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Institutional and technical drivers of intra-household marketing decisions for smallholder farmers in Uganda: evidence from Northern Uganda

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ABSTRACT

Agricultural output marketing as an economic venture, increases smallholders' economic welfare (incomes) through market participation. However, the venture is plagued by inefficiencies that emanate from incomplete institutional and physical infrastructures as well as imperfect competition. Data were obtained from a random sample of 206 farmers in Nwoya district. A Tobit regression was conducted to determine the institutional (and technical) drivers of farmers' intra-household market participation decisions. The results revealed that variety used ($p < 0.1$), group membership ($p < 0.01$), markets ($p < 0.05$), road access (0.05), distance to markets ($p < 0.05$), total labor ($p < 0.05$) and household size ($p < 0.1$) significantly influenced intra-household market participation decisions. The outcome of this study provides a course-way upon which government institutions and relevant stakeholders can make strides through addressing policies aimed at enhancing sustainable economic welfare through increased productivity which reduces poverty and boosts food security among farmers.

IMPACT STATEMENT

Unlike other lowly developed economies, smallholder farmers especially in Sub-Saharan Africa continue to register low gains in terms of household economic welfare. Increase and sustainability in both productivity and market participation has for long been billed as a crucial pathway in ensuring continuous propagation of economic welfare. However, these ventures have continuously failed to deliver accordingly due to poorly instituted and hardly maintained institutional and physical (technical) infrastructures as well as competition. As an alternative, farmers have then to devise marketing decisions prudently and adeptly so as to realize the desired outcome (welfare). Moreover, when made prudently and calculative, intra-household marketing decisions have the capacity to improve on the household economic welfare and reduce on the poverty levels.

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Introduction

Empirical studies contend that agricultural output marketing increases smallholders' economic welfare through market participation (Dlamini & Huang, 2019). Thus, well organized markets for agricultural outputs link smallholders to important opportunities crucial for economic welfare improvement (Ebata & Hernandez, 2017). At state levels (Chagwiza et al., 2020; Kyaw et al., 2018) articulate that market participation is integral to sustainable agriculture and economic growth crucial for alleviating poverty as well as inequalities.

Building on this foundation, the genesis of all the above analysis is deeply rooted in agricultural productivity increase and sustenance. This anchors household commercialization and a continuum in market participation (Nordjo & Adjasi, 2019). However, to achieve successful propagation of both productivity and market participation, institutional factors notwithstanding others is one key ingredient that is integral for eventual economic welfare attainment (Jari & Fraser, 2009; Kgosikoma & Malope, 2016). The combination of institutional and physical (technical) factors as well as competition form one such integral and mediating ingredient in fostering productivity

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(Joseph et al., 2018). The proponents of the productivity strand argue that it is potent in alienating households from extreme poverty measured by more than a dollar per day subsistence (Osabohien et al., 2019; Thirtle et al., 2003). On the other hand, the champions of participation also adduce that it has the potential to move farmers out of subsistence to more commercial and lucrative ventures, thus welfare gain (Sher et al., 2021).

Despite these potential benefits, studies indicate that though productivity and participation have been instrumental in improving livelihoods in most parts of the rural world, in Sub-Saharan Africa, most smallholders are still subsisting on less than a dollar per day with few farming household able to participate in such markets (Chagwiza et al., 2020). The porosity of productivity and market participation in ensuring steady household economic welfare in SSA necessitated this analysis on intra-household marketing decisions with emphasis on identifying the institutional and technical drivers behind them. Given this context, with both the afore mentioned avenues faulting in guaranteeing household welfare, we take keen interest in analyzing intra-household marketing decisions in relation to these mediating factors (institutional and technical) because such decisions dictate the eventual household welfare.

Furthermore, it is well documented that intra-household marketing decisions when well calculated and prudently made, have the potential to improve household economic welfare (Bárcena-Martín et al., 2020; Molina Chueca et al., 2018). Most studies have focused on the empirical study of market participation in relation to transaction costs, household's commercialization and extent, productivity and liquidity analysis (Barrett, 2008; Masuku et al., 2001; Me-Nsope & Larkins, 2016; Pingali, 2005) yet few studies have attempted to analyze the intra-household specter relative to institutional factors. Thus, in analyzing household welfare from market participation, intra-household decision should take precedence although the driving forces stem from varying perspectives, hence the study's stand point (Barrett & Mutambatsere, 2008; Mirie & Zemedu, 2018).

