4thICAAAE 2013 SEPTEMBER 22-25, Hammamet Tunisia
4th International Conference of the African Association of Agricultural Economists
icaaae.org aaae-africa.org

Sweet Potato Marketing Among Smallholder Farmers: The Role of Collective Action

By:

Eric Mukundi
Mary Mathenge
And
Margaret Ngigi

Invited paper presented at the 4th International Conference of the African Association of Agricultural Economists, September 22-25, 2013, Hammamet, Tunisia

Sweet Potato Marketing Among Smallholder Farmers: The Role of Collective Action

Eric Mukundi[1]
Graduate student at Department of Agricultural Economics - Egerton University, P.O. Box 536, Egerton, Kenya

Mary Mathenge
Tegemeo Institute of Agricultural Policy and Development, P.O. Box 20498, 00200, Nairobi, Kenya

Margaret Ngigi
Department of Agricultural Economics - Egerton University, P.O Box 536, Egerton, Kenya

Abstract

Participation of smallholder producers in market-oriented production holds potential for diversifying their incomes and increase agriculture productivity hence promoting food security and poverty eradication. However, participation of smallholders in commercialized production is generally limited by various institutional, technical and investment constraints along the supply chain. Collective action presents a potential channel for addressing such bottlenecks in the supply chain but favourable policies must be geared towards smallholder agriculture in order to ensure successful collective action. This paper investigates the role of collective action in smallholder market participation using a sample of 150 sweet potatoes producing households in Southwest Kenya. Our findings suggest that market participation is predominantly determined by the resource base of a household whereby, size of land owned is a fundamental factor. Furthermore, the results provide supportive evidence that participation in collective action has the potential to strengthen market participation among the poor and marginalized smallholder producers.

Keywords: Collective Action, Smallholder farmers, Market Participation, Sweet potatoes

Acknowledgements: The authors would like to thank Prof. Melinda Smale of Michigan State University (MSU) for support and advice accorded.

[1] Corresponding author: ericnjueh@yahoo.com

I. Introduction

Sweet potato has emerged as an attractive crop of choice for resource-constrained households in Kenya due to its ability to tolerate drought, low demand for inputs, multiple uses, and income-generating potential in marginal areas that are not suited to production of traditional cash crops such as tea and coffee. In addition, there is growing demand for sweet potato in Kenya especially in the urban areas which could be attributed to the increasing consumer health awareness on the associated health gains particularly of the orange fleshed variety. Despite this potential, past efforts have concentrated on increasing crop productivity with minimal attention to post-harvest activities. As a result, production of sweet potato is characterized by low market participation. In addition, the perishable and bulky nature of sweet potatoes discourage small scale farmers from accessing high price markets in urban centers since the associated transaction costs are high (Low, 1995*)*. It is believed that over 70 percent of sweet potato produced in Kenya is sold in unorganized and informal markets where farmers fetch low value for their crop.

While collective action is expected to strengthen bargaining power of sweet potato producers, however, little is known about whether it would benefit smallholder farmers. There is also a common perception that poor farmers in marginal rainfall areas experience difficulties in joining and participating in collective action initiatives which ought to facilitate their participation in the market.

Research shows that small-scale farmers have a competitive edge compared to large-scale producers because they have greater local knowledge and access to cheap labour from household members (Poulton et al., 2010). However, because they usually buy inputs in small quantities involving small and repetitive transactions, they often have high production costs, reducing incentives for market participation (Barrett, 2008). Substantial literature (see: Manalili, 2003; Poulton *et al*., 2006; Markelova and Meinzen-Dick, 2009; Markelova *et al*., 2004; Mathenge *et al*., 2010; Fischer and Qaim, 2011a,b; Olwande and Mathenge, 2010) indicates that organization among smallholder farmers has proved to be one of the means for smallholder farmers to overcome market imperfections. Acting collectively can help to reduce transaction costs, enhance access to credit and market information as well as access to innovation. Of course, performance depends on group costs, and efforts of any group to organize collective action are faced with common challenges, such as agreement upon

rules/institutions, ensuring all members are committed to participation, the challenges of free-riding, monitoring for non-compliance, and enforcing rules (Stockbridge et al. 2003).

Key analytical approaches (themes) as well as common factors associated with successful collective action have been examined by Ostrom, 2004; Markelova and Meinzen-Dick, 2009; Markelova *et al*., 2010; Fischer and Qaim, 2011a,b; Barham and Chitemi, 2011; Francesconi and Reuben, 2007 and Gyau *et al., 2011*. Researchers studying other farm products in Kenya such as fruits (bananas), fodder crops (*Calliandra*) and dry land legumes (pigeon pea, groundnut and chicken pea) have identified factors that influence group membership and market participation by smallholder groups through estimation of multiple linear regression, logit and bivariate probit models, double hurdle regression, and two-stage econometric methods.

