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# Determinants of Smallholder Farmers' Commercialization of Potato in Kofale District, West Arsi Zone, Oromia Regional State, Ethiopia

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**ABSTRACT**

*Even though agricultural commercialization is considered as the main engine to contribute to economic growth of the country and to transform the traditional agriculture of farmers the extent of commercialization is still not as expected in Ethiopia as evidenced from different literature particularly there are no adequate studies on the determinants of potato commercialization in the study area. This study was aimed to identify status and determinants of farmers' commercialization decision and level of potato commercialization. A two stage random sampling procedure was used to select 150 sample households potato producer. Descriptive statistics and econometric model were used to analyze the data. About 66.67% of sample farm households were potato commercialized. Double hurdle model was used in the econometric analysis. In first hurdle result of probit model showed that, land allocated for potato production, frequency of extension contact, Livestock holding and access to market information influenced potato producers commercialization decision positively and significantly. While distance to all weather roads affected potato commercialization decision significantly and negatively. In the second hurdle, family size and distance to market influenced intensity of potato commercialization negatively and significantly while participation in social organization and land allocated for potato production affected it positively. The study indicated that the government, stakeholders and concerned bodies need to focus on facilitating farmers to participate in different social organization, strengthen family planning through health extension worker, improving livestock production, strengthen extension service and disseminate market information to producers so as to improve potato commercialization and intensity of commercialization.*

***Keywords:*** *Commercialization, Double-hurdle, Kofale and Smallholders farmer.*

## I. INTRODUCTION

Ethiopia is one of the fastest growing economies in Africa. In the last decade, the Ethiopian economy registered a growth of 11 percent per annum on average in Gross Domestic Product (GDP) (MoFED, 2014) compared to 3.8 percent in the previous decades (World Bank, 2015).Agriculture is main economic pillars of the Ethiopian economy and the overall economic growth of the country is highly dependent on the success of the agriculture sector. The sector represents 38.5% of the GDP of the country and about 72.7% of the population gains their livelihood directly or indirectly from agricultural production. Crop and livestock subsectors accounted for 27.4% and 7.9% respectively. The total production of major crops by smallholder farmers during the *Meher* season (main season) increased to 270.3 million quintals. The performance of major crops has been the major contributor to overall growth in agriculture and allied activities during GTP-I plan period given its relative importance in crop production and agriculture at large (NPC, 2016).

In GTP-II period, agriculture expected to remain the main driver of the rapid and inclusive economic growth and development. It is also expected to be the main source of growth for the modern productive sectors. Therefore, besides promoting the productivity and quality of staple food crops production, special attention will also be given to cash crops, industrial inputs and export commodities. To this end, addressing constraints entrenched in the agricultural development and marketing systems is given utmost emphasis and priority (NPC, 2016).

Ethiopia's industrial strategy necessitates the establishment of industrial zones for agro-processing industries. Agro-industry can link up or integrate the agricultural sector which is the source of livelihood for the majority of Ethiopians. It can also create sustainable market link by establishing Rural Transformation Centers (RTC) that can

improve production and productivity. One of the objectives of GTP-II is establishing Integrated Agro-industrial Parks (IAIPs) to link up the agricultural sector and add value to basic agricultural products (Abiy, 2016).

The commercialization of crops grown by small-scale, resource-poor farmers has the potential to increase household food security, reduce rural poverty, and contribute to agricultural development and economic growth. By encouraging the application of improved agricultural inputs and farming techniques, diversification out of low-yielding subsistence crops, and specialization in more tradable crops, commercialization can increase farming incomes, enhance purchasing power, and reduce vulnerability to food insecurity of smallholders. Commercialization of agriculture is, therefore, the strategy Ethiopia is following to bring dynamic change to transform the traditional agriculture of smallholder farmers (Afework and Endrias, 2016).