In addition, across most enterprises (crop, animal and fruits), market participation in most developing economies is marred by inefficiencies (Gramzow et al., 2018). These stem from incomplete institutional and physical infrastructures as well as imperfect competition (Barrett & Mutambatsere, 2008). This breeds transaction costs, flaws in market information flows and failures in market access hence impinging

on household economic welfare. Initiatives by governments and development partners to salvage farming households were put in place to moderate commodity prices and also delved much into setting institutions right (Dorward et al., 2003; Tekalign, 2019). Despite these initiatives, most farming households by far have not attained economic welfare from market participation (Wilkinson, 2015).

Moreover, some scholars however argue that economic welfare may be attained by the household as a whole, depending on the decisions made collectively, while others contend that the welfare may not equitably be attained by all household individuals due to differences and preferences (Lenjiso et al., 2016). Thus, in terms of the farm model and household economics, economic welfare gains may result from variations in intra-household decisions between males and females or between and among household groups (Arora & Rada, 2017; Coles and Mitchell, 2011; Oduol et al., 2017; Rubin & Practice, 2011; Sahan and Fischer-Mackey, 2011). Consequently, in smallholder households, marketing decisions are dependent on dynamic economic conditions within households as well as the existing market imperfection (Giannetti & Wang, 2016).

Though broad in nature and practice, understanding it from different perspectives/paradigms is important for unlocking household dynamics (Anderson et al., 2017; Bjornlund et al., 2019). This study purposely looked at the intra-household marketing decisions and explored the institutional and technical drivers responsible for intra-household marketing decisions. Thus, significant relationships between markets and households have to be coordinated and bridged through institutional and technical aspects (Jari & Fraser, 2009). These aspects denote the rules of the game that facilitate coordination and govern relationships/interactions between groups or individuals (North, 1990), ultimately defining incentives and sanctioning people's behavior (Dorward et al., 2003).

In this context, it is central to this study to identify factors that hinder the potential of intra-household marketing decisions of smallholder farmers, giving special attention to institutional and technical factors. Hence, in Uganda as well as in other less developed rural economies, smallholder farmers face constraints when participating in markets due to a range of technical and institutional constraints. Factors such as poor infrastructure, lack of market transport, dearth of market information, insufficient expertise on value chain development and a poor business environment have led to the inefficiencies

in intra-household marketing decision hence slackening welfare.

Given the institutional and technical constraints, we build on the literature and posit three key propositions. First, we hypothesize that formal institutional access such as group membership and extension services enhance intra-household market participation by lowering transaction costs and strengthening farmers' bargaining power (Dorward et al., 2003; Jari & Fraser, 2009). Second, we expect technical factors including road infrastructure, market proximity and improved seed varieties to significantly boost marketable surplus and participation frequency by reducing logistical barriers (Gramzow et al., 2018; Masuku et al., 2001). Finally, we propose that household dynamics such as household size and dependency ratio mediate the effects of institutional and technical drivers, as labor availability influences a household's capacity to respond to market opportunities (Arora & Rada, 2017; Quisumbing & Maluccio, 2013). These hypotheses align with utility decision theory which frames farmers' market participation as a risk-adjusted optimization process under structural constraints.

Ultimately, by governing relationships, institutions become sanctuaries of hope for farmers ultimately contributing to scaling down poverty in the long run and ensuring sustained livelihood. Institutions according to North (1990): Jari and Fraser (2009) are divided into formal and informal categories and can also be tangible or intangible. Notably, tangibility can manifest in the physical interaction between extension workers and the farmers and to some extent with traders, while prices on the other hand can define and govern relationships without the necessity for physical observation of it. Thus, in whatever dimension, institutions have the propensity to arbitrate on farmers' intra-household marketing decisions and these in turn improve household economic welfare when adeptly and prudently made.

Theoretical framework

Intra-household marketing decisions focus on creating an environment which is conducive for farmers by way of improving livelihoods and leading to sustainable growth and poverty reduction. Consequently, farmers' marketing choices should prioritize profitability from their output. In this context, the utility decision theory pioneered by John Von Neumann and Oskar Morgenstern (1947) fits the study's framework. The theory postulates that when faced with a

choice of items or outcomes subject to series or levels of chance, the individual's optimal decision will be one that yields highest satisfaction. Rooted in developmental economics, the approach has prominence through the analysis of individuals' behavior which represents/or constitute the economic community (Goldscheider et al., 2015).

