Market Participation among Poor Rural Households in Kenya

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Abstract

Kenya's smallholder agriculture remains a major engine of rural growth and livelihood improvement, yet it is largely semi-subsistence. Therefore, any pathway that can lift large numbers of the rural poor out of poverty will require some form of transformation of smallholder agriculture into a more commercialized production system. This study used a three-year panel household data set collected in 2000, 2004 and 2007 and across nine agro-ecological zones of Kenya to assess the extent of market participation among poor smallholder farmers in Kenya with a view to identifying constraints to market participation among and potential market opportunities for the poor. Descriptive results reveal differences in market participation across selected commodity groups among poor and non-poor households, with poor households having generally lower market participation. Some characteristics of the poor households that could partly explain this low market participation include low literacy levels, small land sizes, low asset values, low access to credit and limited ability to produce surpluses for the market. In terms of factors that could enhance market participation for poor households, we find that land size and membership in farmer organization play significant roles. These results suggest that any hope for the poor to participate in markets and make any meaningful gains from agriculture lies in improving productivity of their land as well as improving their access to land. Increasing social capital through promotion of collective action among poor households can also be of great value in enhancing their access to markets.

1. Introduction

It is estimated that about 80% of Kenya's population live in rural areas, with half of this proportion being poor (Republic of Kenya, 2008). The rural population mainly depends on small scale agriculture for food and income. This suggests that smallholder agriculture remains the major engine of rural growth and livelihood improvement for any pathway that can lift large numbers of the rural poor out of poverty (Hazell, 2005). Increasing rural incomes will require some form of transformation out of the semi-subsistence, low-input, low-productivity farming systems that currently characterize much of rural Africa (Govereh et al., 1999), Kenya included.

Agricultural commercialization refers to the shift from subsistence production to an increasingly complex production and consumption system based on the market (Goletti, 2005). Apart from marketing of agricultural outputs, it includes product choice and input use decisions based on the principles of profit maximization (Pingali and Rosegrant, 1995). Jaleta (2009) argues that commercialization strengthens linkages between input and output sides of a market. Demand for modern technologies promotes the input side of production and facilitates the development and advancement of technological innovations. In turn, the use of modern technologies can result in higher productivity and production entering markets. From the other side, output market growth can often drive input market linkages as the cash generated from sales can be used as investment funds.

Commercialization of agriculture benefits the poor by increasing agricultural labour productivity which in turn generates employment in low-capital smallholder agricultural production. Both the households that are commercializing their production and hired laborers receive direct income benefits (von Braun, 1995). However, von Braun (1995) also cautions that, while commercialization by itself rarely has adverse consequences on household welfare, commercialization combined with failures of institutions, policies, or markets can be damaging.

While there is a general agreement that improving market access and commercialization of smallholders will help induce greater investment, productivity, and income, there remains several challenges in making progress. Some of these challenges include identification of output markets and types of commodities that can enable large numbers of smallholders to improve their incomes; identification of which markets and commodities can provide significant opportunities for the poor; and identification of constraints to and interventions that are important for improving access to markets by the poor. Several studies have attempted to address these challenges.

In terms of the first challenge, several recent studies have reached different conclusions. On the one hand, there is ample evidence to suggest that the sheer magnitude of domestic staple food markets is far greater than those for exported commodities or for higher value commodities (e.g. Hazell (2005), Diao et al., 2007). The implication is that domestic staple food markets have the potential to involve a much larger number of smallholder farmers than

other commodity markets, both domestic and export for most countries in sub-Saharan Africa. Other studies stress the importance of ties between a particular sector and the overall economy through, for instance, labour market and other multiplier effects such as induced investment in input use and technological change, which may make certain high value crops such as horticulture a promising growth strategy despite their current small base (Diao and Dorosh, 2007). However, some studies provide evidence on the increasingly stringent health standards on agricultural imports into developed countries, potentially hampering access by smallholders (Asfaw, 2007; Okello *et al.*, 2008).

Yet, other evidence suggests that currently smallholders do not often participate much in staple food markets and their overall market share is very low (Jayne et al., 2005). Jayne et al. (2005) found that the top 2% of commercial farmers sold about 50% of observed marketed maize in Kenya, Mozambique and Zambia. Ellis (2005) also shows that farmers in semi-arid areas of Africa have very low proportions of output marketed. Further complicating the picture is evidence of growing participation of smallholders in horticulture, dairy, and tree crops, and a shifting away from staple food production as farm sizes shrink (see evidence on Kenya by Jayne et al. (2005). This is due to the low prices received for staple foods and farmers' desires to increase their returns. Thus there appear to be divergent trends on the demand and supply side: demand trends which may be creating greater opportunities for staple foods in domestic markets and supply trends which suggest an interest of farmers to diversify away from lower value staple food crops. Few studies appear to have focused specifically on market participation and poor farmers in Kenya. Jayne et al. (2005) and Jayne et al. (2004) investigated relationships between land holdings, market participation, and incomes. They found that most smallholders did not sell cereals and in fact were net buyers of cereals. The size of land holding was also found to be highly correlated with income, including crop income and livestock income. This shows that the land-poor are not benefitting from markets nearly as much as those with more resources. Yet, an interesting finding is that even the land poor households count on crop production for a sizeable amount of their household income (where crop income is defined as net value of production) meaning that they do not largely turn their backs on agriculture and seek predominantly off-farm livelihoods.

In terms of understanding the constraints to market participation and the types of interventions that can overcome these constraints, a number of studies have been done. Barrett (2008) stresses the importance of distinguishing location level constraints that tend to influence participation at a meso or community scale from household level constraints that influence participation across households within a given location. Among the types of constraints, others have differentiated between transactions costs, risks, and resources (e.g. skills, land, capital) which all may manifest themselves at a meso or household level (e.g. Bijman et al., 2007, Poulton et al., 2005).

One key point is that interventions may be different for different types of commodity market chains. For example, investments required in vegetables or fruits are different from those in cereals, due to differences in perishability, potential for value adding, and standards, inter

alia. Identifying which agricultural commodities offer the best opportunities for sales, income, and poverty alleviation is thus a critical step in the process of making wise investments.

The main objective of this study is to assess trends in output market participation among and explore potential output market opportunities for the poor agricultural households, and further to identify factors that enhance their participation in output markets. Specific questions we aim to address in our study are listed below:

- What is the extent of participation in output markets by the poor relative to the non-poor?

- What are the key constraints to output market participation by the poor?

- Is market participation important in helping the poor transition out of poverty?

- What factors explain the degree of commercial orientation by the poor?

2. Data and Methods

2.1 Data

The data for this study was drawn from the Tegemeo Agricultural Policy Research and Analysis (TAPRA) panel data set collected by Tegemeo Institute of Egerton University with support from the United States Agency for International Development (USAID). The TAPRA dataset was collected over a ten year period (1997-2007) and was obtained through rural household surveys covering 24 administrative districts, 39 divisions and 120 villages using structured questionnaires. The data was classified into 8 agro-regional zones based on existing agro-ecological zones and population density[1]. Detailed information on land use, crop production, livestock and livestock products, off-farm activities, demographic characteristics, consumption, food security and asset endowment were collected.

This current study is based on 1,275 households and covers the 1999/00, 2003/04 and 2006/07 cropping years (hereafter referred to as 2000, 2004 and 2007, respectively). The distribution of the sampled districts and interviewed households across various agro-regional zones is presented in Table 1. The agro-regional zones represent differing agricultural potential with the Lowlands having the lowest potential, Western transitional and Marginal rain shadow represent medium potential while the Highlands and the High potential maize zone have the highest agricultural potential.