Our study assesses the effectiveness of collective action in enhancing market participation engagement among smallholder sweet potato producers in Homa Bay County, Kenya. With the aim of exploring ways though which collective action can benefit these producers, we apply probit and double hurdle econometric models to: 1) assess socio-economic factors that influences household decision to join sweet potato producer groups, and 2) identify the determinants of household decisions to participate and the intensity of participation in sweet potato marketing respectively.

The next section summarizes the theoretical framework we apply. Section 3 presents the data source and outlines our empirical strategy. Findings are shown in the fourth section. Conclusions are drawn in Section 5, and the paper closes with implications for Kenyan agricultural policy and future research on the topic.

II. Theoretical approach

The study was based on the New Institutional Economics (NIE) framework which takes into account the role of institutions in the face of imperfect market information and transactions. Theory of collective action falls within the NIE framework since it involves use of institutions (defined as rules of the game, which have been formulated to govern relationships between individuals or groups of people involved in transactional activities) to guide groups or individuals with common objective to achieve a common goal (North, 1990).

At the household level, the decision to participate in the producer group/market is based on maximization of expected utility. The household will participate if $U_i > U_k$, where U_i

and U_k represent a household's utility with participation and without participation, respectively. The probability that a household will choose to participate in producer group/market can then be expressed as (1) $P(Y = 1|X) = P(U_i > U_k)$. A comparative cumulative distribution function evaluated on unknown parameters $\beta' = (\beta_i - \beta_k)$ is associated with a vector of independent variables **X** that influence household decision-making, as depicted for sweet potato in Figure 1. These independent variables include socio-economic, institutional and technical factors, as well as the "external" policy environment and climatic factors. Once a household chooses to join producer group or not, members are faced with a decision to sell their produce or not, and if they sell, the quantity sold.

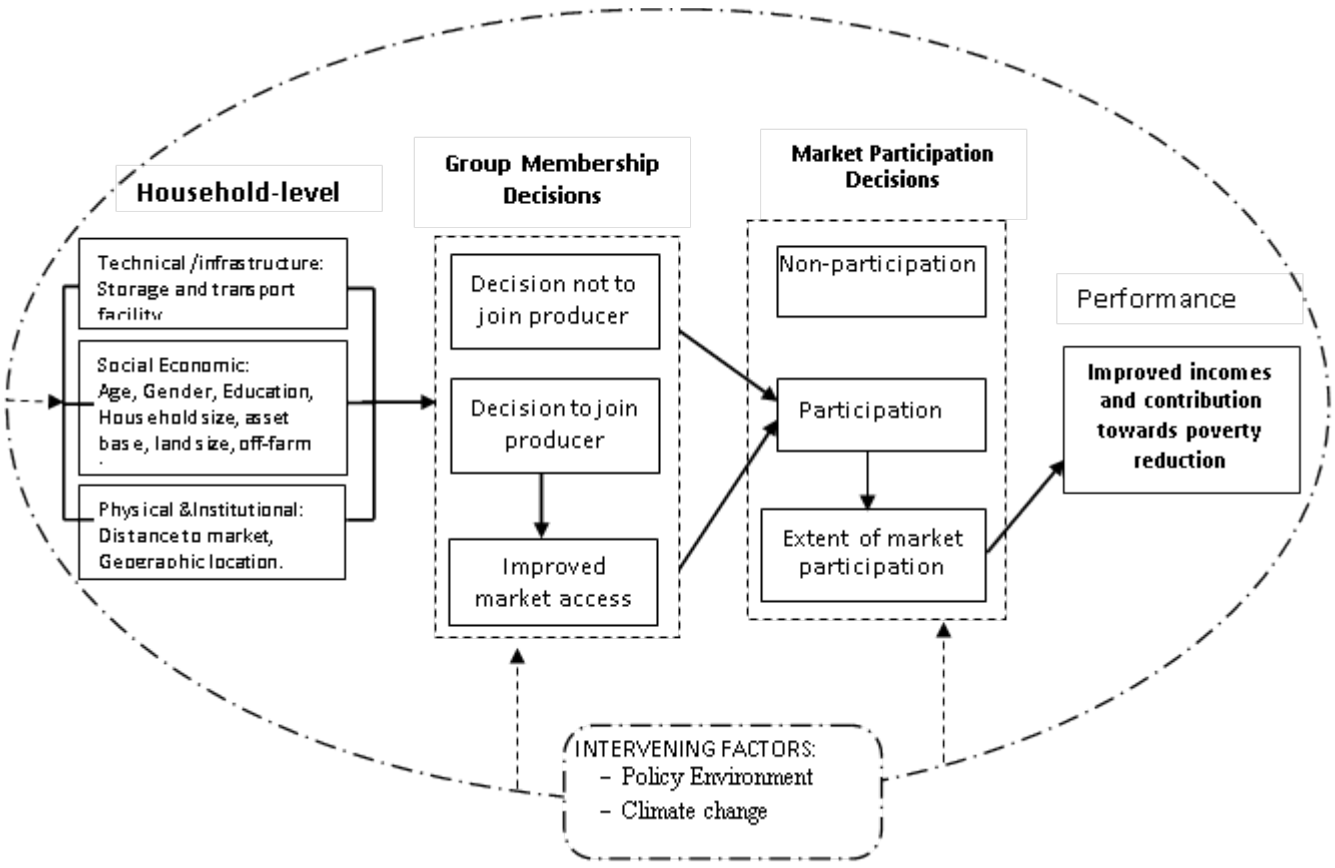

Figure 1: Interdependence in household-level decision making process[2]

