International Academic Research Consortium Journals (IARCJ)
International Journal of Agricultural Science and Technology
ISSN: 2360-9888. Volume 8, Number 4
Pages 1-7 (May, 2020)
www.arcnjournals.org

Drivers of Market Participation Decisions among Smallholder Yam-based System Farmers in Oyo North Area of Oyo State, Nigeria

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Abstract: *Participation in agricultural markets could be the main weapon against hunger, to lift smallholder farmers out of poverty traps. Unfortunately, most of the smallholders are constrained by several factors in their quest to participate in the yam market. This study, thus clarified the underpinning drivers of market participation among small-scale farmers in Oyo North Area of Oyo State, Nigeria. Using a two-stage random sample of 227 farmers, the study tests the hypothesis that factors affecting farmers' decision to participate are not necessarily the same as those affecting the extent of participation. Non-price constraints played a significant role in determining decisions on market participation. Policies that reduce transaction costs and induce farmers to commercialize could be critical alternatives to policies based on price, to promote a marketed surplus and the commercialization of agriculture by yam farmers and thereby alleviate poverty.*

Keywords: *Market participation; Double-Hurdle Model, Yam producers; Oyo North Area.*

Introduction

Africa is the lead player in the supplies of cassava, with 50 percent of world production and of yam, with 95 percent of world production. Research efforts have been directed to cereals but cassava is now enjoying some level of support. However, yam continues to be sidelined in national food policy programs in West Africa, which remains one of the main areas challenged by hunger and poverty. Yam can be a formidable weapon against these scourges, if investments in food crop Research and Development, specially directed on yam by national governments, regional and non-government organizations, and donors, are used to bring the crop into a central focus in national food policies (IITA, 2012).

An approach in this regard is the encouragement of yam-growing rural smallholder farmers and other stakeholders in the yam sector to participate in the market. Agricultural growth depends on agricultural/food commercialization contributing largely to economic development. According to Mathenge *et al.* (2010), market-oriented production can be highly instrumental in realizing welfare gains by exploiting the opportunities and benefits provided via specialization and comparative advantage, economies of scale, and the regular interaction and exchange of ideas. Moreover, increasing agricultural output will amount only to an exercise in futility if it is devoid of markets that effectively bind the increasingly specialized activities of widely dispersed producers into an integrated national economy. Therefore, participation in agricultural markets can be a key scheme in lifting poor small holder farmers

out of the hunger and poverty traps. Stimulating their participation in agricultural markets will help them to enjoy the benefits necessary to boost food security in the region. Enhancing returns from yam production through improved access to market can be a way-in for welfare gain and a way-out of poverty. Unfortunately, most of the small-scale farmers are constrained by several factors from benefitting from participation in the yam market for their goods and services. Farmers in the study area are confronted with marketing problems indicated by low farm gate prices in spite of the high yam market value, leaving smallholder farmers with low income. Literature on market participation in rural areas continues to be relatively scarce (Bellemare and Barrett, 2006). The present paper is primarily concerned with the question: What holds farmers back from commercialization.

This study, thus, intends to fill those knowledge gaps by clarifying the drivers of market participation among smallholder farmers in Oyo North Area of Oyo State and looks beyond the decision to participate. In the first stage, farmers who produce yam decide whether or not to sell that commodity to the market. In the second stage, farmers who decide to sell determine the extent of their participation.

Underlying Theoretical Background

This paper considers farmers' participation in the market and recognizes that this decision may be made in a single or a sequential two-step process. In the sequential process, the farmers decide whether or not to participate in the market and, if they choose market participation, the next step in the decision is about the quantity to sell. Simultaneous decision-making means that the farmers make choices about market participation and quantity at the same time (Abdoulaye and Sanders, 2005; Chirwa, 2005). Increasing research on sequential decisions on market participation has been done (Croppestedt et al. 2003; Holloway et al., 2005; Ballemare and Barrett, 2006; Xu et al. 2009). The last study explicitly tests whether or not farmers make sequential or simultaneous decisions and finds the evidence necessary to support sequential decision making. None of these studies explicitly tests whether the decision could be made sequentially or simultaneously, as this study does. Small scale farmers' decision to participate in the market can be understood, based on a utility model. Any smallholder farmer in a rural area engages in a range of economically significant market activities. In modeling, the utility or satisfaction derived from the farmers' participation in yam markets, as integrated into the smallholder farming system, the economic values or benefits associated need to be considered. A typical smallholder farmer seeks to participate in the commercial market to maximize a multi-dimensional objective function, including increasing income and food security and reducing all forms of risk (Strauss *et al.* 1989). When there is a change in the economic parameters associated with market participation, the central question is related to how much compensation, whether paid or received, would make the decision-maker uninterested about the change. Thus, the change in welfare associated with this development was used as the basis for the economic valuation process. When an individual farmer faces a change in a measurable attribute, for example, higher returns or lower expenditures from participating in the market (p), then p changes from p^0 to p^1 (with $p^1 > p^0$).

