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Factors Influencing Smallholder Bean Producer's Participation in Collective Marketing in Kawambwa, Luwingu and Senga Hill Districts of Zambia

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***Abstract*—Commercialization of agricultural produce through cooperatives that undertake collective marketing can decrease transactions costs for smallholder farmers. This study investigated the factors influencing smallholder bean producers' decision to participate and intensity of participation in collective marketing in Kawambwa, Luwingu and Senga Hill districts of Zambia. A multi-stage sampling design was used to draw 150 smallholder farmers from cooperatives from the three districts. Cross sectional data were collected through semi structured questionnaire and in-depth focused group discussions were also conducted with the three cooperatives. Double hurdle results revealed that the decision to participate in collective marketing was influenced by age, gender, household size, farm size, output price, farm income, hybrid seed, access to market information, ownership of a bicycle, radio and mobile phone. On the other hand, the determinants of intensity of participation in collective marketing were education level of the household head, bean output and distance to the nearest market. To increase smallholder farmers' participation in collective marketing, there is need to focus on policies that enhance access to market information, promotion and adoption of hybrid bean varieties, increased bean production and construction of bulking facilities in rural areas away from main markets. Smallholder farmers who have attained at least primary level education should be targeted as well as encourage youth and women participation.**

Keywords*— *Collective marketing, Participation, Bean Producers, Double hurdle model

I. INTRODUCTION

Globally, sustainable agriculture is viewed as one of the long-term strategic economic development approaches for inclusive growth [26]. The agriculture sector is highly depended on by the majority of rural households in least developed nations for income and employment. In Zambia, the sector offers employment to 70 percent of the labor force and is the main source of income and employment for 75 percent of women in rural areas [10, 40]. The current contribution of the agricultural sector to GDP is 2.7 percent [14].

Formation of farmer organizations and promotion of collective marketing has been recognized to play a major role in farming throughout the world and has many advantages such as reducing transaction costs, ensures higher output and lower input prices [1, 3, 9, 29, 38]. Farmer organizations also increase production and improve the quality required in modern markets and enhances the use of post-harvest techniques as well as help strengthen the social coherence and trust [28, 33, 38]. Gyau [12] also observed that market interventions, such as collectives, are often proposed as key strategies to deal with market failures. Empirical evidence however, reveals that farmer organisations do not always succeed, and therefore there is need to better understand the conditions under which collective action is useful and viable [15].

The Zambian government in partnership with NGOs, the private sector as well as UN agencies such as Food Agriculture Organization (FAO) and World Food Programme (WFP) has in the last decade supported smallholder farmers with the necessary skills, information and technology. World Food Programme (WFP) through Purchase for Progress (P4P), IFAD through Smallholder Productivity Promotion Programme (S3P) and Smallholder Agribusiness Promotion Programme (SAPP) promoted and facilitated collective marketing of common beans in Luapula and Northern provinces.

In Zambia, common bean is one of the six most widely grown crops, besides maize, groundnuts, sweet potatoes, cassava and rice. The bulk of the crop is produced in the Northern Province, accounting for 62% percent of the total production mostly grown during the rainy season. The other three provinces include Northwestern which accounts for 8 percent while Central and Luapula account for 11 percent and 6 percent respectively [39]. Most farmers grow local cultivars that are favored for their color and taste but have low yield potential and are susceptible to pests and diseases [27]. There has also been a bigger concern regarding the declining area

under common bean since 2014, and that yields have constantly remained below one metric ton per hectare [6].

Common bean is highly consumed in sub-Saharan Africa despite consumption being low in Zambia standing at 10 kg per capita per year (Sichilima et al., 2016). Consumption is determined by numerous factors. Singhal [37] notes that there are rapid changes in diets that have taken place among the new generation over the past 30 years as a result of the introduction of modern crop varieties among other factors.

