalized markets (Fafchamps, 2004). Services such as extension and marketing that were previously offered by government agencies were privatized (Shiferaw *et al.*, 2009). This adversely affected agricultural marketing by reducing market access to farmers. Efficient agricultural marketing plays an important role in attainment of food security, poverty reduction and sustainable agriculture (Ranjan, 2017). Despite agriculture's documented potential to transform agriculture, challenges of marketing along the value chain continue to limit growth (FAO, 2014). This is a big draw back in Africa's agriculture, which is the main economic activity of the region and source of income and livelihood in the continent.

Collective marketing model has been proposed as an option to fill the gap for accessing agricultural markets and agriculture services in general (Meinz-Dick, 2009). Collective marketing is defined as actions taken by a group of people or actors in pursuit of members perceived or shared interests (Sandler, 1992; Marshall, 1998). In agricultural value chains, collective marketing presents positive economic effects by increasing the economies of scale and reducing transaction costs as well as delivering other public goods(Mukundi, 2013). The use of collective marketing in smallholder farmer activities has had several benefits to farmers (Tsion, 2008). Among the main benefits are improved access to resources such as inputs, credit, training, transport and information, and increased bargaining power (Courtois, 2013). There is also reduced transaction costs (search for trading partners, screening trading partners, bargaining) that are related to market access (Holloway *et al.*, 2000; Roy and Throat, 2008). Farmers involved in collective marketing can access capital, transportation facilities and avoid exploitation at the market (Mukhwana, 2007). Studies in collective marketing report improved linkages between rural and urban market as a main benefit (Dorward *et al.*, 2009). The participants in collective action have also been able to access markets that had complex food safety and quality requirements (Reardon *et al.*, 2009) and therefore can facilitate registration and labeling. In addition, there has also been improvement in processing activities, accelerated innovations and improved quality standards due to collective action (Kaganzi *et al.,* 2009; Markelova *et al.,* 2009).

The developing countries experienced benefits and challenges in the adoption and development of the collective action model (Shiferaw *et al.,* 2009). Central and South America had successful initiatives in the use of smaller grain stores for collective marketing (Coulter *et al.,* 2007). Malawi experienced a success in the cereal banks which led to surpluses

for exports (Chirwa *et al.*, 2005). Farmers in Ghana were able to access loans from financial institutions against grain stocks in stores (Kwadjo, 2000). In Kenya, however, the cereal banks founded in Kenya in the 1970s experienced difficulties(Coulter *et al.*, 2007). Tanzania also had challenges in the collective marketing of maize by farmers, who preferred to store their maize at home due to unattractive liberalized markets. The other challenges that were experienced included lack of clarity on the ownership of land and equipment, poor working capital management, lack of trust and free riding among members (Coulter, 2007).There is a low commercialization of cereals, such as, maize in Sub Sahara Africa(SSA),which further reduces chances of poverty alleviation (Omamo *et al.*,1998).

Maize is the most important cereal crop in sub-Saharan Africa (SSA) and an important staple food for more than 1.2 billion people in SSA and Latin America(Akramov, 2012; Chibwana and Shivley, 2013). The production of maize must be intensified to boost food security, increase incomes and reduce poverty. In 2010, it was estimated by CIMMYT and IITA that by 2025, maize will have become the crop with the greatest production globally and in developing countries (CIMMYT and IITA, 2010). However, maize yields on most smallholder farms in SSA has remained less than one ton per hectare, which threatens households' food security for over 70% of the rural populations as they primarily draw their livelihoods from agriculture (Willer, 2014).

There is a strong correlation between market participation and productivity (Benfica *et al.*, 2014). This is because the farmer perception of market conditions is linked to adoption of better technologies and production of surplus cereals (Mukhwana, 2007). To raise productivity, availability of market access must be provided and farmers assured of their sustainability.

Despite the role of the collective marketing model to fulfil this and its other benefits, participation by farmers is generally low.