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[1]Refer to Argwings-Kodhek (1997) for a detailed discussion on the sample design

Table 1: Distribution of sampled districts by agro-regional zones

Agro-regional zone	Districts	No. of households
Coastal Lowlands	Kilifi, Kwale	75
Eastern Lowlands	Machakos, Mwingi, Makueni, Kitui, Taita-Taveta	145
Western Lowlands	Kisumu, Siaya	153
Western Transitional	Bungoma (lower elevation), Kakamega (lower elevation)	148
Western Highlands	Vihiga, Kisii	129
Central Highlands	Nyeri, Muranga, Meru	242
High-Potential Maize Zone	Kakamega (upper elevation), Bungoma (upper elevation) Trans Nzoia, Uasin Gishu, Bomet, Nakuru, Narok	346
Marginal Rain Shadow	Laikipia	37
Overall sample		**1275**

2.2   Methods

Analytical methods

We use standard descriptive statistics to show trends and patterns in input and output market participation over time. The analysis has been disaggregated by poverty status of the household for comparison purposes. We estimate output supply functions to determine factors that enable small scale farmers to participate in the respective output markets. We explore factors that determine whether a household sells all or some of their farm production in the market.

Various studies on small holder market participation have mainly modelled both/either output and/or input market decisions as a two-step decision process. This is based on the assumption that households make two separate decisions; one involves the decision to participate in the market or not and secondly the level of participation. These studies have used either the sample selection model of Heckman (1979) (Makhura, et al., 2001; Boughton, et al., 2007; Alene at al., 2008) or the two tier/ hurdle models (Omiti, et al., 2009).

The sample selection model is ideally used to deal with non-random samples as a result of survey design, non-response on survey questions, sample attrition or the specific attributes of the variable being analyzed. The sample selection model of Heckman (1979) was based on wage offer functions given that some wage data was missing due to the outcome of another variable – labour force participation[2]. In this case, usually known as *incidental truncation*, it is important to account for the non-random nature of the sample using a selection model. It would be erroneous to equate these missing observations to zero as would be the case under corner solution outcomes[3] (discussed later). The Heckman type models deal with such a sample selection problem by computing a selection term from the first equation (selection

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[2] Not possible to collect wage data on all persons of working age since some were not working at the time of the survey.

[3] See details of this discussion in Wooldridge (2002) pp 562-3.

model) and including it as a regressor to correct for self selection in the second stage regression involving observations from the selected sample. In other words, as indicated by Wooldridge (2002), the selection bias is viewed as an omitted variable in the selected sample which is corrected by this procedure.

The two tier/hurdle models are a type of corner solution outcome (sometimes referred to as censored regression model). These models define an initial discrete probability of participation model. Conditional on participation $(y > 0)$, a second decision is made on the intensity of participation. Originally, such models were estimated using the Tobit model that accounts for the clustering of zeros due to non-participation. However, a major limitation with the Tobit model is that it assumes that the same set of parameters and variables determine both the probability of market participation and the level of transactions. A two-step model however relaxes these assumptions by allowing different mechanisms to determine the discrete probability of participation and the level of participation. These models allow for a separation between the initial decision to participate $(y > 0 \text{ vs } y = 0)$ and the decision of how much y given $(y > 0)$. In this case, it is assumed that some right hand side variables may affect differently the decision to participate at all and the decision on the level of participation.

The first step in a two-tier model involves a Probit estimation while the second stage can take different functional distributions. The simplest two step model for a corner solution outcome assumes that conditional on $y > 0$, $y \mid x$ follows a lognormal distribution (second stage).

$$P(y = 0 \mid x) = 1 - \Phi(x\alpha) \tag{2.1}$$

$$\text{Log}(y) \mid (x, y > 0) \sim Normal\ (x\beta, \delta) \tag{2.2}$$

A most commonly used two tier model is the double hurdle of Craig (1971). In this model, the second stage is defined by a truncated normal distribution instead of the lognormal distribution described above. The main advantage of the truncated normal distribution over the lognormal is that it nests the usual Tobit Model thus allowing us to test the restrictions implied by the Tobit hypothesis against the two step model (Wooldridge, 2002, pp 536-38). The double hurdle model can thus be denoted by:

$$P(y = 0 \mid x) = 1 - \Phi(x\alpha) \tag{2.3}$$

$$\text{Log}(y \mid x, \theta) = 1(y = 0) \ln\left[\Phi\left(\frac{x\beta}{\sigma}\right)\right] + 1(y > 0)\left\{\ln\left[\frac{\phi\left(\frac{x\beta}{\sigma}\right)}{\Phi\left(\frac{x\beta}{\sigma}\right)}\right] + \ln\left[\frac{1}{\sigma\sqrt{2\pi}}\exp\left(-\frac{1}{2\sigma^2}(y - x\delta)^2\right)\right]\right\}$$

$$\tag{2.4}$$

Tobit hypothesis

$\beta = \delta/\sigma \rightarrow$ Tobit

$\beta \neq \delta/\sigma \rightarrow$ Double Hurdle

The main issue between a sample selection model and a corner solution model is data observability. For corner solution problems, all data is observed and non-participation implies that some economic agents have made the optimal choice of a corner solution i.e. $y = 0$.

Examples here include charity contribution, labour supply decisions, expenditure on research and the like. According to Wooldridge (2002) pp 520-21, it is important to avoid emphasizing on the latent variable y^* when dealing with corner solution problems since our variable of interest, y is observed.

In sample selection problems, and more precisely in cases of incidental truncation, some part of the dependent variable is not observed as a result of the outcome of another variable. In this case, it is erroneous to infer a zero for non-participation and any estimation based on the selected sample would be biased unless we account for those agents who never participated or whose data is missing through the correction term as described above.

From the above discussion and given the nature of the problem in this study, we adopt the two step method advanced by Craig (1971), usually known as the double hurdle model to model output market participation decisions. In this, we assume that non participation is a purely economic decision by households not to participate in the market.

The estimated double hurdle model for market supply thus takes the following specification:

$$P(Y_1 = 1) = P(Q_s > 0) = X_1 \alpha + \varepsilon \qquad \text{(market participation model)} \qquad (2.5)$$

$$Q_s = Z_1 \beta + \mu \qquad \text{(intensity model)} \qquad (2.6)$$

Equation 2.5 defines the market participation model where Y_1 takes the value of one if a household made any positive sales to the market and zero if no sales were made. Q_s is the proportion of quantity sold (or alternatively might represent the quantity sold or value sold) and X_1 and Z_1 define factors that affect the discrete probability of participation and intensity of participation respectively.

Variable description

Factors that may influence a household's participation in output markets are grouped into five categories: demographic characteristics and human capital; physical resource endowments; distances to markets and information; membership in groups; output prices; and agro-ecological potential. These factors are discussed below, where direct and indirect indicators for transaction costs are printed in bold.

Demographic characteristics and human capital: Included under this category are gender, age, education of household head and dependency ratio.[4] Gender of household head is expected to capture differences in market orientation between males and females with males expected to have a higher propensity to participate in markets than females. Age of household head is an indicator of experience in farming. It is expected that higher age, and therefore, more experience in farming will improve orientation to market participation. On the other hand, experience can also be expected to be negatively associated with market participation, as older household heads (up to a certain maximum) tend to have more dependents and hence more subsistence production activities (Ehui, et al, 2009). The conventional age squared variable is added. Human capital is represented by formal education of household head. Education enhances the skill and ability to better utilize market information, which may reduce marketing costs and make it more profitable to participate in the market. Higher dependency ratio is expected to lower the propensity of a household to participate in markets. Household size may explain a household's family labour supply for production activities. This measure, however, assumes that all household members are actively involved in family labour provision. Dependency ratio, which takes care of the level of burden active household members bear, is, therefore, used in this analysis. It is expected that a higher dependency ratio will result in a household consuming a higher proportion of its produce and hence leaving lower proportions for sale. All of these variables can be considered as indicators of household specific transaction costs.