Marketable surplus for common bean is moved mainly by small scale commodity traders from rural areas to main markets [4]. However, there are a few organized commodity traders [5]. In Northern and Luapula provinces, the market for beans is fragmented and mainly informal with traders moving from door to door in search of the commodity and in some cases designating makeshift buying points. NGOs like WFP have also played a key role in the bean market in the two provinces. It provides a ready market to the farmers as it procures to meet its requirements for emergency assistance in other countries [4].

Despite the various development actors supporting some cooperatives in Luapula and Northern provinces by constructing bulking centres and feeder roads, the centres have been under-utilized for bean collective marketing [19, 35]. Most farmers in the two provinces prefer to market individually despite recording huge quantities of marketable surpluses of beans. The factors that influence smallholder bean producers' participation in collective marketing have been the subject of conflicting and equivocal empirical research, over time [30, 38]. These inconsistent results can be ascribed to the different bean varieties, geographic locations, and estimation techniques employed; thus, there is a compelling need for additional analysis and/or further assessment. Furthermore, smallholder farmers provide the majority of the bean produce in the districts of Kawambwa, Luwingu, and Senga Hill in Zambia. Thus, smallholder market participation is therefore crucial to both economic expansion and the eradication of poverty. Despite the great potential benefits of beans, some farmers decide not to enter the market. Given the increasing demand for beans in both domestic and international markets, a well-designed marketing strategy may optimise the earnings of all parties involved in the supply chain. As far as research literature is concerned, there has not been a single study that focuses on participation in collective marketing regarding common beans in Zambia's Senga Hill, Kawambwa, and Luwingu districts, or in the provinces where these districts are located. Thus, determining the factors that influence smallholders' decisions to engage in the market and the degree (extent) to which they do so is crucial to maximising their return. By analysing the factors that influence the choice and/or decision and level and/or extent of collective market involvement, this paper aims to add to the body of literature. In particular, by understanding the factors that influence market participation, researchers would be better equipped to offer policies that will assist farmers in shifting the direction of their production systems in order to get around the obstacles that stand in the way of their involvement in local output collective markets.

The overall objective of the study was to investigate the factors influencing smallholder beans producers' decision to participate in collective marketing and intensity of participation. The specific objectives were to describe the socio-economic characteristics of small holder bean participating and non-participating farmers in collective marketing. Second, determine the socio-economic, production and institutional factors that influence smallholder farmers' decision to participate and intensity of participation in collective marketing.

II. METHODOLOGY

A. Theoretical framework

This study is premised on collective action theory. The theory of collective action falls within the NIE framework since it involves use of institutions to guide groups or individuals with common objectives to achieve a common goal [25]. Since at household level, the decision to participate in collective marketing is based on maximization of expected utility, the household will participate if,

$$U_i > U_x \quad (1)$$

Where Ui and Uk represent a household's utility with participation and without participation, respectively. The probability that a household will choose to participate in collective marketing can then be expressed as:

$$(Y=1|X) = (Ui>Uk) \quad (2)$$

A comparative cumulative distribution function evaluated on unknown parameters $\beta'=(\beta i-\beta k)$ is associated with a vector of independent variables X that influence household decision-making. These independent variables include socio-economic, institutional, and production factors, as well as the external enabling environment and market interventions. Utility maximization is subject to individual socioeconomic characteristics, production factors and institutional characteristics.

The double-hurdle model, Cragg [8] was estimated from cross sectional data collected through semi-structured questionnaires to assess factors influencing smallholder farmer's participation decision and intensity of participation in collective marketing. Within the context of collectively marketing, the double-hurdle model assumes that the zero values reported in the first hurdle arise from smallholders' deliberate choice not to participate in collective marketing, while those in the second hurdle come from smallholders that would not have sold common beans through the respective cooperative due to their deliberate choice or random circumstances. Various models have been used to understand factors that influence participation and extent of participation in collective marketing. These include tobit, double hurdle, and Heckman two-stage models. Moono [23] observed that the tobit model assumes the same set of parameters and

variables to determine both the probability of participation and intensity of participation. On the other hand, the double-hurdle model is a generalization of the Tobit model, where the decision to participate and the level of participation are determined by two separate stochastic processes [13]. Even though in some aspects, parameterization of the double-hurdle model is similar to that of Heckman procedure in that two separate sets of parameters are obtained in both cases, the double-hurdle model is considered to be less restrictive [16].