Econometric specification: the Double Hurdle model

As to be mentioned later, generally, not all smallholder farmers participated in yam market. This could be explained in two ways; the farmers do not have yam to take to market or the farmer have yam but did not take it to market, for some reason. The zero values in the former case are related to the respondents' yam ownership decisions, while those in the latter case

are termed as random zeros and they arise from random events. The traditional approach to deal with data that have many zeros (censored dependent variable), has been to use the Standard Tobit model, originally formulated by Tobin (1958). The Tobit estimator fits conceptually when we think of decisions on market participation and yam supply as being made simultaneously. Tobit's model is too restrictive as it assumes the entire zero to be the respondent's deliberate choices. Cragg (1971) modifies the Tobit model to overcome the restrictive assumption inherent in it, namely, he suggests the Double Hurdle (DH) model, to tackle the problem of too many zeros in the survey data, by giving special treatment to the participation decisions. When thinking of decisions on market participation and yam supply as a sequential process, the DH model is appropriate for analyzing the possibility that the factors influencing a farmer's decision to participate in the yam market may not affect the quantity sold. The DH model also allows us to consider that the same factor can potentially affect participation and the amount sold in different ways. We relied on this approach and estimated a DH model, using Craggit command (Burke, 2009) in Stata software (StataCorp, 2013) which combines a probit estimation with a truncated normal regression, in the second step. The first equation in the DH model relates to the decision to participate and can be expressed as follows:

$$yi = 1 \text{ if } y_i^* > 0 \text{ and } 0 \text{ if } y_i^* \leq 0\varepsilon$$
$$y^* = x_{i\propto} + \varepsilon_i$$

Where:

y_i^* is latent participation variable that takes the value of 1 if a household participates and 0 otherwise, x is a vector of household characteristics and $\propto$ is a vector of parameters;

The second hurdle, which closely resembles the Tobit model, is expressed as:

$t_i = t_i^* > 0$ and $y_i^* > 0$

$t_i = 0$ otherwise

$t^* = zi^{\beta} + u_i$

Where:

t_i is the observed response on how much yam should be conveyed to the market.

The decisions whether or not to participate in market and about how much yam to convey to market can be jointly modelled, if they are made simultaneously by the household; and independently, if they are made separately, or sequentially, if one is made first and affects the other as in the dominance model (Martinez-Espineira, 2006).

Empirical Specification

We used a DH model. These decisions are made in a sequential manner and can be subject to two very different decision-making processes. Therefore, we used a set of explanatory variables. The choice of the variables used in this study is largely based on work by Lapar *et al.* (2003), Ballemare and Bartett (2006), Alene *et al.* (2008), and Xu *et al.* (2009), who extensively reviewed factors that influence farmers to participate in a market. The set of independent variables potentially expected to influence market participation are grouped into the following classes: household characteristics, physical assets, social capital and transaction costs.

Data and Results

The survey was carried out between May and September, 2010. Using a carefully designed and pre-tested questionnaire; we conducted interview with yam producers in Oyo North Area of Oyo State, Nigeria. A two-stage sampling procedure was adopted for the study. Oyo North area was however, purposively selected because it is regarded as the "food basket" of Oyo

State. Random sample technique was employed to draw the final study sample. In all, a total of 240 farmers were sampled. Out of this, information from 227 farmers was found useful for the analysis. The data collected valuable information on several variables, including socio-economic, farm-related, institutional, and technological factors.

The extent of market participation was captured by the proportion of quantity of yam produced, that ended up being sold by each farmer. In the study area, about 50% of the yam produced was marketed while about 92% of the farmers participated in the yam market. This is reflective of the importance of yam as a main source of income in the area. The average age of the farmers was 57 years, an indication that the farmers in the study area are old people, who are already close to their declining production curve. Availability of labor for farming (especially family labor) was indicated by the large size of households (10). The farmers were fairly literate, as about 40% of them completed six years of primary education. The farmers cultivated small plots of land, with an average size of about 2.0 ha. Access to non-farm credit was extremely low, as a sizeable proportion of the respondents claimed that they had never had access to loan facilities from any formal or informal institutions. The yield obtained from the farms varies from farmer to farmer but are low on average (about 9t/ha).