There are studies that have examined the socioeconomic factors and institutional factors that affect the decision of smallholder farmers to participate in collective marketing. Sinja *et al.* (2006) reported that the decision to participate in dairy farmer groups in Kenya was influenced by the presence of milk bar. However, none of the other socioeconomic variables had a significant effect on the decision to join dairy groups. Shiferaw *et al.* (2009) found that the decision to participate in farmer groups had a significant relationship with the following: Sex of household head, the dependency ratio of the household, the location of the household, the farm size, the main occupation of the household, ownership of ICT facilities and contact of household with Non-Government Organisations (NGOs). Handschuch *et al.* (2013) reported that the decision to participate in collective marketing of high value crops in Western Kenya was affected by: Sex of household head, quantity of millet harvested, quantity of maize harvested, housing index, membership in female group and region dummy (Mumias and Teso). A study by Tanguy *et al.* (2008) showed that the decision of farmers to participate in marketing groups in Ethiopia was significantly influenced by: Age of the household, sex, non-farm income, land size, yields of maize, teff, barley and sorghum.

In the central highlands of Kenya, farm incomes and returns on investments amongst smallholder farmers is poor and food insecurity is rampant due to low farm productivity usually associated with low soil fertility and low prices of agricultural commodities and poor markets (Government of Kenya, 2010). There are efforts to enhance market access through collective marketing but the results are mixed. There is inadequate information on how farmers perceive collective marketing as well as factors that influence

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the farmers to actively engage in collective markets. Few studies (Fischer and Qaim, 2011; Fischer and Qaim, 2012; Mukundi, 2013) have empirically investigated these factors in central Kenya and thus the necessity of this study which aimed at determining socioeconomic factors influencing smallholders' farmers' decision to participate in collective marketing. This paper contributes to the literature on agricultural households' market participation as well as provides direction for future research and development of strategies for spurring farmers' participation in collective marketing. The study assessed farmers perception of benefits of collective marketing, challenges farmers faced in collective marketing and factors associated with participation in collective marketing of maize. It gives vital insights into interventions that can be instituted to improve smallholder farmers' access to agricultural commodity markets through collective marketing.

Conceptual and theoretical framework. The conceptual frame work for this study was based on the literature reviewed on collective action. The information that was obtained revealed that there was a relationship between the decision to participate in collective marketing and socioeconomic factors and institutional factors. These relationships are summarized in the conceptual framework in Figure 1. The production decisions are made at the household level before any marketing decisions (Mukhwana, 2007). The membership of farmers in the farmer groups is then based on their production levels (Tanguy *et al.*, 2008). The different members of the groups then make decision to participate in the marketing of maize through the farmer groups. The choice to participate in the marketing of maize through the groups is based on the utility levels.

According to Green (2008) discrete decisions are made based on the utility levels from the alternatives. A random utility framework

assumes that if a rational consumer has M levels of utility then it is possible to make a choice (Fishburn, 2010). The maize producer has to make a choice whether to participate or not to participate in the farmer groups. The utility level of participating in the farmer groups is represented by U_{ij} that household i gets from alternative j. The linear random utility model can be represented as:

$$U_{itj} = X_{itj}\beta + Z_{it}\gamma + \varepsilon_{itj}, j = 1,......J_{it}, t = 1,....,T_i,$$

(Green, 2008)……………………..(1)

According to Green (2008) X_i and Z_i represent the vector of the dependent variables that are assumed to affect the choices and ε_j is the error term, which is assumed to be independent and identically distributed. The probability that a household chooses alternative j instead of k can be defined as:

$$P(Y=1/X) = P (U_i > U_k) \dots\dots\dots (2)$$

and the unknown parameters are given by

$$\beta' = (\beta_i - \beta_k) \dots\dots\dots (3)$$

The choice indicators can be represented as:
$d_{itj} = 1$ if individual i makes choice j at time t, and 0 otherwise.