The formal model of the first hurdle or the participation decision equation is estimated with a normal probit model given below:

$$Di* = \alpha'Zi + \upsilon i$$

$$Di = 1, \text{ if } Di* > 0 \text{ and } 0 \text{ if } Di* \leq 0$$

Where, $\mathbf{D}_i^*$ is a latent variable that takes the value 1 if the famer sells common beans through the cooperative and zero otherwise; and **α** is a vector of parameters. **Z** is a vector of explanatory variables that include: socioeconomic, production and institutional factors, while **υ** is a vector of error terms.

The formal model of the second hurdle or intensity of participation equation is given below:

$Y_i^* = \beta' X_i + \mu_i$

$Y_i = Y_i^*$, if $Y_i^* > 0$ and $\mathbf{D}_i^* > 0$

$Y_i = 0$, otherwise

Where, Y_i^* and Y are latent and observed levels of participation in collective marketing respectively. The extent of participation in cooperatives was estimated by the quantity of common beans sold through the cooperative; where the numerator equals the quantity of common beans sold through the cooperative and the denominator equals the total quantity of common beans sold through the cooperatives. **β** is a vector of parameters to be estimated and X_i is a vector of variables (socioeconomic, production and institutional factors) influencing the households' level of participation in collective marketing, while **μ** is a vector of error terms.

B. Empirical Model

Based on the above-described econometric framework, the probit model for the decision to participate in collective marketing was specified as follows;

$$D_i^* = Pr(D_i = 1) \quad \alpha_0 + \alpha_1 Z_1 + \alpha_2 Z_2 + \alpha_3 Z_3 + \alpha_4 Z_4 + \alpha_5 Z_5 + \ldots + \alpha_n Z_n + \upsilon_i$$

Where, $\mathbf{D}_i^*$ is a latent variable that takes the value 1 if the famer sells common beans through the cooperative and zero otherwise.

Z_1 =Age, Z_2 = Gender, Z_3 = Education level, Z_4 = Household size, Z_5 = Bean price, Z_6 = Farm size, Z_7 = Hybrid seed, Z_8 = Distance to tarmac, Z_9 = Distance to market, Z_{10} = Bean output, Z_{11} =off farm income, Z_{12} = on-farm income, Z13 = Access to market information, Z14 = Farmer experience, Z15= Radio ownership, Z16 =Bicycle ownership, Z17 =Mobile ownership

The parameter estimates (α) accord the signs of the partial effects of the explanatory variables, Zi on the probability of the outcome variable. Then their marginal effects were used for evaluating the effect of each independent variable on the outcome variable.

The truncated regression model for determinants of the intensity of participation in collective marketing was specified as follows.

Y_i^* *(Quantity of common beans sold)* $= \beta_0 + \beta_1 Age + \beta_2 Gender + \beta_3 Education\ level + \beta_4 Household\ Size + \beta_5 Farm\ size + \beta_6 Distance\ to\ tarmac + \beta_7 Distance\ to\ market + \beta_8 Off\ farm\ income + \beta_9 Access\ to\ market\ information + \beta_{10} Farmer\ experience + \beta_{11} Bicycle\ ownership + \beta_{12}\ Radio\ ownership + \beta_{13} Bean\ output + \beta_{14} Bean\ price + \varepsilon_i$

C. Sample design and sample size

Multistage sampling design was used to draw 150 farmers where Purposive sampling was first employed to select three bulking centres where collective marketing is conducted. Then three districts with sampled bulking centres were selected and these included Kawambwa in Luapula province and Luwingu and Senga Hill in Northern Province. The bulking centres were selected based on proximity and high bean production. Proportionate random sampling method was then used to draw a sample of household members in each of the selected cooperatives. The respective cooperative registers were used as sampling frames comprising of farmers that marketed collectively and individually.