Physical resource endowments: Included in this category are per capita land size, **ownership of transport equipment** and **ownership of communication equipment**. Both of the latter are further proxies for household specific transaction costs. Land may have indirect positive impacts on market participation by enabling farmers to generate production surpluses, overcome credit constraints, where land can be used as collateral for credit, and allow them to adopt improved technologies that increase productivity. Ownership of communication equipment such as telephone, radio and television is expected to have a positive impact on the decision to participate in markets. Ownership of transport equipment such as bicycles, motorcycles and vehicles is expected to have a positive impact on market participation by reducing the cost of transporting inputs from the market to the farm and output from the farm to the market.

Distances to service and infrastructure: **Distances to tarmac road and extension service** are included to capture the role of travel costs in influencing market participation. It is expected that longer distances increase travel time and travel costs, which impact negatively on market participation. These are location specific and to a lesser extent household specific measures of transaction costs.

Membership in groups: **Participation in farmer groups increases** a household's access to information important to production and marketing decisions. Many farmer groups also engage in group marketing as well as credit provision for their members. It is expected that

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[4] A household's dependency ratio is calculated by dividing the number of individuals under 15 years of age plus the number of individuals over 64 years of age by the number of individuals from 15 to 64 years.

membership in groups will positively impact on market participation. This may be a measure of household specific as well as location specific transaction costs.

Output prices: District median prices for various crops and milk are used. For crops grouped in one category, the simple average of the district median prices for the individual crops is used. District median prices were constructed from the actual prices reported by the households that sold produce. Prices are indirect indicators of location specific transaction costs, reflecting cost of commerce and integration of the local market in the national/ regional market. Prices could also constitute indirect measures of crop specific transaction costs. For instance, crop characteristics such as perishability might make prices of such crops to fluctuate differently from those of storable crops. Higher output price acts as an incentive to sell. Output price is, therefore, expected to have a positive impact on market participation.

Agro-regional zone dummies were included in the analyses to account for differences in agricultural potential across the zones. The Lowlands have the least agricultural potential. Western transitional, Western highlands and Marginal rain shadow can be said to be medium potential while Central highlands and High potential maize zone have the highest agricultural potential. It is expected that market participation would be lower in marginal agricultural potential zones.

To account for variations across the survey years of 2000, 2004 and 2007, year dummies were included using 2000 as the comparison year.

Commodity Categories

Participation in maize, vegetables, fruits and milk (cow milk) markets was considered in this study. Maize is the main staple crop in Kenya widely grown in virtually all agricultural regions of the country. The category for vegetables includes kales (*sukuma wiki)*, onions, cabbages, tomatoes and cowpeas leaves while in the fruits category are avocadoes, mangoes and pawpaw among others. Maize is not perishable and can be stored for future consumption or marketing. Vegetables, fruits and milk, on the other hand, are highly perishable and must be consumed or sold off a few hours or days after harvesting/production. This makes market access for vegetables, fruits and milk critical for the producing households.

Model estimation

As discussed earlier, the output supply functions are estimated using the double hurdle model of Craig (1971) involving a Probit model for the first stage and truncated normal regression for the second stage. The two stages of the double hurdle are estimated separately based on the assumption that the respective error terms (ε and μ; η and υ) are not correlated.

3. Results and Discussion

Descriptive analyses on the characteristics of the poor households and their use of inputs and participation in output markets are presented and discussed in this section. Results of the econometric estimation of output market participation are also presented and discussed.

3.1   Socio-economic Characteristics of Households

This sub-section presents a discussion on socio-economic characteristics the poor households. Characteristics of the non-poor households are included for comparison purposes. The level of household income per adult equivalent was used as the basis for defining a household as poor or non-poor. Household income comprised of crop income (gross value of crop production less input costs); livestock income (gross value of livestock products plus sales of live animals less purchases of live animals plus input costs); salaries for all household members; business income for all household members; income from informal labour employment for all household members; and remittances and share dividends received by all household members. To account for differences in the size of households, adult equivalents (see Annex 1) categorization was used to get household annual income per adult equivalent, which was converted into monthly values by dividing by 12. The resulting monthly income per adult equivalent for each household in each of the three years was compared with nominal poverty threshold for that year: Ksh 1,347/month in 2000; Ksh 1,490/month in 2004; and Ksh 1,598/month in 2007. The nominal poverty lines for the respective years were computed by linear extrapolation of the Kenya rural poverty lines for 1997 (Ksh 1,239) and 2006 (Ksh 1,562) as provided by the Kenya National Bureau of Statistics. A household was defined as poor in a particular year if its monthly income per adult equivalent was below the poverty threshold and non poor if its income per adult equivalent was at par with or above the poverty threshold for that year. The proportion of poor households declined from 42% to 38% between 2000 and 2007 (Table 2). This decline was statistically significant. The decline in poverty rate between 2000 and 2004 was, however, statistically insignificant. The declining trend in poverty is generally consistent with that observed at the national level over the same time period. Regional differences, however, exist in the distribution of poverty. It is observed that the proportion of poor households is highest in the Western and Coastal Lowlands and Western Highlands and lowest in the Central Highlands. Western and Coastal Lowlands are among the regions with low agricultural potential.

Table 2: Percent of poor households

Zone	2000		2004		2007	
	No. of hh	%	No. of hh	%	No. of hh	%
Coastal Lowlands	45	60.0	48	64.0	39	52.0
Eastern Lowlands	60	41.4	42	29.0	57	39.3
Western Lowlands	118	77.1	103	67.3	89	58.2
Western Transitional	55	37.2	77	52.0	68	45.9
High Potential Maize Zone	128	37.0	129	37.3	119	34.4
Western Highlands	69	53.5	84	65.1	66	51.2
Central Highlands	45	18.6	41	16.9	32	13.2
Marginal Rain Shadow	19	51.4	7	18.9	9	24.3
Overall Sample	**539**	**42.3**	**531**	**41.6**	**479**	**37.6**

Demographic characteristics

The demographic characteristics considered are education, gender and age of household head and household size and dependency ratio. Dependency ration was computed as the ratio of the number of household members aged below 15 years and those aged above 64 years to the number of household members aged from 15 to 64 years.

The proportion of household heads under each of the broad education categories is presented in Table 3. In the overall, over 70% of the households were headed by persons with at least primary level of education. Approximately 20% of the household heads had secondary education while only slightly over 5% of the heads had post-secondary education. The proportion of household heads with no formal education averaged 20% across the three years. Among the poor and non-poor households, a closely similar distribution in education as with the overall sample is observed. However, a higher proportion of the poor has no formal education while a lower proportion has secondary education compared to the proportions among the non-poor households. This reveals the clear disadvantage that the poor household heads have with respect to education.

Table 3: Proportion of households by education category, gender and age of household head, household size and dependency ratio

	Year	Income poor	Income non-poor	Overall sample
Education level (% of hhs)				
No education	2000	27.3	13.9	19.5
	2004	26.4	16.1	20.4
	2007	25.9	16.1	19.8
Primary education	2000	57.7	50.1	53.3
	2004	56.3	48.8	51.9
	2007	57.0	50.5	52.9
Secondary education	2000	13.7	27.0	21.4
	2004	15.4	23.7	20.2
	2007	15.0	23.6	20.4
Post secondary	2000	1.3	9.0	5.7
	2004	1.9	11.4	7.5
	2007	2.1	9.8	6.9
Gender (% of female)	2000	15.2	9.4	11.8
	2004	26.6	15.9	20.3
	2007	31.7	18.6	23.5
Age (Years)	2000	55.0	52.7	53.7
	2004	57.1	56.0	56.5
	2007	58.9	58.5	58.7
Size (No. of residents)	2000	7.2	6.2	6.6
	2004	6.8	5.5	6.0
	2007	6.8	5.2	5.8
Dependency ratio	2000	0.9	0.8	0.8
	2004	0.9	0.7	0.8
	2007	0.8	0.7	0.8

The percent of female headed households more than doubled between 2000 and 2007, with the percent among poor households consistently higher than among non-poor households.

