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SMALLHOLDER FOOD CROP COMMERCIALIZATION IN UGANDA: PANEL SURVEY EVIDENCE FROM UGANDA

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ABSTRACT

A number of policy initiatives in Uganda's agriculture sector have been tailored towards transforming the sector from subsistence to commercial production. Owing to this background, this study examines the drivers of food crop commercialization in Uganda. The unique feature of this study is threefold: one, we exploit the seasonal component of the surveys to examine the seasonality of participation; two, we provide results of two different measures to proxy commercialization, namely; the likelihood of participation, and intensity of participation, in the market for selected crops; and finally, we investigate these issues using a new panel dataset for Uganda. Findings reveal that different household and community level characteristics pose varying impacts on commercialization across seasons. Of particular interest is evidence that self-sufficiency needs override household decisions during the second season. This finding underscores the need to design interventions that target increased production in this season, charaterised by short rains and less production activity.

Key words: Food crop commercialization, seasons, Uganda
JEL classifications: Q10, Q12, Q13

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1.0 INTRODUCTION

There is strong empirical evidence that increasing the participation of small holder farmers in the market enhances economic development. Studies conducted in Africa and elsewhere find that commercialization increases household incomes resulting from labor and land productivity. It is also provides opportunities for off-farm employment (Von Braun, 1994). In light of this, Sub Saharan African (SSA) have identified agriculture commercialization as one of the crucial components of their growth agenda. In SSA, agriculture accounts for more than 30 percent of Gross Domestic Product (GDP) and 60 percent of total employment , and has a strong potential to contribute to growth and reduce poverty and food insecurity (World Bank, 2013; 2007). While need to transform the sector has dominated the policy discourse, African countries have continued to register marginal achievement compared to countries in East Asia that are already at the high end of agricultural commercialization, or South East Asia and parts of Latin America that are rapidly moving towards commercialization (Pingali and Rosegrant, 1995; World Bank, 2011).

In Uganda, Government interventions in form of the Poverty Alleviation Action Plan (PEAP) and its subsequent revisions, the Plan for the Modernization of Agriculture (PMA), the Agriculture Development Strategy and Investment Plan (DSIP), and lately the National Agriculture Policy (NAP), reveal interest to transform the sector. Despite these efforts, dismal achievements have been registered. Rural farm households have remained largely subsistent in nature with only 25 percent selling more than half of their total production (World Bank, 2011). Interestingly, only 12 percent of households in Uganda are net sellers of food yet in contrast, 66 percent are net buyers of food and rely on the market for more than 25 percent of the value of food that they consume (MAAIF, 2010). Opportunities for selling agriculture produce exist given this high demand and calls for more efforts in ensuring increased agriculture output.

In order to enhance understanding of agriculture commercialization, it is imperative to investigate factors that influence household decisions to participate in the market. While literature on drivers of market participation is vast (see for instance Okezie et al., 2012; Omiti et al., 2009; Pender and Alemu, 2007), lack of panel data has restricted analysis to cross sectional units. Using a household panel survey, we fill this void in literature by investigating these issues for Uganda. Our contribution to literature is three. First, the use of a panel structure facilitates the study of the factors that impact on market participation and intensity. Second, our data allows us to capture seasonal heterogeneity in market participation. With this novel feature, we are able to understand whether the factors that influence market participation vary across farming seasons. Third, we expound on the understanding of agriculture commercialisation by comparing two definitions. As will be seen later. From a policy perspective, this study is pertinent in steering debate on policy options to increase farmer participation and the intensity in the market.

Results reveal the importance of household and location level characteristics on the likelihood and intensity of market participation. Strikingly, the outcomes are more likely for 2005 than 2009. Seasonal variations also

show up strongly, with households tending to participate and sell more in the first rather than the second season especially in 2009. This results signals self-sufficiency in the second season, largely emanating from limited production activity caused by short rains. This underscores the need for interventions to increase productivity in the second season, for farmers to continuously participate in the market and ensure stable income streams.

The rest of the paper is structured as follows: the next section looks at agriculture policy shifts in favor of agriculture commercialization in Uganda. Literature is reviewed in chapter two; chapter three looks at the methodology and description of data while in chapter four we present the results and discussions. Lastly in chapter five, we conclude and give some policy recommendations of the findings.

1.1 Policy shifts in favor of agriculture commercialization in Uganda and lessons from elsewhere.

Agriculture commercialization has been the goal of many policy interventions in Uganda's agriculture sector. The government recognizes the need to transform the sector in order to improve the livelihoods of close to 70 percent of the population that are dependent on the sector. From 1987 to date, the sector has been driven by a number of policy interventions (Appendix 1).

In 1987, under the economic recovery structural adjustment programs undertaken by several SSA countries, Uganda liberalized its economy and privatized most of its parastatals with the main objective of increasing efficiency of resource allocation while reducing the direct role of the government. This resulted into the disbandment of agriculture parastatals and direct engagement of farmers in the market. The downside of free market mechanism is that farmers are exposed to increased risks due to greater volatility of prices. Subsequently, governments in some of the countries have had to intervene through market regulation to protect and stabilize the prices of certain agricultural commodities (Pingali and Rosegrant, 1995).

