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Effect of socio-economic and institutional factors on common bean commercialization among smallholder farmers in Chepalungu sub-county, Bomet County, Kenya

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Abstract

Smallholder common bean commercialization is a critical factor for rural development as it provides a pathway for improving productivity, food security and alleviating poverty. However, common bean sector is dominated by subsistence farming which is not economically efficient as the level of commercialization is low at 0.4. Therefore, the study intended to determine the effect of socio-economic and institutional factors on common bean commercialization in Chepalungu sub-county, Bomet county. The study utilized cluster sampling procedure to obtain a sample size of 313 and data was collected using a semi-structured questionnaire. Descriptive statistics and Tobit regression model were utilized to analyze the data through SPSS version 29 and Stata version 15 software. The average level of common bean commercialization was 0.39 indicating a low level of input and output market participation. The model showed that market distance and access to extension services were significant at 1% and positively influenced common bean commercialization among smallholder farmers while marketing experience and total land size were significant at 5% and positively influenced common bean commercialization. Age was significant at 1% and negatively influenced common bean commercialization. Strategies need to be developed to improve farmers' market participation in input and output markets based on these variables. Youth need to be involved more on common bean production and marketing and the county government can provide training and extension services to farmers to increase level of productivity and commercialization.

Keywords: Common Beans; Socio-Economic; Institutional Factors; Commercialization

1. Introduction

The common bean (*Phaseolus vulgaris* L.) is a significant grain pulse consumed directly worldwide. Common beans have short growth period, high nutritive value, long storage period and low input requirements [1]. Considering its high nutritive value and financial viability, common bean has substantial potential for combating hunger, raising income, and enhancing the fertility of the soil in Sub-Saharan Africa [2]. It offers nutritional protein and other vital nutrients to individuals living in rural and destitute urban settings, with Eastern Africa having the world's largest yearly per capita bean intake (45 kg) [3]. Beans offer a consistent and lucrative supply of revenue for many rural families since they can be easily converted to cash, but smallholder common bean farming must be transitioned to a more commercialized system for economic growth [4].

Smallholder common bean commercialization is a critical factor for rural development as it provides a pathway for improving productivity, food security and alleviating poverty. It illustrates how commercialization can help alleviate poverty and boost economic development by improving the income of smallholder farmers [5]. In agribusiness, stepping

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up to intensive and profit oriented commercial farming improves farmers' living standards. Commercializing smallholder farming via broadened involvement in both agricultural output and input markets has become a potential strategy to enhance agricultural production and reducing poverty and food insecurity among developing country's rural farmers [6]. Similarly, smallholder farmers are also willing to commercialize common bean farming so as to benefit from increased productivity and higher incomes [7].

However, in order to develop outputs that can satisfy both dietary and market demands, farm inputs must be used, which advocates for input market involvement [8]. Inputs play an integral part in common bean production as well as efficiency since they are the foundation of the common bean value chain, such as efficiency-enhancing technology or inputs like improved seeds and agro-chemicals [9]. Due to financial and institutional constraints, smallholder farmers continue to face significant challenges in using productivity-enhancing technologies. Seeds and fertilizers are important agricultural inputs in increasing common bean output and if smallholder farmers implement recommended agricultural practices in addition to having the ability to purchase inputs, they should be able to attain improved yields and profitability [10].

Commercialization of common beans in Kenya has increased due to increase in demand throughout the value chain from seed multiplication, production, marketing and purchase of marketed beans over the years but the level is still low in output markets that is only 40% of the total production is marketed [11]. This may be due to common bean farming being dominated by subsistence farming which may not be economically efficient in the long run. Also, the level of smallholder common bean commercialization maybe influenced solely by resource endowments in the rural areas, farmers' characteristics, access to institutional services and access to the markets. Thus, the study focused on the precise socioeconomic and institutional variables affecting smallholder commercialization of common beans.

2. Methodology

The study was conducted in the Chepalungu sub-county of Bomet County. Chepalungu sub-county has an estimated population of 164,837 individuals and a land area of 539.8 km2 [12]. It is located between latitude 00° 56' 00'' South and longitude 55° 12' 00'' East, with an elevation of 1839 m above sea level. Rainfall fluctuates between 1000 millimeters in the lower regions to 1400 millimeters in the upper regions, while temperatures vary from 16 °C to 24 °C. [13]. The sub-county has five wards namely Siongiroi, Sigor, Chebunyo, Kong'asis and Nyongores. The area is suitable for growing a variety of crops ranging from maize, beans, sweet potatoes, sugarcane, bananas, avocadoes, sorghum, onions, tomatoes, water melons, butter nuts, finger millet, indigenous vegetables, kales as well as livestock keeping [14]. The study utilized descriptive research design. The desired sample size was obtained using [15] formula where by 313 smallholder farmers were obtained from a population of 1440 through cluster random sampling procedure.