METHODOLOGY
Study area. The study was carried out in Kiroo Located in Maara sub county, Tharaka Nithi County in the Central highlands of Kenya. Maara district lies in the Upper zones-LH1, UM1, UM2, Middle zones-UM3 and Lower zones-LM3, LM4, LM5 (Jaetzold *et al.*, 2006) on the eastern slopes of Mount Kenya at an altitude ranging from 830 meters to 1850 meters above sea level at the base of Mt. Kenya. Annual mean temperature ranges from 18ºC to 24ºC with a total annual rainfall of between 1200 mm and 1400 mm. The rainfall is bimodal with long rains (LR) occurring from March to June and short rains (SR) from October to December. The
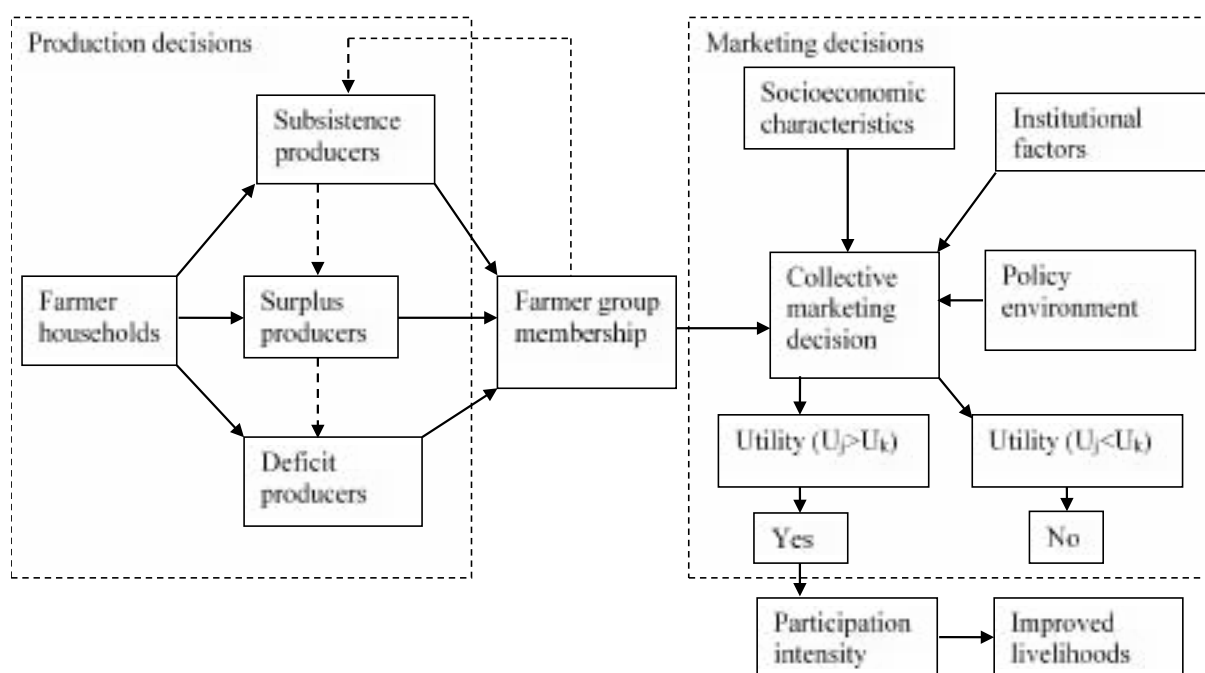
Figure 1. Conceptual framework. Source: Authors construction

soils are mainly humic Nitisols which are deep, well weathered with moderate to high inherent fertility (Jaetzold *et al.,* 2006). Meru South has a population density of 205 persons per km^{-2} while Maara district has a population density of 230 persons per km^{-2} (GoK, 2010). Both districts predominantly have smallholdings ranging from 0.1 to 2 ha with an average of 1.2 ha per household (GoK, 2010).

Farmers in Tharaka-Nithi County practice mixed farming, with diverse range of crops, keep livestock and agro-forestry production. The main subsistence agricultural products include: maize (*Zea mays*), beans (*Phaseolus vulgaris*), yams (*Dioscorea* spp.), cassava (*Manihot esculenta*), millet (*Eleusine coracana*), sorghum (*Sorghum vulgare*), and bananas (*Musa* spp.). The main cash crops include tea (*Camellia sinensi*s), coffee (C*offea* spp.), and macadamia nuts (*Macadami*a spp.). The main livestock in the region include cattle,

goats, sheep and poultry.