In 1997, Government adopted the Poverty Eradication Action Plan (PEAP) with an overall policy focus of enhancing rural incomes. The focus was maintained even as the plan underwent several revisions (from PEAP 1997, to PEAP 2001 and later to PEAP 2004). Within PEAP, Plan for the Modernization of Agriculture (PMA) emerged as a second tier policy framework to guide the activities of the agriculture in 2000. Through PMA, it was assumed that agriculture would contribute to increasing incomes of the poor by raising farm productivity, increasing the share of farm production that is marketed and creating off farm and on farm employment. (Kasirye, 2013). However, its major weakness was its failure to kick start some important pillars like the marketing and agro-processing strategy.

Amongst the seven pillars of PMA, the provision of Agricultural Advisory Services through National Agriculture Advisory Services (NAADS) is seen as the most significant contribution (ITAD, 2008). Currently, NAADS is the major program driving agriculture commercialization through input provision and provision of advisory services to farmers in Uganda. In its second phase of implementation, NAADS currently uses the approach of hand selecting a market oriented

farmer at parish level and commercialized farmer at district and/ or sub county level plus nuclear farmers at national level to ensure better targeting of support for progression towards commercialization (MAAIF, 2010). These selected farmers show to others proper farming methods and are used as reference points. NAADS has also focused on supporting farmers to get organized in groups along a common identifiable farming interest to promote the commercialization strategy. The approach of hand selection of already established farmers has been termed insufficient and unsuitable as it excludes small scale farmers and does not permeate inclusiveness (World Bank, 2008). On a positive note, an evaluation of the program by Benin et al., (2007) found that participating sub counties promoted commercial marketing of commodities more than their counterparts in non NAADS sub counties. Contrary, Okoboi et al., (2013) found weaker or negative growth in commercialization of such crops like maize and ground nuts amongst beneficiaries when compared to non-beneficiaries.

Other policy endeavors to increase commercialization in the sector include programs like the Rural Development Strategy (RDS) and the Prosperity for All (PFA) program. The objective of RDS was to ensure that value addition and stable markets prevailed in the sector. Support was to be directed to groups and value addition and stability in markets was to be achieved through establishment of a commodity information system, enhancing market access for agriculture products and facilitation of the delivery of agriculture inputs through market mechanism. However, RDS only lasted between the years 2005 and 2007. In between the implementation of the RDS, the Government came up with the Prosperity for All program in 2006 whose main goal was to ensure that all households were able to earn an annual income of 20 million shillings and above through effectively selecting profitable enterprises at farm level. However, the program was misconceived from onset as an opportunity to reward loyal supporters of the National Resistance Movement (NRM). Implementers also thought that it was to have separate funding from the already existing programs which was not the case (MAAIF, 2010).

Currently, the agriculture sector is anchored on the recently passed National Agriculture Policy (NAP) that in part seeks to develop a private sector led agriculture sector has also recently been passed. Investments in the sector are guided by the Agriculture Development Strategy and Investment Plan (DSIP). The DSIP aims to enhance agriculture production and productivity, improving access to and sustainability of markets, creating an enabling environment and undertaking institutional reforms and development for the sector. The plan promotes a commodity approach were value chain development is directed towards 10 selected commodities within the different agro ecological zones. Previous interventions have taken a blanket approach of supporting all enterprises with little or no targeting of specific commodities. While there has clearly been positive results, it is argued that a lot more development can be achieved by focusing on commodities where most gains could be realised (MAAIF, 2010).

Lessons from elsewhere:

Overall, while it is evident that Uganda has made significant policy endeavors in ensuring a commercialized agriculture sector, the

extent to which farmers have been able to commercialize, is far from countries such as Thailand and Brazil whose farmers have gradually grown to conquer the world markets. Nevertheless important lessons can be drawn from the Cerrado region of Brazil and the Northeast region of Thailand which are both landlocked agricultural zones that were originally characterized by high levels of poverty and remoteness (World Bank, 2009). First it is important to note that modern commercial agriculture is not synonymous with vast mechanized farms. Small holder farmers when supported can be key in agriculture commercialization and most importantly the fruits of agriculture led growth are more widely shared when small holder farmers participate (Pingali and Rosegrant, 1995; World Bank, 2009). Secondly, factors that are crucial in the commercialization drive of the country include amongst other things: research and extension to generate productivity and income technologies, developed rural financial markets, secure land tenure rights, investment in rural infrastructures and development of support services particularly health and nutrition (Pingali and Rosegrant, 1995; World Bank, 2009). Lastly, strong farmer organizations or groups such as the National Small holder Farmer's Association of Malawi (NASFAM) that provide some form of social cohesion amongst farmers are important in the commercialization drive (Jayne et al., 2011). They can potentially secure better prices for produce, lower prices for inputs and also provide technology assistance which allows participating farmers harvest higher yields. NASFAM is a farmer based organization that was created in 1994 with a major vision of promoting farming as a business amongst small holder farmers cultivating less than one hectare. It is composed of small groups of between 10-15 individual farmers that combine to form an action group which plays a key role in dissemination of information to members and bulking of member's crops. NASFAM has remarkably been crucial in promoting groundnut production for export in Malawi. In Zambia, different forms of contract farming like out grower schemes have become the main means of small holder commercialization. About one third of the 800,000 Zambian farmers participate in some form of out grower scheme arrangement (World Bank, 2007). This is an arrangement in which small holder farmers are contracted to produce commodities of high value to be marketed by an entrepreneur. In turn, the entrepreneur provides small holders with the technical advice and inputs needed (World Bank, 2007).