[2] Figure 1 is based on work of Barham and Chitemi (2009) and Meinzen-Dick et al., (2004).

II. Methods

A. Data source

The study was conducted in Rachuonyo district, Homa-Bay County, in Southwest Kenya. The area of study was purposively chosen because it is the major sweet potato producing area in Kenya, with identifiable producer groups. Two divisions were selected purposively based on their sweet potato productivity. To obtain a sample of non-members of producer groups, locations were then selected randomly and proportionate random sampling method was used to draw a sample of households in each of the sampled location. To obtain a sample of members of producer groups, a random sample of registered farmer groups was drawn from a complete list in each division and farmers were then selected from among listed members.

Primary data was collected through interviews at household level using structured questionnaires. In addition, secondary data was synthesized from literature review and annual reports from the Ministry of Agriculture (MoA) and Kenya National Bureau of Statistics (KNBS) among other sources.

B. Econometric models

A Probit model was used to identify the factors that influence the decision of households that grow sweet potato to join producer groups, according to the utility expression shown in (1) above:

$$Y\ (1,0) = \alpha_1 + \beta_1 X_1 + \ldots\ldots + \beta_n X_n + \varepsilon \quad \ldots\ldots (2)$$

$$\varepsilon \sim N(0,1)$$

Where α_1= constant, Y= decision to join producer groups or not, β= beta coefficient, X= respective factors influencing the decision and ε_i= error term.

The Tobit model, with has been widely used, assumes that the participation and sales decisions are determined by a similar mechanism (variables and parameters). By contrast, Cragg's (1971) double hurdle model allows the factors that influence the participation decision to differ from those that affect the amounts sold. An advantage is that the Tobit is nested in the double hurdle model, and its appropriateness can be tested by comparing the likelihood ratio from the Tobit regression (the constrained regression) to the sum of those obtained with a probit and truncated regression (the unconstrained regression).

Variable definitions

Distance to market and extension services capture the travel time and associated costs that influence market participation (Olwande and Mathenge, 2010). Long distances are expected to have positive effect on group membership and negative effects on market participation.

Group membership is expected to have positive effect on household market participation. Fiscer and Qaim (2011) argue that participation in farmer organizations can reduce high transaction cost associated with smallholder agriculture. Therefore, group membership can increase household's access to market information necessary for decision marking.

Location dummies were used to account for any socio-economic and agro-potential differences that may arise within the households across the sub-regions of the study.\

The variables that capture household and farmer characteristics include: age, gender, education level, household size and years of farming. The age of the household head is used as measure of risk attitude of the farmer. Increase in age of household head is expected to have negative effect market participation due to risk-averse nature of older farmers. Age squared was included to account for the effect of life cycle path on market participation.

Gender of household head is used to capture differences in taste and preference for men and women in farmer group and market participation. Female headed household are expected to have relatively higher chance of joining farmer groups but less inclined to market participation. In contrast, male headed household is expected to be more disposed to participate in market but less likely to participate in farmer groups.

Household size accounts for supply of family labour and household consumption level (Mathenge *et al*., 2010 and Alene *at al.,* 2008). Large household size is expected to have positive impact on market participation if the household provide labour efficiently (labour supplied translated into output greater than household's consumption demand) and vice-versa.

Education level of the household is used as a proxy for human capital endowment. Increase in education of the household head (represented by the years of formal schooling) is expected to have positive effect on participation in producer groups and commodity markets. Olwande and Mathenge, 2010 point out that education enhance the ability of farmers to

utilize market information which could lower transaction cost thereby making market participation worthwhile.

Years of sweet potato farming of the household represent conventional farming experience gained in the course of production. It is expected that increase in farming experience is associated with improved market participation. However, in the life cycle of a farmer, point of decreasing marginal labour productivity is anticipated whereby further increase in farming experience is expected to be negatively associated with market participation, hence, square of farming experience is included to account for the effect of life cycle on market participation.

Total land owned in acres is included to represent physical production resource. Agricultural land resource is expected to have positive impact on market participation but negative impact on group membership. As land owned increases, competition for land resource among the practiced enterprises reduces and increases in output and marketable surplus. This would discourage need for participating in farmer groups since increase in output would help to lower cost of production and marketing. Olwande and Mathenge (2010) argue that land may have indirect positive market participation such as collateral for credit that would enhance adoption of improved technologies that would increase agricultural productivity.