Sampling and data collection and analysis. A cross sectional survey involving interviews of respondents was adopted to enable an in-depth investigation into the subject matter under study. The study collected data from the smallholder farmers on factors determining their participation in collective marketing of maize in the central highlands of Kenya. A random sample of 126 households was selected from Mwimbi ward, within which Kiroo sub location is found in Maara Sub-county. Five enumerators were interviewed, trained and assisted in pretesting of the questionnaires as well as in carrying out the interviews. The enumerators had a post secondary education and were natives of Maara Sub county.Consequently most of the enumerators were conversant with the local dialect used in Mwimbi ward and Maara sub county.

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The questionnaires were examined to ensure they were completed and consistently filled. The response questions were numerically coded and responses stored in a database template using statistical package for social sciences (SPSS) computer software. Descriptive statistics including frequencies, percentages and Chi-Square were used to test for association between the dependent and independent variables. Logistic regression analysis was used to predict the influence of socioeconomic variables on the farmer's participation in collective marketing. A value of 0 was assigned if the farmer had not participated while a value of 1 was assigned if the farmers had participated in collective marketing. Variables with skewed distribution were transformed by taking the natural logs for variables. The logs have an effect of drawing in the observations that are further away from sample means. Other variables were coded and included into the Logistic regression model to determine which factors/variables significantly affected the participation in collective marketing (Table 1).

Analytical model. The logistic model was used to analyze the determinants of farmers' decision to participate in the collective marketing in Central Kenya. The logit model is an example of a limited dependent model (LDM) used when the regress and is a yes or no response. The LDM is represented as:

$$Pi = E(Y = 1/X_i) = \frac{1}{1 + e^{-(\beta + \beta_2 X_i)}}$$
(Guajarati, 2004)   (4)

Therefore the probability of the decision to participate in collective marketing can be represented as follows:

$$P_i = \frac{1}{1 + e^{-zi}} = \frac{e^z}{1 + e^z}$$
(Gujarati, 2004)   (5)

Where $Z_i = \beta_1 + \beta_2 X_i$ and P_i is the probability of the decision to participate in collective marketing. The probability of not participating in collective marketing can therefore be given as:

$$1 - P_i = \frac{1}{1 + e^{z_i}}$$ (Gujarati, 2004)   (6)

The ratio of the probability of a farmer decision to participate in collective marketing to that of not participating in collective marketing is referred to us the odds ratio. The odds ratio is given by the following formula:

$$\frac{p_i}{1 - p_i} = \frac{1 + e^{z_i}}{1 + e^{z_i}} = e^{z_i}$$ (Gujarati, 2004)   (7)

The natural log of the odds ratio gives:

$$L_i = \ln(\frac{P_i}{1 - P_i}) = z_i = \beta_1 + \beta_i X_i + u_i \text{(Gujarati, 2004)}$$ (8)

Where Xi is a vector of the independent variables β_i is the constant and $\beta_2 .... \beta_n$ are the coefficients of the independent variables.

RESULTS AND DISCUSSION
Farmers perceptions on benefits of collective marketing. All respondents were in groups and therefore aware of collective marketing. Results of data collected on farmers perception on benefits of collective marketing (ranked using a scale of 1-5) showed that collective marketing was associated with several benefits. Key among them were better prices ($\bar{x}$=4.15), improved access to markets ($\bar{x}$=4.02), low cost of inputs ($\bar{x}$=3.92), bigger sale volumes ($\bar{x}$=3.88), cheaper means of transport ($\bar{x}$=3.73) and cheaper extension services ($\bar{x}$=3.68) (Table 2). The highly ranked benefits were better prices and improved access to markets and were significantly different from the perceived benefit of cheaper services from extension.