Vegetables and root crops took up about 1.69% and 1.82% of the area under all crops at national level respectively which is very low in area coverage when compared to grain crops that cover 81.27% at national level. Potato share 0.53% from all crops at national level as well as 29.21% coverage out of root crops. Potato production also contributes 19.90% to total root crop production at national level. The productivities of potato were 137.68 quintals per hectare. From root crops area coverage in the region, potatoes cover 43.97%. West Arsi zone produced 21% of root crops out of area coverage at regional level. From total area coverage by root crops potatoes cover about 86.86% (CSA, 2017).

The land use pattern of the kofale district shows that 33,599 ha is cultivable, 21,631ha grazing land, 5,157 ha is covered by forest, bushes, and shrubs, and 5,913 ha is being used for other purposes such as encampments, and infrastructure facilities. From cultivated land about 7890 ha for potato production and about 790 ha head cabbage production in 2017 production year. The district features a crop-livestock mixed farming system. Live stocks like cattle, sheep, donkey, horse, and poultry production were practiced in the study area. The types of crops widely grown in the district are barley, potato, maize, enset, normal cabbage (*Etiopian kale*) and head Cabbage. The main staple crops for food are enset, barley, maize, and potato while potato, head cabbage and malt barley for market. The productivities of major crops in kofale district are maize 60 quintals per hectare, barley 35 quintals per hectare, potato 165 quintals per hectare and head cabbage 110 quintals per hectare (DOANR, 2017).

In some commodities, such as specific fruits and vegetables, the oligopolistic nature of the market structure involves just a few intermediary buyers who control a significant aspect of the supply chain, thus reaping the largest portion of the benefit. In addition, due to an absence of commodity grading and standardization, price incentives related to product quality are limited, resulting in low-quality outputs that do not attract premium prices in domestic markets and make it difficult to access export markets. This also results in high transaction costs and limited transparency as market actors are forced to negotiate with imperfect information. This usually puts smallholders at a disadvantage, given their limited economies of scale and sophistication when dealing with large wholesale buyers (ATA, 2017).

Moreover, the expansion of market infrastructures such as roads, telecommunications, electricity and access to market information foster market orientation production. To exploit the growing opportunities for commercial production of potatoes and head cabbage the farmers in the district need to change their production system from

subsistence to commercialized market-oriented production. This requires enhancing the coordination and integration of various stakeholders like extension, marketing, and other institutional services.

However, there is apparent knowledge gap as regards to factors influencing commercialization of vegetable producers in general of potato and head cabbage growers in particular in study area. Therefore, identification of the determinants of smallholder farmers' potato and head cabbage commercialization decision and farmers' level of potato and head cabbage commercialization are crucial to improve their commercialization decision by providing information generated from this research work.

### *A. Objectives of the Study*

The overall objective of this study was to analyze the status of commercialization and identify factors influencing farmers' potato commercialization in Kofele district.

The specific objectives of the study were:

1. To estimate farmers status of potato commercialization in the study area;
2. To identify the determinants of farmers' decisions to commercialize potato; and
3. To identify the determinants of farmers' level of potato commercialization in the study area**.**

## II. RESEARCH METHODOLOGY

### *A. Description of the Study Area*

The study was conducted in Kofele district, West Arsi zone of Oromia National Regional State, Ethiopia. Kofele district is located at 305 km from Addis Ababa towards Southern direction. It shares borders with Shashemene district in the West, Kokosa district in the South, Gedab Asasa district in the East and Kore district in North directions. The district covers an area of 1187 square kilometers and has 38 rural and two urban Kebeles. From rural kebeles, 34 kebeles are high land while 4 kebeles are midland. The total population of the district were 207,339 (104,173 males and 103,166 females) having the rural population of 186,680 (93,100 males and 93,580 females), and urban population of 20,659 (11,073 males and 9,586 females) in which more than 65% depend on farming activities while the rest 35% of off and non-farm activities (DOANR, 2017).