D. Study area

The study was conducted in Kawambwa of Luapula Province and Luwingu and Senga Hill of Northern province. Kawambwa district is about 233Km from Mansa and is located on the edge of the northern plateau. Luwingu district on the other hand is situated 165 Kilometers from Kasama, the provincial headquarters of the Northern Province. Senga Hill is located between 300 53' - 320 15' east of prime meridian and latitude of between 80 23' - 90 39' south of the equator. All the districts are in agro ecological region (AER) three with an altitude range from 1000 to 1500 meters above sea level. The AER three receives more than 1000mm of rainy fall annually. The soils are moderately fertile with occurrences of strong acidic soils in some parts that are moderately suitable for production of all types of cereals, legumes, tubers, and cassava.

E. Explanatory variables for this study

Gender is used to assess the difference in preferences, assets, education and technology for men and women. The extent of participation in markets for Male headed households is expected to be high but less likely to participate in collective marketing as compared to the female counterparts who are highly likely to participate in group marketing but with low intensity and therefore is given an intermediate sign [25, 36].

Education level is usually used as a proxy for human capital development and is given a positive sign. A farmer with some level of education is expected to utilize production and market information which in turn will lower transaction costs [20, 25].

The household size explains the family labor supply for production and household consumption levels [32]. A Large household size is expected to have positive impact on market participation if the household utilizes labour efficiently and vice-versa [25].

TABLE I. LIST OF VARIABLES HYPOTHESIZED TO INFLUENCE PARTICIPATION DECISION AND THE INTENSITY OF PARTICIPATION IN COLLECTIVE MARKETING

Variable	Description	Sign
Dependent		
Sold through the Cooperative 1 = Yes 0 =No	If a member sold through the Cooperative	
Quantity Sold in Kg	Quantity sold through the cooperative	
Independent variables		
Age (Years)	Age of household head	(+/-)
Gender (1= Male Female = 0)	Gender of household head	(+/-)
Education	Education level of (years) household head	(+)
Household size	Number of persons in a household	(+/-)
Farm size (Ha)	Total land owned by the household	(+/-)
Farmer experience	(Years) Number of years of farming	(+)
Average Price (K)	Average price per 5Kg of beans	(+)
Bean Output (Kg)	Quantity of beans produced in Kilograms	(+)
On farm income (K)	Amount earned from farming activities	(+)
Off farm income (K)	Amount earned from non-farming activities	(+)
Hybrid seed (1 = Hybrid 0 =	otherwise) Type of bean seed planted	(+)
Distance to tarmac (Km)	Distance to nearest tarmac	(+)
Distance to market (Km)	Distance to nearest main market	(+)
Access to market information	Farmer had price information prior selling	(+)
Bicycle	Household owned a bicycle	(+)
Mobile Phone	Household owned a mobile phone	(+)
Radio	Household owned a Radio working radio	(+)

Land is an important factor of production. There is an indeterminate relationship between land size and the probability and intensity of participation in collective marketing in past studies. Simon [36] found that increase in the farm size by an acre reduced the intensity of participation while Mukundi [25] in their study concluded that farmers with large farms had the potential to increase marketable surplus. Farmer experience was given a positive sign as Martey [22] argue that experienced households are able to take better production decisions and have greater contracts which allow trading opportunities to be discovered at a lower cost.

A decrease in the selling price significantly reduces the probability of producers selling through collection centres and was therefore given a positive sign. Nangobi and Mugonola [28] argue that intensity of participation in collective marketing was found to be positively influenced by the selling price of sorghum producers in Uganda. Bean output was measured in Kilograms. Nangobi and Mugonola [28] found that large output quantities positively influenced farmers to sell through the collection centre and earn higher profits.

Higher farm income is expected to positively influence participation in collective marketing [38]. This is because farmers invest in new technologies which can enhance high yields as well as meet other production costs and therefore given a positive sign. Household heads with an alternative source of income are more likely to participate in collective marketing and therefore given a positive sign. Off farm income increases marketable surplus and participation [18, 36].