2.0. EVIDENCE FROM LITERATURE

The concept of agriculture commercialization has been defined differently across studies. Okezie, Sulaiman and Mwosu (2012) using the income concept of agriculture commercialization ranked based on the relative importance of subsistence production to total income. In this case, agriculture subsistence orientation is measured by the extent to which the farm households consume out of their aggregate agriculture produce as compared with the value of total production. Likewise Pender and Alemu (2007) defined agriculture commercialization as the ratio of the value of crop sales in households over the total value of crop production. Households were classified as either being autarkic (neither a net seller nor net buyer of agriculture produce), net seller or net buyer in the production and

sales of maize and teff in Ethiopia. Pingali and Rosegrant (1995) define agricultural commercialization as extending beyond the marketing of agricultural output to include the product choice and input use decisions that are based on the principles of profit maximization. They argue that as farmers commercialize, household's mixed farming systems give way to specialized production units that are designed to rapidly respond to market and use quality inputs. Households also a shift from using non-traded inputs to tradable ones as the opportunity cost of family labor becomes high such that households start to hire labor more and there is increased demand for agricultural commodities. A broader definition of agriculture commercialization was provided by Jayne et al., (2011). They referred to small holder commercialization as the virtuous cycle in which farmers intensify their use of productivity enhancing technologies on their farms, achieve greater output per unit of land and labor expended, produce greater surpluses (or transition from deficit to surplus producers), expand their participation in markets and ultimately raise their incomes and living standards.

For purposes of this study, we limit our definition of commercialization to two definitions: 1) the incidence of household's market participation measured by the likelihood of the household selling to the market and 2) the intensity of market participation measured by the share of output that the household sells to the market. The main limitation of the former is its inability to measure the level or the intensity of market participation. A given household may participate in the market in both the first and second seasons but only engage in selling small quantities of a given commodity whereas another household may only participate in one season but then is able to sell in larger quantities. In both scenarios, the latter household may be defined as more commercialized than the former.

The benefits of small holder commercialization to farming households are usually accredited to increased household incomes. Evidence suggest that subsistence farming in any form is not a viable activity for safeguarding household food security and welfare (Pingali, 1997). As rural households gradually commercialize, household incomes are increased improving household welfare, food security and nutritional status (Von Braun 1994). Von Braun (1994; 1995) found that a 10 percent increase in the income of the poor had a positive influence on the nutritional status of children below the ages of 5 years in Rwanda, Zambia and Malawi. Despite the benefits, small holder farmers may not necessarily integrate into the market because of the transaction costs associated with participation. Households may allocate their limited resources to both subsistence and commercial production such that the disutility of risks is balanced against the utility of marketing goods (Von Braun et al., 1991). If costs of undertaking the transaction outweigh the value of market participation, then households are not likely to participate (Sadoulet and de Janvry, 1995). In Ethiopia, Pender and Alemu (2007) found that reduction of transaction costs increases the likelihood of participation in markets and improves the welfare of both sellers and buyers of maize and teff crops. Costs can range from household specific factors to location and crop specific factors (Pingali, Khwaja and Meijer, 1995).

Okezie et al., (2012) in a study on farm level

determinants of agricultural commercialization in Nigeria found that inputs such as labor, fertilizer and planting material were found to be significant determinants of agricultural commercialization. In the Himalayas Rahut et al., (2010) find that assets were important determinants of whether households commercialized or not. In Ethiopia, Pender and Alemu (2007) found that increased small holder access to road, land, livestock, farm equipment and traders was key to enabling small holder production and commercialization of food crops. In Uganda, available evidence on small holder commercialization have tended to be crop and area specific (Sebatta et al., 2012; Komarek, 2010). Komarek (2010) for example looked at the determinants of banana market commercialization in western Uganda and found that increasing land size does not help generate larger marketable surpluses when distance to markets increase.

