

Determinants of agricultural commercialization among the rural poor: The Role of ICT and Collective Action Initiatives and gender perspective in Kenya

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Abstract: Modernization and commercialization of the smallholder agricultural sector provides the stimulus and impetus to reducing food insecurity in developing countries. This study seeks to fill the gaps in the literature particularly by comprehensive conceptualization of the drivers of commercialization at a household level and across different socio-economic and agro-ecological zonation in the wake of promotion of collective action initiatives and the newly introduced but vastly penetrating ICT tools (mobile phones). The purpose of this study is to highlighting determinants of agricultural commercialization (market participation) by the farm households in Kenya. Specifically, special focus is given to the role played by gender, collective action initiatives and information communication technologies (ICTs) as well as interaction of these factors among the farm households in Kenya. The study uses a Tobit regression model to assess the determinants of commercialization using data of 379 farm households in three different districts in Kenya. The study finds that farmer-specific characteristics, farm-specific and capital endowment variables influence the commercialization process. Female farmers are constrained from market participation; however, collective action initiatives (farmer groups) as well as use of ICT tools (mobile phones) significantly and positively influence their commercialization. The implications for policy and practice are discussed.

1. Introduction

Modernization and commercialization of the smallholder agricultural sector provides the stimulus and impetus to reducing food insecurity in developing countries. This has been a subject of considerable focus among policy-makers and development specialists not only at the level of farming households but also at the level of national and international policies [Om98]. The agricultural sector plays a critical role in the Kenyan economy especially to millions of rural populations that depend on small-scale agriculture for food and income. The sector contributes to about 24 percent of the Gross Domestic Product (GDP) and supports up to 70 per cent of population that engage directly in it [Fa04].

Smallholder agriculture remains the major engine of rural growth and livelihood improvement in Kenya [Ha05]. Meeting the challenges of eliminating food insecurity and improving rural incomes in Kenya will require transformation and transition out of the semi-subsistence, low-input, low-productivity farming systems that currently characterize much of rural Kenya [Gu07].

Agricultural commercialization can broadly be looked at from two perspectives: a rise in the share of marketed output; or of purchased inputs per unit of output [JGH09]. In essence, agricultural commercialization can occur on the output side of production with increased marketed surplus, or on the input side with increased use of purchased inputs. On the output side, commercialization is measured as a ratio of the value of agricultural sales to the value of agricultural production while it is measured as a ratio of the value of inputs acquired from market to the value of agricultural production on the input side [ibid]. Technically, agricultural commercialization entails a shift from subsistence production to a more complex market-based production and consumption system that leads to the strengthening of the linkages between input and output sides of a market [JGH09].

A number of factors have been identified to influence agricultural commercialization. These factors can be grouped into long-term or short term and can either facilitate or impede the commercialization process [FQ12]. Some examples of long-term factors are population growth and rural infrastructural development [Ba08]. Some studies show that population growth can increase the quantity of marketable surplus [Ba08] while other studies find that rural infrastructure affected agricultural commercialization through its impact on prices, diffusion of technology, and efficient combination of inputs and outputs [Ba08]. Further, studies highlight that development of infrastructure increases the extent of use of modern technology, such as irrigation, improved varieties and fertilizer [Ok12]. The work of Strasberg et al [St99] found that price and distances to a paved road (an indication of travel costs) significantly reduced fertilizer use among farmers [St9]. Their study summarizes that a household's decision to commercialize can be said to depend on the sum of the consumption effects and income effects. While households whose food production hardly meets their consumption requirements are expected to be less commercialized, incomes earned from marketing of produce may significantly facilitate input acquisition and hence increased productivity and in turn improve commercialization [To06].

Recent academic pursuits point out that agricultural commercialization is also determined by transaction costs faced by farmers as they participate in the market [KON12]. It is indeed acknowledged that a low proportion of products exchanged in the market reflect the existence of high transaction costs [Ab10]. In many instances, market participation declines as a result of inhibitive transaction costs [Ok12].

Gaps in the literature still exist particularly in comprehensive and concurrent conceptualization of the drivers of market participation and extent of market participation at a household level and across different socio-economic and agro-ecological zonation. It is also imperative to undertake a comprehensive assessment of the role of collective action initiatives and newly introduced but vastly penetrating ICT

(mobile phones). This study seeks to fill these gaps particularly by comprehensive conceptualization of the drivers of commercialization at a household level and across different socio-economic and agro-ecological zonation in the wake of promotion of collective action initiatives and the newly introduced but vastly penetrating ICT (mobile phones). The purpose of this study is to highlighting determinants of agricultural commercialization (market participation) by the farm households in Kenya. Specifically, special focus is given to the role played by gender, collective action initiatives and information communication technologies (ICTs) as well as interaction of these factors among the farm households in Kenya. The study hypothesizes that: Collective action and use of ICTs significantly increases market participation.