According to Barrett [2] the barriers to market participation could also depend on production technologies such as access to hybrid seed and fertilizer needed to generate adequate surpluses to induce crop sales. Chilundika [7] and Mather [21] found that use of production technology (hybrid seed or fertilizer) positively influenced the probability of entering the market among bean producers in Zambia, but had no influence on the intensity of market participation. Use of hybrid seed is a positive and negative sign

Distance to the tarmac was expected to have a positive effect on the decision to participate and intensity of participation in collective marketing. Fischer, E. and Qaim [10] found that farmers who stay near places with improved infrastructure such as roads tend to market their agricultural produce individually and are not motivated to market collectively.

Distance to the markets, state of roads in communities and the frequency of market visitation are some of the factors that determine access to input and output markets [24] The distance to the nearest main market was captured in kilometers. Proximity to the market affects market participation in terms of travel time and costs. Mukundi [25] found that distance to the market had a negative and significant influence on market participation.

Members of farmer organisations share market information for decision making [31]. Mukundi [25] found that farmer organizations as a source of information was positively associated with market participation.

Ownership of a bicycle was captured as a dummy variable. Mango [20] argue that households that owned bicycles increased the chances of farmers to participate in collective marketing compared to those without.

Mobile ownership is given a positive sign as farmers who own mobile phones are able to search for important information on various aspects of life including market information. Mango [20] found that farmers who owned mobile phones increased the odds of participation in collective marketing in malawi.

Ownership of a working radio has been found to positively influence market participation because it reduces fixed transaction costs associated with information search on market availability and prices. Informing farmers through radio about new agricultural technologies and innovations is one of the best and quicker ways than human connections (Kwame et al., 2023 [17]. Abdul-Rahaman and Abdulai [1] found that ownership of a radio among rice farmers in Ghana positively influenced their participation in collective marketing.

III. RESULTS AND DISCUSSION

A. Highly marketed varieties of common bean

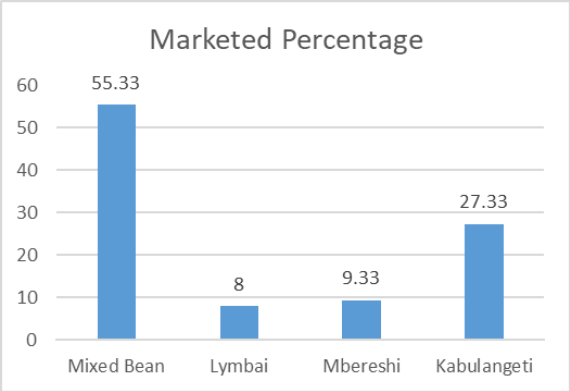

Figure 1: Highly Marketed Varieties

Figure 2. Mixed bean Varieties

Figure 3. Kabulangeti variety

Figure 4. Lymbai variety

Figure 5. Mbereshi variety

Figure 1 shows the common bean varieties that were mainly sold through the cooperatives and traders. Mixed bean in figure 2, ranked the highest, accounting for 55.33 percent of the total sales followed by Kabulangeti depicted in figure 3. Mbereshi (Figure 5) and Lyambai (Figure 4) varieties accounted for 9.33 percent and 8 percent respectively of the total sales.

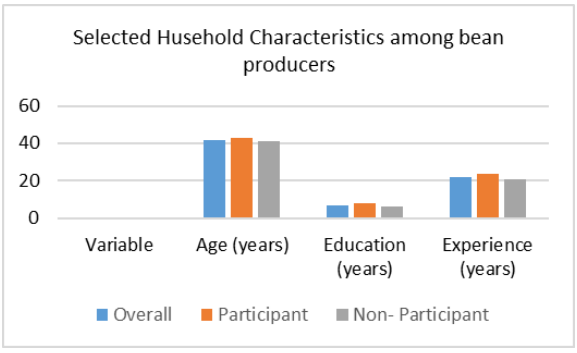

Figure 6: Selected household characteristics among bean producers

Figure 6 shows selected household characteristics among bean smallholder producers. It revealed that the average age was 41.78 years in pooled sampled. The average age of farmers who participated in collective marketing was 43.08

while for non-participants it was 41.35. The average number of years spent in school among the bean farmers in the sample was 6.62 years. The average number of years spent in formal education by participants was 7.92 years while non-participants spent 6.19 years. The mean number of years of experience among the farmers was 21.63 years. Participants had 23.70 years while non-participants had 20.96 years of experience. The mean area of land under bean production among the participants was 1.70 hectares while non-participants cultivated and planted 1.12 hectares of beans.