The individual is able to compare all possible prospects with greater relativity to uncertainty (risk) (Miletzki, & Broten, 2017). Thus, households economic prospects (livelihoods) are purposed and conditioned both by the broader socio-cultural context as well as by intra-household economic decisions (Rubin & Practice, 2011). This study is contextually skewed towards the intra-household market participation decisions. The basic insight here is that relative to risks and variations in individuals' prudence in the economic household model, the resultant intra-household decisions should yield greater economic welfare (Quisumbing & Maluccio, 2013).

Relatedly but notwithstanding other axioms, households model market participation decisions adapted from (Albaum, 1997), such as when to sell, quantities to be sold, place of sell, form of product taking into account reasonable expectation accruing to households in which individuals exhibit agnate expenditure patterns. This would indicate that it is the specific decisions made within the households that cause a shift towards resources increase. Nevertheless, although there are innate preferential differences between household individuals, we would still expect to find the outcome of aggregate intra-household decisions more focused towards economic welfare (Filipiak et al., 2017).

Moreover, it is also important to note that compositions of the total household assets and their accordant distributions between the household individuals have different implications on the decision dynamics and the eventual economic well-being within the households. For valuable outcome and economic growth, sacrifices and compromises between individuals is inevitable in the wake of apparent risks, preferences and differences in assets accordingly (Haer et al., 2017). Our study, thus provide insight into the general household economics decisions and does not segregate between unitary or non-unitary models. In this respect, the intra-household marketing decisions are made as long as they yield highest possible profits or economic welfare gain for the farming households (Otegunrin et al., 2019).

Additionally, empirical research has shown that profits accruing to farmers depend on how prudent and adept the farmers are when it comes to devising marketing decisions as sanctioned by market imperfections. Several authors have their work deeply rooted and grounded in this theory. Authors such as Gebremedhin et al. (2009), postulate firmly that farmers' market participation decisions are driven by utility maximization under risky conditions. Notably, the risks emerge from imperfect or non-existent markets, a common feature in sub-Saharan Africa (De Janvry et al., 1991; Disse & Sommer, 2020). Importantly, it is essential to note that intra-household decisions are made for the welfare of the family members. Welfare thus is blended in many forms but in the context of this study, the interest is in the economic welfare gain (profitability) that accrues to households (farmers) when intra-household marketing decisions are made with the overall tenet of reducing poverty.

Methodology

Study area, research design and sample selection

A cross-sectional survey was employed on a sample of farmers from several government programs on sustainable means of economic livelihood with the main purpose of reducing poverty in rural areas. Such programs include the National Agriculture Advisory Services (NAADs), operation wealth creation and parish development model schemes that are prevalent at grass-root levels.

The study was conducted in Nwoya district in northern Uganda. Nwoya was purposively selected as a greater percentage of the population is engaged in farming and crop marketing and it is also a prioritized district for restoration of livelihoods program financed by the Government of Uganda and other development agencies. Nwoya district is located between latitude 2°38'6.31"N and longitude of 32°0'9.93"E respectively. The district receives on average an annual rainfall of 1500mm with mean annual maximum temperatures of around 31.3°C and mean minimum of around 18°C. According to the 2014 population census, Nwoya District had an estimated population of approximately 133,506 people. By the 2024 national population and housing census, this figure has risen to about 220,553, reflecting a growth rate of 5.2%. The district covers an area of 4736.2 square kilometers and approximately 1828 square miles.

Most people are engaged in agricultural farming as their main source of livelihood with mixed

farming system being widely practiced. In addition, intercropping is carried out where various crops are grown together on the same piece of land. Farmers occasionally engage in marketing of their harvested (surplus) output as a way of raising household income.

The study adopted across sectional survey design and a random sampling technique was employed. In the first stage, Nwoya district was purposively selected as observed above. Then the two sub-counties namely Anaka and Alero were purposively selected for the sampling of respondents because they relatively contained higher numbers of farmers compared to the other Sub-counties. This was followed by random selection of one parish from each subcounty (Gok and Pabali), two villages (Ywaya, Kulu Anyeri and Bidin) from each parish and lastly, the respondents from each of the villages. For estimating sample size, the method advanced by Cochran and later modified by Mugenda and Mugenda in 2003 was followed. Accordingly, the estimated sample size was 206 which were distributed between the two sub-counties using proportional sampling. The sample size estimation equation was specified as follows:

$$n = \frac{Z^2 * P(1-P)}{e^2}$$

where; n=sample size, Z=level of confidence ($\alpha=0.05$), hence a 95% (1.96) confidence level was used.

P=proportion of the population, e=standard error (5%) or (0.05) was tolerated.

Therefore;

$$n = \frac{(1.96)^2 * 0.84(1-0.84)}{(0.05)^2} = 206$$

The sample size of 206 is above the minimum threshold of 30 and is thus adequate for a Tobit model.