Off-farm income is expected to have negative impact on market participation and membership into farmer groups an indicator of household's income diversification.

Table 1: Description and measurement of variables used in the models

Variable	Description	Unit of measurement	Sign
group	If joined sweet potatoes producer group or not.	Membership in Sweet potato producer group : 1=yes 0=no	
sellcrop	If sold sweet potatoes or not.	Participation : 1=yes 0 =no	
qnsale	Quantity of sweet potatoes sold through producer groups.	Extent of participation: Kilograms	
age	Age of household head	Number of years	(+/-)
age_sq	Age squared	Number of years squared	(+/-)
gender	Gender of household	1=male, 2= female	(+/-)

	head		
heduc	Education level of household head	Number of years of schooling	(+)
hhsize	Household size	Number of households members	(+/-)
tacres	Land size	Total land owned in Acres	(+)
offarm	Off farm income	Proportion of off farm income in Kshs	(-)
expyrs	Experience	Years of sweet potato farming	(+)
expyrs_sq	Experience squared	Years of sweet potato farming squared	(+)
hvtkgs	Output	Quantity of sweet potatoes harvested in Kgs	(+)
mktkm	Distance	Distance to the nearest sweet potato output market	(-)
extnkm	Distance	Distance to the nearest extension service provider.	(+)
infor	Source of production and market information services	o Extension agents o Farmer organization o Radio o Research institution	(+/-) (+) (+/-) (+/-)
loc	Geographical location dummies	Kasewe, Atela, Wang'chieng	

IV. Findings

A. Descriptive Analysis

The sample consisted of 65 group members and 85 non group members. Table 2 and 3 compare their characteristics.

Generally results in table 2 and 3 indicate that household characteristics across the two categories of households were not statistically different except in terms of age of household head, distance to the market and credit access. For group members, the average age of household head was 51.04 whereas their counterparts were somewhat younger by 2.4 years. This difference in household head age was significant at 10% level of significance.

Similarly, there was significant difference in the mean distances to the market between group members and non-group members. On average, group members were faced with longer distance of about 3.07 kilometers which was 0.58 km more than for non-group members. The variation in the average distance to the market was also significant at 10% level of significance.

Table 2: Household characteristics

Continuous Variable	Non-members	Group Members	Overall Sample		
	(Mean)	(Mean)	Mean	t - statistic	p-value
Household size	6.33	6.14	6.25	0.29	0.59
Years of schooling	6.69	6.46	6.59	0.18	0.68
Proportion of harvest sold	0.78	0.79	0.79	0.16	0.69
Total land owned (acres)	2.31	2.51	2.4	0.36	0.55
Land under sweet potatoes (acres)	0.92	0.94	0.93	0.01	0.91
Distance to extension (Km)	8.25	6.88	7.65	2.19	0.14
Distance to market (Km)	2.49	3.07	2.74	2.98*	0.09
Age(years)	48.64	54.18	51.04	5.00*	0.03
Experience (years)	13.74	13.95	13.83	0.01	0.91
Price per kg (KES)	10.7424	10.7914	10.7645	0.005	
Output (kgs)	1178.18	1077.36	1134.88	0.18	0.67
Productivity(kgs/acre)	1188.38	960.4	1085.71	0.78	0.38
Quantity sold (kgs)	1366.44	1393.32	1377.99	0.05	0.83
Off-farm income(KES)	54526.57	53323.56	54015.94	0.02	0.90
Crops income(KES)	15635.56	12631.36	14282.52	0.56	0.46
Livestock income(KES)	16781.7	16900.7	16830.76	0.00	0.98
Total income(KES)	79765.61	75062.16	77745.34	0.17	0.68

(Exchange rate at the time of survey: 1 USD = KES. 86)

Access to credit between group members and non-members differed significantly. According to table 3, more the households in farmer groups (86.2 percent) obtained credit as compared to their counterparts. Only 62.4 percent of non-group members were able to access credit services.

Table 3: Categorical variables

Categorical Variable		Non-group member (n=85) %	Group member (n=65) %	χ^2 statistic	P value
Gender	Female	24.7	32.3	1.056	0.304
	Male	75.3	67.7		
Marital status	Windowed	23.5	30.8	1.675	0.433
	Married	75.3	69.2		
	Divorced	1.2	0.0		
Education level	none	12.3	7.1	1.976	0.577
	primary	69.2	78.8		
	secondary	17	12.9		
	post-secondary	1.5	1.2		

Credit access	no	37.6	13.8	10.505**	0.002
	yes	62.4	86.2		

B. Regressions

(1) Determinants of group membership

Among the hypothesized factors that influence probability of participating in producer groups, only age and gender of the household head, household's credit access status and proximity to the market had significant effect on marginal probability of participating in farmer groups. All predictor variables had the expected signs as shown in table 4 below.