TABLE II. DESCRIPTIVE STATISTICS OF CONTINUOUS VARIABLES USED IN THE DOUBLE HURDLE MODEL.

	Collective marketing			
	Overall	Participant	Non-Participant	
Variable	Mean	Mean	Mean	t-Statistic
Age (years)	41.78	43.08	41.35	0.97
Education (years)	6.62	7.92	6.19	3.30***
Household size	6.13	6.89	5.88	2.70*
Experience (years)	21.63	23.70	20.96	1.61
Farm size (Ha)	7.14	6.86	7.23	0.37
Land under beans Cultivation(Ha)	1.26	1.70	1.12	3.81***
Seed planted(Kg)	82.85	111.08	73.60	3.83***
Bean Output/Ha(Kg)	691.9	962.16	603.50	2.94*
Quantity sold(Kg)	591.4	844.59	508.58	3.00***
Price per 5Kg(K)	31.49	34.97	30.34	5.34***
Bean income (K)	4013.7	5902.4	3395.2	3.99***
Off-farm income	937	1746	672	1.92
On-farm income	11989	15150	10954	2.25
Hh owns radio	1.161	0.430	0.007***	0.160
Hh owns mobile	1.475	0.819	0.072*	0.203
Constant	-5.737	0.832	0.002***	
Pseudo R2	0.5583			
Number of observations	150			
Log Pseudolikelihood	-37.01			
Prob>Chi2	0.0000			

***, ** and * are significance levels at 1%, 5% and 10% respectively. Source: Author´s survey (2021)

B. Probit estimates of factors influencing participation decision in collective marketing

Diagnostic tests were conducted before the model was estimated. Probit from the first stage of the double hurdle model was used to estimate factors that influence the decision to participate in collective marketing. The variables included in the model were age, sex, education level, household size, farming experience, farm size, distance to main town market, distance to tarmac, off farm income, information access, hybrid seed, output price, bean output, on farm income, off farm income, bicycle ownership, mobile and radio ownership.

The table reveals that age, household size, farm size, output price of beans, on farm income and ownership of a mobile phone and bicycle bean hybrid seed Being male, access to market information, bean output and ownership of a working radio were the significant factors in explaining household participation decision in collective marketing.

TABLE III. PROBIT ESTIMATES OF FACTORS INFLUENCING PARTICIPATION DECISION IN COLLECTIVE MARKETING

Variable	Parameter Estimate	Robust Std Err	p value	Marginal effects
Age of HH head (years)	-0.074	0.038	0.054*	-0.0101
Sex of HH head (Male =1)	-1.476	0.438	0.001***	-0.2030
HH head Education level (years)	0.058	0.045	0.203	0.0079
Household size	0.149	0.088	0.091*	0.0204
HH head Farming exp (years)	0.051	0.041	0.867	0.209
Farm size (Ha)	- 0.085	0.043	0.051*	-0.0117
Seed Type (Hybrid = 1)	1.746	0.771	0.023**	0.0002
Distance to market (Km)	0.019	0.034	0.581	0.0026
Distance to Tarmac (Km)	0.003	0.025	0.910	0.0004
Off farm income (K)	-0.0001	0.000	0.266	-0.0000
Information access	1.681	0.467	0.000***	0.2313
Hh owns bicycle	0.787	0.477	0.099*	0.108
Output Price (K)	0.056	0.033	0.093*	0.0076
Bean output (Kg)	0.002	0.0005	0.000***	0.0002
Hh owns radio	1.161	0.430	0.007***	0.160
Hh owns mobile	1.475	0.819	0.072*	0.203
Constant	-5.737	0.832	0.002***	
Pseudo R2	0.5583			
Number of observations	150			
Log Pseudolikelihood	-37.01			
Prob>Chi2	0.0000			

