

PARTNERSHIPS AND CHOICE OF MARKET OUTLETS AMONG BEANS FARMERS IN KENYA

Esther NG'ANG'A¹ * , Raphael GITAU¹ , Eliud BIRACHI²

Address:

¹ Department of Agricultural Economics and Agribusiness Management, Egerton University, P.O Box 536 Egerton 20115 Kenya

² Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT)

* Corresponding author: esthersheilla3@gmail.com

ABSTRACT

Research background

Beans form a substantial part of the household diet in East and Central Africa and are consumed by most households. They are alternative low-cost proteins for less endowed people in a society and can contribute towards nutrition, food security, and employment. In Homa Bay County, beans are staple food grown by a vast majority of farmers. Choice of market outlet is the most significant decision for farm households to sell their produce to the different market outlets, which has a more substantial impact on household income.

Purpose of the article

Factors influencing the choice of market outlets among smallholder bean farmers in Homa Bay County, Kenya

Methods

Data collected were analyzed using a Multivariate Probit. Multi-stage sampling was used to collect data from 362 farmers, which constituted 181 participants and 181 non-participants of Public-private partnerships (PPPs); data was collected using a pretested semi-structured questionnaire.

Findings & value added & novelty

The market outlet choices available in the study area for sales of beans included consumers, brokers, retailers, and wholesalers; however, retailers and wholesalers constituted more than half of the market outlets. Experience in bean farming, farm size, access to training, credit, and partnership participation positively and significantly influenced selling to these market outlets. Farmers who participated in PPP participated more in bean farming than non-participants; this might be attributed to the benefit acquired from partnerships, such as training farm inputs, among others. Thus, PPP could be an effective way of improving smallholder livelihood; policies that include mechanisms that create or secure markets for smallholder farmers will see to it that they get increased returns.

Keywords: market outlets; multivariate probit; public-private partnership; smallholder farmers

JEL Codes: P32; Q13; M31

INTRODUCTION

Common bean (*Phaseolus vulgaris* L.) is the world's most important legume for human consumption (Katungi *et al.*, 2010). In Kenya, consumption of beans contributes relatively high to human nutrition; the per capita consumption is estimated at 14kg per year but can be as high as 66kg/year in western parts of the country (Buruchara 2007; Katungi *et al.*, 2010). There has been increasing demand for beans as a source of proteins in Kenya, although their consumption has been constrained by supply. This deficit is expected to rise given the population increase and health-conscious consumers shifting to plant proteins. This has called for different measures by different actors to help scale up the supply of bean grain by farmers. In Kenya, beans are grown mainly by small-scale farmers with less than 5 acres and are usually intercropped with maize. The crop is grown in

almost all regions in Kenya; However, Eastern, Nyanza, Central, Western and Rift valley are the major bean-growing provinces. Regarding bean outputs, rift valley leads with 33 %, Nyanza and western are ranked second and account for about 22 % of national production while Eastern part and Coast regions outputs are constrained by adverse climatic conditions (Katungi *et al.*, 2010). Beans are a staple food in Homa Bay and are grown by a vast majority (80%) of farmers across the County (GoK, 2013). According to KALRO (2015), Homa Bay County beans per capita consumption has increased from 29.7 kg since 1999 to over 59 kgs in 2015. This compares to the western region's consumption level at 66 kgs per capita. The objective of this study was to analyze factors influencing the choice of market outlets among smallholder bean farmers in Homa Bay County.

Public-Private Partnerships (PPP) are broadly promoted as having the potential to help modernize the

agricultural sector and deliver multiple benefits that can contribute towards sustainable agricultural development that is inclusive of smallholder farmers (WEF, 2011; WEF, 2013). Chandan et al. (2017) defined PPP as a collaborative effort between the public and private sectors contributing to various functions to achieve partners' goals. Public-Private Partnership is an effective way to capitalize on the relative strength of public and private sectors to address problems that neither could tackle adequately on its own (Rankin et al., 2016). Creating a PPP entity with well-defined objectives can create a win-win collaborative arrangement whereby both commercial and developmental goals are achieved, besides promoting the inclusion of smallholder producers in developing countries. However, public-private partnerships are effective ways for the public and private sectors to collaborate and improve agricultural sustainability in developing nations (Chandan et al., 2017).

Public-private partnerships supplement scarce public resources, improve efficiency and reduce cost, thereby creating a more competitive environment. This study included farmers engaging in bean farming, both participants and non-participants of PPP intervention in Homa Bay County. According to (Ugen et al., 2017), the PPP approach is an intervention to help bean farmers with seed credit, some advanced refinancing arrangements, capacity building, and a structured market system. Two partnerships were studied in this study, the major partnership was between farmers and pre-cooked bean partners, and the second partnership was between one-acre fund and the farmers. Public-private partnership in a pre-cooked bean value chain was established in order to enhance the capacity of smallholder farmers to supply seed and grains; the partnership had multiple players such as grain traders, research institutions, farmer groups, aggregators of the bean, financial institutions, local government, seed companies, NGOs, Media, Caritas, Kenya Agricultural and Livestock Research Organization (KALRO), agro-dealers, processor and a law enforcement agency (Ugen et al., 2017).

The major partners were Kenya agricultural and livestock research organizations who developed bean varieties suitable for the pre-cooking process. The seed varieties were later distributed to Caritas, who then distributed them to targeted farmers' groups in different Sub-counties in Homa Bay. In addition, CARITAS mobilized farmers into groups, provided extension services, training, and credit. The improved bean seeds were also taken to agro-dealers who stocked them and sold them to farmers. Alliance of Biodiversity International and the International Center for Tropical Agriculture (CIAT) were in charge of technology development and capacity building in the PPP. The last partner was the lasting solution and collected graded beans for processing; the Processors, however, bought beans from the open market and very minimal quantity from farmers in the study area. The pre-cooked bean value chain was based on institutional PPP, where partner interaction and the parties are the most crucial feature (Andersen, 2004; Brinkerhoff & Brinkerhoff, 2004). Institutional PPP is the most preferred since it is not complex as a contractual PPP and has simpler contract modalities such as the

memorandum of association (Klijn & Teisman, 2003). One Acre Fund has been involved in supplying smallholder farmers with farm inputs, credit, in addition to providing extension services and training.