Others factors such as the gender of the household head and education level also have an influence on the level of commercialization. Gender of the household head was an important determinant of commercialization particularly in the case of cash crops. Male headed households seemed to earn higher income from the sale of cash crops than their female counterparts. Other household-specific variables may not constitute transaction costs in themselves but have significant impact in influencing the costs of information seeking, negotiation, monitoring and enforcement (Pingali et al., 2005). Transaction costs could also be reduced for farmers that participate in farmer groups when compared to farmers that do not participate (Jayne et al., 2011). Potential benefits of participation in farmer organizations include: increased productivity and negotiating power for better prices, secured market outlets and access to technical assistance (Pingali et al., 2005). In Ethiopia, Pender and Lemu (2007) find that membership to a farmer's cooperative organization reduced the transaction costs associated in selling maize to the market by 2 percent.

Apart from household specific factors, other factors that may limit market participation by small holder farmers may be attributed to crop specific transaction costs. These are usually attributed to the type of crop that the household chooses to cultivate. For example high value crops which are often perishable are typically associated with high transaction costs due to poor infrastructure that are exacerbated by the longer distances (Pingali, Khwaja and Meijer, 1995).

3.0 METHODOLOGY AND DATA DESCRIPTION

Data description

We use a nationally representative household panel data set collected by the Uganda Bureau of Statistics (UBoS). From May 2005 to April 2006, UBoS carried out the Uganda National Household Survey (UNHS) that covered 7,421 households. The survey was based on a two stage stratified random sampling design. In the first stage, 750 Enumeration Areas (EAs) was selected using the 2002 census frame. In the second stage, 10 households from each EA were randomly selected to participate in the survey. In 2009, UBoS reinstated the annual Uganda National Panel Survey (UNPS) as part of the wider efforts to monitor government programs. It made an attempt to follow about 3,123 households out of the 7,421 households that were surveyed in 2005/06. Simi-

larly a two stage stratified random sampling was used with the first stage being the selection of the EAs and the second stage being the selection of 10 households. Out of 3,123 intended households, 2,888 households were tracked and 281 households refused to participate in the survey. Because of partially filled information and the study's focus on agriculture, we used information collected from 2,019 households from the two years making a balanced panel of 4,038 households. Note that as much as the panel tracked split off households, this category is excluded from our analysis. We do not delve on the limited debate on inclusion or exclusion of split offs.

The unique feature of the survey is the comprehensive agriculture module. This module was administered to each of the selected agriculture households in both seasons. Seasonal variations are interesting to capture because they may pose different dimensions in market participation and intensity. Except for some districts in the Northern part of the country that are characterized by one rainfall reason, most locations in Uganda experience a bimodal rainfall regime. The wet seasons are in the months of March to May, and September to November while the dry seasons are in the months of June to August and December to Febuary. The second season has shorter rainfall regimes with a longer dry season that does not facilitate production of certain crops. This implies that most smallholder farmers are more concerned about their food sufficiency goals during this season than earning from the market. Therefore households are more likely to engage in the market during the first season than in the second.

The survey also provides a comprehensive socio economic module that captures information on household demographics, health, employment and welfare.

Estimation procedure

First, we model market participation as a binary choice variable in both seasons across the two survey periods. The model is expressed as:

$$Y_{it} \perp \left[\left(X_t \beta_0 + C_i + \mu_t\right) \geq 0\right] \quad t = 1,2 \qquad (1)$$

Y_{it} is the binary observable outcome of household i at time t that is equal 1 if a household participates in the maketing of selected crops and zero otherwise. Focus is placed on maize, beans, cassava, sweetpotatoes and bananas which according to the Agriculture Census of 2008 were the major food crops grown by the majority of households in Uganda. X_{ti} denotes the characteristics at the household and external factors that affect market participation.

C_i are the unobserved fixed effects that we assumed to be time invariant while μ_{it} represents the unobserved error term. β is the deterministic coefficient vector. $\perp(.)$ denotes the indicator function that is equals (1) if its argument is true and zero otherwise With respect to the distribution of the error term conditional on the explanatory variables and the fixed effects, we assum a normal distribution with zero mean and variance matrixϕ. From equation 1 and given that the strict exogeneity assumption for the regressor' holds then:

$$E(Y_t / X_t = x_t, C = c) = \phi\left(x_t \beta_0 + c\right) \quad t = 1,2$$

Where ϕ is the univariate cumulative distribution function. If ϕ takes on a normal distribution, then the panel probit model

is implied. If it takes on a logistic function, then panel conditional logit model is implied (Chamberlain, 1982). The derivative of $P(y_t = 1/x_t, c)$ with respect to a continuous regressor depends on c through the density function $\phi(x_t\beta_0 + c)$ (Woodridge, 2002).

A standard approach to solve the problem posed by unobserved individual effect within this case is the estimation of the random effects probit model or the fixed effect logistic model (Chamberlain,1982). Given the interest in looking at certain policy factors such as access to roads and regional location of the household that may have changed little or not changed at all over, the study does not consider the fixed effect probit model but chooses from random effects probit model or the pooled probit model depending on whether or not panel methods are applicable. In the absence of individual fixed effects, pooled ordinary probit results are more efficient (Woodridge, 2002).

Second, we estimate a pooled OLS model to analyse the drivers of internsity of market participation. Intensity is measured as the proportion of total output that is sold in the market. A description of the variables used in the model is provided in Table 1. The expected effect of a certain variable is either positive or negative or both depending on whether it is likely to increase or descrease market participation and intensity.