***, ** and * are significance levels at 1%, 5% and 10% respectively. Source: Author's survey (2021)

Age of the household head had a negative influence on the decision to participate in collective marketing. A unit Increase in age of household head is expected to have negative effect on market participation decision due to the risk-averse nature of older farmers [25]. Older farmers generally are reluctant to take risks. The findings are in agreement with Moono [23] that age relates negatively with market participation. He contends that households headed by older farmers may opt to wait for buyers at village level or at the farm compared to youth farmers who are able to transport the produce where there is ready market.

Gender is an important indicator of household decision making in an African setup and in most cases, decisions are made by men. As expected, being male was significant ($p = 0.001$) and had a negative influence on the decision to participate. The results are similar with Mukundi [25] and Simon [36] who contend that male farmers are less likely to participate in collective marketing as compared to the female counterparts because of differences in male and female households in terms of access to education, credit, technology and ownership of assets which may influence market accessibility. Gender is also used to assess the difference in preferences for men and women.

Household size positively influenced the decision to participate in collective marketing. The household size explains the family labor supply for production and household

consumption levels [32]. Households with more members as children are less likely to produce considerable quantities of beans as compared to households where adults are more. A large household size is expected to have positive impact on market participation if the household provide labor efficiently. Mukundi [25] and Simon [36] however found that household size had no influence on the decision to participate.

Farm size negatively influenced the decision to participate in collective marketing. A plausible explanation for this result is that larger farms had the potential to decrease the probability of participation because common bean producers mainly use hand hoes and therefore there is minimal expansion of the land under bean cultivation. The results affirm the findings of Kiwanuka and Machethe [16] that increase in farm size reduces participation among farmers. The results indicate that price was positive. This means that a favorable output price offered by the cooperative has the potential to motivate farmers to produce and sell more through groups and use the income generated to meet expenses related to production and other family basic needs. The finding resonates with Nangobi and Mugonola [28] and Ssajakambwe [38] that farmers stand a higher chance of generating high income when the selling price increases at the collection centres.

Contrary to our expectation, the coefficient for on farm income was negatively associated with participation in the bean market. This is in agreement with Ssajakambwe [38] that as more income is generated, farmers tend to shift from subsistence farming to commercial farming and can market individually and avoid challenges of bulking with smallholder farmers.

Ownership of a mobile phone was positively related to the probability of participation as expected. This is because mobile phones enhance communication and information sharing. Our results backed findings by Mango [20] and Abdul-Rahaman and Abdulai [1] that ownership of a mobile phone improves collective marketing participation among the rural populace.

As expected, the coefficient for ownership of a bicycle was positively associated with participation in the common bean market. In the three study areas, bicycles were a common mode of transport used to carry both inputs and various agricultural outputs by the farmers. This is in affirmation with Mango [20].

Use of hybrid seed in bean production positively influenced participation in collective marketing. Hybrid seed varieties are high yielding and therefore guarantee high marketable surplus. The result is consistent with Chilundika [7] that use of production technology such as hybrid seed or fertilizer positively influenced the probability of entering the market among bean producers in Zambia.

As expected access to market information was strongly associated with high level of participation in collective marketing as farmer groups are cheaper sources of information. The results affirm the findings of Mukundi [25] and Omiti [32] who argue that in a situation where farmers bulk agricultural products targeted for a particular market, farmers normally depend on informal sources of information which is timely and accessed at low cost compared with other sources of such as media.

Bean output positively influenced particpation. This implies that having high output increases the likelihood of a household to particpate in collective marketing. The findings concur with Nangobi [28] that higher output increases the likelihood of market participation because it enables households to have sufficient marketable surplus.