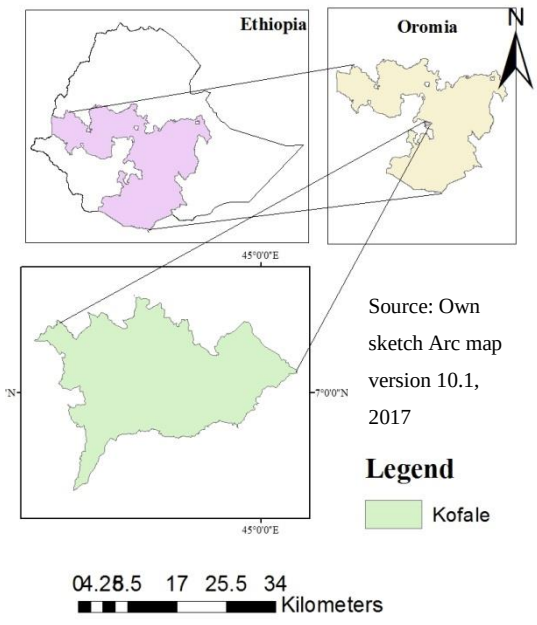


**Figure 1.** Map of the study area

The major agro-ecologies of the district are high land (90%) and mid-land (10%) having clay loam soil type of 90% and the remaining 10% t red and black. The district was found within 2460 to 2790 m-a-s-l. It receives an average rainfall of 1800 mm per annum with minimum 2000mm per annum and maximum 3050mm per annum. The district has bi-modal rainfall distribution with small rains starting from

March/April to May and the main rainy season extending from June to September/October. The average temperatures were 19.5°C per year with minimum of 17°C and maximum of 22°C (DOANR, 2017).

### *B. Data Types, Sources and Methods of Data Collection*

Both qualitative and quantitative data were collected as well as primary and secondary data were used for this study. Semi-structured questionnaire was employed to collect primary data from representative sample of households. Secondary data relevant for this study was collected from Kofele district office of agriculture and natural resource, CSA, and from published and unpublished sources. The questionnaire was designed and pre-tested in the field for its validity and content, and to make overall improvement of the same and in line with the objectives of the study. After necessary corrections made on the questionnaire, enumerators were give none day training to the objectives and content of the interview schedule to collect primary data.

### *C. Sampling Procedure and Sample Size*

The two-stage sampling procedure was used to select sample households. In the first stage, four sample *kebeles* were randomly identified in collaboration with concerned experts from district office of agriculture and development agents from kebeles produced potato.In the second stages, 150 sample households were randomly selected from four sample *kebeles* based on probability proportional to size sampling technique. Since the populations were homogenous the sample size was determined based on Yamane (1967) formula:

$$n = \frac{N}{1 + N(e)^2}$$

Where: n = is the sample of potato producer households that will be taken from potato producer households in the district, N = is the total number of potato producer households in the district and e = 0.08 is the level of precision.

The total number of households is4340, so sample size is calculated as follows:

$$n = \frac{4340}{1+4340(0.08)^2} = \frac{4340}{28.8} = 150$$

Therefore, 150 sample households were selected randomly formal interview based on proportional to sample size of producers in peasant association (table1).

**Table 1.** Sampling frame and sample size

| Name of sampled kebeles | Total potato producers households (number) | Proportion sampled Households (%) | Number of sample household heads (number) |
|---|---|---|---|
| **Germama** | 719 | 28.67 | 43 |
| **WamagnAlkeso** | 619 | 24.67 | 37 |
| **Koma Bitacha** | 602 | 24 | 36 |
| **Gurmicho** | 568 | 22.67 | 34 |
| Total | **2508** | **100** | **150** |

Source: DOANR and Own computation, 2017.

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### *D. Methods of Data Analysis*

Descriptive statistics and econometric model were used for analyzing the data.