Table 1: Description of variables used in analysis

Variable	*Description*	*Expected effect on participation dummy*	*Expected effect on intensity*
DEPENDENT VARIBLES			
Incidence of market participation	A dummy variable of whether the household participated in selling any of the five major food crops grown in Uganda namely maize, beans, cassava, sweetpotatoes and bananas.		
Intensity of market participation	The weighted summation of the share of quantity sold to the quantity harvested for the different crops.		
CHARACTERISTICS OF THE HEAD			
Average age	Age in complete years. This is used as a proxy to experience in farming by the househod..	positive	positive
Gender (cf: male)	Dummy equal 1 if head is male	positive	positive
No primary education (cf; yes)	A dummy variable indicating whether the household head had any primary education or not.	positive	positive
Some primary education (cf; yes)	A dummy variable indicating whether the household head has some primary education or not.	positive	positive
Completed primary education (cf; yes)	A dummy variable indicating whether the household head completed primary education or not	positive	positive
Secondary education and above (cf; yes)	A dummy variable indicating whether the household head had secondary education and above or not	positive	positive
CHARACTERISTICS OF THE HOUSEHOLD			
Average share of the number of children in the household	The share of the number of children aged five years and below to household size.	Positive /negative	Positive /negative
Household size	The number of household members.	Positive /negative	Positive /negative
Land size (acres)	The acreage of land that the household owns and it is measured in acres	positive	positive
Distance to feeder road	How far the household is from a feeder road in terms of the time taken for the household to travel	negative	negative
Household ownership of cattle (cf; yes)	A dummy indicating whether the household owns cattle or not.	positive	postive
Household is exposed to drought (cf: yes)	A dummy indicating whether the household was exposed to drought or not	positive /negative	Positive/ negative
Household has three meals in a day (cf: yes)	A dummy indicating whether the household usually consumes three meals in a day or not and is a good indicator of the food security concerns of the household.	Positive /negative	Positive/ negative
LOCATION			
Central	Dummy =1 if household is located in Central Uganda	postive	postive
Eastern	Dummy =1 if household is located in Eastern Uganda	Positive /negative	Positive /negative
Northern	Dummy =1 if household is located in Northern Uganda	Positive /negative	Positive /negative
Western	Dummy =1 if household is located in Western Uganda	Positive /negative	Positive /negative

4.0. RESULTS

Descriptive results

Results in Table 1 show the proportion of market participants for households that participate in selling atleast one of the five food crops across seasons and regions. In all regions and in both 2005 and 2009, it is visible that on average famers sell more in season one than in season two. Comparing 2005 and 2009, the proportions of participants in each of the seasons was more in 2009 than in 2005 . In northern Uganda, there has been a substantial increase in the number of market participants in any of the seasons. This can mainly be attributed to the return of peace in the region following 20 years of insurgency. Overall increments in market participants in 2009 may be attributed to among other factors improved market conditions such as improved road infrastructure.

The proportion of output harvested that is sold is also greater in season one than in season two for all regions lumped together (Table 3) although there are regional variations with some regions marketing more in season two than in season one for some crops. In Central and Eastern Uganda for example, households marketed more beans in season two than in season one while in central, households marketed slightly more cassava in the second than in the first season. Overall, despite some of these exceptions, Table 2 and 3 show that commercialization of crops is more likely in season one than in season two, a fact that may be attributed to larger volume of production in season one than in season two because of longer rain periods.

Table 2: Proportion of market participants across seasons and regions

	Central	Eastern	Northern	Western	All regions
SEASON1					
2005	51.17	36.94	18.99	52.58	41.05
2009	70.94	74.74	82.43	73.63	77.29
All years	65.55	55.82	50.71	63.11	59.16
SEASON 2					
2005	41.42	35.84	24.65	52.26	39.6
2009	59.79	62.1	58.01	63.26	61.02
All years	50.6	48.95	41.33	57.76	50.31
EITHER SEASON					
2005	59.57	47.84	31.3	63.4	51.64
2009	86.66	84.7	88.09	84.82	85.92
All years	73.11	66.25	59.7	74.11	68.78

Source: Authors computations from 2005/06 UNHS & 2009-12 UNPS data

Table 3: Share of total output sold to total output harvested across seasons and regions for each crop

Crop	Season	Regions				
		Central	Eastern	Northern	Western	All regions
Maize	1	0.42	1.12	0.54	0.61	0.73
	2	0.25	0.44	0.46	0.45	0.40
Beans	1	0.38	0.64	0.41	0.75	0.59
	2	0.47	0.79	0.35	0.35	0.48
Cassava	1	0.36	0.31	0.41	0.44	0.37
	2	0.39	0.22	0.22	0.38	0.29
Bananas	1	0.44	0.35	0.32	0.34	0.37
	2	0.42	0.31	0.29	0.34	0.32
Sweet potatoes	1	0.44	0.31	0.25	0.36	0.36
	2	0.35	0.28	0.28	0.29	0.30

Source: Authors computations from 2005/06 UNHS & 2009-12 UNPS data

Table 4 and 5 compare characteristics of market and non-market participants and their mean differences in both seasons. In season one (Table 4) there is a significant difference between market and non market participants in almost all characteristics except completion of primary school, average share of the number of children, average distance to feeder road, and average exposure to drought. On the otherhand, in the second season, there is no significant difference in the average age, share of children in the household, and proportions of market and non market participants in Central and Eastern Uganda.