Data and data sources

Two constructs were measured using a likert scale: Marketing decisions and institutional drivers. Under marketing decisions, the dependent variable, consisted of five elements which were modified and adapted from (Albaum, 1997; Frankenberger & Albaum, 1997) capturing the aspects of when to sell, whom to sell, where to sell, in which form and the marketing roles. A sample item from the realm of when to sell reads as

follows: “Household waits and sells during crop output scarcities”. All statements/items were rated on a 5–point scale (1–5, where 1= strongly Disagree and 5= Strongly Agree). The construct of institutional drivers was also measured on a scale of five items (1–5, where 1= strongly Disagree and 5= Strongly Agree). This construct comprised of eight elements that captured information on prices, credit, marketing information, assets and distance to markets, infrastructure (roads), farmers’ group and extension services. Sample items of the construct from the realm of price read as follows: “Middlemen and traders manipulate prices of output, the prices are regulated by authorities”. Table 1 below presents the variables used in the overall

study, their description, how they were measured and the expected a priori.

Data analysis

Data were cleaned and transferred for analysis to two statistical software namely; statistical package for social scientists (SPSS version 21) and STATA 13. First, arithmetic means, percentages, and frequencies were computed from social demographic factors and used to describe the sample characteristics of smallholder farmers in Nwoya district. Additionally, descriptive statistics for the constructs were also computed and generated. For sound interpretation of results, there should be no multicollinearity between constructs and thus, correlates should not be above the minimum threshold value of 0.6 (Hamilton). Hence, before any further analysis, correlates were computed to confirm existence of relationships between the constructs and to ascertain nonexistence of multicollinearity among the constructs. Thus, such constructs that exhibited multicollinearity (with values above 0.6) were not included in the regression model.

To further analyze the institutional drivers of intra-household marketing decisions for smallholder farmers, the Tobit regression model was used. This model has been used in several studies as articulated by Omini et al. and Kabiti et al. (2016). The model is suitable for studies that seek to establish relationships, the factors influencing market participation decisions and the extent of commercialization. It assumes that market participation decisions, commercialization and its extent (proportions) are influenced by the same set of variables (Burke, 2009). The Tobit model is appropriate for analyzing variables with lower and upper limits (McDonald and Moffitt 1980). In this study, since we assume that the intra-household market participation decisions are influenced by same set of independent variables (institutional and technical drivers), the Tobit model is recognized over other approaches. Though less restrictive and ensures consistent and efficient asymptotic parameter estimates, the Heckman model is best suitable for non-random samples and is deficient when the normality assumption is violated (Dlamini & Huang, 2019). On the other hand, due to censoring, the ordinary least square (OLS) approach also becomes technically unemployable in estimating regression parameters (Wang et al., 2016). Unlike the direct linear regressions where the dependent variable is observable and thus the relationship between

Table 1. Description of variables used in the overall study.

Variables citation(s)	Description	Measurement	Apriori and some
Sex/gender	Gender of respondent	1=Male & 2=Female	+ Rubhara & Mudhara, 2019
Age	Age of respondent	Years	-/+ Han, 2024
Marital status		1=Married & 2=Otherwise	+
Family size	Household members	Number	+ Iwuchukwu et al., 2016
Education	Respondents education level	Level1=<7, 2=>7 years	+ Rubhara & Mudhara, 2019
Poccupation	Household's main activity	1=farming, 2=otherwise	-/+ Llewellyn et al., 2020
Soccupation	Households' secondary activity		±
Incomes_log (Agric-income)	Earnings from farming activitie	Ugandan shillings	± Namazzi et al., 2015
Non-agric-income	Off-farm earnings	Uganda shillings	± Namazzi et al., 2015
Farmer's group	Belonging to a farmers' group	1=Yes, 0=No	-/+ Mmbando et al., 2015
Land-farmed	Land size household cultivated	Acres	+ Jayne et al., 2010
Roads	Types & nature/ condition convenience		-/+ Kgosikoma & Malope, (2016)
Extension-services	Services from extension workers	No of extrn visits	+ Martey et al., 2012
Distanc	Distance to markets	Kilometers	-/+ Alene et al., 2008
Credit	Availability of credit	+	+ Tadesse & Shively, 2013
MIA	Access to market information	1=yes/2=No	+ Dlamini & Huang, 2019
Variety	Seed varieties used	1=local & 0=improved	+
AS	Household has assets		+ Dorward et al., 2003

We should note that some variables such as credit, Poccupation etc. were dropped during analysis because they exhibited multicollinearity. They were not included in the regression model but still could form part of the descriptive statistics for the sampled households.

the dependent and independent variables is an observed direct linear relationship, Tobit regressions assume that there is an unobserved but indirect relationship. In particular, the assumed latent relationship between Y^* and the parameters (X) hence $Y^*_{(not-observed)} = a + BX + u_i$, leads to normal distribution of the error term with B being more accurately measured. In essence, using a Tobit, we obtain information relating to latent interactions that contribute to independent variables which may not be readily or easily observed through a direct linear regression. Tobit can also be used to estimate both changes in the probability of being above the limit and changes in the value of the dependent variable when above the limit.