#### *Econometric model specification Descriptive*

Commercialization index (CI) is used to analyze the level of potato output marketed. Here, the commercialization of potato production was analyzed from the output side. Using this approach was more prevalent than the input side. According to Strasberg *et al*. (1999) and von Braun and Kennedy (1994), commercialization index for crop production can be defined as:

$$\text{CIp} = \frac{\text{The gross value of all potato sales of hhi in yearj}}{\text{Gross value of all potato production of hhi in yearj}} \text{X } 100\ \%$$

The index measures the ratio of the gross value of potato sales by the household i in year j to the gross value of all potato produced by the same household i in the same year j expressed as a percentage. CIp represents commercialization index of potato

A double-hurdle model was used in analysis. The determinants of decision to commercialize (output commercialization index greater than 50% as decide to commercialize) was analyzed first and then the determinants of the intensity of commercialization (output commercialization index in percent) followed.

Double hurdle model (Cragg, 1971) involves two-step estimation procedure. In the first stage, probit model was used to identify factors affecting decision to commercialize. Probit model takes values 1 and 0 that were assigned to represent the choice whether a farmer decides to commercialize potato or not. The standard probit model that assesses the household market-entry decision was described as follows:

***First Stage:*** The decision to commercialize can be modeled as a probit regression following Cragg (1971) can be given:

$$Y_i^* = x_i\beta + e_i(1)$$

$$Y_i = \begin{cases} 1 \text{ if } Y_i * > 0 \\ 0 \text{ if} Y_i * = 0 \end{cases}$$

where $e_i$is independent of $x_i$ which is a 1 by K vector of factors affecting the decision of commercialization for all households (i), $\beta$ is a 1 by K vector of parameters, and $e_i \sim N(0,1)$

***Second stage:*** In the second stage, the truncated regression model was used to analyze factors determining the level (extent) of potato commercialization. Truncated regression excludes part of sample observation based on the value of the dependent variable (Wooldridge, 2002). That is, the truncated regression uses observations only from farming households whose commercialization index positive or greater than zero. The intensity of potato and head cabbage commercialization is modeled as a regression truncated at zero:

$$Z_i^* = x_i\beta + \mu_i \quad , \quad \mu_i \sim N(0, \delta^2)$$

$$Z_i = \begin{cases} Z_i^* \text{ if } Z_i^* > 0 \text{ and } Y_i = 1 \\ 0 \text{ otherwise} \end{cases}$$

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Where $Z_i$ is the intensification level of commercialization which depends on latent variable $Z_i$* being greater than zero and conditional to the decision to commercialize $Y_i$.

If both decisions are made by the individual farmer independently, the error terms are assumed to be independently and normally distributed as:$u_i \sim N(0, \sigma^2)$

The log-likelihood functions as the double-hurdle model that nests a univariate probit model and a truncated regression model is given following Cragg (1971) by:

$$LogL = \sum \ln\left[1 - \Phi(Z_i' \alpha)\left(\frac{x_i'\beta}{\sigma}\right)\right] + \sum_{+} \ln\left[\Phi(Z_i' \alpha)\frac{1}{\sigma}\phi\left(\frac{y_i - x_i'\beta}{\sigma}\right)\right]$$

Where,$\Phi$ and $\phi$ refer to the standard normal probability and density functions respectively,$Z_i'$and $X_i'$represent independent variables for the Probit model and the Truncated model respectively, $\alpha$, $\sigma$, and $\beta$ are parameters to be estimated for each model.

**Table 2.** Summary of variables description and hypothesis

| Dependent Variables | Unit/ type | Variables Description | |
|---|---|---|---|
| **Commercialization decision** | Dummy | Commercialization index greater than 50% value of 1and 0 otherwise | |
| **Level of Commercialization** | Continuo | Commercialization index greater in % | |
| Explanatory Variables Description of variables | | | **Exp sign** |
| **Gender** | Dummy, 1 for male and 0 for female | | + |
| **Age** | Continuous, age of household in years | | +/- |
| **Land under production** | Continuous, land allocated in hectares | | + |
| **Education** | Continuous, education status years of schooling | | + |
| **Family size** | Continuous, number of family members living together | | - |
| **Distance to market center** | Continuous, in kilometers | | + |
| **Access to market information** | Dummy, Yes=1, 0=No | | + |
| **Frequency of extension contact** | Continuous, number of extension contact | | + |
| **Access to credit service** | Dummy ,Yes=1, 0=No | | + |
| **Participation in farmer groups** | Dummy, Yes=1, 0=No | | + |
| **Livestock owned** | Continuous, tropical livestock unit | | +/- |
| **Off and non-farm income** | Dummy, Yes=1, 0=No | | - |