Table 4: Determinants of group membership

Variable Dependent: if FG member (yes=1, otherwise=0)	Coefficient	Standard Errors	P value	Marginal effects
Age of head (years)	0.0250	0.0104	0.0170*	0.0097
Marital status (1 married, 0 otherwise)	0.9056	0.7651	0.2370	0.3172
House hold size	0.0025	0.0566	0.9650	0.0010
Education level in years	0.0470	0.0447	0.2930	0.0182
Gender (1 = male)	-1.3155	0.7847	0.0940*	-0.4882
Total owned land (acres)	-0.0432	0.0657	0.5110	-0.0168
Credit (1 = yes)	0.8047	0.2830	0.0040**	0.2883
Distance to extension service in km	-0.0285	0.0255	0.2640	-0.0110
Distance to local market in km	0.2161	0.0805	0.0070**	0.0839
Atela location dummy	0.4387	0.3563	0.2180	0.1710
Wang'chieng location dummy	0.1352	0.3318	0.6840	0.0529
Farming experience in years	-0.0177	0.0141	0.2090	-0.0069
Off-farm income share to total income	-0.5993	0.5197	0.2490	-0.2325
Constant	-1.8100	0.9870	0.0670	

*Note: *, ** and***, represents significance levels at 10%, 5% and 1% respectively.*
Log likelihood = -83.162922; $\chi 2$ = 28.2 and Pseudo R2 = 0.145.

Holding other factors constant, positive significant coefficient of the household age implies that per unit increase in the age of the household head increases the probability of participation in farmer groups by about 0.97 percent. The findings support the role of age in resource ownership. In rural settings, older household heads have better access to land resource which is an important factor of production unlike the younger household heads that mainly rely on inherited land (Taruvinga and Mushunje, 2010). This signifies that youthful

household heads are less likely to join and participate in farmer groups because they are forced to wait longer before they own ample production resources which could enable them to participate in farmer group activities.

Gender is an important indicator of household decision making whereby in traditional setup, key decisions in a household are made by men. Gender also depicts preferences of male heads and female household heads. Results in table 1 show that male headed households are less likely to join groups (by about 48.82 percent). The findings agree with observation of Musyoki *et al*. (2012) that gender is crucial determinant of household decision to join community associations. This argument could be attributed to the importance of gender in defining specialization of labour supply within a household.

Proximity to the market has economic implication on the household farm and market activities (Owuor, 2009). A positive significant coefficient of the household distance to the market is an indicator of the relative effect of transaction costs to the household's socio-economic activities. The results show that per unit increase in distance to the market increases probability of participation in farmer group initiatives by 8.39 percent. As distance of the household to the nearest agricultural market increases, smallholders would be better off by organizing to lower their transaction costs (Markelova and Meinzen-Dick, 2009).

Significance of credit in the results indicates that access to credit positively influences household's group membership decision. Per unit increase in household access to credit increases probability of participating in farmer group by 28.83 percent *ceteris paribus*. This implies that a household that has access to financial credit is more likely to join farmer group. Following the argument that poor households experience difficulties (like compliance with the group membership demands) in their quest for membership in producer groups, access to credit helps to better financial capacity of such households hence facilitating membership into farmer groups.

(2) Determinants of Market Participation and the Intensity of Participation

In our analysis, the likelihood ratio test comparing the Tobit and Cragg's models using Stata 12 shows that, imposing the constraint that parameters are equal in the two parts of the decision significantly reduces explanatory (statistical) power. Estimation results of Cragg's double hurdle (table 5 column 1) shows that variables that were significantly associated with participation in sweet potato markets are membership in producer groups,

education level of the head, gender, size of land owned, distance to the market, farming experience, off-farm income, and source of information. These covariates had the expected sign of influence on market participation except off-farm income.

Membership in producer groups was positive and statistically significant at 10 percent level. This implies that belonging to a producer group increases the likelihood of a household to participate in sweet potato market. Our findings are consistent with Jagwe *et al*. (2010) and Mathenge *et al*. (2010) who argue that producer groups can be good platforms for social capital formation and through which smallholders can obtain market information at a lower cost hence lowering the fixed transaction costs of market participation.

The results indicate that education of the household is strongly associated with higher likelihood of market participation. Education level of the household head had positive and significant relationship on the smallholder's decision to participate in the market. The result supports findings by Martey *et al*. (2012) and Lubungu *et al*. (2012) that formal education is an essential requirement for utilization of market information whereby it enhances understanding of market dynamics resulting into informed market participation decision.

Gender of the household head significantly influenced market participation. Being a male was negatively associated with market participation and statistically significant at 10 percent level. Our findings are similar with Mathenge *et al.* (2010). The results imply that women-headed households are more likely to participate in the sweet potato market as compared to male headed households. A plausible explanation for the effect of gender is that sweet potato production in the area of study was traditionally regarded as women crop; more women were involved in sweet potato production activities than men. As such, female headed household relied heavily on sweet potato as source of income.