Data on intra-household marketing decisions (IHMDs) were captured on items that included; Time of Selling, Buyer Type, Selling Place, Product Form and marketing roles. Each of these items had separate statements that were rated by the respondents on a five-point likert scale. The maximum rating was five points using likert scale. Responses for each item for each household (HH) were added and divided by the product of the number of statements and the maximum point which is a five for this case. The outcome composites (compressed items) were then added up to arrive at an overall or composite intra-household marketing decision index as a dependent variable. All

these were generated using statistical package for social scientists (spss) computer program.

Econometric analysis

To estimate the institutional drivers of intra-household marketing decisions, we estimated the following set of regressions. The Tobit regression estimates was defined by; Intra-household marketing decisions-IHMDs(Y) = β_0 + (institutional drivers) + stochastic (error term)

$$Y = \beta_0 + \beta_1x_1 + \dots + \beta_nx_n + u$$

$$Y = b_0 + b_1x_1 + \dots + b_{12}x_{12} + u$$

where:

Y = Intra-household marketing decisions (IHMDs), β_1 β_{13} = coefficient of parameters, x_1 ... x_{13} are the parameters that were estimated, β_0 = the intercept and μ = error term.

The empirical model was thus specified as;

$$Y = \beta_0 + \beta_1 \text{ varieties} + \beta_2 \text{ farmers' group} + \beta_3 \text{ Size} + \beta_4 \text{ Distance to market} + \beta_5 \text{ Markets} + \beta_6 \text{ Extension services} + \beta_7 \text{ Incomes_log} + \beta_8 \text{ Education} + \beta_9 \text{ Credit} + \beta_{10} \text{ Roads} + \beta_{11} \text{ Total Labour} + \beta_{12} \text{ As} + \beta_{13} \text{ MIA} + \mu$$

Table 2. Descriptive statistics of sampled households.

Variables	Mean	Standard deviation	Minimum	Maximum
Age	38.27	11.86	19	73
Education level	7.37	3.12	0	16
Income_log (per year)	1761943	1318464.80	384000	10000000
Non Agric-income	864672.80	869443.56	50000	6000000
Actual acreage farmed	3.85	1.43	1	9
Size (household size)	5.99	2.68	2	15
Household farming experience (years)	13.01	10.26	2	55
Household marketing experience (years)	8.47	7.17	1	41
Variables	Frequencies		Percentage	
Sex/gender				
Male	117		56.8	
Female	89		43.2	
Marital status				
Married	160		77.7	
Otherwise	46		22.3	
Primary occupation				
Farming	182		88.3	
Otherwise	24		11.7	
Secondary occupation				
Shop attendant	11		5.3	
Business	57		27.7	
Farming	58		28.2	
Casual labour	6		31.6	
Formal employment	10		4.9	
Commercial motorcycle riding (Boda-bodas)	5		2.4	
Ownership of land				
Yes	188		91.3	
No	18		8.7	
Household land size farmed (both hired/owned)				
Less than 5 acres	145		70.3	
Other-wise	61		29.7	

Table 3. Tobit regression estimates of the institutional drivers of farmers' intra-household marketing decisions.

Variables	Coefficients	Standard errors	$P> t $
Farmers' group	0.309***	0.097	0.002
Varieties	-0.078*	0.042	0.069
Size (household size)	0.013*	0.007	0.067
Distance to markets	-0.413**	0.192	0.033
Markets	-0.000**	0.000	0.018
Income_log	-0.019	0.022	0.388
Extension services	0.025	0.127	0.841
Roads	0.268*	0.144	0.064
Credit	0.050	0.117	0.668
Total labor	0.012**	0.004	0.036
AS	0.192	0.170	0.262
Education	0.053	0.040	0.188
MIA	0.041	0.131	0.757
_cons	3.006		0.000

Prob > $F=0.003$.

Pseudo $R^2=0.68$.

4 left-censored at IHMDs<=2.2095238.