## III. RESULTS AND DISCUSSION

### *A. Summary of Descriptive Statistics*

The results of descriptive statistics analysis indicated that about 100 sample households (66.67%) was commercialized potato and the average intensity of potato commercialization was 57.77% that implied the farmers in the study area commercialized potato production. The mean age of the sample respondents was about 36.33 years. The average number of family size for the sample respondents were about 8.7 and about 91% respondents were male households. The average land size allotted under horticultural crops per sample household head was about 1.34 hectares which less than two hectares while the mean livestock possession was about 7.91 TLU that implies livestock is the main contribution in the study area. The average distance to the nearest market was estimated to be about 4.55 kilometers and only about 19.33% participated in non/off-farm activities. About 90% of sample households were literate and 10% illiterate that implied literate households are easily understand extension service to adopt technology. About 55.33% of sample respondents' access to extension service by different extension service providers (Table 3).

**Table 3.** Summary of descriptive statistics

| No | Continues Variables | Mean | Std.Dev. |
|---|---|---|---|
| **1** | Age (Years) | 36.33 | 8.47 |
| **2** | Family Size (Numbers) | 8.77 | 3.90 |
| **3** | Livestock holding(TLU) | 7.91 | 3.92 |
| **4** | Land allocated for production | 0.46 | 0.20 |
| **5** | Distance to nearest market center | 4.35 | 1.70 |
| **6** | Commercialization index | 57.77 | 27.29 |
| | | Percent | |
| | Dummy variable | Yes | No |
| **7** | Sex | 91.33 | 8.67 |
| **8** | Participation social organization | 60 | 40 |
| **9** | Access to extension service | 55.33 | 44.67 |
| **10** | Access to credit service | 36 | 64 |
| **11** | Educational status | 90 | 10 |
| **12** | Participation in non/off farm activities | 19.33 | 80.67 |

Source: Own survey result, 2017

### *Determinants of commercialization decision (Probit regression)*

The model specification was carried out using the Ramsey-reset test, and the result is insignificant (prob >F= 0.421 and 0.475 for potato and head cabbage respectively) indicating that there were no problem of omitted variables in the model for both commodities. Variance inflation factors (VIF) was computed for all explanatory variables that are used in the Probit model and the result shows VIF values of less than 10 indicating multicollinearity was not a problem (Table Appendex2). Robust method was also employed to correct the possible problem of

heteroscedasticity. Outliers were checked using the box plot graph so that there were no serious problems of outliers and no data get lost due to outliers.

The probit regression model was used to analyze the commercialization decision of the households for potato and head cabbage after normality of data distribution and better goodness-of-fit as compared to logit model was checked. The model chi-square test indicates that the overall goodness-of-fit of the probit model was statistically significant at 1% probability level which in turn indicates the usefulness of the model to explain the relationship between the dependent and at least one independent variable. The result of Probit model estimation shows that the decision made by respondents to commercialize potato in the study area is significantly influenced by livestock holding, land for potato production, frequency of extension contact, access to market information and participation in social organization (Table 4).