The mean age of household head increased between 2000 and 2007, the sample being a panel. The heads' ages for the poor and non-poor households show no significant difference. In the overall, the mean household size declined from seven to six between 2000 and 2007. The mean size of poor households is larger than that of the non-poor across all the years. Dependency is also higher in the poor than non-poor households.

Household Income

In the overall, the annual household income per adult equivalent increased from Ksh. 23,462 in 2000 to Ksh. 47,584 in 2007 (Table 4), a trend that is also observed among both the poor and non-poor households. However, the poor's income levels are significantly lower than those for the non-poor households; the non-poor's income levels are about five times those of the poor. This indicates that the poor really cannot productively engage in farming activities given the limitations they are likely to face in acquiring productivity enhancing inputs.

Table 4: Household annual mean income and shares of income components

	Year	Income poor	Income non-poor	Overall sample
Total income (Ksh)	**2000**	55,200	236,039	159,590
	2004	60,035	249,532	170,612
	2007	72,922	262,029	190,984
Income per adult equivalent (Ksh)	**2000**	7,389	35,171	23,426
	2004	10,784	59,934	39,464
	2007	13,423	68,140	47,584
Shares of income components (%)				
Crop	**2000**	49.5	48.7	49.0
	2004	47.5	42.8	44.7
	2007	46.5	44.8	45.4
Livestock	**2000**	18.8	18.1	18.4
	2004	20.6	20.3	20.4
	2007	17.7	19.6	18.9
Businesses & Informal labour	**2000**	18.5	14.6	16.1
	2004	16.0	14.8	15.3
	2007	22.5	16.6	18.6
Salaries and & Remittance	**2000**	13.2	18.7	16.5
	2004	15.8	22.1	19.7
	2007	13.3	18.9	17.0

The pattern in the share of income components shows that crop enterprises generally account for the largest share in household income, but has declined from 49% to 45% between 2000 and 2007. The share of business and informal labour activities has gone up by about three percentage points during the same period. A similar trend is also observed between the poor and non-poor households. However, the contribution of crops to household income is higher (46-49%) among the poor households compared to the non-poor households (43-49%). The share of businesses and informal labour activities is also higher among the poor than non-poor households, and has increased more among the poor households. The share of salaries and remittance, in the contrary, is higher among the non-poor households.

Combined, the farm (both crops and livestock) is the most important livelihood source for the households; it contributes to over 68% and over 66% to the poor and non-poor households' income respectively. After agriculture, the poor rely more on businesses and informal labour activities, which is essentially the informal rural sector, while their non-poor counterparts rely more on income from formal employment sector. Developing agriculture and the informal rural sector would be key intervention areas for helping the poor out of poverty.

Household Land Size

On average, the sampled households owned six acres of land (Figure 1). The poor households owned smaller land sizes than their non-poor counterparts. It should also be noted that household land size generally declined between 2004 and 2007, indicating increasing pressure on land among the agricultural households, perhaps as a result of frequent sub-division. These results suggest that the income poor households also double as being land poorer relative to their non-poor counterparts. With smaller land sizes, the only hope for the poor households to make any meaningful gains from agriculture lies in improving productivity of their land and having assured market for their produce.

Figure 1: Mean household land size
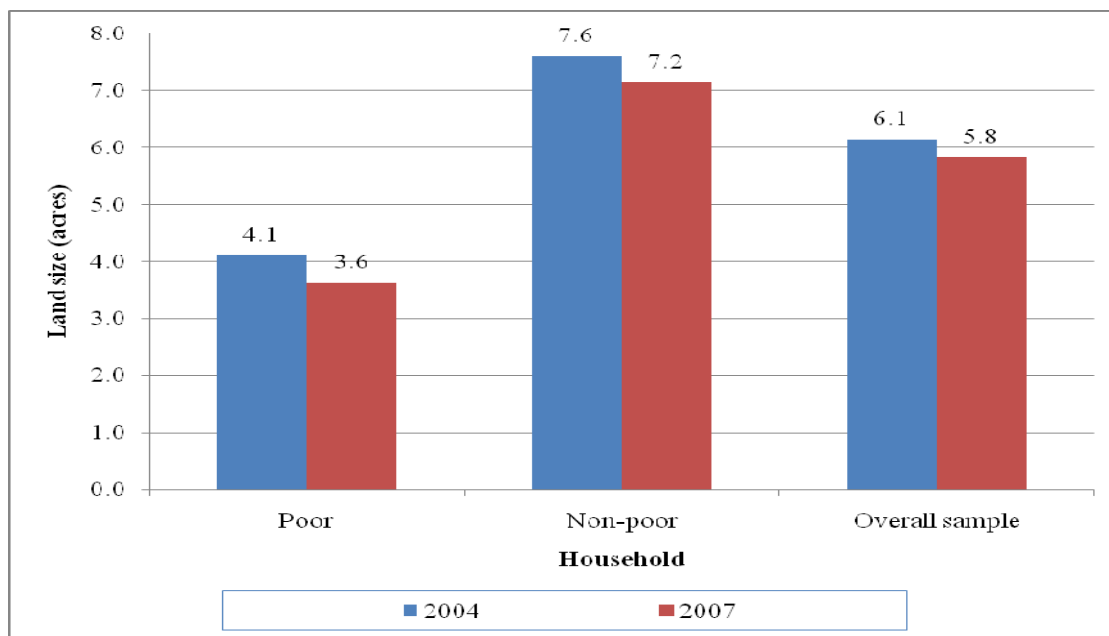

Household Assets

The mean value of household assets is presented in Figure 2. Three observations are made. First, the value of household assets generally increased between 2000 and 2007 for all households, implying that households allocate some of their incomes to accumulating assets, given that household income also increased during this period. Secondly, the increase in asset

values between 2000 and 2007 is lower for the poor than non-poor households. Lastly, mean asset value for the poor is significantly lower than for the non-poor households.

Figure 2: Mean value of household assets
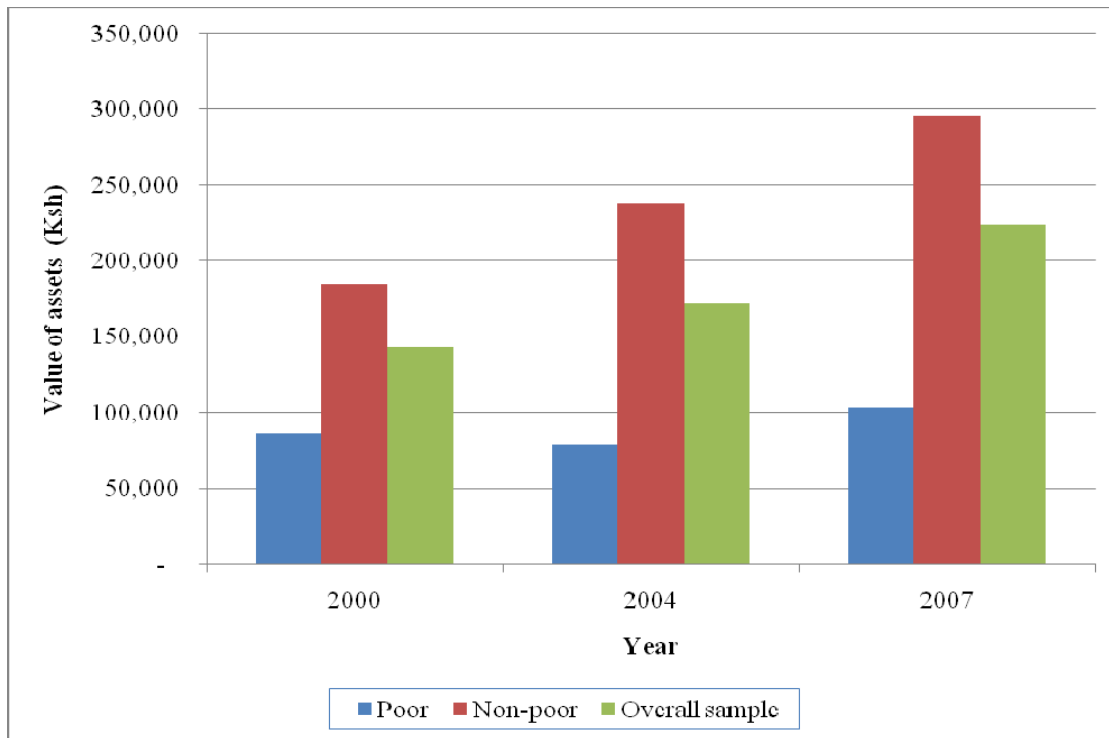
Use of Credit and Membership in Groups