Total land owned by a household is strongly associated with higher level of participation in the sweet potato market. Our results affirms the findings of Martey *et al.* (2012) and Mathenge et al. (2010) that larger farms have potential for a household to increase its marketable surplus hence increasing market participation. Larger farms are also likely to benefit from scale economies which translate into lower transaction cost and increased potential of participating in the market.

Proximity to the market affects market participation in terms of travel time and costs. Our analysis show that distance to the market had negative and significant influence on

market participation. These findings are consistent with Martey et al. (2012) that increase in distance to the market is associated with lower level of market participation as a result of increase in marketing costs.

With regard to farming experience of households, the years of sweet potato production is strongly associated with market participation. Interestingly, our results suggest a U-shaped relationship between years of farming (farming experience) of the household and participation in the sweet potato market. The U-shape relationship is an indicator of the learning that is required in production (Berhanu, 2007). Martey *et al.* (2012) points out that "experienced households are able to take better production decision and have greater contacts which allow trading opportunities to be discovered at lower cost."

Contrary to our expectation, coefficient for off-farm income variable was negatively associated with participation in sweet potato market. The finding was statistically significant at 5 percent level. This implies that sweet potato farmers did not invest the off-farm income earnings into improving farm activities as explained by Martey *et al.* (2012) that, if off-farm income is invested in farm technology to boost production volume, increase in marketable surplus is likely to increase market participation.

Four different sources of production and market information (farmer groups, extension agents, extension agents and radio) were considered in the analysis to elicit their effect on market participation. In the estimation, extension agent source was used as the comparison unit. The results indicate that farmer organizations as source of information was positively associated with market participation. Our findings are consistent with Omit *et al.* (2009) that informal source of information significantly increases market participation. Explanation for this result is given by Omit *et al.* (2009) that in a situation where farmers have to bulking their produce together destined to a particular market before sale, such farmers depend on informal source of information because it delivers the most timely and relevant information at low cost for the particular market than formal sources (such as media). The finding also concurs with Jagwe *et al.* (2010) that farmer groups are good platforms for informal exchange of information at low cost which translates into lower fixed transaction costs of market participation.

Table 5: Determinants of market participation and extent of participation in sweet potato output market

Variable	(1) Sold or not sold		(2) Amount Sold(in Kgs)	
	Coeff.	Std. error.	Coeff.	Std. error.
Membership in producer group (1=yes)	1.326*	(-1.97)	0.142	(-1.04)
Age of household head in years	-0.2	(-1.66)	0.0316	(-0.92)
Age of household head squared	0.00193	(-1.76)	-0.00024	(-0.75)
Household size	-0.146	(-0.92)	-0.0622	(-1.23)
Education level in years	0.406**	(-2.84)	0.0537	(-1.9)
Gender (1=male)	-1.738*	(-2.44)	0.0764	(-0.47)
Land size (acres)	5.886***	(-3.63)	0.708***	(-6.85)
Distance to the market (km)	-0.599*	(-2.31)	-0.0501	(-1.08)
Farming experience (years)	-0.178**	(-2.81)	0.00399	(-0.23)
Farming experience (years squared)	2.025**	(-2.58)	-0.129	(-0.59)
Off-farm income (KES)	-1.054**	(-2.73)	0.00377	(-0.05)
Road type to market (Tarmac)	1.701	(-1.56)	0.488*	(-2.27)
Road type to market (Dry weather)	-0.289	(-0.48)	0.225	(-1.2)
Road type to market (foot path)[3]	-1.846	(-1.16)	0.246	(-0.6)
If source of information=farmer organization	1.208*	(-2.38)	-0.302*	(-2.02)
If source of information=Radio	0.908	(-1.1)	-0.0165	(-0.08)
If source of information=Research institution[4]	-	-	-0.049	(-0.12)
Atela location dummy	-1.41	(-1.40)	-0.116	(-0.47)
Wang'chieng location dummy	-1.282	(-1.53)	0.0406	(-0.18)
Constant	12.94*	(-2.48)	4.957***	(-4.24)
N	**134**		**121**	
Prob >Chi2	0.0000		0.0000	

*Note: *, ** and***, represents significance levels at 10%, 5% and 1% respectively. t - Statistics are in parentheses.*

Column 2 of table 5 show results of the covariates that condition the amount of sweet potato sold conditional on probability to participate in sweet potato output market as a seller. Only three variables were significant in explaining and these variables are land size, road type and source of market information (if source is farmer organization). All significant

[3] Murram road type was used as the base
[4] The extension agents information source was used as the comparison units

covariates had positive and expected sign except source of information (farmer organization) which negatively influenced the amount of sweet potato sold.