**Table 4.** Determinants of sample households commercialization decision potato production

| Variables | Coefficient | Robust Std.Err | P > z | Marginal effect |
|---|---|---|---|---|
| Age | -0.022 | 0.019 | 0.248 | -0.007 |
| Sex | 0.135 | 0.512 | 0.793 | 0.044 |
| Education status | 0.049 | 0.047 | 0.298 | 0.015 |
| Family size | -0.034 | 0.038 | 0.368 | -0.011 |
| Livestock holdings (TLU) | 0.064* | 0.039 | 0.099 | 0.020 |
| Land allocated for potato production | 1.425** | 0.681 | 0.036 | 0.448 |
| Frequency of extension contact | 0.360*** | 0.123 | 0.003 | 0.113 |
| Access to credit service | -0.354 | 0.272 | 0.193 | -0.115 |
| Access to market information | 0.536** | 0.270 | 0.047 | 0.174 |
| Distance to market center | -0.090 | 0. 086 | 0.297 | -0.028 |
| Participation in social organization | 0. 544** | 0.266 | 0.041 | 0.176 |
| Participation in non/off-farm activities | -0.040 | 0.386 | 0.918 | -0.013 |
| Constant | -0.432 | 0.957 | 0.652 | |

***, **,*: implies statistical significance 1%, 5% and 10% levels,

Log pseudo likelihood = -61.16, Pseudo $R^2$= 0.360, Wald $chi^2$ (12) = 66.62, Prob > $chi^2$ =

0.0000, N = 150, Source: model result, 2017.

***Livestock holdings:*** Livestock holding size, which is a proxy for measuring wealth status of household head, is found to have a positive and significant influenced on farmers' decisions to commercialize potato production at 10% level of significance. This result implies that for each additional tropical livestock unit, the households would 2% more likely to commercialize potato; keeping all other factors constant suggesting that a farmer with large number of livestock are more likely to potato commercialize than others (Appendex table 1). These could possibly be explained as better mitigtion behavior and livestock make use of the income obtained from livestock cover the

potato production cost and livestock by products like animal manure applied for potato production. This is in line with the findings of Melkamu *et al*. (2017) and Aman *et al*. (2014).

***Size of land allocated for potato production:*** Size of land allocated for potato production is found to have a positive and significant influenced on farmers decisions to commercialize potato at 5% level of significance. This result implies that for each additional hectare of land, the probability of households' potato commercialization would increase by 44.8%, keeping all other factors constant. This could be due to economies of scale that would increase to farmers to get the opportunity to harvest more and increase their participation in market. Those who have large land size could allocate their land partly for food crop production and partly for cash crop production giving them better position on commercialization. This is in line with the finding of Aman *et al*. (2014).

***Frequency of extension contact:*** Frequency of extension contact was found to have a positive and significant influenced on smallholder farmers decisions to potato commercialize at 1% level of significance. This significance indicates that for each additional extension contact potato producer farmers are more likely to potato commercialize than others. The result implies that an additional unit of extension contact would increase farmers' commercialization decision by 11.3%than others, keeping all other factors constant. This implies that agricultural extension services enhancing farmer skills and knowledge, link farmers with modern technology and markets, and ease liquidity and input to supply constraints. This is in line with the findings of Agwu *et al*. (2012) and Yallew (2016).

***Access to market information:*** Access to market information was found to have a positive and significant influenced on farmers decisions to commercialize potato at 5% level of significance. Farmer who had access to market information was 17.4% more probability of potato commercializes than others, keeping all other factors constant. This finding implies that households with better information access are more likely to participate in potato production for sale since they know the price of products and place where the products more expensive to increase income. This is in line with the finding of Martey *et al*. (2012).

***Participation in social organizations:*** Household heads participation in social organizations had a positive and significant affected on farmers decisions to potato commercialize at 5% significance level. The result implies those farmers that participate in different social organization were 17.6% more probability decision to commercialize potato production than others, keeping all other factors constant. It suggests that the collective action by farmers can allow stronger bargaining power in the market for outputs. Thus contribute to achieving economies of scale. In addition, provides a platform for sharing information that may be helpful in production and marketing activities the farmers. This is in line with the finding of Emilola *et al.* (2016).

### *Determinants of intensity of commercialization (Truncated regression)*

The truncated model result shows that the model statistically significant at 1% level of significance, indicating the goodness of fit of the model to explain the effects of the hypothesized variables on the dependent variable in terms of at least one covariate. The estimation result also revealed that the intensity of farmers' potato commercialization

was influenced significantly by family size, land allocated for potato production, distance to market center and participation in social organization (Table 5).