The data was gathered between April and May 2023 from the sampled smallholder common bean farmers in Chepalungu sub-county. The respondents were interviewed and data was developed through a semi structured questionnaire. Data analysis involved use of descriptive statistics and econometric models with the help of SPSS version 29 and Stata version 15 software packages. To characterize and assess the socioeconomic characteristics and institutional factors, descriptive statistics such as means and percentages were utilized. The household commercialization index was used to determine the level of common bean commercialization in the output market. The household output commercialization index was computed as follows:

$$HOCI = \frac{GVCS}{GVCP} \times 100\% \quad \text{.....(1)}$$

where;
HOCI= the household output commercialization index of common beans
GVCS= gross value of common beans sold
GVCP=gross value of common beans produced

The input market participation was calculated by dividing the value of purchased inputs by the value of common beans produced. It is expressed as follows:

$$CBICI = \frac{a}{b} \quad \text{..... (2)}$$

where;
$CBICI$ = common bean input commercialization index
a = the value of purchased inputs
b = total value of common beans produced

CBICI denotes the magnitude to which a farmer participates in the input market as a customer. Tobit regression model was used to analyze the socio-economic and institutional factors affecting common bean commercialization. The Tobit regression model is known as the censored regression model because the lower and higher censoring are set to 0 and 1, respectively.

The model was specified as follows:

$$Y = \max(Y^*, 0)$$

where;

Y*s is the latent variable obtained from the exponential regression equation shown below.

$$Y^* = \beta + \Sigma\beta X + \varepsilon, \quad Y = \begin{pmatrix} Y * if\ Y *> 0 \\ Y * if\ Y *\leq 0 \end{pmatrix}$$

Y* denotes household commercialization index (HCI).

The equation model could be entirely written as follows:

$$CCI = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \ldots\ldots \beta 13X13 + \varepsilon i \quad (3)$$

where;
CCI = Composite commercialization index
$\beta 0$ = constant
$\beta 1 - \beta 13$ = explanatory variables (age, gender, household size, education, marketing experience, off-farm, access to market information, land size, distance to the market, credit access, occupation, extension services and group membership)
εi = stochastic error term

Because the parameters used in the Tobit model do not exactly correlate with variations in the dependent variable caused by changes in the explanatory factors [16], the marginal impact on commercialization level caused by a change in the explanatory variable is indicated in the following equation :

$$\delta\varepsilon\left(\frac{Yi}{Xi}\right) \div (\delta Xi) = \beta\varphi(\beta Xi) \quad (4)$$

Tobit model was suitable for this study because the dependent variable ranged from 0 to 1.

3. Results and Discussion

3.1. Description of Variables

The average age of common bean smallholder farmer was 43.82 years depicting that they were in productive years. The average years in schooling was 9.72 years implying that majority of smallholder common bean farmers in Chepalungu sub-county had completed primary school education. Each household had 5.42 members in average. Household size is a great determinant influencing level of consumption and labor provision. The total land size owned was 3.09 acres and the mean distance from the homestead to the market was 3.61 kilometers while the average marketing years was 4.66 years (Table 1).

Table 1 Description of Variables

Variable	Mean	Standard deviation	Minimum	Maximum
Age	43.82	14.29	21	88
Education level	9.72	4.08	0	18
Household size	5.42	2.23	1	13
Land size	3.09	3.24	0.1	25
Distance to the market	3.61	3.28	0.1	25
Marketing experience	4.66	4.21	0	24

Source: Primary Data, 2023

The findings show that 74.84% of the smallholder farmers' households were headed by male and majority of the farmers (63.55%) did not take part in off-farm activities. The findings also show that 61.29% of farmers had accessed market information. Market information access enable farmers to be knowledgeable of the prevailing market conditions such as the current prices, demand and supply, available inputs as well as link buyers and farmers. Majority of farmers (61.93%) partake farming as their primary occupation. This is owed to the fact that farmers in rural areas take farming as their main source of income. The findings also show that majority of the farmers (90.32%) did not belong to farmer groups and majority (87.09%) did not access credit owing to the fact that credit facilities were unavailable and majority of farmers did not have collateral. Also, the findings indicate that 74.19% of farmers accessed extension services (Table2).

Table 2 Description of Categorical Variables

Variable	Description	Percent
Gender	Male	74.84
Off-farm	No	63.55
Group membership	No	90.32
Access to credit	No	87.1
Access to market information	Yes	61.29
Occupation	Farming	68.39
Extension services	Yes	74.19

Source: Primary Data, 2023

3.2. Level of Common Bean Commercialization

The level of common bean commercialization was 0.34 in the input market while the level of commercialization in the output market was 0.43 indicating that 43% of common beans produced by farmers are marketed. The average level of commercialization (composite index) for smallholder common beans farmers was 0.39 which was obtained by weighing the mean of both of input and output commercialization index (Table 3).