LITERATURE REVIEW

Bean is one of the potential legume crops produced in Homa Bay County; this makes a substantial contribution to the livelihood and income of small-scale farmers in the area. Farmers can sell beans via multiple outlets in order to maximize expected utility, making a firm decision. According to Shewaye (2016), market outlet choice is the most significant decision for farm households in selling their produce to the different market outlets, which has a more substantial impact on household income. Choice of the market outlet is a household-specific decision, and various factors are considered to be the basis for such a decision. Past studies have shown that decision to choose different market outlets by smallholder farmers is affected by various characteristics, such as resource endowment, access to a different market outlet, prices, and transport cost (Jaleta & Gebremedhin, 2012; Kuma et al., 2013; Shewaye, 2016). In other studies, by Geoffrey et al. (2014), farmers' decision on market outlet choice is influenced by several factors: farm size, price attitude, contract arrangement, and distance to market. Lack of market information or challenges in accessing more rewarding markets make smallholder farmers sell their produce through outlets offering low prices.

Even though farmers sell beans through the different market outlets, no empirical studies have been done to determine whether partnerships influence market outlet choice for bean farmers in developing countries. Therefore, this study further investigated the influence of partnership on the selection of market outlets for smallholder bean farmers. In order to alleviate market pressure, the agricultural market is evolving into a vertically coordinated system; thus, a detailed analysis of the relationship between partnership and market can be significant in developing livelihood improving programs in developing countries; this may help find out ways in which market participation among smallholder farmers can be improved.

DATA AND METHODS

The study used a multi-stage sampling technique to select the respondents. In the first stage, Homa Bay County was purposively chosen since it was one of the targeted areas for the pre-cooked bean project. In the second stage, out of 8 sub-counties in Homa Bay County, four sub-counties were purposively selected: Suba North, Homa Bay town, Ndhiwa, and Rangwe; this was because the project was implemented in those sub-counties. In the third stage, a list of farmers that participated in PPP was generated from each of the four sub-counties. In the fourth stage, Systematic random sampling of participants was selected proportionate to the actual size of the participant from each sub-county. In the final stage, to get non-participant simple random sampling was used. In determining factors influencing smallholder bean farmers' choice for the

market outlet, the original sample of 362 households was reduced to 253 households in the bean production system; this was due to some of the farmers not selling their beans but instead keeping them for household consumption. Out of 253 farmers, 147 participated in PPP, and 106 were non-participants.

Data collection and analysis

Data was collected through single farm visit interviews using structured questionnaires. The dependent variables, which were market outlet choices, were binary for all the market outlets, indicating a preference for that market outlet and zero otherwise. A binary selection model would appropriately fit the analysis due to the dichotomous nature of the dependent variable (Deb & Trivedi, 1997; Greene, 2002). The four-market outlet chosen were brokers, consumers (direct consumers and institutions like schools), retailers, and wholesalers. The primary data that was collected included socioeconomic and institutional characteristics of farmers, outlets used by farmers to sell their beans in the market, the reason for selling to those markets, prices offered by different markets, and income received from the sales of beans. Data collected was coded, recorded, cleaned, and analysed using statistical packages software's (SPSS v25 and STATA v16)

Empirical model

The study adopted Multivariate Probit (MVP) to simultaneously model the influence of a set of explanatory variables on bean farmers' choice of the market outlet. Smallholder farmers are more likely to choose more than one market outlet to maximize sales and reduce the risk of choosing one. Farmers consider asset or bundle of possible channel choices that maximize their expected utility (Arinloye et al., 2012, 2015); hence selection decision is multivariate and using of univariate model exclude useful economic information contained in interdependent and simultaneous choice decisions (Dorfman, 1996). Estimating independent binary equations for each market would lead to potential bias because the analysis does not allow correlation of error terms, leading to inefficient estimates. Thus, selection decisions were modeled using the MVP model to account for these shortcomings. The MVP model simultaneously regresses a combination of several correlated binary equations against a single vector of explanatory variables (Cappellari and Jenkins, 2003; Kassie et al., 2013; Teklewold et al., 2013). To determine the appropriateness of the MVP model for analysis and the relationship between the market outlets, error terms between binary correlation coefficients of the four market outlets equations were estimated.

Farmer choice of bean marketing outlet in an expected utility framework is based on random utility theory (Green, 2000). The utility is determined by a set of exogenous variables that influence farmers' market outlet choice. Therefore, the decision of a farmer to sell to a particular market outlet depends on whether that market outlet gives the farmer higher utility than another outlet. The utility of economic agents is not observable, but their action is observed through their choice.

Consider the i^{th} household ($i=1.... N$), which confronts whether or not to choose available market

outlets over the specified time horizon. Let u_j represent the farmer's benefit to select j^{th} market outlet, where j represents the different choice of market outlets (R retailers, W wholesalers, B brokers, C consumers). Equation (1) shows that the farmer decides to choose j^{th} market outlet if

$$y_{ij} = u_j - u_o \geq 0 \tag{1}$$

Equation (2) shows that the net benefit γ_{ij} that farmer i derives from choosing a market outlet as a latent variable determined by observed explanatory variable x_i and disturbance term ε_i .

$$y_{ij} = X_{ij} \beta_{ij} + \varepsilon_i \tag{2}$$

Where;

y_{ij} dependent and variable for channel choice of brokers, retailers, wholesalers, and consumers;

X_{ij} the combined effect of the explanatory variable;

β_{ij} vector parameter;