**Table 5.** Determinantssample households intensity of potato commercialization

| Variables | Coefficient | Robust Std.Err | P > z |
|---|---|---|---|
| Age | 0.027 | 0.145 | 0.853 |
| Sex | 0.061 | 4.666 | 0.870 |
| Education status | -0.128 | 0.265 | 0.630 |
| Total Family size | -0.640* | 0.339 | 0.059 |
| Livestock holdings (TLU)[a] | 0.260 | 0.327 | 0.428 |
| Land for potato production | 9.784* | 5.638 | 0.083 |
| Frequency of extension contact | 0.314 | 0.813 | 0.700 |
| Access to credit service | 1.158 | 2.075 | 0.577 |
| Access to market information | -0.963 | 2.254 | 0.669 |
| Distance to market center | -2.283*** | 0.575 | 0.000 |
| Participation in social organization | 5.670*** | 1.978 | 0.004 |
| Participation in non/off-farm activities | -1.088 | 2.626 | 0.679 |
| Constant | 77.650*** | 5.926 | 0.000 |
| Sigma | 8.492*** | 0.523 | 0.000 |

***, *: implies statistical significance at 1%, 5%, and 10% levels, Log pseudo likelihood =-355.81, Wald $chi^2$ (12) = 72.71, Prob> $chi^2$= 0.0000, N = 100, Limit: lower = 0, upper = + inf, Source: model result, 2017.

***Family size:*** Family sizes influenced level of farmers' commercialized potato at 10% of significance level. Increasing family size by one person would decrease the extent of potato commercialization by 0.64 %, keeping all other factors constant. This may be due to large family size resulting in more potato consumption than others. This is in line with the findings of Aman *et al*. (2014), Ele *et al*. (2013) and Yallew (2016).

***Size of land allocated for potato production:*** Size of land allocated for potato production is found to have a positive and significant influenced on farmers' level of potato commercialization at 10% level of significance. This result implies that for each additional hectare of land would increase extent of potato commercialization by 9.78%, keeping all other factors constant. This could be due to economies of scale that would increase to farmers to get the opportunity to harvest more and increase amount supply to market. This is in line with the finding of Aman *et al*. (2014).

***Distance to market center:*** Distance to market center influenced farmers' level of potato commercialize negatively as prior expectation at 1% significance level. The result depicts that as distance from the farm to market center increases by one kilometer, the extent of potato commercialization would decreases by 2.28%, keeping all other factors constant suggesting that longer distances to the market increase travel time and travel costs that would decrease intensity of potato commercialization. This is in line with the findings of Agwu *et al*. (2012), Aman *et al*. (2014) and Yallew (2016).

***Participation in social organizations:*** Consistent with the prior expectation, household heads participation in social organizations had a positive and significant affected on farmers' level of potato commercialization at 1% significance level. The result implied those farmers who participate in different social organization would increase extent of potato commercialization by 5.67% than others, keeping all other factors constant which, suggesting that collective action by farmers can allow stronger bargaining power in the market for outputs. Thus contribute to achieving economies of scale. In addition, provides a platform for sharing information that may be helpful in production and marketing activities the farmers. This is in line with the findings of Emilola *et al.* (2016) and Ele *et al*, (2013).

## IV. CONCLUSIONS AND RECOMMENDATIONS

Agriculture in Ethiopia is dominated by smallholder and largely subsistence farmers who are intended to meet household food consumption. Even though agricultural commercialization is considered as the main engine to contribute to economic growth of the country and to transform the traditional agriculture of farmers the extent of commercialization is still not as expected in Ethiopia as evidenced from different literature.

The overall objective of this study was to analyze status of commercialization factors influencing farmers' commercialization decision and intensity of potato commercialization in Kofele district. To conduct the study, primary data was collected from 150 randomly selected household heads through semi-structured questionnaire. Secondary data were also collected from different sources including MoFED, CSA, NPC, DOANR, and published and unpublished sources to supplement primary data. In this study, both descriptive statistics and econometric analysis were employed. The primary data were analyzed using descriptive statistics and double-hurdle model.