Table 3 Level of Commercialization

Variable	Mean	Standard Deviation	Minimum	Maximum
Input index	0.3461	0.2601	0	1
Output index	0.4347	0.3763	0	1
Composite index	0.3904	0.2212	0	0.95

3.3. Determinants of Common Bean Commercialization

The results of Tobit model show that age, distance to the market, marketing experience, total land size and access to extension services were significant and affected common bean commercialization (Table 4). Age was significant at 1% and negatively influenced the level of common bean commercialization. A one-unit increase in age results in a 0.003-unit decrease in common bean commercialization. Older people do not engage in common bean commercialization as they are deemed productively inactive, risk averse and since common bean production is labor intensive, they may not be able to produce enough for the market. Younger farmers, on the other hand, are more responsive to technological developments such as the use of high productive beans and run small families, resulting in a comparatively bigger marketable surplus as opposed to risk-averse elderly household heads. These findings are in line with [17] who reported that aged farmers were less commercialized because they produce less due to labor requirements. However, the findings disagree with [18, 19] who reported that older people are more enthusiastic and participate more on marketing as compared to young persons.

Table 4 Empirical Results of Tobit Model

CCI	Coefficient	Standard Error	P>t
Age	-0.003***	0.001	0.000
Gender	0.001	0.029	0.973
Education	-0.002	0.004	0.593
Household size	-0.008	0.005	0.140
Occupation	-0.039	0.028	0.153
Land size	0.009**	0.004	0.026
Distance	0.011***	0.004	0.005
Marketing experience	0.006**	0.003	0.042
Access to market information	0.019	0.028	0.503
Off-farm	0.032	0.025	0.211
Access to credit	0.048	0.037	0.200
Extension services	0.101***	0.030	0.001
Group membership	0.029	0.041	0.465
_cons	0.495***	0.076	0.000

,* represents 5% and 1% significance level respectively, CCI- composite commercialization index

Total land size owned by the smallholder farmers positively influenced common bean commercialization and was significant at 5% level of significance. A unit increase in the total land owned by the farmer will increase common bean commercialization by 0.009 units. This imply that farmers who own large tracks of land will allocate more land for common bean production and participate more in the input market hence higher level of commercialization. The findings are consistent with [20, 21] who reported that farmers that own larger land sizes are more inclined to get involved in the market. The findings show that families with larger land holdings are more inclined to transform their farming operations into cash and are additional likely to produce greater quantities of food crops beyond their daily use. The findings also agree with [22, 23] who reported that having larger farm holdings will increase crop production through adoption of technologies. However, the findings disagree with [24] who stated that as total land increases farmers would allocate the land to other competing crops.

Distance to the market positively influenced common bean commercialization. An increase in distance will increase common bean commercialization by 0.010 units. An increase in distance increased the volume the farmer takes to market as market which far offer better prices. Increase in distance to the market made farmers to take larger volumes to the market so as to minimize cost and to enjoy the economies of scale. The findings are consistent with [25] who reported that distance to increase in market distance increases market participation. However, the findings contradict with [26] who stated that distance to the market had a negative correlation with market involvement as transport and transaction costs increases with distance.

Marketing experience positively impacted common bean commercialization and was statistically significant at 1%. Increase in marketing experience by one unit will increase common bean commercialization by 0.010 units. Experienced farmers participate more on input market and sell most of their outputs as they are aware of the existing market conditions as well as they have customer loyalty. The findings are consistent with [27] who stated that experienced farmers make informed decisions regarding marketing and participate more on the output market. The findings also agree with [28] who reported that marketing experience enabled pigeon pea farmers to be acquainted with relevant agribusiness skills especially in input and output sources which may help them in production and marketing skills.

Access to extension services was significant at 5% and positively influenced common bean commercialization. This imply that access to extension services increases common bean commercialization by 0.1 units. During the study it was observed that farmers who had access to extension services were more commercialized. It is possible that farmers who had access to extension services were given training and information on production, marketing, price, cultivation methods and agrochemicals. The findings are in line with [21, 29] who reported that extension contact influenced market participation positively because extension staff offered knowledge on input utilization and commercialization.

4. Conclusion

The level of commercialization in both input and output markets was relatively low at 0.39. Smallholder farmers consumed more than half of what they produce thereby reducing quantities available for the market and they did not participate more in the input market limiting the level of productivity. Tobit model showed that distance to the market, marketing experience, total land size and access to extension services positively impacted the level of common bean commercialization at input and output markets. Age had a detrimental impact on commercialization. Institutional factors, such as market structures, and extension services, play a significant role in shaping the commercialization behavior of smallholder farmers. Research in this area has contributed to understanding how institutional frameworks impact smallholders' ability to participate in commercial markets as well the impact of socioeconomic characteristics.

Recommendations

The following were recommended to improve smallholder common bean commercialization in input and output markets as the level of market orientation is currently low: Involve more young farmers in common bean production and marketing. This can be a solution for ever growing youth unemployment problem in Kenya. The county government to provide more training and extension services to farmers to increase level of productivity and commercialization. Training farmers on the benefits of smallholder commercialization and implementing the recommendations can foster productivity, resilience and a more sustainable agricultural sector in the region and beyond.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declared no competing interests.

Statement of informed consent

Informed consent was obtained from all the participants included in the study and relevant documents were obtained accordingly

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