ε_i error term.

with $y_{ij} = 1$ if $y_{ij} \geq 0$ and 0 if otherwise (3)

In a multivariate model, where the choice of several market outlets is possible, the error terms jointly follow a multivariate normal distribution (MVN) with a mean of zero and variance-covariance matrix and has values of 1 on the leading diagonal, where $(\mu_R, \mu_W, \mu_B, \mu_C) = MVN \approx 0, \Omega$ p_{ij} represents the correlation off-diagonal elements, the asymmetric covariance matrix is given by (Eq. 4).

$$\Omega = \begin{bmatrix} 1 & PRW & PRB & PRC \\ PWR & 1 & PWB & PWC \\ PBR & PBW & 1 & PBC \\ PCR & PCW & PCB & 1 \end{bmatrix} \tag{4}$$

Equation (4) generates the MVP model that jointly represents a decision to choose a particular market outlet. The diagonal element in the variance-covariance matrix represents the unobserved correlation between the stochastic components of different outlets. The specification with non-zero off-diagonal elements allows for correlation across disturbance terms of several latent equations, representing unobserved characteristics that affect the choice of alternative outlets. Selecting an appropriate market channel is not easy because different factors influence market outlet choices. Household Socio-economic variables, market factors, and institutional factors were used to analyse market outlet choices derived from previous studies (Arinloye et al., 2015; Geoffrey et al., 2015; Abera et al., 2016; Tarekegn et al., 2017).

RESULTS AND DISCUSSION

This section presents and discusses the study findings. It begins by showing descriptive statistic results of

significant categorical variables (Table 1) such as gender, group membership, and partnership in relation to smallholder bean farmers' choice of marketing outlet. Traders play a crucial role in buying beans. Some buy at the farm gate, and some believe at a marketplace. Buyers of beans in the study area included; wholesalers, retailers, brokers, and consumers. Wholesalers comprised 35.44 %, wholesalers buy bean grain mainly from individual farmers, some collectors/small traders, and a few other wholesalers. Retailers were 34.74%; they buy beans from wholesalers and farmers in their surroundings and directly sell to consumers. Consumers who were direct consumers and school comprised 16.14%. Finally, brokers comprised 13.68%; they physically handle products for buyers and sellers and are paid on a commission basis for the services rendered.

The most preferred outlet among female farmers was wholesalers, with 77.23% female selling to the outlet. The least preferred was brokers, with only 61.54% selling to brokers. For male farmers, the most preferred outlet was a broker with 38.46% selling to brokers, and the least preferred was wholesalers, with only 22.77% male farmers selling to the outlet. However, there was a statistical difference at a 5% significance level for male and female farmers that sold their beans to broker outlets. The result shows that the majority of the female farmers were able to participate more in bean farming as compared to their male counterparts, hence the choice of wholesaler market outlets.

There was a significant difference for those farmers who supplied their beans to the wholesaler market. Farmers who supplied their beans to brokers, consumers, retailers, and wholesalers acquired credit from the bank, microfinance, and other informal sources represented 25.64%, 32.61%, 35.35%, and 47.52% respectively.

Education level was broken down into four categories; none, primary, secondary and tertiary. The majority of farmers who sold their beans to different market outlets had primary education. However, there was a significant statistical difference for farmers that sold their beans to broker and wholesaler market outlets.

In regard to training, 51.28%, 71.74%, 58.59%, and 59.41% of farmers that supplied their beans to brokers, consumers, retailers, and wholesalers received training, respectively. However, there was a significant difference for those farmers that supplied their beans to the consumer market. Result confirms that the majority of the farmers in the group sold their beans to the consumer market, which comprised direct consumers and schools. From the finding of this study, 48.72 %, 69.57%, 49.49%, and 67.33% of the farmers in partnership supplied their beans to brokers, consumers, retailers, and wholesaler market outlets, respectively. However, there was a significant difference between farmers who sold their beans to consumer, retailer, and wholesaler market outlets. Results indicate that most farmers who participated in the partnership supplied their beans to consumer and wholesaler market outlets.

Descriptive statistics for the continuous household variables are summarised in Table 2. The results indicate that the minimum age of the bean farmers was 20 while

the maximum age was 80 years. The mean age of farmers selling to broker's outlets was 42.6, while consumers, retailers, and wholesalers were 46.4, 44.3, and 46.3, respectively. However, there was a minimal difference for farmers who sold their beans to the broker market. This indicates that farmers who sold their beans to broker outlets were slightly younger than those who sold to other outlets. This may be attributed to the fact that younger people do not take time in search of a better market as compared to older people.

In terms of experience in bean farming, results indicated that the minimum number of years for bean farming was one while the maximum year of experience in farming was 40. This implies that there were farmers with little and others with more experience in bean farming. The mean years in bean farming experience was 8 for brokers and consumers, 10, 9 for retailers, and wholesalers, respectively; however, there was a statistical difference in bean farming experience for those farmers that sold their beans to retailers. Experienced farmers have a better knowledge of the cost and benefits of various bean marketing outlets, thus leading to informed choices on the market with better returns, such as the retailer market.

The minimum land size was 0.1 hectares, while the maximum was 3.6 hectares. The mean land size under bean production was less than one hectare across the market outlets, with 0.5, 0.6, 0.4, and 0.7 hectares for farmers who sold their beans to brokers, consumers, retailers, and wholesalers. However, there was a high statistical difference between those farmers that sold their beans to retailers and wholesalers' markets. Land size is an important asset that affects marketable surplus. Result confirms that farmers with big land sizes were able to participate more in bean farming and thus choose a wholesaler market outlet.