Table 1: Descriptive statistics

Variables	Symbol	Obs.	Mean	Std.Dev.
Dependents				
Yam market participation (=1if the farmer sold yam; 0 otherwise		227	0.92	0.23
Proportion of yam sold		227	50.06	28.9
Independents				
Age of the farmers (Years)	AGE	227	57.02	13.73
Education status (=1 if farmer has 6 years schooling or more; 0 otherwise	EDUCS	227	0.60	0.42
Household size (number)	HSIZE	227	9.75	4.36
Distance to market (Km)	DISMARK)	227	8.41	9.45
Total farm size	TFSIZE	227	2.02	1.86
Yam yield (Kg/ha)	YYIELD	227	8932	12203
Average price at which each unit of yam was sold (N/kg)	PRICE	227	250	0.42

Source: Field survey (2010)

The econometric estimation results of output market participation among smallholder farmers, using the DH of Cragg (1971) are discussed in this section. Correlates are hypothesized of yam market participation (whether a farmer sold yam) and extent of participation (the proportion of yam sold). The hypothesized variables focused on existing literature of interest, which will inform conclusions on this. Based on relevant statistical tests, as evidenced by the values of Wald Chi^2 and Log Likelihood, as well as signs and magnitude of the estimates, the regression results made better statistical sense and were therefore used in explaining market participation decisions. 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 2.

Age was negative and insignificant in influencing market participation but significant

in affecting the extent of participation, meaning that more of the older people participated in yam marketing. The rationale behind this is that younger people tend to shy away from agricultural activities due to the drudgery involved. Education was negative and significantly related to decision to participate in yam market. This implies that the more education they have, the less the willingness to sell yam by farmers. The tendency could be attributed to improved understanding of storage and possession of better storage facilities by seemingly educated yam farmers.

Farm size was positively and significantly associated with a higher probability of participating in the yam market. In addition, farm size positively and significantly influenced marketed volumes for yam. This is in agreement with the a priori expectation that farmers with large farms produce beyond what they use for home consumption. An increase in farm size naturally implies an increase in output. These results indicate the constraints that farmers who happen to have farms of smaller size face in getting access to markets due perhaps to their inability to produce a marketable surplus. The result also showed that the yield of yam was positively and significantly related to the probability of participating in marketing activities. The higher the yam yields, the higher the tendency for the farmers to sell yam. After the decision to participate in the market has been made, yield has a significant influence on the proportion of yam sold. Increased productivity results in a larger marketed surplus of yam, which could drive the commercialization of other crops.

Membership of a yam producer/marketing group/cooperative society was positively associated with the extent of participation in the yam market. After the decision to participate has been made, membership has a significant influence on the share allocated for sale. These results underscore the importance of social capital in the volume of yam sold by the poor smallholder farmers.

Contrary to expectations, the price for yam was negatively, albeit insignificantly, associated with the decision to sell. This is in agreement with the findings of Mathenge *et al*. (2010). A possible explanation for this unexpected behavior in the sign of price could be connected with the status of the farmer as net buyers of food crops. A high price could stimulate farmers to keep as much yam as possible on the farm, to prevent significant spending on the food crop. Another reason is the fluctuation in prices, occasioned by a lack of storage facilities and high perishability of yam crop.

Table 2: Estimates of Double-Hurdle Model of Determinants of Yam Market Participation Decision and Degree of Participation

Variable	Coefficient	Z-Value
	First Hurdle	
AGE	-0.00034	-0.04
EDUCS	0.24161	-0.96
HSIZE	0.02231	0.61
TFSIZE	0.08444	0.84
PRICE	-0.16912	-0.69
DISMARK	0.00026	0.09
YYIELD	0.0003***	1.76
OFF-INC	$3.77e^{-07}$	0.07

CONSTANT	2.14636***	3.57
	Second Hurdle	
AGE	-0.17008***	-2.67
EDUCS	-0.86820	-0.47
HSIZE	-.05943	0.29
TFSIZE	0.87674	1.14
DISTMARK	0.03053	1.46
YYIELD	0.00068***	9.04
OFF-INC	$9.94e^{-06}$	0.82
CONSTANT	62.0677***	12.83

Field survey: 2010.

Conclusion and Policy Implications

Participation in agricultural markets could be the main weapon against hunger, to lift millions of poor farmers out of poverty trap. Unfortunately, most of the potential beneficiaries are constrained by several factors in their quest to participate in the yam market. The mean proportion of 50% of the production was marketed and yam was the main source of income for most smallholder farmers in the study area. Market participation is becoming crucial to motivate the farmers in increasing their farm's output, hence enabling them to earn more income. This study, thus, clarified the underpinning driver of market participation among smallholder yam farmers in the study area. Evidence from yam markets in Oyo North area suggests the presence of institutional and infrastructural barriers to participation in the yam market. Factors that suggest these are distance from the farmers' village to the nearest market and the transportation cost of supplying yams to the market, which were negatively associated with yam sale. The DH estimation reveals that market participation is governed by two independent decisions; the decision to participate in the market and the decision on the extent of participation. The estimation results show that these two separate decisions are determined by different sets of factors. Non-price constraints also played a significant role in determining decisions on market participation. Policies that reduce transaction costs, which are usually associated with agricultural marketing and value addition; and induce farmers to commercialize could be critical alternatives to policies based on price, to promote a marketed surplus and the commercialization of agriculture by yam farmers and thereby alleviate poverty.

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