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[1] Tests were conducted to check on the normality in the distribution of data. Further, other tests were done to check the quality of data and ensure that the coefficients estimates were consistent, unbiased and reliable.

Table 1. Definition of study variables influencing farmers' participation in collective marketing in the central highlands of Kenya

Variables	Definition
Dependent variables	
Participation in collective marketing	0 =No
	1=Yes
Independent variables	
Gender of the household head	0 Male
	1 Female
Age of the household head (years)	Continuous variable
Education level	1 No education
	2 Primary level
	3 Secondary level
	4 Tertiary level
Years of farming experience	Continuous
Remittance	0 No
	1 Yes
Total farm size (acres)	Continuous variable
Access to market information	0 No
	1 Yes
Ability to search for markets	0 No
	1 Yes
Record keeping	0 No
	1 Yes
Policy factors	
Extension service	Frequency of contact with extension officers
Market Access fee	Fee paid to access market in Kenya Shillings
Institutional factors	
Group meeting frequency	Number of group meetings per year
Marketing group size	Number of members in a marketing group
Registration fee	Registration fee paid to join group
Distance to meeting center	Distance from household to meeting center

Table 2. Benefits of collective marketing as perceived by farmers in Kiroo village, Kenya

Benefits of collective marketing	*Mean	Std. Deviation
Better prices	4.15a	1.56
Better access to market	4.02a	1.75
Low cost of inputs	3.92a	1.12
Bigger sale volume	3.88ab	1.32
Low cost of transport	3.73ab	0.98
Cheaper services (Extension)	3.68 b	1.56
p	0.042	

*Mean scores were based on 1=Least severe while 5=Most severe); N=126

This implies that farmers perceive that collective marketing allows them to get better prices, reduces the transaction cost of input and output markets, improves on the bargaining powers and improves on income. These results agrees with Markelova *et al*. (2009) who argues that collective marketing lead to improved bargaining power in negotiations with buyers and intermediaries. Similarly, Masakure and Henson (2005) reported increased access to inputs by farmers engaging in collective action. Several other studies in developing countries have reported positive impact of collective action on farmers in terms of market access and increased incomes (Barham and Chitemi, 2009; Bernard and Spielman, 2009; Fischer and Qaim, 2012).

Challenges faced in collective marketing. According to farmers, involvement in collective marketing had challenges (Table 3). Key among these were poor road infrastructure ($\overline{x}$ =4.21), disagreement amongst members ($\overline{x}$ =3.94), lack of credit ($\overline{x}$ =3.78), lack of adequate knowledge ($\overline{x}$ =3.62), and poor storage and bulking facilities ($\overline{x}$ =3.55) (Table 3).

The poor road infrastructure, poor storage and bulking facilities are likely to affect the quality of the produce, pricing and hence the profits. According to farmers, the road network was poorly maintained and hence a big hindrance to market access because of increased transport costs. In Northern Ethiopia, good road accessibility was found to significantly increase farm gate prices of agricultural commodities (Amlaku *et al*., 2012), while marginal costs of transporting produce decreased with improved infrastructure including road and communication network Bhalla, (2000). This agrees with Achike and Anzaku (2010) who found that good transport created conducive marketing environment for agricultural produce, and encouraged interactions among geographical and economic regions and opens up new areas. Improvement of the road network would therefore directly translate into lower transport costs for inputs such as fertilizer by reducing travel time and damage to the produce especially for perishable goods.

In this study, disagreement amongst members and lack of credit raised a big concern. This is because cohesion in the groups is a necessity for success of group activities (Bruns and Bruns, 2004). Disagreement could be addressed through training the members on governance structures. Credit on the other hand is necessary for the purchase of inputs and for the production of cereals. Lack of sufficient credit to purchase adequate input quantities of inputs could be linked to variability in crop yields in different seasons. Yields are variable due to erratic rainfall pattern which is a major challenge that affects agricultural production in several areas. Efforts are being made to develop technologies

Table 3 Challenges faced in collective marketing mentioned by farmers in Kiroo village, Kenya