Availability of reliable and affordable credit to farmers is of critical importance in strategies aimed at improving their production and marketing capacity. Collective action by farmers can allow stronger bargaining power in the market for inputs and outputs and thus contribute to achieving economies of scale. It also provides a platform for sharing information that may be helpful in production and marketing activities by the farmers. Trends in the proportion of households that used credit and the proportion with membership in farmer organizations/groups are presented in Figure 3. In the overall, the proportion of households that used credit decreased between 2000 and 2004, and then rose in 2007 to reach just over 50%. This trend is mirrored among both the poor and non poor households. However, a higher proportion of non-poor than poor households used credit; about 68% versus 41% in 2007. This gap may suggest more limited access to credit by the poor households. A study by Kibaara (2006) found that few credit providers were willing to lend to agriculture, and that supply of agricultural credit was skewed towards the high potential agricultural regions served by mainly commodity based credit providers and cooperatives.

In the overall, the proportion of households belonging to farmer organizations/groups remained over 70% between 2000 and 2007. Across all the years, a higher proportion of non-poor than poor households had membership in groups, suggesting less collective action among the poor than non-poor households.

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Figure 3: Proportion (%) of households using credit and belonging to groups
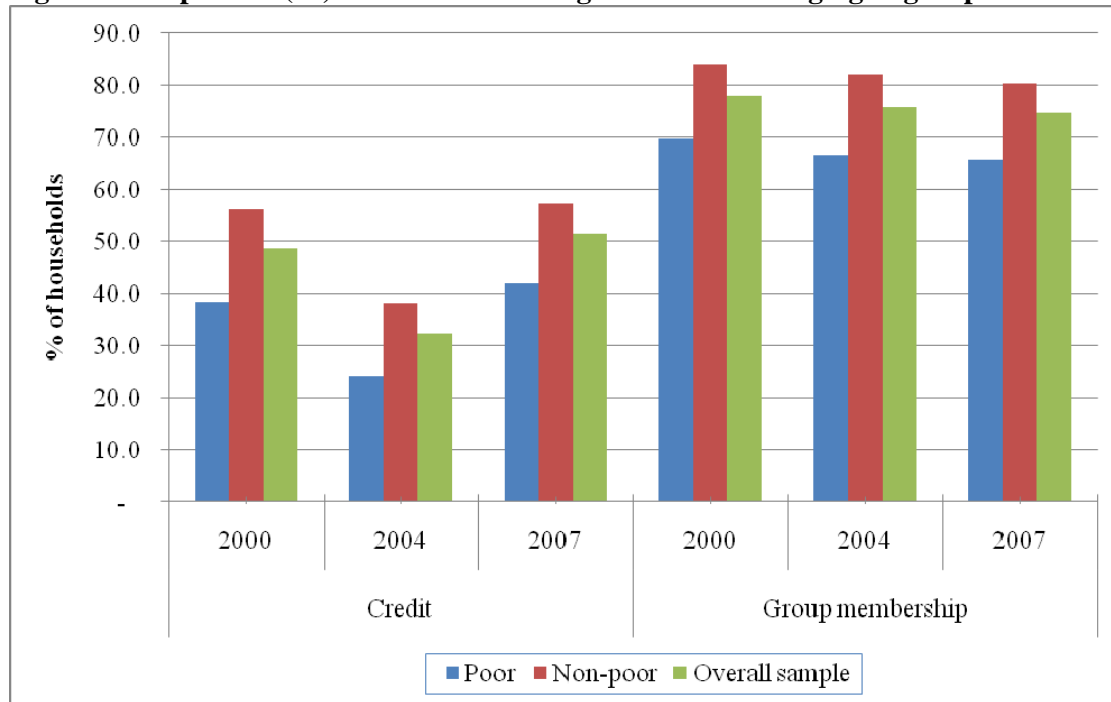
3.2   Market Participation

Production Trends and Patterns

Kenya's agro-ecological conditions are varied and this dictates the kinds of agricultural enterprises in which farmers engage as well as performance of the enterprises. However, maize, vegetables, fruits and dairy are enterprises that are widely spread in many agro-ecologies of Kenya. The proportion of the sampled households engaged in these enterprises, volume of production and the importance of each of the crops enterprises in the households' total value of crop production across the three years are presented in Table 5. In the overall, maize is produced by over 95% of the households across the three years, indicating the importance of the enterprise to the majority of Kenyan rural households. Vegetables are produced by over 85% and fruits by over 80% of the sample households. Approximately 68% of the sample households engage in dairy production. Between the poor and non-poor households, the proportion of households engaged in maize, vegetables and fruits enterprises does not show significant variation. For dairy, it is observed that just over half of the poor households compared to over 77% of the non-poor households are engaged in the enterprise.

On the volume of production, the overall pattern indicates that poor households compared to their non-poor counterparts produce significantly less of all the three enterprises. The difference in the volume produced between these groups of households may be influenced by differences in resource endowments such as land size and differences in use of productivity enhancing inputs such as fertilizer and improved varieties as observed earlier.

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Table 5: Percent of households producing various enterprises, volume of production and percent contribution to total value of crop production

Commodity	Year	% producing			Volume (kg) of production			% contribution to total value of crop production		
		Poor	Non-poor	Overall sample	Poor	Non-poor	Overall sample	Poor	Non-poor	Overall sample
Maize	**2000**	94.4	97.1	96.0	776	2,691	1,895	33.6	27.0	29.8
	2004	97.6	98.8	98.3	935	2,405	1,797	36.1	29.3	32.1
	2007	98.1	98.2	98.2	1,244	2,453	1,999	40.9	30.0	34.1
Vegetables	**2000**	81.8	92.4	87.9	425	1,700	1,198	11.0	12.0	11.6
	2004	94.7	97.4	96.3	549	1,635	1,190	13.5	12.7	13.0
	2007	92.9	93.5	93.3	481	1,353	1,027	12.0	11.6	11.8
Fruits	**2000**	73.8	80.0	77.4	653	1,247	1,008	11.1	6.6	8.4
	2004	81.4	83.3	82.5	503	1,195	911	9.0	6.7	7.6
	2007	80.0	82.3	81.4	482	757	656	7.7	5.3	6.2
Milk	**2000**	55.8	78.7	69.0	520	2,055	1,406			
	2004	52.5	80.6	68.9	527	2,510	1,684			
	2007	53.2	77.8	68.5	499	2,220	1,573			

Various crop enterprises have various weights in terms of their contribution to total value of crop production. Among the three crops, maize has been the most important crop enterprise in terms of contribution to total value of crop production across the three years. The share of maize in the total value of crop production has in fact been on the rise. The contribution of vegetables has remained in the neighbourhood of 12%. The weight of fruits in total value of crop production has declined from 8% to 6% between 2000 and 2007. The overall pattern and trend is also observed among the poor and non-poor households. However, two observations are made. Firstly, the contribution of maize to total value of crop production is higher and has increased much faster among the poor than non-poor households, suggesting the more dominant importance of maize among the poor than non-poor households. Secondly, the poor have experienced faster decline in the contribution of fruits than have the non-poor households.