Regarding distance, the mean distance transported in kilometers was 1.8, 0.4, 2.5, and 2.4 for brokers, consumers, retailers, and wholesalers, respectively; however, there was a high statistical difference for those farmers who sold their beans to retailers and wholesalers' markets. The minimum number of visits by extension service provider was 0, and the maximum was five times within the last year. Extension services are a means of disseminating production and marketing information to farmers and consequently affecting their output. The mean number of extension services received was 0.9, 0.8, 1, and 1.2 for farmers who sold their beans to brokers, consumers, retailers, and wholesaler market outlets. Nevertheless, there was a high statistical difference for those farmers who sold their beans to the wholesaler's market.

Table 3 shows the differences between participants and non-participants of PPP. The result shows that there was a statistical difference between the two groups. The mean quantity harvested was 3.3 for PPP participants, whereas for non-participants were 2.9; the difference was significant at a 1% significant level. The mean price for PPP participants was 139, whereas for non-participants were 135 the difference was significant at a 10% significance level.

Table 1: Descriptive statistics for categorical variables

| Categorical variable | Brokers (n=39) | | Consumers (n=46) | | Retailers (n=99) | | Wholesalers (n=101) | |
|---------------------------|----------------|---------|------------------|---------|------------------|---------|---------------------|----------|
| | % | pr | % | pr | % | pr | % | pr |
| <i>Sex</i> | | | | | | | | |
| Female | 61.54 | 0.047** | 69.57 | 0.416 | 74.75 | 0.898 | 77.23 | 0.386 |
| Male | 38.46 | | 30.43 | | 25.25 | | 22.77 | |
| <i>Level of education</i> | | | | | | | | |
| none | 10.26 | 0.079* | 10.87 | 0.873 | 10.1 | 0.873 | 11.88 | 0.028** |
| primary | 43.59 | | 56.52 | | 56.57 | | 69.31 | |
| secondary | 38.46 | | 28.26 | | 28.28 | | 14.85 | |
| tertiary | 7.69 | | 4.35 | | 5.05 | | 3.96 | |
| <i>Non-farm income</i> | | | | | | | | |
| yes | 64.1 | 0.144 | 54.35 | 0.882 | 56.57 | 0.412 | 48.51 | 0.208 |
| no | 35.9 | | 45.65 | | 43.43 | | 51.49 | |
| <i>Acquire credit</i> | | | | | | | | |
| yes | 25.64 | 0.106 | 32.61 | 0.481 | 35.35 | 0.635 | 47.52 | 0.005*** |
| no | 74.36 | | 67.39 | | 64.65 | | 52.48 | |
| <i>Received training</i> | | | | | | | | |
| yes | 51.28 | 0.294 | 71.74 | 0.050** | 58.59 | 0.936 | 59.41 | 0.893 |
| no | 48.72 | | 28.26 | | 1.41 | | 40.59 | |
| <i>Group Membership</i> | | | | | | | | |
| yes | 64.1 | 0.697 | 76.09 | 0.139 | 65.66 | 0.757 | 68.32 | 0.676 |
| no | 35.9 | | 23.91 | | 34.34 | | 31.68 | |
| <i>Partnership</i> | | | | | | | | |
| yes | 48.72 | 0.197 | 69.57 | 0.082* | 49.49 | 0.026** | 67.33 | 0.015** |
| no | 51.28 | | 30.43 | | 50.51 | | 32.67 | |

Table 2: Descriptive statistics for continuous variables

| | Brokers | | Consumers | | Retailers | | Wholesalers | |
|--|-------------------|----------|-------------------|----------|--------------------|-----------|---------------------|---------------|
| | Mean | t-test | Mean | t-test | Mean | t-test | Mean | t-test |
| | Std. Dev | | Std. Dev | | Std. Dev | | Std. Dev | |
| Age | 42.641 (13.39) | 0.0919* | 46.413 (14.57) | 0.674 | 44.374 (15.027) | 0.302 | 46.277 (14.493) | 0.542 |
| Experience in bean farming | 8.410 (7.563) | 0.372 | 8.043 (6.730) | 0.1852 | 10.101 (9.046) | 0.0263** | 9.069 (6.977) | 0.257 |
| price | 139.28 (23.65) | 0.000*** | 135.04 (26.37) | 0.000*** | 140.13 (27.2) | 0.000** | 137.712 (27.736) | 0.000*** |
| Total land in hectares | 0.858 (0.598) | 0.682 | 0.869 (0.572) | 0.546 | 0.730 (0.471) | 0.0381** | 0.898 (0.672) | 0.089* |
| Land under bean production in hectares | 0.495 (0.468) | 0.334 | 0.591 (0.424) | 0.776 | 0.418 (0.362) | 0.0005*** | 0.729 (0.656) | 0.0003** * |
| Number of visits by extension | 0.900 (0.706) | 0.691 | 0.828 (0.785) | 0.271 | 1.039 (0.708) | 0.334 | 1.197 (0.831) | 0.005*** |
| Distance to market | 1.831 (1.599) | 0.189 | 0.4601 (2.155) | 0.444 | 2.561 (1.845) | 0.0000*** | 2.429 (2.428) | 0.0000 |
| Quantity harvested | 3.946 (1.044) | 0.008 | 3.400 (1.208) | 0.663 | 3.585 (1.208) | 0.228 | 3.459 (1.239) | 0.899 |

Table 3: Continuous variables comparison for PPP participants and non-participants

| | Public- private partnerships participants | | Non-participants | | t test |
|----------------------------|---|-----------|------------------|-----------|--------|
| | Mean | Std. Dev. | Mean | Std. Dev. | |
| log of quantity harvested | 3.316 | 1.275 | 2.867 | 1.220 | 0.001 |
| Price | 139.624 | 22.101 | 135.025 | 23.539 | 0.058 |
| Land under bean production | 0.703 | 0.601 | 0.413 | 0.395 | 0.000 |

Table 4: Categorical variables comparison for PPP participants and non-participants

| | Public- private partnerships participants % | Non-participants % | pr |
|---------------------------|---|-----------------------|----------|
| Receive extension service | | | 0.000*** |
| YES | 87.07 | 17.92 | |
| NO | 12.93 | 82.08 | |
| Receive training | | | 0.000*** |
| yes | 89.8 | 16.04 | |
| NO | 10.2 | 83.96 | |
| Group membership | | | 0.000*** |
| Yes | 85.03 | 41.51 | |
| NO | 14.97 | 58.49 | |
| Acquire credit | | | 0.000*** |
| yes | 51.7 | 16.98 | |
| No | 48.3 | 83.02 | |

PPP participants allocated more land than non-participants; the mean land allocated for bean production was 0.7 for PPP participants, whereas for non-participants were 0.4, the difference was significant at a 1% level.