Challenges	*Mean	Std. Deviation
Poor road infrastructure	4.21a	1.07
Disagreement amongst members	3.94a	1.25
Lack of credit	3.78a	1.3
Lack of adequate knowledge on collective marketing	3.62a	1.12
Poor storage and bulking facilities	3.55ab	1.36
Low pricing in some seasons	3.31ab	0.87
Lack of adequate quantities for the market	3.23b	1.07
Poor weights and measures	3.17b	1.39
Market problems	2.88c	1.47

*Mean scores were based on 1=Least severe and 5=Most severe

that enhance moisture retention in agricultural soils (Kiboi *et al.*, 2017).

Transport challenges. The study assessed the challenges associated with transportation. The greatest challenge in the transportation of farm produce was identified as high transport cost (58%), insecurity (58%), poor roads (54%) and county council fees (46%).The high transport cost is mainly associated with the poor roads. Most of the roads are rough roads hence the cost of transportation charged by the transporters is high.

Relationship between socioeconomic factors and farmers' participation in collective marketing. Out of the 126 households interviewed 56% participated in collective marketing (Table 5). The ability of households to search for markets showed some significant association (p=0.055) with participation in collective marketing (Table 5). Most (62%) of the households that had the ability to search for markets were participating in collective marketing. This observation could probably be because of information gained as the households interacted with other stakeholders in the agricultural sector. During search of markets information gained included knowledge on what is needed in which location and in what amounts and therefore enhanced their participation in collective marketing.

Maintenance of farm records was also significantly (p=0.056) associated with the decision to participate in collective marketing. This implied that farmers who kept records were more likely to participate in collective marketing than those who did not keep records (Table 5). This could be attributed to the trained households having the capacity and commitment to monitor their individual levels of agricultural production in line with input cost-benefit ratios and thus being able to determine whether they are making profit from their agricultural enterprises when they sold as individuals or collectively as a group.

Training on marketing information was also significantly (P=0.029) associated with the decision to participate in collective marketing. The majority (73%) of those households who had attained training on market information participated in collective marketing compared to their counterpart who had not been trained on marketing information (Table 5). This implies that training was an essential element in making the decision to participate in collective marketing which has more benefits than individual selling of farm produce. Years of farming experience was significantly associated with the decision to participate in collective marketing (p=0.098). Therefore there is evidence that the years of farming experience affected the decision to participate in collective marketing (Fischer and Qaim, 2011); education was used as a proxy for experience in collective marketing.

Logistic regression model parameters of factors influencing decision to participate in collective marketing. The logistic regression model had a fairly good explanatory power and correctly predicted 63% of the participants and non-participants in collective marketing. The pseudo R^2 was 0.41 and the Prob>Chi2 was 0.000***. Moreover the log likelihood had a value of -44.65.The variables that had a significant influence on the decision to participate in collective action included: Gender of household head, years of farming experience, training on market information search, keeping records, ability to search market information, marketing group size, extension contact frequency and group meeting frequency (Table 6).

Gender of the household head positively influenced decision to participate in collective marketing with female headed households having higher likelihood of participating in collective marketing than male headed households (Table 3). Female farmers in most

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[2]Local government authorities in Kenya levy fees for agricultural commodities transiting between two or more counties.

cases in this region are not the land owners but have user rights to the land and bear the bulk of the agricultural and domestic work (Mugwe *et al.*, 2009). Through the groups, the women have managed to unite and form groups which provide valuable learning and collective bargaining opportunity (Sebadieta *et al.*, 2007). The women in groups in the current study were therefore able to use the existing group infrastructure to enhance their participation in collective marketing. The findings of the current study agree with that of Fischer and Quaim (2011), who found that women were more likely to participate in collective marketing than men. Their argument is that women were more vulnerable to opportunistic behavior by farm gate traders and thus perceived that they would accrue greater benefits through collective bargaining. Similarly, a study in Swaziland concluded that women were more likely to sell through collective markets than men.