2. Methodology

2.1. Empirical framework

The extent of market participation (agricultural commercialization) in this study refers to the ratio of the total value of crop sales to the total value of crop production. The index is therefore a value bound between 0 and 1 and cannot fall outside of this range; 0 indicates that a household did not participate in the crops output market at all while 1 indicating that a household is completely commercialized. Tobit model, originally formulated by Tobin [To58] and commonly used in adoption studies, is commonly used in such instances where the response variable is censored. Following [Wo02] the Tobit model explaining drivers of extent of market participation household commercialization can be formulated as:

$$Y_i = \beta_0 + \beta_i X_i + u_i \quad i = 1, 2 \dots n \quad (1)$$

Where; Y_i is the dependent variable (commercialization index), β_0 is the constant term, β_i is the parameters to be estimated, X_i is a matrix of the explanatory variables that include:

- 1) Farmer specific variables: log of age, gender, and occupation
- 2) Farm specific variables: distance to output market, number of crop enterprises, household size and distance to local market
- 3) Capital endowment variables: Physical asset (log of crop income, log of assets, log of land, use of ICT tool), human capital (education level, years of farming experience) and social capital (membership in collective action initiatives – farmer groups)
- 4) Location variables: District of survey: Kirinyaga, Bungoma and Migori districts

The implicit functional form to assess the drivers of extent of participation in markets is given by:

Extent of participation = f (gender, age, occupation, distance to market,, number of enterprises, household size, crop income , use of ICT, assets, area cultivated, education, farming experience, group membership, district) + e (2)

2.2. Study area, sampling procedure and data

This study was part of a wider project implemented by Electronic Agricultural Research Network in Africa (eARN-Africa). The aim of the project was to evaluate the effectiveness of ICTs in helping smallholder farmers commercialize and was implemented in three different districts each in a separate province. These include Kirinyaga (Central province), Bungoma (western province) and Migori (Nyanza province). These districts were characterized by poor access to markets by small farmers and reliance on agriculture. The study districts were selected to represent diverse agro-ecological zones, socio-economic environment, cultural diversity and varying production systems. For example, Kirinyaga district is considered a high potential area with export oriented export crops (French beans, baby-corn and Asian vegetables). Bungoma district on the other hand grew mainly maize with sugarcane while Migori is considered low potential area with main crops grown being maize and tobacco. Thus the choice of the districts presents differing levels of commercialization. Kirinyaga district is mainly inhabited by people of Kikuyu ethnic group while Bungoma and Migori districts are mainly inhabited by Luhya and Luo ethnic groups respectively.

Sampling procedure was done in three stages. First, the three districts (project districts) were purposely selected. Second, in each of the district, a location was randomly identified. A list of all farm households was then drawn with the help of local administration (village elders and area agricultural extension officers). Third, the respondents were then randomly sampled from the lists. A total of 379 farmers were interviewed in this study. The data collected included household characteristics, socio-economic indicators, household assets, information sources, ownership and use of mobile phones, sources and uses of income, among others. The household survey was conducted during March and April of 2010.

3. Results and Discussions

3.1. Selected characteristics of study respondents

We present results of these selected variables in Table 1. Results show that about 53 per cent of the sampled households use ICT tools (mobile phones) for agricultural related transactions (communicating with traders and fellow farmers and agricultural extension staff). This was slightly different between male and female headed households. A higher proportion of male headed households (74 percent) as compare to 31 percent of female headed households. Similarly about 52 percent of the sampled farmers participated in collective action initiatives (farmer groups or cooperatives) that facilitate agricultural production and marketing process. About 36 percent of female headed household participated in collective action initiatives as compared to twice as many male headed households (69 percent). Lastly, about 45 percent of all sampled households participated

both in collective action initiatives and used ICT tools (mobile phones). This represented about 64 percent and 26 percent of male and female headed households respectively.

Table 1: Summary statistics of selected characteristics

Gender of household head	Use of ICT tools (mobile phones)	Participation in collective action initiatives	Participation in collective action and Use of mobile phones
Male (n=192)	140 (73.8)	132 (68.9)	122 (63.6)
Female (187)	58 (31.1)	68 (36.4)	48 (25.9)
Total (n=379)	198 (52.2)	200 (52.6)	170 (44.9)

Source: Author’s compilation. Numbers in parentheses are percentages of the total.

3.2. Determinants of decision to participate in the markets

The results of the Tobit regression model estimated to assess the determinants of commercialization are presented in Table 2. As shown (by the p-values and highlighted in bold), a number of factors condition participation in markets. Notably, among the farmer-specific characteristics, age and gender significant in influencing commercialization. Specifically, log of age has a positive significant effect on commercialization. However, female household heads were less likely to participation in in the markets.

Among the farm specific variables, distance to bank and the number of crop enterprises grown by the farmer are significant in influencing commercialization. The study finds a negative significant effect of distance on market participation. This finding may suggest that the transaction and opportunity costs associated with time taken to reach markets may outweigh the benefits of market participation. Results further show that, among capital endowment variables, education level, non-farm as well as total farm income positively influence the commercialization process. Among the location variables, the coefficients of dummy variable representing the Kirinyaga district is statistically significant showing that moving from Migori to Kirinyaga increases commercialization.