Table 4 presents institutional factors for comparison between PPP participants and non-participants. From the result, the majority of the farmers that participated in PPP received extension services, training, and credit and were group members. Chi-square value was significant at 1% significant level across all variables; this means that there was a significant difference between the two groups.

The Wald test indicated that the MVP was fit for analysis. The null hypothesis that the market outlets' choice decision for the four-market outlets being independent was rejected at a 1% significance level. The likelihood ratio test in the model indicated that the interdependence between market outlet choices decision was rejected at a 1% significance level and that there are joint correlations for four estimated coefficients across the equations in the model. This verifies that separate estimation of choice decision to choose the four-market outlet choice for the beans is interdependent for household decision. This suggests that the Multivariate Probit model had strong explanatory power and hence the model fits the data reasonably, the result for MVP is presented in Table 5.

The farmer's age had a negative and significant influence on the choice of broker outlet at a 95% confidence level. This means that a one-year increase in the farmer's age reduces the likelihood of the household delivering to brokers by 18%. This suggests that the older the household head becomes, the less the likelihood of delivering their beans to the broker's market. This might be because older people might have marketing experience, accumulated capital, or a long-term relationship with their clients or might have preferential access to credit due to their age and availability of land. The result also confirmed that older farmers choose a better market outlet than young farmers. The aged people are more conventional, avoid market participation through intermediaries, and prefer direct participation. Older people avoid exploitation by brokers since they play the role of intermediary. This study concurred with the finding of *Anteneh et al. (2011)*, who found out that there was a

negative relationship between age and the proportion of coffee sold to cooperatives by non-members.

Experience in bean farming had a negative and significant influence on the choice of wholesaler market outlets. A one-year increase in bean farming experience decreases the likelihood of bean farmers by 21% to sell to a wholesaler market. This result indicated that more experienced households in bean production were less likely to deliver beans to wholesaler market outlets than less experienced farmers. Experienced farmers have a better knowledge of the cost and benefits associated with various bean marketing outlets; consequently, they are more likely to decrease the quantities supplied through the wholesaler market outlet and increase the amount supplied to other lucrative market outlets. The negative relationship between experience in bean farming and selling to wholesaler outlets can be explained by the fact that experienced farmers can make informed decisions concerning the choice of marketing outlets to sell their farm produce based on the marketing margin and marketing cost involved, such as logistic. According to *Shiimi et al. (2012)*, experience replicates the ability of the seller to negotiate marketing transactions to their benefit better.

Non/off-farm income negatively affects the probability of choosing a wholesaler market outlet at 5% levels of significance. This indicates that bean farmers involved in non/off-farm activities are less likely to sell their produce to the wholesaler market than those who do not have non-farm income. Moreover, farmers involved in off/non-farm activities are less likely to sell their beans to retailers, consumers, and broker outlets than farmers who don't have non-farm income. The possible explanation is that farmers involved in non/off-farm activities have less time to spare to produce marketable surplus; hence, this decreases the probability of participating in the wholesaler market channel, which is a larger market than other markets. Non-farm income gives farmers an extra source of income, and therefore, they do not have to be concerned about producing more for the wholesaler market. The rationale is that they produce beans production for consumption, and when they get surplus, they sell to other markets.

This study revealed that, as the land size allocated for bean production increases by 1 hectare, the probability of farmers selling their produce to the retail outlet decreases by 98 %, whereas the probability increases by 58% to sell to the wholesaler market outlet *ceteris paribus*. This indicates that those households who allocated large size of land for bean production would produce more output, and farmers would be more likely to sell their produce to the wholesaler market outlet and less likely to sell their produce to the retailer market outlet. This means that farmers receive higher prices from the wholesale market outlet than retailer market outlets from the sale of bean products. The result of this study is also consistent with **Takele et al. (2017)**, who found out that the probability of selling to wholesalers increased as the number of mangos produced increased.

Price had a negative and significant influence on consumers' market outlet choice at a 95% confidence level. This means that a one-unit increase in price reduces the likelihood of farmers selling their beans to the consumer market. The possible reason may be that other farmers and institutions (schools) consumers offered lower prices than other outlets. Upon probing why they would sell to consumers, i.e., institutions and direct consumers, most farmers said they agreed that they would take their beans to schools, and the earnings would be used to offset their children's school fees. Farmers will avoid the lowest paying outlet (consumer) and go for one that pays better. Pricing plays a vital role when farmers make decisions on the choice of market outlet to sell their products. **Mburu et al. (2007)** found that more farmers in central Kenya chose the higher milk price channel. **Staal et al. (2006)** also found a positive relationship between the price offered for milk and Marketing channel choice in Gujarat. Higher prices increase farmers' margins and act as motivation to produce more and get more income. Distance to the market had a significant and negative influence on the choice of broker market outlet by 11%. This means that one increase in one kilometer's distance negatively influenced the choice of broker market outlet. An increase in one kilometer will result in farmers selling to consumer, retailer, and wholesaler markets. Smallholder farmers decide between selling at the farm gate and receiving a low price or traveling to the market where you can receive a better price but incur transaction costs. Brokers usually buy at the farm gate, but farmers avoid them due to them offering low prices.