The size of land owned had the strongest influence on the quantity of the output sold. Our results backed finding by (Randela *et al*. (2008) that farmers with larger farms have a higher probability of selling more or their output because households with large farms have potential to increase marketable surplus thereby spreading the fixed transaction costs across more output.

The road type to the nearest output market was considered in the analysis to establish the influence of road infrastructure on market participation. Of the four roads type compared, murram road type was used as the comparison unit and our results show that tarmac road surface had positive influence on the quantity of sweet potato sold. This result hints that participation in sweet potato output market is not only a function of the proximity to the terminal market but also the existing road infrastructure that link major production areas with the major consumption sites.

The use of farmer organization as main source of production and marketing information was negatively associated with intensity of market participation. This finding was unexpected and explanation for such an outcome is not apparent. Possibly, competition among smallholder producers for the same buyers of their produce could generate negative influence of farmer organization as a source of market information. Further examination is however required.

5. Conclusions

The study set out to evaluate the role farmer groups in enhancing market participation among smallholder sweet potato producers with a view to provide insights for leveraging collective action as this would ensure better integration of the poor into commodity markets. Two key issues studied were: 1) determinants of group membership, and 2) factors that affect decisions to participate in the sweet potato market and the amount sold.

Covariates that significantly influenced membership into farmer groups among sweet potato producers are age of the household head, proximity to the market, credit access, and gender of the household. Age of the head and credit access status of a household positively influence market participation whereas gender (if head is male) and distance to the market had negative effect on the decision to join farmer groups.

The study also shed light on the determinants of market participation. The double hurdle results showed the factors that are positively associated with participation in sweet potato output market are membership in producer group, education level source of market information (farmer organizations/groups), farming experience and land holding whereas gender of the head (if head is male), non-farm income, and proximity to the output market were negatively associated. On the other hand, the results point that intensity of market participation is shaped by the size of land owned, the nature of road infrastructure between production regions and the major market/consumption site and the source of market information used.

Membership in farmer group was positively associated with market participation. Results further indicate that access to market information via farmer organizations positively influence market participation. These outcomes support the assertions in market participation literature that collective action has the potential to enhance market participation among smallholder farmers. Farmer groups provide a good platform for information sharing and consequently lowering transaction costs.

6. Policy Implications

In general, integration of smallholder farmers in the market-oriented production and successive market participation can transform the rural economy through increased incomes and improved food security. In order to eradicate high poverty and unemployment levels in

rural Kenya, there is need to shift to a new paradigm of approaches that will step-up growth and development of the smallholder sector. Such approaches should not be limited to support of local organizations that promote collective action initiatives among smallholder farmers and establishment of market linkage (as a means to overcome market information asymmetry) but also, policy formulation should take into account the heterogeneity attributes of the smallholder farmers with respect to gender and poverty levels. Furthermore, investment in rural education and transport infrastructure is indispensable if collective action is to achieve market linkage and informatory roles among smallholder farmers.

Since the study centered on the role of collective action in market participation among sweet potato producers, market channels were not explored. Therefore, an in-depth evaluation of the most promising market channels that would enhance market access and the bargaining power of smallholder producers and the sequent gain in sweet potato proceeds is highly recommended.

REFERENCES

Alene, A. D., Manyong, V. M., Omanya, G., Mignouna, H. D., Bokanga, M., & Odhiambo, G., (2008). Smallholder market participation under transactions costs: Maize supply and fertilizer demand in Kenya. *Food Policy*, *33*(4), 318-328.

Alene, A. D., Manyong, V. M., Omanya, G., Mignouna, H. D., Bokanga, M., & Odhiambo, G., (2008). Smallholder market participation under transactions costs: Maize supply and fertilizer demand in Kenya. *Food Policy*, *33*(4), 318-328.

Barham, J. and Chitemi, C., (2009). Collective action initiatives to improve marketing performance: Lessons from farmer groups in Tanzania. *Food Policy* 34(1), 53–59.

Barham, J. and Chitemi, C., (2009). Collective action initiatives to improve marketing performance: Lessons from farmer groups in Tanzania. *Food Policy* 34(1), 53–59.

Barrett, C.B., (2008). Smallholder market participation: Concepts and evidence from eastern and southern Africa. *Food Policy* 33(4), 299–317.

Cragg, J. G. (1971). Some statistical models for limited dependent variables with application to the demand for durable goods. *Econometrica: Journal of the Econometric Society*, 829-844.

Fischer, E., and Qaim, M., (2011a). Linking Smallholders to Markets: Determinants and Impacts of Farmer Collective Action in Kenya. *World Development Journal*, doi:10.1016/j.worlddev.2011.11.018

Fischer, E., and Qaim, M., (2011b). Smallholder Farmers and Collective Action: What Determines the Intensity of Participation? Paper presented at the EAAE 2011 Congress, 'Change and Uncertainty Challenges for Agriculture, Food and Natural Resources', August 30- September 2, Zurich, Switzerland.