Marketing Trends and Patterns

The proportion of households that marketed the various enterprises, mean volume of sales and the extent of sales (measured by the proportion of marketed production) are presented in Table 6. In the overall, there is a general increase in the proportion of households that marketed the various enterprises across the years. As expected, vegetables, fruits and milk (the perishable commodities) in that order lead in the proportion of households marketing. The proportion of households marketing maize remained below 50%, but increased from 40% to 48% between 2000 and 2007. With respect to poverty, several observations are made. Firstly, a higher proportion of non-poor compared to poor households engaged in marketing of the various enterprises. Secondly, the proportion of poor households marketing maize increased faster than that of the non-poor. This may suggest that maize market is becoming more accessible to the poor. It may also be a reflection of the increased volumes in production (as observed in Table 5), which generated more marketable surplus. Thirdly,

participation in marketing of fruits declined among the poor while it increased among the non-poor households. Finally, the proportion of the poor households marketing milk remained between 32% and 33%, just about half the proportion among the non-poor households.

Table 6: Proportion (%) of households that marketed various crops, sales volume and proportion of marketed production

Commodity	Year	% selling			Volume (kg) of sales			% of production sold		
		Poor	Non-poor	Overall sample	Poor	Non-poor	Overall sample	Poor	Non-poor	Overall sample
Maize	2000	28.7	47.8	39.9	175	1,413	900	9.4	22.7	17.2
	2004	33.4	54.8	46.0	257	1,295	866	11.7	26.1	20.2
	2007	37.9	53.5	47.6	319	1,220	882	12.8	24.3	20.0
Vegetables	2000	52.0	68.2	61.9	202	1,206	811	26.3	38.5	33.7
	2004	62.6	71.7	68.0	276	1,066	742	27.3	37.0	33.0
	2007	55.3	69.4	64.1	219	951	677	26.6	39.1	34.4
Fruits	2000	50.4	54.0	52.5	199	527	395	21.5	27.0	24.8
	2004	53.9	58.9	56.8	185	638	452	24.1	28.6	26.8
	2007	48.7	63.4	58.0	215	431	351	25.5	34.7	31.3
Milk	2000	32.1	64.5	50.8	222	1,142	753	17.0	35.6	27.7
	2004	31.6	67.1	52.3	208	1,510	968	16.1	39.3	29.6
	2007	33.0	67.8	54.7	220	1,411	964	17.1	40.1	31.4

In the overall, marketed volumes of the commodities do not show a clear trend between 2000 and 2007, except for vegetables and fruits where there was a marked decline. The mean volumes marketed for all the enterprises are significantly lower among the poor than non-poor households, a scenario that reflects differences in production volumes as observed earlier. The differences in the mean volumes sold between the poor and non-poor households are particularly large for maize and milk. However, the volume of maize marketed increased among the poor and declined among the non-poor households between 2000 and 2007.

The proportion of households marketing various enterprises and the average volume marketed may mask important information about the extent of participation by the households in the markets for the various enterprises. The extent of market participation can also be captured by looking at the proportion of the quantity produced that ended up being sold for each enterprise. For all the enterprises and across all the years, less than 35% of the production was marketed, with maize registering the least (17-20%) and vegetables the highest (33-34%) proportion marketed. Comparing 2000 and 2007, it is observed that in the overall the proportion of marketed production increased for all the four enterprises. Across poverty status, the proportion of marketed production is lower among the poor than non-poor households for all the enterprises. This again is reflective of the differences in production volumes earlier observed. The differences in the proportion of marketed production between the poor and non-poor households are largest for maize and milk. However, a marked increase in the proportion of marketed production is observed in maize and fruits among the poor and in fruits and milk among the non-poor households between 2000 and 2007.

Market concentration, defined as the distribution of the total volume marketed across the sample households, is presented in Table 7. Generally, it is observed that between 59% and 87% of all marketed volumes for the various commodities were sold by top 20% of households across the three years. The bottom 20% of the households sold less than 2.5% of the marketed volumes for the commodities. For maize, over 70% of the marketed volume was sold by top 20% of the households while the bottom 20% sold less than 1.5%. For vegetables and fruits, over 75% and 65% respectively of the marketed volume was sold by top 20% of the households, while the bottom 20% of the households sold less than 1% for vegetables and 2% for fruits. Milk market is the least concentrated, with the top 20% of the sellers accounting for 59-62% and the bottom 20% accounting for about 2% of the marketed volume. These results indicate that agricultural commodity market participation among the smallholder farmers is dominated by a minority of households; majority of the smallholder farmers are locked in subsistence production.

Table 7: Distribution of marketed volumes of various commodities across the sample

Commodity	Year	Lowest 20%	20%	20%	20%	Highest 20%	Total
Maize	2000	0.5	2.8	4.3	13.3	79.1	100.0
	2004	1.3	3.3	8.5	15.3	71.7	100.0
	2007	1.4	4.3	7.4	14.8	72.1	100.0
Vegetables	2000	0.6	1.9	5.1	14.4	78.0	100.0
	2004	0.6	2.1	5.6	15.1	76.5	100.0
	2007	0.8	3.1	6.0	12.8	77.3	100.0
Fruits	2000	0.9	2.7	6.4	13.6	76.4	100.0
	2004	0.9	3.1	6.1	12.6	77.3	100.0
	2007	1.7	4.8	10.0	17.6	65.9	100.0
Milk	2000	2.2	5.9	9.8	20.0	62.2	100.0
	2004	1.8	6.6	10.8	19.8	61.0	100.0
	2007	2.4	6.0	11.8	20.5	59.3	100.0

Market Participation and Poverty Dynamics

Based on the previous definition of poverty, households were classified into various categories based on their income poverty status in order to explore the relationship between market participation and poverty dynamics. The households that remained in poverty in the three years are categorized as 'always poor' while those whose income levels remained above the poverty line in all the three survey years are classified as 'always non-poor'. The households that 'exited' poverty are those that were poor in 2000 or in both 2000 and 2004 then rose above the poverty line in 2007. On the other hand, households that were not poor in 2000 or in both 2000 and 2004 but became poor in 2007 are classified as having 'descended' into poverty. The 'oscillators' are those households that moved in and out of poverty or vice versa in the three survey years. The interest here is to explore trends in output market participation by the households that exited poverty to provide a snapshot of the role market participation could play in poverty reduction.

Changes in participation in the commodity markets among the households categorised by poverty status is presented in Tables 8. Changes in participation are computed as the

difference in the participation statistics between 2007 and 2000. A positive difference means an increase and a negative difference means a decline in participation. It is observed that among the households that exited poverty there are tremendous and largest increases in both the percent selling and the marketed proportion, compared to the other categories of households. The increase in the marketed proportion among these households is particularly huge for fruits and milk. Among the households that descended into poverty, the percent selling declined for vegetables, fruits and milk and marginally increased for maize. The marketed proportions also declined for all the commodities except fruits where marginal increase is observed. These results point to a strong relationship between market participation and exiting poverty, and indicate the role that expanded access to markets among small holder farmers can play in poverty reduction.