This study revealed that engagement in the partnership had a positive and significant influence in selling to wholesaler markets. The possible reason may be that most of the farmers in partnership received farm input for free and others on credit, increasing the level of their participation in bean farming compared to those that did not engage in a partnership. The partnership had a positive impact on bean output, and as a result, farmers increased the amount of bean harvested hence the choice of wholesaler market outlet. Wholesaler becomes the best option when you have more quantity since they will carry all your supply, unlike retailers you have to sell to several.

Access to credit was positively related to the probability of choosing a wholesaler market outlet, and credit access increased the choice probability by 40

percent, *ceteris paribus*. Access to credit increases access to resources needed for production. Covering transport costs to the market allows farmers to purchase inputs such as seed and fertilizer, increasing production, leading to a marketable surplus. This result concurred with **Tura & Efa (2018)**, who found that credit access had a positive and significant effect on retailers' market outlets. Access to credit increases an individual's access to resources needed to cater to production and marketing costs. **Randela et al. (2008)** found that credit availability allows farmers to meet transaction costs of output and input markets in South Africa. Therefore, the positive relationship between credit access and the choice of wholesale outlets means that farmers who have access to credit can meet the production and marketing costs in the wholesaler marketing channel. Access to training had a positive and significant influence in choosing the retailer market. The results of this study indicated that access to bean production training increases the household likelihood of selling its beans to the retailer by 41 % at a 95% confidence level. The results imply that it is likely that the training received by the bean farmers selling to retailer outlets impacted their high probability of selling beans to the outlets. Farmers who were probed on the accessibility of training received reported that most extension officers regularly organize training and are available at any given time. However, it is argued that farmers with higher education levels may have a superior ability to access and understand more information and technology. Therefore, applying that knowledge to venture into new opportunities than farmers with lower education (**Nyaupane & Gillespie, 2010**).

CONCLUSIONS AND RECOMMENDATIONS

This paper investigated factors influencing the choice of market outlets by bean farmers using multivariate probit. Identifying factors influencing bean farmers' choice of market outlets is significant for developing the bean value chain. Experience in bean farming, farm size, access to training, credit, and partnership participation positively and significantly influenced selling to this market. The majority of the farmers who participated in PPP sold their beans to wholesaler market outlets. The study's findings showed a significant difference in quantity harvested and price received from the sale of beans for PPP participants and non-participants. Farmers who participated in partnership received farm input for free and others on credit, increasing their participation level in bean farming compared to those who did not engage in a partnership. Therefore, a wholesaler becomes the best option when you have more quantity since they will carry all your supplies, unlike the other outlets.

Based on the findings of this study, PPP could be an effective way of improving smallholder livelihood; policies that include reduction of cost to smallholder farmers such as more significant tax incentives for farm inputs, subsidized farm inputs, and credit could significantly improve farmers' income. Alternatively, policies that include mechanisms that create or secure markets for smallholder farmers will see that they get increased returns.

Table 5: Multivariate Probit result for factors influencing the choice of market outlets

| | Brokers (n=39) | | | Consumers (n=46) | | | retailers (n=99) | | | Wholesalers (n=101) | | |
|--|----------------|----------|---------|------------------|----------|--------|------------------|----------|----------|---------------------|----------|---------|
| | Coef. | Std. Err | P>z | Coef. | Std. Err | P>z | Coef. | Std. Err | P>z | Coef. | Std. Err | P>z |
| Age | -0.018 | 0.009 | 0.037** | 0.002 | 0.008 | 0.811 | -0.011 | 0.007 | 0.104 | 0.002 | 0.006 | 0.739 |
| Sex | 0.338 | 0.245 | 0.169 | 0.217 | 0.241 | 0.368 | 0.056 | 0.213 | 0.793 | -0.069 | 0.199 | 0.727 |
| Years of schooling | -0.004 | 0.031 | 0.894 | 0.008 | 0.030 | 0.781 | 0.009 | 0.025 | 0.728 | -0.037 | 0.024 | 0.116 |
| Experience in bean farming | 0.000 | 0.017 | 0.98 | -0.023 | 0.016 | 0.165 | 0.019 | 0.013 | 0.153 | -0.021 | 0.012 | 0.086* |
| Non-farm income | 0.099 | 0.219 | 0.652 | 0.007 | 0.204 | 0.972 | 0.104 | 0.178 | 0.559 | -0.314 | 0.167 | 0.061* |
| Total land in hectares | 0.408 | 0.313 | 0.193 | 0.161 | 0.298 | 0.588 | 0.262 | 0.262 | 0.318 | -0.214 | 0.255 | 0.403 |
| land under bean Production in hectares | -0.455 | 0.319 | 0.154 | -0.248 | 0.297 | 0.405 | -0.989 | 0.297 | 0.001*** | 0.567 | 0.267 | 0.033** |
| Price/kg | -0.003 | 0.003 | 0.354 | -0.005 | 0.003 | 0.093* | 0.002 | 0.003 | 0.544 | -0.001 | 0.002 | 0.801 |
| Quantity harvested | 0.104 | 0.086 | 0.224 | -0.102 | 0.081 | 0.205 | 0.003 | 0.070 | 0.965 | 0.054 | 0.068 | 0.428 |
| Group membership | -0.005 | 0.284 | 0.985 | 0.152 | 0.270 | 0.574 | -0.049 | 0.241 | 0.839 | -0.189 | 0.234 | 0.42 |
| Distance transported (kms) | -0.115 | 0.066 | 0.082* | -0.077 | 0.053 | 0.15 | 0.033 | 0.040 | 0.415 | 0.034 | 0.042 | 0.416 |
| Extension contacts | -0.001 | 0.295 | 0.997 | 0.273 | 0.297 | 0.358 | 0.127 | 0.271 | 0.641 | -0.410 | 0.259 | 0.114 |
| Engage in partnership | -0.182 | 0.315 | 0.563 | 0.089 | 0.318 | 0.779 | -0.737 | 0.302 | 0.015** | 0.825 | 0.268 | 0.002* |
| Access to credit | -0.239 | 0.255 | 0.349 | -0.315 | 0.238 | 0.185 | 0.030 | 0.208 | 0.884 | 0.395 | 0.196 | 0.044** |
| Received training | 0.074 | 0.313 | 0.812 | 0.170 | 0.344 | 0.621 | 0.636 | 0.311 | 0.041** | -0.337 | 0.283 | 0.234 |