204 uncensored observations.

1Right-censored at IHMDs>=3.6714286.

Results and discussion

Sample characteristics

The results of the descriptive statistics in Table 2 indicate that up to 70.3% of the sampled households were smallholders operating on average 4 acres of land with 88.3% actively engaged in farming as a primary activity and about 91.3% owning land. Secondary activities comprised of six elements with casual labor pooling most on average at 31%. Households' annual earnings from farming and non-farming activities on average were Ugandan shillings 1761943 and 864672 respectively. The mean age was 38 years with the minimum being 19 and maximum 73 respectively implying that the participants were adults. The average level of education for the household head was 7 indicating that most farmers attained primary education. The results further indicate that the average household size was approximately 5 members. Farming and marketing experience on average were 13 and 8 years respectively and this has an impact on the volumes of output sold in the markets. Male headed households were predominant in the study accounting for 56.8% compared to the female headed households at 43.2%. Of the 206 sampled farmers, 77.7% were married while 22.3% were single (not married, widowed or divorced).

Institutional and technical drivers of intra-household marketing decisions

The Tobit regression estimates for the institutional drivers of intra-household marketing decisions are summarized in Table 3. The coefficient of determination (R^2) value obtained was 0.68 implying that

68% of the variation in the intra-household marketing decisions was explained by the independent variables. The following variables were statistically significant institutional drivers of intra-household marketing decisions: nature and condition of roads, farmers' group, household size, total labour force, markets, inputs (varieties) and distance to markets. Variables such as access to credit facilities, household incomes, access to extension services, education level and access to marketing information had no significant influence on intra-household marketing decisions.

The results indicate that Farmers' group or group membership was found to influence IHMDs positively and significantly ($p<0.01$). Belonging to a farmers' group creates social networks thereby leading to social capital which is very vital for farmers in the wake of modern and competitive marketing. The outcome is in line with the study by Mmbando et al. (2015) who notes that belonging to a farmers' group creates synergies for knowledge flow and sharing which is integral for innovation both in production and marketing. Membership to a farmers' group increases access to information and also ensures efficient flow of information among members and this reduces transaction costs experienced especially when entering output markets (Adeoti et al., 2014; Kyaw et al., 2018). This study thus reaffirms the evidence that farmers who belong to a farmers' group have a high propensity to engage in marketing than those who do not belong to any (Christopher et al., 2010). It's thus critical for development partners to embark on avenues that bring farmers together so as to tap into the benefits that accrue to farmers when in some form of membership.

The variety used in the production and eventual marketing also influenced the IHMPDs within farming households ($p<0.1$). Advancements in technology have led to improvements in seed varieties, thus increasing productivity which leads to marketable surpluses thereby inducing farmers to produce mainly for the market. Empirical research suggests that the use of improved seeds is attributed to adverse climate changes that have affected yields overtime coupled with increasing population growth trends (Terdo & Feola, 2016). However, a negative coefficient was realized indicating a possibility that farmers could have been reluctant to adapt to new varieties. The finding is in line with the study by Ingabire et al. (2017) who used a double hurdle model to analyze the levels of market participation and drivers of output commercialization of bean farmers in Rwanda. The results indicated that use of

improved inputs negatively influenced the commercialized proportions. However, numerous related studies had differing results as their *a priori* had a positive sign. Hence, results of studies by Egbetokun et al. (2017), Geremewe (2019) using multiple linear regressions and (Mirie & Zemedu, 2018) using the Heckman double hurdle revealed that improved inputs like seed varieties have the capacity to vary output and thus the level of output for marketing within farming households.

The results also reveal that household size positively and significantly ($p < 0.1$) influenced IHMPDs. On average, family household size was 6 individuals meaning that the households had steady, cheap and abundant labor much needed for agricultural productions thereby enabling them to participate in marketing and hence the IHMDs that come in handy. The outcome conforms with that of Rabbi et al. (2019) whose study revealed a positive coefficient on household size and was also significant. A related study by Gebremedhin et al. (2009) using the Heckman's double hurdle reveal that household size influences market participation decisions as households with many individuals have steady supply of labor at even lower costs which reduces on the transaction costs. However, other studies suggest that household size limits market participation and so IHMPDs cannot be made as great proportions that would constitute marketable surpluses are reserved for sustaining the household members. However, contrary to the findings of this study, studies done by Randela et al. (2008) using a logistic regression and Osebeyo and Aye (2014) using a logit model on smallholder farmers' marketing decisions in Makurdi Benue State Nigeria, reveal that household size (dependence ratio) negatively influenced farmers market participation decisions in that households with more dependents are likely to consume greater proportions of their produce and hence have little or nothing left for the market.