Collective action (farmer groups) as well as use of ICT tools (mobile phones) significantly and positively affected commercialization. The interaction of these two variables with gender gives a different outcome for the female headed households. Results (model 2) show that participation in collective action significantly increases commercialization of female farmers. Results (model 3) further depict that use of ICT tools improves commercialization of the female farmers. Finally, results (model 4) indicate that female farmers using ICT tools and at the same time operating in collective action initiatives are significantly and positively commercialized.

Table 2: Determinants of commercialization: Tobit results

Variables	Model 1 ^a		Model 2 ^b		Model 3 ^c		Model 4 ^d	
	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value
Household characteristics								
Gender (female)	-		-		-		-	
	0.006	0.089	0.075	0.096	0.004	0.075	0.040	0.033
ICT use	0.008	0.004	0.110	0.015	0.011	0.030	0.011	0.071
Group member	0.049	0.037	0.043	0.026	0.034	0.032	0.014	0.092
Log age	0.141	0.053	0.141	0.052	0.144	0.046	0.142	0.051
Occupation	0.035	0.463	0.040	0.392	0.035	0.470	0.034	0.475
HH size	0.003	0.736	0.003	0.725	0.003	0.712	0.003	0.728
Farm-specific variables								
Output market distance	-		-		-		-	
	0.005	0.087	0.005	0.084	0.005	0.087	0.005	0.087
Number of crops	0.040	0.000	0.042	0.000	0.047	0.000	0.043	0.000
Bank distance	-		-		-		-	
	0.003	0.309	0.003	0.312	0.003	0.293	0.003	0.317
Extension agent distance	-		-		-		-	
	0.000	0.947	0.001	0.842	0.000	0.398	0.000	0.893
Capital endowment variables								
Education	0.008	0.065	0.008	0.068	0.008	0.064	0.008	0.058
Farming experience	-		-		-		-	
	0.004	0.048	0.004	0.052	0.004	0.048	0.004	0.047
Land size	0.001	0.789	0.001	0.688	0.001	0.777	0.001	0.733
non-farm income	0.113	0.000	0.113	0.000	0.114	0.000	0.113	0.000
Log total income	0.182	0.000	0.180	0.000	0.183	0.000	0.182	0.000
Log assets	0.005	0.664	0.004	0.735	0.005	0.660	0.004	0.674
Regional dummy variables [#]								
Kirinyaga	0.176	0.000	0.174	0.000	0.177	0.000	0.176	0.000
Bungoma	0.025	0.540	0.023	0.555	0.026	0.513	0.021	0.601
Interaction Effects								
Group*female			0.028	0.021	0.073	0.033	0.013	0.067
ICT use*female					0.107	0.020	0.123	0.056
Group*ICT*female							0.167	0.047
Constant	0.378	0.001	0.430	0.001	0.391	0.004	0.474	0.001
/sigma	0.256		0.255		0.253		0.255	

Source: Author's compilation. Notes:

^a: Model 1: is the base model (without any interaction effects).^b: Model 2: contains interaction effects between gender and participation in collective action initiative^c: Model 3: contains interaction effects between gender and use of ICT (mobile phones)^d: Model 4: contains interaction effects among gender and participation in collective and use of ICT[#]: District dummies included in estimation to control for district fixed effects

The dependent variable - commercialization index – is continuous ranging from 0 and 1

4. Conclusions and recommendations

This study sought to fill the gaps in the literature particularly by comprehensive conceptualization of the drivers of commercialization at a household level and across different socio-economic and agro-ecological zonation in the wake of promotion of collective action initiatives and the newly introduced but vastly penetrating ICT (mobile phones). The purpose of this study was to highlighting determinants of agricultural commercialization (market participation) by the farm households in Kenya. Specifically, special focus was given to the role played by gender, collective action initiatives and information communication technologies (ICTs) as well as interaction of these factors among the farm households in Kenya.

The uses a Tobit regression model to assess the determinants of commercialization using data of 379 farm households from three different districts, each in a separate province, in Kenya. The study finds that farmer-specific characteristics (age and gender) farm specific (distance to bank and the number of crop enterprises grown by the farmer) and capital endowment variables (education level, non-farm as well as total farm income) influence the commercialization process. Collective action (farmer groups) as well as use of ICT tools (mobile phones) significantly and positively determines commercialization. The interaction of these two variables with gender show that participation in collective action as well as use of ICT tools (mobile phones) significantly increases commercialization of female farmers.

The implications of this study are that collective action initiatives and use of ICT tools will improve the competitiveness and promote the relevance of female smallholder farmers in the commercialization process. Eliminating challenges facing farmers in participating in collective action groups through capacity building will help them leverage from the groups. ICT tools tailored to suit the rural areas (such as solar-powered phones) will enhance the adoption and use of such tools by female farmers and hence facilitate commercialization.

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