Table 4: Descriptive statistics of market and non market participants in Season one

	Participants	Non participants	All participants	p value of difference
	(i)	*(ii)*	*(iii)*	*(i) =(ii)*
CHARACTERISTIC OF THE HOUSEHOLD HEAD				
Average age	46.10	44.90	45.59	0.48***
Gender (cf: male)	0.74	0.71	0.73	0.01***
No primary education (cf; yes)	0.17	0.25	0.20	0.01***
Some primary education (cf; yes)	0.45	0.42	0.44	0.016
Completed primary education (cf; yes)	0.14	0.13	0.14	0.01
Secondary education and above (cf; yes)	0.19	0.15	0.17	0.01***
CHARACTERISTICS OF THE HOUSEHOLD				
Share of the no. children in the household	1.32	1.26	1.29	0.04
Household size	6.69	6.16	6.47	0.1***
Land size (acres)	4.03	3.21	3.68	0.11***
Distance to feeder road	16.38	16.49	16.42	0.7
Road in the community (cf; yes)	0.75	0.71	0.73	0.01***
Owns of cattle (cf; yes)	0.39	0.22	0.32	0.01***
Proportion in Central (cf; yes)	0.24	0.17	0.21	0.01***
Proportion in Eastern	0.25	0.28	0.26	0.01***
Proportion in Northern	0.24	0.31	0.27	0.01***
Proportion in Western	0.27	0.24	0.26	0.01***
Exposed to drought (cf: yes)	0.55	0.52	0.54	0.01
Has three meals in a day (cf: yes)	0.45	0.31	0.40	0.02***

Source: Authors computations from 2005/06 UNHS & 2009-12 UNPS data

There also exist some interesting mean differences between market and non market participants in the two seasons. Market participants in the second season are nearer to the feeder road and are less likely to report a drought compared to non market participants in the season. Also unlike in the first season where market participants are significantly more than non market participants in central Uganda, the mean difference between the two categories is insignificant in the second season. These differences could be attributed to the fact that so many households do not cultivate in the second season and if they do, the quantity produced is so minimal to permit market participation. Instead, they pay more attention to food self sufficiency needs of the households. They are unable to counteract constraints to commercialization such as infrastructure access (feeder roads) and pay more attention to food self sufficiency needs of the households in times of drought.

Table 5: Descriptive statistics of market and non market participants in Season two

	Participants	Non participants	All participants	P value of difference
	(i)	(ii)	(iii)	(i)=(ii)
CHARACTERISTIC OF THE HOUSEHOLD HEAD				
Average age	45.66	45.53	45.59	0.475
Gender (cf: male)	0.76	0.70	0.73	0.014***
No primary education (cf; yes)	0.15	0.26	0.20	0.013***
Some primary education (cf; yes)	0.46	0.41	0.44	0.016***
Completed primary education (cf; yes)	0.15	0.13	0.14	0.011***
Secondary education and above (cf; yes)	0.19	0.16	0.17	0.012***
CHARACTERISTICS OF THE HOUSEHOLD				
Share of the no. children in the household	1.31)	1.28	1.30	0.037
Household size	6.66	6.29	6.47	0.05***
Land size (acres)	4.04	3.33	3.68	0.109***
Distance to feeder road	15.56	17.28	16.42	0.687***
Road in the community (cf; yes)	0.77	0.70	0.73	0.014***
Owns of cattle (cf; yes)	0.38	0.26	0.32	0.015***
Exposed to drought (cf: yes)	0.52	0.56	0.54	0.016***
Has three meals in a day (cf: yes)	0.47	0.33	0.40	0.015***
Central (cf; yes)	0.22	0.21	0.21	0.014
Eastern	0.25	0.27	0.26	0.014
Northern	0.23	0.30	0.27	0.014***
Western	0.29	0.38	0.26	0.046***

Source: Authors computations from 2005/06 UNHS & 2009-12 UNPS data

Drivers of market participation and intensity for the five major food crops grown in Uganda

Table 6 and 7 show the determinants of the incidence and intensity of market participation respectively. It is important to note from the onset that the two definitions differ conceptually. Households may engage in the market, in a particular season, while the corresponding output sold is less. As such, it is possible that the drivers of these outcomes may pose varying effects.

The incidence of market participation in the first and second season is affected by factors such as levels of education, average share of the number of children in the household, household size, interaction of the land and the community access to road, ownership of cattle, regional locations in eastern, northern and western Uganda compared to central, household's experience to drought and ownership of business. Lastly, participation was more likely in 2009 than in 2005.