Table 5. Descriptive statistics of socioeconomic factors and decision to participate in collective marketing

Variable	Variable name	Decided not to participate in collective marketing	Decided to Participate in collective marketing	X^2 P value
Gender of the household head	Male	50 (47)	56 (52)	NS
	Female	6 (30)	14 (70)	
Education level	Primary education	32 (42)	44 (58)	NS
	Secondary education	19 (51)	18 (49)	
	Tertiary education	5 (39)	8 (61)	
Remittance	No	46 (48)	49 (52)	NS
	Yes	10 (32)	21 (68)	
Ability to search for markets	No	27 (55)	22 (45)	0.055
	Yes	29 (38)	48 (62)	
Keeping records	No	47 (49)	49 (51)	0.056
	Yes	8 (29)	20 (71)	
Trained in marketing information search	No	46 (49)	47 (51)	0.029
	Yes	8 (27)	22 (73)	
		Mean	Mean	T-test P value
Age of the household head		53.96	51.73	NS
Years of farming experience		26.34	22.46	0.098
Total land owned		3.88	2.81	NS

*Figures in parentheses represent the percentages

Table 6. Logistic regression estimates of factors influencing decision to participate in collective marketing

	Marginal elasticities			
	dy/dx	Std. Err.	z	P>z
Education level of household head	-0.01	0.04	-0.26	0.793
Gender of household head	0.32	0.16	2.02	0.044**
Remittance	-0.22	0.15	-1.42	0.155
Years of farming experience	-0.64	0.30	-2.12	0.034**
Training on market information search	0.39	0.12	3.11	0.002**
Age of household head	0.14	0.10	1.48	0.138
Keeping records	0.03	0.01	1.9	0.058*
Total land size owned	0.05	0.07	0.69	0.492
Ability to search market information	0.05	0.02	2.31	0.021**
Distance to meeting center	-0.99	0.77	-1.29	0.196
Group registration fee	-0.21	0.57	-0.38	0.705
Marketing group size	-0.32	0.15	-2.05	0.041**
Extension contact frequency	0.03	0.01	2.38	0.017**
Group meeting frequency	0.16	0.09	1.77	0.077*
Toll fees	-0.07	0.09	-0.74	0.459
Market access fees	-0.03	0.07	-0.36	0.719

*Significant at 10%, **5% level of probability.
Dependent variable = Decision to participate in collective marketing (0 = No, 1 = Yes).

Years of farming experience negatively influenced decision to participate in collective marketing with the less experienced farmers having a higher likelihood of participating in collective marketing. This could be due to more experienced farmers holding on to the old ways of agricultural practices and being difficult to switch to new agricultural approaches. According to Akinwumi *et al.* (2000), it may also be that older farmers are more risk averse and less likely to be flexible than younger farmers and thus have a lesser likelihood of utilizing new agricultural innovations. It could be that younger farmers are often better exposed to trying new innovations and have lower risk aversion and longer planning horizons. According to Onweremadu and Mathews-Njoku (2007) older farmers tend to hold tenaciously to traditional practices and therefore have a lesser likelihood and willingness to access information on new agricultural innovations.

Ability to search for information on market trends positively influenced decision to participate in collective marketing with an increase in the ability to search for market leading to an increase in participation in collective marketing. This could be attributed to the households with capability of accessing information on markets trends, which is not costless, investing in the information sources and thus able to participate in the markets. According to Key *et al.* (2000) and Makhura *et al.* (2001), high information costs are one of the key reasons for smallholder farmers' failure to participate in markets. A fundamental transaction cost that farmers face is the cost of obtaining information (Shepherd, 1997). Access to market information is extremely critical to the market participation decision, as was also observed by Omiti *et al.* (2009). Households with no access to market information or even those whose main source of market information is their neighbours are not likely to participate in markets (Omiti *et al.*, 2009).