Table 8: Participation in output markets by poverty status

Poverty status	Crop	% producing			% selling			% of production sold		
		2000	2007	Change (2007-2000)	2000	2007	Change (2007-2000)	2000	2007	Change (2007-2000)
All households	Maize	96.2	98.4	2.2	39.9	47.6	7.7	17.2	20.0	2.8
	Vegetables	88.3	93.6	5.4	61.9	64.1	2.2	33.7	34.4	0.7
	Fruits	85.1	89.7	4.6	52.5	58.0	5.4	24.8	31.3	6.5
	Milk	69.0	68.5	-0.5	73.6	79.9	6.2	40.2	45.9	5.7
Always poor	Maize	94.9	98.7	3.8	30.4	32.5	2.1	9.3	10.1	0.8
	Vegetables	83.4	94.5	11.1	51.8	52.3	0.5	26.6	22.8	-3.8
	Fruits	81.7	89.4	7.8	48.0	47.7	-0.3	19.5	24.1	4.6
	Milk	50.2	49.4	-0.8	47.9	53.0	5.1	24.0	26.0	2.0
Always non poor	Maize	97.4	98.5	1.1	51.0	60.0	9.0	25.2	28.7	3.5
	Vegetables	94.3	94.3	0.0	72.3	69.7	-2.6	41.1	42.1	1.1
	Fruits	88.1	89.5	1.4	52.8	62.4	9.6	26.9	34.3	7.4
	Milk	84.2	84.6	0.4	85.9	91.2	5.3	48.1	54.1	6.0
Exited	Maize	93.8	97.8	4.0	25.6	42.8	17.2	9.1	18.0	8.9
	Vegetables	80.9	92.9	12.0	51.1	66.5	15.4	26.1	33.7	7.5
	Fruits	80.6	91.5	10.9	48.8	66.3	17.5	20.6	36.1	15.5
	Milk	61.7	66.1	4.4	60.7	82.0	21.3	32.7	48.7	16.0
Descended	Maize	98.8	97.0	-1.8	42.7	44.1	1.4	18.8	16.6	-2.2
	Vegetables	91.0	92.2	1.2	59.2	59.1	-0.1	34.9	30.9	-4.1
	Fruits	86.4	85.7	-0.7	55.1	51.6	-3.5	26.5	28.1	1.5
	Milk	66.5	58.1	-8.4	75.7	71.1	-4.5	39.6	38.3	-1.4
Oscillated	Maize	95.2	99.5	4.3	38.5	45.5	6.9	15.2	16.6	1.4
	Vegetables	86.2	93.1	6.9	61.1	66.9	5.7	30.3	34.2	3.9
	Fruits	86.3	91.4	5.1	58.9	55.6	-3.3	28.8	30.1	1.3
	Milk	67.0	66.0	-1.1	73.0	74.2	1.2	40.1	41.6	1.4

Factors Influencing Market Participation and Extent of Participation

We discuss econometric estimation results of output market participation among the poor households in this section. Correlates of market participation (whether a household sold) and extent of participation (the proportion of produce sold) are discussed for maize, vegetables, fruits and milk. The discussion focuses on only the variables of interest (gender of household head, land size, membership in farmer groups, ownership of transport and communication equipment, distance variables, output and prices and agricultural potential), which will inform conclusions for this. The probit results on the decision to participate in markets and truncated regression analysis results on the extent of market participation are presented in Table 9.

Table 9: Correlates of decision to participate and extent of participation in markets for selected commodities among poor households

Variable	Correlates of decision to participate				Correlates of extent of participation			
	Maize	Vegetables	Fruits	Milk	Maize	Vegetables	Fruits	Milk
Gender of household head (1=male)	-0.08	0.12	-0.08	-0.12	-0.04	0.02	-0.02	0.01
	(0.84)	(1.30)	(0.81)	(0.97)	(1.38)	(0.58)	(0.96)	(0.61)
Household head age (years)	-0.02	0.00	0.02	-0.05*	-0.00	-0.01	-0.00	0.00
	(1.18)	(0.15)	(1.02)	(1.75)	(0.32)	(1.59)	(0.21)	(0.33)
Household head age squared	0.00	-0.00	-0.00	0.00	0.00	0.00	0.00	-0.00
	(0.90)	(0.39)	(0.91)	(1.43)	(0.31)	(1.28)	(0.30)	(0.40)
Education of household head (1=no education)	-0.06	-0.17*	-0.24**	0.04	0.00	-0.05*	-0.02	0.01
	(0.58)	(1.83)	(2.39)	(0.28)	(0.03)	(1.65)	(0.84)	(0.54)
Education of household head (1=secondary education)	0.14	0.06	-0.05	-0.05	0.02	-0.04	-0.01	0.02
	(1.34)	(0.59)	(0.43)	(0.33)	(0.64)	(1.24)	(0.19)	(0.85)
Education of household head (1=post-secondary education)	-0.06	-0.55**	0.11	0.40	0.20***	0.05	0.02	0.04
	(0.23)	(2.15)	(0.39)	(1.04)	(2.62)	(0.66)	(0.22)	(0.75)
Dependency ratio	-0.09*	-0.07	0.04	-0.01	-0.02	-0.03*	0.00	-0.01
	(1.90)	(1.39)	(1.00)	(0.19)	(1.34)	(1.78)	(0.32)	(0.56)
Per capita land size (acres)	0.00	-0.02	0.11**	-0.02	0.03**	-0.00	0.02*	0.01
	(0.12)	(0.55)	(2.35)	(0.64)	(2.33)	(0.07)	(1.80)	(1.43)
Membership in farmer group (1=yes)	0.23***	0.27***	0.11	0.18*	0.01	0.05**	0.03	-0.00
	(2.78)	(3.39)	(1.30)	(1.70)	(0.42)	(2.08)	(1.07)	(0.02)
Ownership of communication equipment (1=yes)	0.06	0.19*	0.27***	0.25*	0.09**	0.03	0.05	-0.01
	(0.60)	(1.95)	(2.70)	(1.80)	(2.24)	(1.04)	(1.59)	(0.32)
Ownership of transport equipment (1=yes)	0.14*	0.07	-0.06	-0.06	0.04	0.02	-0.00	-0.02
	(1.66)	(0.91)	(0.67)	(0.60)	(1.39)	(0.81)	(0.12)	(0.87)
Distance to tarmac road (km)	0.01**	-0.01*	0.00	-0.02**	-0.00	0.00	-0.00***	-0.00*
	(2.51)	(1.75)	(0.41)	(2.20)	(0.26)	(1.13)	(2.72)	(1.88)
Distance to extension service (km)	-0.00	0.00	-0.00	-0.00	-0.00	0.00	0.00	-0.00
	(0.22)	(0.51)	(0.04)	(0.20)	(0.04)	(1.27)	(0.87)	(0.84)
Commodity price (ksh/kg)	-0.01	0.01*	-0.02	0.04***	0.03***	-0.00	-0.02***	0.00
	(0.31)	(1.69)	(1.06)	(3.26)	(3.00)	(1.30)	(3.33)	(0.36)
Coastal Lowlands dummy	-0.39	-0.19	-0.27	-0.40	0.05	0.10	-0.04	0.15
	(1.64)	(0.98)	(1.39)	(0.69)	(0.40)	(1.41)	(0.64)	(1.21)