The result also revealed that about66.67% of sample households were commercialized in potato production respectively. The average intensity of potato commercialization was 57.77 percent. All sample potato producers in the study area produce using rain-fed. The sample households allocated more cultivated land for potato next to barley.

The result of double hurdle model revealed that out of total 12 explanatory variables included in the model for both commodities. Total of nine variables found significantly determined sample farmers commercialization decision and intensity of potato commercialization. To this effect, livestock holdings, area allocated for potato production, frequency of extension contact, access to market information and participation in social organization positively influenced households potato commercialization decision whereas, total family size and distance to market center negatively affected sample households intensity of potato commercialization while participation in social organization and land allocated for potato production positively affected farmers intensity of potato commercialization.

***Based on the findings of this study, the following recommendations are made:***

Land allocated to potato productions significantly affected farmers' commercialization decision on potato as well as level of potato commercialization so farmers better to increase the land productivities by using organic fertilizers

and increase management practice for both commodities to increase their commercialization decision and level of potato commercialization.

*Participation in social organization significantly affected farm households' commercialization decision and level of potato commercialization positively. The cooperative development office better to strength the organization by giving training and encourage farmers participation in different social organizations.*

Access to market information significantly affected farmers' potato commercialization decision positively. The government should give price and market information by different means of information providers' instruments as well as create market integration to enhance farmers' commercialization decision.

*Family size has a negative and significant affected on the farmers' level of potato commercialization. Therefore, health extension workers and other stakeholders need to give attention to strengthening and leverage policies on improving rural family planning to enhance farmers' livelihood and level of potato commercialization in particular.*

Livestock holding significantly affected sample potato producers commercialization decision positively. The study suggested strengthening the existing livestock providing improved health services, better livestock feed (forage), targeted credit and adopting agro-ecologically based high-yielding breeds and disseminating through artificial insemination in the area.

*Frequency of extension contact influenced farmers' commercialization decision potato in study area. Therefore, the agricultural development offices need to increase extension service to enhance farmers' commercialization decision.*

Distance to market center significantly and negatively affected sample households level of potato commercialization. Trade and market development office need to facilitate linkage of potato producers to buyers and give valuable market information to decrease market transaction cost that enhance farmers' level of potato commercialization.

*Finally this study is related information generated from the sample household survey during a single cropping season using a cross-sectional data due to the limited time and logistics to know dynamics of commercialization since commercialization is process of change from subsistence production to market oriented production further study will be important.*

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## APPENDICES

**Appendix Table 1.** Conversion factors used to compute tropical livestock units (TLU)

| Livestock Categories | Conversion factor |
|---|---|
| Cow/Ox | 1 |
| Bull | 0.75 |
| Heifer | 0.75 |
| Calf | 0.2 |
| Horse/Mule | 1.1 |
| Camel | 1.25 |
| Sheep/Goat | 0.13 |
| Donkey | 0.7 |
| Poultry | 0.013 |

Source: Stork *et al*., 1991

**Appendix Table 2.** Multicolinearity test

| Variables | VIF | 1/VIF |
|---|---|---|
| Age | 1.73 | 0.577432 |
| TFSZ | 1.66 | 0.603342 |
| TLU | 1.60 | 0.623536 |
| Ecuc | 1.59 | 0.630095 |
| Extefreq | 1.54 | 0.648020 |
| AMInformation | 1.46 | 0.685932 |
| TLPP | 1.42 | 0.704193 |
| Sex | 1.38 | 0.725603 |
| Social | 1.34 | 0.746945 |
| Pnonoff-farm | 1.23 | 0.811434 |
| DMarkNcenter | 1.17 | 0.854345 |
| Acredit | 1.12 | 0.896481 |
| Mean VIF | 1.44 | |


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