However there are important seasonal differences across the years. Distance to the feeder road is only significant in the second season. Households that are far away from the feeder roads are less likely to participate unlike their counterparts who maybe nearer to the road, but this only matters in the second season. This could be attributed to the possibility that fewer households engage in production in the second season unlike in the first season and for those that do, the transaction costs associated with reaching the market contrain market participation. The effect of the number of children is positive and significant in the first. Children could be acting as a source of labor to the households in the first season when agriculture activities are more intense.

Household's experience of a drought is marginally significant in the first season and insignificant in the second season. In the first season households that have experienced a drought are more likely to participate in the market unlike those that have not and this could be a coping mechanism to ensure availability of food in the household. Its insignificance in the second season could be that households withdraw because of minimal production in the season and food sufficiency concerns.

Table 6: Determinants of the incidence of market participation in Season one and two

	Season One	Season Two
CHARACTERISTICS OF THE HOUSEHOLD HEAD		
Average age of the household head	0.049	0.002
	[0.09]	[0.09]
Gender (cf: male)	-0.021	0.015
	[0.06]	[0.06]
Some primary education	0.318***	0.424***
	[0.07]	[0.07]
Completed primary education	0.278***	0.418***
	[0.09]	[0.09]
Secondary education and above	0.342***	0.380***
	[0.09]	[0.08]
HOUSEHOLD CHARACTERISTICS		
Average share of the number of children in the household	0.399**	0.210
	[0.17]	[0.16]
Average household size	-0.102*	-0.057
	[0.06]	[0.06]
Land size (log)	0.230***	0.215***
	[0.04]	[0.04]
Household ownership of cattle	0.539***	0.350***
	[0.06]	[0.05]
Distance to feeder road (Log)	0.014	-0.048**
	[0.02]	[0.02]
Interaction between land and community road access (log)	-0.149***	-0.221***
	[0.05]	[0.05]
Household has three meals (cf: yes)	0.188***	0.220***
	[0.05]	[0.05]
Household experienced drought (cf: yes)	0.095*	-0.057
	[0.05]	[0.05]
Household has a business (cf: yes)	-0.090*	-0.116**
	[0.05]	[0.05]
PERIOD AND COMMUNITY LEVEL CHARACTERISTICS		
Year 2009 (cf: 2005)	1.075***	0.577***
	[0.06]	[0.05]
Eastern (cf: Central region)	-0.485***	-0.134*
	[0.08]	[0.07]
Northern	-0.576***	-0.208***
	[0.08]	[0.07]
Western	-0.140*	0.213***
	[0.08]	[0.07]
lnsig2u	-1.483***	-1.845***
	[0.28]	[0.33]
Observations	3,786	3,786
Wald chi2(18)	515.41	344.67

Notes: Standard errors in parenthesis, * implies significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7 displays the drivers of market intensity in both seasons. In season one, the drivers include: some primary education of the household head, secondary education and above, land size, household's ability to have three meals in a day and location in northern Uganda. Household heads with some primary education and also those with secondary education on average sell more than their counterparts who have no primary education.

Table 7: Determinants of market intensity in Season one and two

	Season one	Season two
CHARACTERISTICS OF THE HOUSEHOLD HEAD		
Average age of the household head	-0.006	-0.004
	[0.01]	[0.01]
Gender (cf: male)	0.002	0.006
	[0.01]	[0.01]
Some primary education	0.012*	-0.003
	[0.01]	[0.01]
Completed primary education	0.002	0.008
	[0.01]	[0.01]
Secondary education and above	0.019**	0.007
	[0.01]	[0.01]
HOUSEHOLD CHARACTERISTICS		
Average share of the number of children in the household	0.005	-0.006
	[0.02]	[0.02]
Average household size	-0.005	-0.011*
	[0.01]	[0.01]
Household ownership of cattle	-0.001	0.002
	[0.01]	[0.00]
Land size (log)	0.010**	0.012***
	[0.00]	[0.00]
Distance to feeder road (Log)	0.001	-0.003
	[0.00]	[0.00]
Interaction between land and community road access (log)	0.003	-0.009*
	[0.00]	[0.00]
Household has three meals (cf: yes)	0.018***	0.016***
	[0.00]	[0.00]
PERIOD AND COMMUNITY LEVEL CHARACTERISTICS		
Year 2009 (cf: 2005)	-0.080***	-0.076***
	[0.01]	[0.00]
Eastern (cf: Central region)	-0.009	-0.015**
	[0.01]	[0.01]
Northern	-0.032***	-0.026***
	[0.01]	[0.01]
Western	0.007	-0.014**
	[0.01]	[0.01]
Observations	2,171	1,881

Notes: Standard errors in parenthesis, * implies significant at 10%; ** significant at 5%; *** significant at 1%.

Households with larger land sizes and those who have at least 3 meals a day have a greater share of their output sold to the market. For northern region unlike other regions when compared to central, the share of output that is sold in the market is less in both seasons.