Record keeping positively influenced the decision to participate in collective marketing with households that kept records having a higher likelihood of participating in collective marketing. This could be attributed to the level of awareness and commitment towards agricultural practices. According to Agbogidi and Ofuoku (2009) record keeping is a very important aspect of farming, especially where several individuals or groups are involved for the sake of transparency and accurate recording in carrying out cost-benefit analysis of their agriculture enterprises. Records provide a basis for setting the selling price of the agricultural produce especially in making a profit margin.

Training farmers on how to search for market information positively influenced decision to participate in collective marketing implying that the trained households had a higher likelihood of participating in collective marketing than those households without training. Training enhances the ability of the households to search for the right markets, keep records and be able to fully participate in the collective marketing of their produce using the skills and knowledge acquired. According to Tsion (2008) training improves levels of knowledge by keeping the farmers informed about agricultural innovations. Training also overcomes constraints through providing appropriate knowledge and new skills (Wegulo *et al.*, 2009) and thus providing an understanding of what an innovation entails and facilitates its efficient uptake and utilization

Marketing group sizes had a negative relationship with the decision to participate in collective marketing (Table 6). Explanation for this observation is that large group tend to be associated with free riding among members and reduction in the efficiency of groups. Moreover these large groups tend to have disagreements among members, which may act as a deterrent to smallholders who may want to participate in collective marketing. This findings are similar to those of a study by Akindale (2013), which reported a negative relationship between group size and decision to participate in contract farming.

Group meeting frequency had a positive relationship with decision to participate in collective marketing (Table 6). This implies that smallholder farmers are more likely to participate in collective marketing if marketing groups have frequent group meetings. The frequency of group meetings are a proxy for efficiency of marketing groups. The groups that have low frequency of group meetings are deemed to be dormant and hence smallholder farmers may not participate in collective marketing. These results are similar to those of a study by Kirumba *et al*. (2011) that reported that higher frequency of group meetings encouraged farmers to participate in activities that involved collective action.

Extension frequency contact had a positive relationship with the decision to participate in collective marketing by smallholder farmers (Table 6). This results can be explained by the effect of extension on exposing smallholder farmers to the benefits that collective marketing presents to the smallholder farmers. For example, a farmer who comes into contact with extension service more frequently is likely to be induced to collective marketing from awareness on benefits of collective marketing. On the other hand farmers with less contact or no contact with extension are less likely to be aware of the benefits of collective marketing. This observation concur with that of a study by Bellamere (2010), which showed a positive effect of extension on collective marketing.

CONCLUSION AND RECOMMENDATIONS
Three main conclusions were made from this study. First is that farmers perceived participation in collective marketing of maize to be beneficial mainly due to improving prices

of maize, increasing access to markets, lowering cost of inputs and ability to sell large volumes. Future efforts can therefore leverage on these four aspects to promote selling of agricultural commodities collectively.

Second is that though there were many benefits of participating in collective marketing, there were also major challenges. Key among them were; poor infrastructure (transport and storage facilities), disharmony among the members, and lack of adequate information on collective marketing. To address this, the County Governments need to improve the rural roads and especially maintenance. Addressing most of the other challenges centre on instituting training for farmers on skills of collective marketing from production and consolidation of the produce.

Thirdly, this study provided information on the socioeconomic factors influencing smallholder farmers' participation in collective marketing of maize in the central highlands of Kenya. Results indicated that gender of the household head, farming experience, ability to search for market information, record keeping and training in marketing information were possible factors explaining smallholders' farmers' participation in collective marketing. Therefore it is recommended that the participation of the farmers in marketing groups be improved by strengthening the existing women groups and encouraging more to participate in collective marketing. Moreover, it is important to focus on improving marketing groups through improved extension services to smallholder farmers. This services must incorporate training of marketing group dynamics in capacity building of stakeholders. Support to these groups should also include relevant and updated market information. Innovations such as the information hub and market information boards could be used to provide information to farmers in the groups.

Overall, results of this study show that training in collective marketing skills is likely to play a key role in improving marketing of agricultural commodities. This could be done by linking the existing farmers groups to extension services. Trainings should be customized and tailored around governance, to improve disharmony, record keeping and searching for markets.

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The authors declare that there is no conflict of interest in this paper.

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