The results indicate that distance to markets negatively and significantly ($p < 0.05$) influenced IHMPDs. Market distance influences marketing decisions in many folds but particularly in terms of costs incurred when accessing markets. Travel costs during market search is high and affect the resultant profit margins of farmers (Martey et al., 2012). The outcome resonates with the results obtained by Kyaw et al. (2018) who also found market distance to negatively impact on the market participating farmers in Myanmar. Empirically, farmers nearer to markets tend to have access to useful and reliable information about the

marketing trends such as buyers' reputation much more than those far afield (Tadesse & Shively, 2013). Similar results are also observed in studies by Mojaverian and Rasouli (2014) and (Alene et al., 2008) using selectivity model which revealed that distance to markets influences inversely smallholder farmers marketing decisions. These studies revealed that increase in the outputs' distance from the nearest city, the producers'/farmers' tendency to sell their products through channels of shorter distances from buyers also increases and vice versa. Therefore, increase in distance from the nearest selling place increases the tendency for farmers to sell to markets or buyers within the shortest distance.

The nature and condition of roads as predicted also positively and significantly ($p < 0.05$) influenced IHMPDs. Poorly constructed and hardly maintained roads inhibit movements to marketing centers and are avenues for greater loses while good road infrastructures facilitate the transportation of agricultural products from farm to market with better prices. In line with this study's finding, Kgosikoma and Malope (2016) using a logit model to determine the institutional constraints to market participation in Kweneng West, Botswana notes that the tarred road network reduced the distance and time in accessing the markets and this induced farmers to participate fully in marketing.

Markets as avenues for which exchange of goods and services take place also negatively and significantly ($p < 0.01$) influence IHMPDs. The livelihoods of most poor people are grounded in their involvement in a wide range of markets and as such, modest improvement in markets and its access is critical for sustained and broad-based poverty-reducing development (Dorward et al., 2003). Researchers such as (Patience) also had similar results and the findings reveal that markets may not be competitive thus repelling farmers from participation. A related study by Oduro and Osei-Akoto (2008) in Ghana reveals that as markets and opportunities become competitive and modestly improved, farmers get incentivized and increase production and this when coupled with the necessary structures and institutions, leads to flourishing in market participation. Therefore, markets in general are critical for farmers as they provide and link them to important opportunities that bolster reduction in poverty levels.

Whereas family size has previously been identified as impacting the IHMPDs, the total labour force employed including family members, hired laborers and other labour sources, had a positive and

significant ($p < 0.05$) influence on IHMPDs. Given the labor-intensive nature of farming especially in low-mechanization contexts, mustering it (labor) is beneficial for households. This increases production leading to larger marketable surpluses. However, empirical studies indicate that when both family size and labour are constrained, market participation and its intensity may falter. This is because the marketable surpluses that anchor participation may not be factored (Hailua et al., 2015).

Conclusion and recommendations

Households' economic and the general farm welfare are both anchored/or rooted respectively in market participation. Sadly, across most enterprises (crop, animal and fruits) especially in Sub-Saharan Africa, market participation is marred by inefficiencies emanating from both incomplete institutional and physical infrastructures as well as imperfect competition. Given this plight, smallholders should be adept in devising prudent marketing decisions in order to realize substantial gain from market participation. Notably, in most developing economies smallholders lack adequate market information and contractual arrangements, lack lobbies in the legal framework and are not easily receptive to innovative changes. This study was thus undertaken to assess the institutional and technical factors that play significant roles in influencing intra-household market participation decisions. Generally, the results revealed that household characteristics driving intra-household marketing decisions were household size. Since farmers are actively engaged in farming, it means that household sizes ensure steady, cheap and abundant supply of labor at lower costs that is employed in farming activities. Total labor force employed had a significant influence on IHMPDs. Given the fact that farming is labor intensive especially in lowly mechanized settings, mobilizing it (labor) is beneficial as such households tend to realize increased production leading to larger marketable surpluses. In addition, farmers' group, inputs (varieties), distance to marketing arenas, market presence as well as road network and conditions were significant drivers of intra-household marketing decisions. Contrary to expectations, improved seed varieties showed a negative association with market participation, suggesting potential barriers to adoption or mismatches between crop types and market demands, warranting deeper scrutiny. Thus, the development of institutions as well as physical (technical) infrastructures

should be fast tracked to ease constraint on farmers and aid supply response to any incentives in both agricultural production and marketing. Thus, it's vital for stakeholders and development partners to institute policies aimed at improving institutions as well as the technical and physical infrastructures so that farmers continue to participate in markets for improved welfare. We propose that future research should explore gender-differentiated decision-making dynamics and the role of digital tools in bridging market information gaps.