The determinants of market participation in the second season are: the average share of the number of children in the household, interaction between land and the community's access to the road, land size, household's ability to have three meals in a day, regional locations in Eastern, Northern and Western Uganda when compared to Central.

We also note some interesting seasonal differences. Whereas having some education and secondary education and above increase the share of output that is sold in the first season, these have no effect in the second season implying that even knowleageable farmers find it unprofitable to engage in the market and would rather store the food for home consumption. Another important difference that emerges is the fact that with more children, households sell less of their output to the market in the second season whereas this factor has no significant effect in the first season. This reaffirms our earlier explanation of the possibility that in the second season households are more worried about their food security/ sufficiency needs than in the first season probably due to less output.

The interaction between land and community access is also marginally significant in the second season although non significant in the first season. Ideally it is assumed that with increasing land size and hence greater production, the transactions costs associated with reaching the market should become minimal and households should participate and market more of their output. However this assumption does not hold in the second season. Whereas land size is associated with increased share marketed in both the first season and second season (positive and significant variable for land), community access to the road is constraining factor in the second season that decreases the share that households market. Households in eastern and western also market less of their output in the second season compared to those in central Uganda possibly due to better infrastructures and hence reduced transaction costs to the market.

Lastly, the share of the output marketed in 2009 was less than in 2005 in both the first and second season even when households were more likely to participate in the market in 2009 than in 2005.

5.0 CONCLUSIONS

This paper uses the nationally representative panel data set of 2005/06 and 2009/10 to provide evidence of the seasonal drivers of food crop commercialization in Uganda. Focusing on 5 major crops identified in the National Census of Agriculture (2008), the definition of commercialization was limited to the incidence of participation, and the share of output marketed.

The results underscore the role of household and location level characteristics in influencing these outcomes. One of the key intuitive observations is that food self-sufficiency goals override self-reliant goals for most households in the second season. Therefore, while households could have

preferred to engage in the market in both seasons, low productivity in the second season necessitates reserving most of the output for domestic use. This phenomenon is important for policy targeting agriculture commercialization. Food sufficiency goals could be addressed by improving crop productivity and storage. Interventions could also target crop varieties that perform well during short rains to encourage smallholder farmers to actively engage in production throughout the year. While NARO should be commended for developing these varieties, the challenge is dissemination and farmer adoption.

Appendix 1: Policy shifts in favor of agriculture commercialization in Uganda

Policy/ Strategy	Years	Policy focus	Specific objective	Strength and weaknesses
Liberalization and privatization policy	1987 -	- Deregulation of exchange rate controls and liberalization of trade including agriculture inputs and outputs - Concentration on public sector reforms and privatization of state owned enterprises	Increase efficiency of resource allocation while reducing the direct role of Government	**Strengths:** By removing market restrictions to trade, small holder farmers have had the opportunity to deal directly with private investors, trade freely and competitively. **Weakness** It exposes producers to increased risks due to greater volatility of prices
Poverty Eradication Action Plan (PEAP)	1997-2007	Enhancing rural incomes	Accelerate growth, reduce poverty and promote sustainable development	
PMA strategy	2000-2001	Modernization of agriculture	Stimulating a shift from subsistence to modern commercial farming	**Strengths** PMA was a holistic approach to agriculture development whose objectives and implementation were well targeted to the poor. It was also popularized throughout the country. **Weakness** Some pillars crucial to the commercialization drive did not take off such as marketing and agro-processing pillars.

National Agricultural Advisory Services (NAADS)	2000 - 2001	Establish an effective sustainable demand driven agricultural advisory services.	- Promote food security, nutrition and household income through increased productivity and market oriented farming. - Empower farmers to access and utilize contracted agricultural advisory services - Develop private sector agricultural advisory delivery capacity and systems and assure quality of advice	**Strengths** Its coverage has expanded to cover all districts and sub-counties in the country. **Weaknesses** Hand selection of farmers to be commercialized and nucleus farmers has received criticism because it excludes small holder farmers who lack access to critical inputs like improved seeds and fertilizers. Results from evaluation of the program have also been mixed.
Development Strategy and Investment Plan (DSIP)	2010/11-	- Enhancing griculture production and productivity - Improving access to and sustainability of market - Creating an enabling environment for the agriculture sector - Undertaking Institutional reforms and development in the agriculture sector	- Increase rural incomes and livelihood - Improved household food and nutrition security	DSIP captures key elements of the PMA, RDS and PFA and encompasses all farmer categories. However it has not been as popularized as PMA
Rural Development Strategy (RDS)	2005-2007		Ensure that value addition and stable markets prevailed in the sector	Advocated for proactive government but it was short lived.
Prosperity for All (PFA)	2006	Ensure that all households were able to earn an annual income of 20 million shillings	Ensure that households were able to earn an annual income of 20 million shillings through effectively selecting profitable enterprises at farm level	Program was misconceived from onset as a political mobilization tool. Implementers also thought that it was to have separate funding from the already existing programs which was not the case. It is quietly vanishing away.

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