Variable	Correlates of decision to participate				Correlates of extent of participation			
	Maize	Vegetables	Fruits	Milk	Maize	Vegetables	Fruits	Milk
Eastern Lowlands dummy	0.17	0.14	0.28*	-0.92***	-0.00	0.07	-0.01	0.00
	(0.86)	(0.81)	(1.66)	(3.38)	(0.05)	(1.15)	(0.13)	(0.04)
Western Lowlands dummy	0.06	0.46***	-0.06	-1.42***	-0.04	0.15***	0.03	-0.01
	(0.34)	(2.82)	(0.38)	(5.85)	(0.52)	(2.66)	(0.67)	(0.34)
Western Transitional dummy	0.60***	0.81***	-0.14	-0.15	0.08	0.13**	-0.03	0.04
	(3.24)	(4.70)	(0.80)	(0.62)	(1.02)	(2.31)	(0.56)	(1.06)
High Potential Maize Zone dummy	1.16***	0.48***	-0.20	-0.32	0.22***	0.10*	0.07	0.02
	(6.77)	(3.08)	(1.22)	(1.47)	(3.15)	(1.92)	(1.50)	(0.50)
Western Highlands dummy	0.54***	0.88***	0.07	-0.92***	-0.11	0.12**	-0.03	0.01
	(3.18)	(5.44)	(0.46)	(3.93)	(1.47)	(2.25)	(0.57)	(0.26)
Marginal Rain Shadow dummy	0.03	0.42	-0.05	0.31	0.08	0.24***	-0.09	0.11**
	(0.09)	(1.37)	(0.12)	(0.86)	(0.65)	(2.63)	(0.81)	(2.09)
Year of survey (1=2004)	0.08	0.24***	0.07	0.08	0.04	-0.08***	0.02	-0.01
	(0.91)	(2.67)	(0.77)	(0.70)	(1.40)	(2.90)	(0.93)	(0.70)
Year of survey (1=2007)	0.23**	0.02	-0.07	0.08	0.06	-0.01	0.11***	-0.01
	(2.06)	(0.19)	(0.74)	(0.67)	(1.46)	(0.41)	(3.95)	(0.24)
Constant	-0.40	-0.71	-0.75	1.47*	-0.19	0.63***	0.49***	0.48***
	(0.59)	(1.22)	(1.20)	(1.74)	(0.79)	(3.50)	(2.61)	(3.30)
Observations	1493	1387	1212	835	496	790	620	499

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

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Gender of the household head neither significantly influences the decision to participate nor the extent of participation in any of the commodity markets among the poor.

Larger per capita land size is significantly associated with a higher probability of participating in fruits market. In addition, per capita land size also positively and significantly influences marketed volumes for fruits and maize. These results indicate the constraints the poor, majority of who happen to have smaller land sizes, face in accessing markets perhaps due to their inability to produce marketable surplus.

Membership in farmer organizations/groups is positively and significantly associated with a higher probability of participating in maize, vegetables and milk markets. After the decision to participate in the market has been made, membership in group does not have significant influence on the volume sold except for vegetables. These results underscore the importance of social capital in accessing markets by the poor smallholder farmers.

Ownership of communication equipment such as radio, television and/or phone is positively and significantly associated with a greater likelihood of participating in vegetables, fruits and milk markets. It also has a positive and significant influence on the amount sold for maize. Ownership of transport equipment is significantly associated with the decision to sell maize. It, however, has no significant influence on the decision about how much to sell of any of the commodities.

Distance to tarmac road, which is an indicator of travel time and cost to the market, shows mixed results both in the model for decision to participate in the markets and in the extent of participation. It is significantly and positively associated with the decision to participate in maize markets and negatively – as expected – and significantly associated with the decision to participate in vegetables and milk markets. This puzzling result can be explained by the characteristics of the commodities, where perishability may possibly be influencing farmers to specialize depending on the relative advantages of their location. After decision to sell has been made, distance to tarmac negatively and significantly influences the amount sold for fruits and milk.

Contrary to expectations, prices for maize and fruits are negatively, albeit insignificantly, associated with the decision to sell. For vegetables and milk, prices have a positive and significant association with the decision to sell, as expected. The influence of prices on the amount sold is significant and positive for maize but significant negative for fruits. A possible explanation for the unexpected behavior of price on market participation could be that many of the households are actually net buyers of food crops and a high price may encourage them to keep as much on the farm as possible to avoid making significant expenditures to buy more food

In comparison to poor households in Central Highlands, poor households in the Western Transitional, High Potential Maize Zone and Western Highlands have a significantly higher propensity to participate in maize and vegetable markets. Also poor households in the Western

Lowlands have a higher likelihood of participating in vegetable markets compared to their poor counterparts in the Central Highlands. Poor households in the Eastern and Western Lowlands and Western Highlands compared to their counterparts in the Central Highlands have a lower likelihood of selling milk. These results suggest that Western Lowlands, Transitional and Highland zones may be productive in vegetables such that their production levels allow for marketable surplus. Efforts in improving the production of vegetables in these regions may be desirable in enhancing greater market participation by the poor households. The amount of maize sold is significantly higher in the High Potential Maize Zone than in the Central Highlands. On the other hand, the poor in Western Lowlands, Transitional and Highland zones, Marginal Rain Shadow and High Potential Maize Zone compared to their counterparts in the Central Highlands sell significantly larger volume of vegetables. For milk, the poor in the Marginal Rain Shadow compared to those in the Central Highlands sell significantly larger volume.

4.   Conclusions

It has been argued that market-oriented production can achieve welfare gains through comparative advantage, economies of scale and regular interaction and exchange of ideas. Unfortunately, some groups, who in particular would benefit from this kind of welfare boost, may be constrained by several factors in their quest to participate in the market for their goods and services. This study set out to assess the extent of market participation by the poor smallholder farmers in Kenya with a view to identifying constraints to market participation among and potential market opportunities for this group of households.

The results from the study reveal differences in market participation across selected commodity groups among the poor and non-poor households. Compared to their non-poor counterparts, the poor households have generally lower market participation for the selected enterprises. Some of the characteristics of the poor households that could partly explain this low market participation include the following:

- Low literacy levels, which could impact on their managerial ability on the farm.

- Small land sizes, indicating that they are not only income poor but also land poor. This constrains them in producing marketable surplus

- Low asset values, indicating that they also experience asset poverty, which compromise their agricultural productive capacity, and consequently limit their ability to exploit available market opportunities

- Low access to credit, which may limit their ability to access inputs to improve their production

- Limited ability to produce surpluses for the market, as observed in the low volumes they produce and sell. This implies low levels of adoption of productivity enhancing inputs such as fertilizers and improved seed varieties

Tremendous increases are observed in market participation for the various commodities among the households that exited poverty. Among the households that descended into poverty, market participation either declined or increased marginally. These results point to a strong relationship between market participation and exiting poverty, and indicate the role that expanded access to markets among small holder farmers can play in poverty reduction.

Results also show that the commodity markets are generally very highly concentrated; the top 20% of the selling households account for over 70% of the marketed volume for maize, vegetables and fruits and about 60% of the marketed volume of milk. This indicates that majority of the smallholders are essentially subsistent and any sales they make are very negligible in volumes to derive any substantial market benefits. Improving production through raising productivity levels need to be considered alongside any measures that are aimed at reducing transaction costs that hinder access to markets by these farmers.

In terms of factors that could enhance market participation for the poor, we find that land size play a significant role, indicating that innovations that enhance the poor's access to land can be instrumental in raising their ability to exploit market opportunities. With diminishing household land sizes, it is also important to focus on interventions that improve land productivity. The results also show that membership in farmer organizations/groups is positively associated with increased market participation. Collective action is important in facilitating access to information and, where the groups deal in financial services, credit. Both credit and information are critical in accessing market opportunities. Therefore, increasing social capital for the poor can be of great value in enhancing the households' access to markets.

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Annexes

Annex 1: Conversion factors for computing adult equivalents

Age	Male	Female
Under 1 year	0.33	0.33
1 - 1.99	0.46	0.46
2 - 2.99	0.54	0.54
3 - 4.99	0.62	0.62
5 - 6.99	0.74	0.70
7 - 9.99	0.84	0.72
10 - 11.99	0.88	0.78
12 - 13.99	0.96	0.84
14 - 15.99	1.06	0.86
16 - 17.99	1.14	0.86
18 - 29.99	1.04	0.80
30 - 59.99	1.00	0.82
60 and Over	0.84	0.74

As per the World Health Organization (Jayne and Argwings-Kodhek 1997)