Ethical statement, consent to participate and use of survey information

This study was approved by the Gulu University Research Ethics Committee (GUREC). Permission and clearances to conduct this study in the study area were also granted by the local leaders. Written informed consent and assent were obtained from the adult participants and persons under the age of 18, respectively. Publication of the findings of the research is important as it can be used by the interested stakeholders. In reporting and publication of the findings, individual identification was not disclosed to respect the need for anonymity and guarantee confidentiality in reporting findings.

Authors' Contribution

Moses Mwesige Lukwago (LMM), Daniel Michael Okello (DMO) and Basil Mugonola (BM) participated in designing the study; LMM participated and supervised data collection. LMM, DMO and BM participated in analyzing and presenting the data. The initial draft was written by LMM and supervised by DMO and the final draft was written by LMM and finally supervised by both DMO and BM. All the authors read and approved the final manuscript. The study highlights the plight that rural smallholder farmers face in their struggle to improve on household economic welfare and curb poverty levels. The study further notes that modest improvements in institutional establishments and maintenance should be given priority so as to increase farmers' income. In due course, subsistence on more than a dollar per day will be achieved just like their counterparts in other developing countries experiencing steady improvements.

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No potential conflict of interest was reported by the authors.

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About the authors



Moses Mwesige Lukwago is a doctoral candidate in Management and Policy of Agri-Food Systems at Universidade Eduardo Mondlane, Mozambique, while maintaining affiliation with Gulu University's Department of Rural Development and Agribusiness. His academic foundation includes an M.Sc. in Agri-Enterprises Development and a B.Sc. in Development Studies from Gulu University. Mwesige's research examines food systems transformation, with particular focus on sustainable rural livelihoods, agricultural commercialization pathways, and institutional innovations for smallholder resilience. His current work contributes to understanding systemic barriers in East African farming systems, particularly how market linkages and policy frameworks can enhance farm incomes. This aligns with Uganda's Parish Development Model initiatives, where he investigates scalable solutions for food security and poverty reduction.

Dr. Daniel Micheal Okello serves as Lecturer in Kabale University's Department of Agribusiness and Natural Resource Economics, bringing expertise in socioeconomic analyses of smallholder agricultural systems. His research portfolio spans agricultural market participation, rural infrastructure impacts, and gender-inclusive approaches to resource access - themes critical to Sub-Saharan Africa's agrarian transformation. Dr. Okello's methodological strengths in institutional economics inform ongoing studies on climate-smart livelihood strategies and policy engagement frameworks. His collaborations with Gulu University's research team enhance interdisciplinary work on poverty reduction strategies, particularly in assessing how national development programs interact with local farming systems.

Associate Professor Basil Mugonola (PhD, KU Leuven University) an agricultural economist, leads research initiatives at Gulu University's Department of Rural Development and Agribusiness. With over a decade of experience, his scholarship advances knowledge on agricultural commercialization constraints, resilience-building for climate-vulnerable households, and evidence-based policy formulation. Prof. Mugonola's work underpins several national development projects, including Uganda's agricultural modernization agenda, where he analyzes institutional dynamics affecting smallholder market participation. His current focus on agrarian community transformation integrates infrastructure development, gender equity in resource allocation, and scalable models for income diversification - contributing directly to international development partnerships in East Africa.

The research team, based in the Department of Rural Development and Agribusiness at Gulu University, Uganda, specializes in analyzing the socioeconomic and institutional dynamics affecting smallholder agriculture in Sub-Saharan Africa. Our work focuses on sustainable rural livelihoods, agricultural commercialization, and the role of infrastructure and policy in enhancing market participation. Key research themes include poverty reduction strategies, gender equity in resource access, and resilience-building for agrarian communities facing climate and economic shocks.

The study aligns with the broader agenda of identifying scalable solutions to systemic barriers in smallholder farming systems. This research contributes to ongoing projects funded by national initiatives like Uganda's Parish Development Model and international development partners, which seek to strengthen market linkages, improve rural infrastructure, and foster inclusive agricultural policies. By bridging empirical insights with policy engagement, we aim to translate findings into actionable frameworks for boosting farm incomes and food security across East Africa.

Data availability statement

The datasets used and/or analyzed in the study are available at Gulu university institute for graduate studies and from the corresponding author on reasonable request.

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