Francesconi, G. N., and Ruben, R., (2007). Impacts of Collective Action on Smallholders' Commercialisation: Evidence from Dairy in Ethiopia. A Paper presented at the I Mediterranean Conference of Agro-Food Social Scientists. 103rd EAAE Seminar 'Adding Value to the Agro-Food Supply Chain in the Future Euromediterranean Space'. Barcelona, Spain, April 23rd - 25th, 2007.

Gyau, A., Mbosso, C., Tchoundjeu, Z., Foundjem, T., Asaah, E., & Franzel, S. (2011). Antecedents and effects of group sales on supply chain performance: The case of kola production and marketing in Cameroon. *Journal of Development and Agricultural Economics*, *3*(13), 621-626.

Jagwe, J.N., Machethe, C.L., and Ouma, E., (2010). Transaction costs and smallholder farmers' participation in banana markets in the Great Lakes Region of Burundi, Rwanda and the Democratic Republic of Congo.

Low, J.W., (1995). Determinants of Sweet potato Commercialization in South Nyanza, Kenya. Paper Presented at the Sixth Triennial Symposium of the International Society for Tropical Root Crops, 22-28 October, Lilongwe, Malawi.

Lubungu, M., Chapoto, A., & Tembo, G. (2012). Smallholder Farmers Participation in Livestock Markets: The Case of Zambian Farmers (No. 140902). Michigan State University, Department of Agricultural, Food, and Resource Economics.

Manalili M.N., (2003). Linking Farmers to Markets through Cooperatives Vegetables Supply Chain Redesign Options for Kapatagan, Mindanao, Philippines. Paper presented at the Australian Agricultural and Resource Economics Society Conference, Perth, WA, 11-14 February 2003.

Markelova, H., and Mwangi, E., (2010). Collective action for smallholder market access: Evidence and implications for Africa. *Review of Policy Research*, 27(5), 621–640.

Markelova, H., Meinzen-Dick, R., Hellin, J., and Dohrn, S., (2009). Collective action for smallholder market access. *Food Policy*, 34(1), 1–7.

Martey, E., Al-Hassan, R.M., & Kuwornu, J.K., (2012). Commercialization of smallholder agriculture in Ghana: A Tobit regression analysis. *African Journal of Agricultural Research, 7*(14), 2131-2141.

Mathenge, M., Place, F., Olwande, J., and Mithöfer, D., (2010). Participation in Agricultural Markets among the Poor and Marginalized: Analysis of Factors Influencing Participation and Impacts on Income and Poverty in Kenya. Tegemeo Institute. Egerton University, Kenya.

Meinzen-Dick, R., DiGregorio, M., and McCarthy, N., (2004). Methods for studying collective action in rural development. *Agricultural Systems* 82(3), 197–214.

Musyoki, J.K., Mugwe, J., Mutundu, K., and Muchiri, M., (2013). Determinants of Household Decision to Join Community Forest Associations: A Case Study of Kenya. ISRN Forestry, 2013.

North, D.C., (1990): Institutions, Institutional Change and Economic Performance. Cambridge: Cambridge University Press.

Olwande, J., & Mathenge, M. (2010). Market participation among poor rural households in Kenya. *Tegemeo Institute of Agricultural Policy and Development*.

Omiti, J., Otieno, D., Nyanamba, T., & McCullough, E. (2009). Factors influencing the intensity of market participation by smallholder farmers: A case study of rural and peri-urban areas of Kenya. *African Journal of Agricultural and Resource Economics*, *3*(1), 57-82.

Ostrom, E. (2004). Collective Action and Property Rights for Sustainable Development. Understanding Collective Action, 2020.

Owuor G., (2009). Can Group Based Credit Uphold Smallholder Farmers Productivity and Reduce Poverty in Africa? Empirical Evidence from Kenya. Seminar paper presented at 111 EAAE-IAAE Seminar 26th- 27th June 2009, University of Kent, Canterbury, United Kingdom.

Poulton, C., Dorward, A., and Kydd, J., (2010). The future of small farms: New directions for services, institutions, and intermediation. *World Development* 38(10), 1413–1428.

Poulton, C., Kydd, J., and Dorward, A., (2006). Overcoming Market Constraints on Pro-Poor Agricultural Growth in Sub-Saharan Africa. *Development Policy Review* 24(3), 243–77.

Randela, R., Alemu, Z.G., & Groenewald, J.A. (2008). Factors enhancing market participation by small-scale cotton farmers. *Agrekon*, *47*(4), 451-469.

Stockbridge, M. Dorward, A., Kydd, J., (2003). Farmer Organizations for Market Access: Learning from Success. Briefing Paper. Wye College, University of London, UK.

Taruvinga, A. and Mushunje, A., (2010). Socio-economic factors that influence households` participation in wetland cultivation: A binary logistic regression of wetland cultivators and non-cultivators. Paper presented at the Joint 3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa, September 19-23, 2010.