Ownership of a radio among bean farmers positively influenced the chances of participation in collective marketing. Using radio sets facilitates receipt of market information on prices of inputs and prices. The result supports the findings by Abdul-Rahaman and Abdulai [1] that farmers who owned radios were more likely to participate in collective marketing.

C. Truncated regression estimates of factors influencing the quantity of beans sold through collective marketing

The second stage of the double hurdle model (truncated regression) concerning the quantity of common beans that smallholder producers sold collectively through the cooperative was used to determine the extent of participation in collective marketing. The variables included in the model were age, sex, education level, household size, farming experience, farm size, distance to main town market, distance to tarmac, off farm income, information access, output price, output, bicycle ownership and radio ownership.

TABLE IV. TRUNCATED REGRESSION ESTIMATES OF FACTORS INFLUENCING THE QUANTITY OF BEANS SOLD THROUGH COLLECTIVE MARKETING

Variable	Parameter Estimate	Robust Std Err	p value
Age of HH head (years)	3.108	3.126	0.320
Sex of HH head (Male =1)	-39.212	28.692	0.172
HH head Education level (years)	12.203	4.776	0.011**
Household size	-2.142	9.422	0.820
HH head Farming exp (years)	-0.599	3.577	0.867
Farm size (Ha)	-6.630	4.462	0.137
Distance to main town market (Km)	6.043	2.596	0.020**
Distance to Tarmac (Km)	2.265	1.913	0.236
Off farm income (K)	-0.0070	0.0045	0.123
Information access	-34.154	36.513	0.350
Hh owns bicycle	-0.076	40.100	0.998
Output Price (K)	7.192	5.012	0.151
Quantity output (Kg)	0.951	0.022	0.000***
Hh owns radio	10.988	19.557	0.574
Constant	-516.041	217.390	0.018**_
Number of observations	37		
Log Pseudolikelihood	-199.0463		
Prob>Chi2	0.0000		

***, ** and * are significance levels at 1%, 5% and 10% respectively. Source: Author's survey (2021)

Education level of the household head positively influenced intensity of collective market participation. The results are backed by Simon [36] that education level of the household head enhances utilization of market information and therefore farmers have more market opportunities for agricultural commodities.

Bean output was positively related to intensity of market participation. The results confirm the observation by Omiti [32] that output is a key determinant of the percentage of farm produce that is sold. The more marketable surplus a farmer produces, the higher the quantity that will be sold through the collection centre.

Distance to the nearest main district market positively influenced intensity of participation in collective marketing. This is because farmers were able to reduce transport costs by selling at the collection centres close to their homesteads. Longer distances are associated with increased transaction costs Omiti [32].

IV. Conclusion And Recommendations

Participation in markets by smallholder farmers through collectives still remains a challenge in the world today. The study found that the decision to participate in collective marketing was influenced by age, gender, household size, farm size, and output price, on farm income, hybrid seed, and access to market information, ownership of a bicycle, radio and mobile phone. On the other hand, the determinants of intensity of participation in collective marketing were education level of the household head, bean output and distance to the nearest market.

Policies that encourage access to market information should be enhanced. At individual farmer and cooperative levels, this could be done by promoting and strengthening awareness of available platforms on mobile phones that provides information both on output and input prices. Output price influenced the decision to participate in collective marketing. Cooperatives need to be capacity built through training on how they can effectively bargain higher prices hence generate high income compared to fellow farmers that would opt to market individually. Hybrid seed and bean output positively influenced participation and intensity of participation respectively. Bean hybrid seed varieties have high yield potential and withstand pests and diseases. Distance to the nearest main market positively influenced intensity of participation in collective marketing. Therefore there is need to prioritize construction of bulking centres in rural areas, away from main markets because cooperative members who receive support and are near big markets usually have a lot of market options. Collective marketing should be promoted among youth cooperatives members that have attained primary education. High literacy levels will allow youth farmers utilize market information which will lower transactions costs and make participation and intensity of participation worthwhile. Female farmers should also be targeted and encouraged to increase the quantities sold through groups.

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