Note ***1% **5% *1% significance level

Further research needs to be done focusing on different value chains to understand better the overall effect of PPP performance and how effective PPP can be used in the marketing of different products in the agricultural value chain. Most rural households in Africa don't keep farm records, and capturing accurate data was a challenge since we relied on recall to gather information on the marketing of beans; however, to overcome this challenge, the study covered a recent period for ease of recall. Further research needs to be done focusing on different value chains to understand better the overall effect of PPP performance and how effective PPP can be used in the marketing of different products in the agricultural value chain.

Acknowledgments:

We are grateful to the Center of Excellence in Sustainable Agriculture and Agribusiness Management (CESAAM), Egerton University and Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT) for their financial support. We also wish to thank all the producers, key informants, and enumerators who participated in this survey.

REFERENCES

- ABD KARIM, N. A. (2011). Risk allocation in public-private partnership (PPP) project: a review on risk factors. *International Journal of Sustainable Construction Engineering and Technology*, 2(2). <https://publisher.uthm.edu.my/ojs/index.php/IJSCET/article/view/344>
- ABERA, S. (2016). Econometric analysis of factors affecting haricot bean market outlet choices in Misrak Badawacho District, Ethiopia. *International Journal of Research Studies in Agricultural Sciences*, 2(9), 6-12. <http://dx.doi.org/10.20431/2454-6224.0209002>
- ANDERSEN, O. J. (2004). Public-private partnerships: organisational hybrids as channels for local mobilisation and participation. *Scandinavian Political Studies*, 27(1), 1-21. <https://doi.org/10.1111/j.1467-9477.2004.00097.x>
- ANTENEH, A., MURADIAN, R., & RUBEN, R. (2011). Factors Affecting Coffee Farmers Market Outlet Choice, The Case of Sidama Zone, Ethiopia. Centre for International Development Issues, Nijmegen, Radboud University, the Netherlands.
- ARINLOYE, D. D. A., PASCUCCHI, S., LINNEMANN, A. R., COULIBALY, O. N., HAGELAAR, G., & OMTA, O. S. (2015). Marketing channel selection by smallholder farmers. *Journal of Food Products Marketing*, 21(4), 337-357. <https://doi.org/10.1080/10454446.2013.856052>
- BARDHAN, D., SHARMA, M. L., & SAXENA, R. (2012). Market Participation Behaviour of Smallholder Dairy Farmers in Uttarakhand: A Disaggregated Analysis. *Agricultural Economics Research Review*, 25(2), 243-254.
- BELDERBOS, R., CARREE, M., DIEDEREN, B., LOKSHIN, B., & VEUGELERS, R. (2004). Heterogeneity in R&D cooperation strategies. *International journal of industrial organization*, 22(8-9); 1237-1263. <https://doi.org/10.1016/j.ijindorg.2004.08.001>
- BRINKERHOFF, D. W. (2004). Accountability and health systems: toward conceptual clarity and policy relevance. *Health policy and planning*, 19(6), 371-379. <https://doi.org/10.1093/heapol/czh052>
- BURUCHARA, R. (2007). Background information on common beans (*Phaseolus Vulgaris* L) in biotechnology, breeding & seed systems for African crops. The Rockefeller Foundation, Nairobi.
- BURUCHARA, R., CHIRWA, R., SPERLING, L., MUKANKUSI, C., RUBYOGO, J. C., MUTONHI, R., & ABANG, M. M. (2011). Development and delivery of bean varieties in Africa: The Pan-Africa Bean Research Alliance (PABRA) model. *African crop science journal*, 19(4), 227-245. <https://www.ajol.info/index.php/acsj/article/view/74168>
- CAPPELLARI, L., & JENKINS, S. P. (2003). Multivariate probit regression using simulated maximum likelihood. *The STATA Journal*, 3(3), 278-294. <https://doi.org/10.1177/1536867X0300300305>
- CHANDAN K. R., ARTI, S. K., ABUL K. AZAD & MUKESH K. (2017). Public-Private Partnership in Agriculture: A Stern Review. *Int.J.Curr.Microbiol.App.Sci.* 6(9): 3510-3517. doi: <https://doi.org/10.20546/ijcmas.2017.609.431>
- DEB, P., & TRIVEDI, P. K. (1997). Demand for medical care by the elderly: a finite mixture approach. *Journal of Applied Econometrics*, 12(3), 313-336. <http://www.jstor.org/stable/2285252>
- DORFMAN, J. H. (1996). Modeling multiple adoption decisions in a joint framework. *American Journal of Agricultural Economics*, 78(3), 547-557. <https://doi.org/10.2307/1243273>
- GEOFFREY, S. K., BETT, K. H., KIPROP, K. J., & ODIPO, O. T. (2015). Factors influencing the choice of marketing outlets among small-scale pineapple farmers in Kericho county, Kenya. *International Journal of Regional Development*, 2(2), 1-11. <https://doi.org/10.5296/ijrd.v2i2.6237>
- Government of Kenya (GOK) (2013). Homa Bay County First County Integrated Development Plan (CIDP) 2013-2017. Government of Kenya, Nairobi, Kenya. <http://repository.kippra.or.ke/handle/123456789/2606>
- GREENE, W. (2002). Econometric analysis. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1292651
- HONJA, T., GETA, E., & MITIKU, A. (2017). Determinants of market outlet choice of the smallholder mango producers: the case of Boloso Bombe Woreda, Wolaita Zone, Southern Ethiopia: a multivariate probit approach. *Global Journal of Science Frontier Research*, 17(2), 23-30. https://globaljournals.org/GJSFR_Volume17/4-Determinants-of-Market-Outlet.pdf
- JALETA, M., & GEBREMEDHIN, B. (2012). Interdependence of smallholders' net market positions in mixed crop-livestock systems of Ethiopian highlands. *Journal of Development and Agricultural Economics* 4(7):199-209. <https://hdl.handle.net/10568/16894>
- KASSIE, M., JALETA, M., SHIFERAW, B., MMBANDO, F., & MEKURIA, M. (2013). Adoption of interrelated sustainable agricultural practices in smallholder systems: Evidence from rural

- Tanzania. *Technological forecasting and social change*, 80(3), 525-540. <https://doi.org/10.1016/j.techfore.2012.08.007>
- KATUNGI, E., FARROW, A., MUTUOKI, T., GEBEYEHU, S., KARANJA, D., ALAMAYEHU, F., ... & BURUCHARA, R. (2010). Improving common bean productivity: An Analysis of socioeconomic factors in Ethiopia and Eastern Kenya. Baseline Report Tropical legumes II. *Centro Internacional de Agricultura Tropical-CIAT. Cali, Colombia*, 126.
- KLIJN, E. H., & TEISMAN, G. R. (2003). Institutional and strategic barriers to public-private partnership: An analysis of Dutch cases. *Public Money and Management*, 23(3), 137-146. <https://doi.org/10.1111/1467-9302.00361>
- KUMA, B., BAKER, D., GETNET, K., & KASSA, B. (2013). Factors affecting milk market outlet choices in Wolaita zone, Ethiopia. *African Journal of Agricultural Research*, 8(21), 2493-2501.
- MBURU, L. M., GITU, K. W., & WAKHUNGU, J. W. (2007). A cost-benefit analysis of smallholder dairy cattle enterprises in different agro-ecological zones in Kenya highlands. *Development*, 19, 7. <http://www.lrrd.cipav.org.co/lrrd19/7/mbur19095.htm>
- MELESE, T., GOSHU, D., & TILAHUN, A. (2018). Determinants of outlet choices by smallholder onion farmers in Fogera district Amhara Region, Northwestern Ethiopia. *Journal of Horticulture and Forestry*, 10(3), 27-35. <https://doi.org/10.5897/JHF2018.0524>
- MUEMA, E., MBURU, J., COULIBALY, J., & MUTUNE, J. (2018). Determinants of access and utilisation of seasonal climate information services among smallholder farmers in Makueni County, Kenya. *Heliyon*, 4(11), e00889. <https://doi.org/10.1016/j.heliyon.2018.e00889>
- NYAUPANE, N. P., & GILLESPIE, J. M. (2011). Louisiana crawfish farmer adoption of best management practices. *Journal of Soil and Water Conservation*, 66(1), 61-70. <https://doi.org/10.2489/jswc.66.1.61>
- RANDELA, R., ALEMU, Z. G., & GROENEWALD, J. A. (2008). Factors enhancing market participation by small-scale cotton farmers. *Agrekon*, 47(4), 451-469. <https://doi.org/10.1080/03031853.2008.9523810>
- RODRÍGUEZ DE LUQUE, J. J., & CREAMER, B. (2014). Principal constraints and trends for common bean production and commercialization; establishing priorities for future research. *Agronomia colombiana*, 32(3), 423-431. <https://doi.org/10.15446/agron.colomb.v32n3.46052>
- SHIIMI, T., TALJAARD, P. R., & JORDAAN, H. (2012). Transaction costs and cattle farmers' choice of marketing channel in North-Central Namibia. *Agrekon*, 51(1), 42-58. <https://doi.org/10.1080/03031853.2012.649543>
- STAAL, S. J., BALTENWECK, I., NJOROGE, L., PATIL, B. R., IBRAHIM, M. N., & KARIUKI, E. (2006, August). Smallholder dairy farmer access to alternative milk market channels in Gujarat. In *IAAE Conference*, Brisbane, Australia. <https://hdl.handle.net/10568/2052>
- TAKELE, A. (2017). Determinants of rice production and marketing in low producer farmers: The case of Fogera districts, North-Western Ethiopia. *International Journal of Environment, Agriculture and Biotechnology*, 2(5), 238936. <https://dx.doi.org/10.22161/ijeab/2.5.34>
- TAREKEGN, K., HAJI, J., & TEGEGNE, B. (2017). Determinants of honey producer market outlet choice in Chena District, southern Ethiopia: a multivariate probit regression analysis. *Agricultural and Food Economics*, 5(1), 1-14. <https://doi.org/10.1186/s40100-017-0090-0>
- TEKLEWOLD, H., KASSIE, M., & SHIFERAW, B. (2013). Adoption of multiple sustainable agricultural practices in rural Ethiopia. *Journal of agricultural economics*, 64(3), 597-623. <https://doi.org/10.1111/1477-9552.12011>
- TURA, E. G., & HAMO, T. K. (2018). Determinants of tomato smallholder farmers market outlet choices in West Shewa, Ethiopia. *Journal of Agricultural Economics and Rural Development*, 4(2), 454-460.
- World Economic Forum (WEF), & MCKINSEY & CO. (2011). Realising a new vision for agriculture: A roadmap for stakeholders. Geneva, World Economic Forum (WEF). https://www3.weforum.org/docs/IP/2016/NVA/WEF_IP_NVA_Roadmap_Report.pdf
- World Economic Forum (WEF), & MCKINSEY & CO. (2013). Achieving the new vision for agriculture: new models for action. Geneva, World Economic Forum (WEF). <https://www.weforum.org/reports/achieving-new-vision-agriculture-new-models-action>