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Econometric Analysis of the Determinants of Quantity of Potato Supplied to the Market: The Case of Jeldu District of Oromia National Regional State, Ethiopia

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Abstract
Potato has been considered as a strategic crop by the Ethiopian government aiming at enhancing food security and economic benefits to the country. However, potato sub-sector in Ethiopia is relatively undeveloped and it is faced with low productivity of less than 14 t/ha which in turn diminishes the quantity supplied to the market. This study applied the two stage least squares econometric model to analyze the determinants of the quantity of potato supplied to the market. Results of the model confirmed that four variables namely education level, quantity of potato produced, membership to cooperatives and area allocated to potato production affected quantity of potato supplied to the market significantly and positively. Contrary to these, livestock holding affected quantity of potato supplied to the market significantly and negatively. Based on the findings, the study suggests that the government and stakeholders should focus on distributing quality inputs, fertilizers and chemicals timely, assisting and encouraging establishments of cooperatives and memberships, identifying and disseminating high yielding and disease resistant potato seed varieties, strengthening the provision of formal and informal education, improving rural infrastructure and promoting coordination among market actors.
Keywords: Potato; Endogeneity; Two-stage least squares regression

1. INTRODUCTION

Potato has been considered as a strategic crop by the Ethiopian government aiming at enhancing food security and economic benefits to the country. As the population grows rapidly, increased productivity of potatoes can improve the livelihood of smallholder potato producers and is required to meet the growing demand (Gildemacher, 2012). About 70% of the country's available agricultural land is located at an altitude of 1800-2500 m which is suitable for potato production (Bezabih and Mengistu, 2011).

However, potato sub-sector in Ethiopia is relatively undeveloped and it is faced with low productivity of less than 14 t/ha. There is a potential for yields of 35 t/ha, which are being attained by progressive farmers using quality seed potato of improved varieties coupled with improved management practices, under the same rain-fed conditions. Due to this fact, low productivity, quantity of potato supplied to the market by producers is still low.

Many scholars had applied different models to analyze the determinants of quantity supplied in general and potato in particular. Debela (2013) had applied Tobit model to analyze the determinants of onion supplied to the market. The results of the study indicated non-farm income of the households, total land size of the households, total quantity of onion produced and access to credit services affected positively and significantly the quantity of onion supplied to the market while total family size showed significant and negative relation with quantity of onion supplied to the market. Christopher *et al.* (2014) and Abraham (2013) multiple linear regression model to analyze the determinants of potato market supply and vegetable market supply, respectively. Some scholars have used Heckman two stage model (for example Habtamu (2015); Berhanu *et al*. (2014); Yeshitila (2012)). Mahilet (2103) and Addisu (2016) had applied two stage least squares (2SLS) approach to analyze factors affecting quantity of malt barley and potato supplied to the market by producers, respectively. The objective of this paper was to analyze the determinants of quantity of potato supplied to the market in central Ethiopia.

2. RESEARCH METHODOLOGY

2.1. Description of the Study Area

This study was undertaken in central Ethiopian highland in one of the major potato growing districts, Jeldu district of Oromia National Regional State. Jeldu district is located at 72 km to the east of Ambo (zonal town) and 115 Km west of Addis Ababa (capital city of Ethiopia). Jeldu district has 38 rural kebeles and four towns. The data obtained from district office of agriculture indicates that out of 38 rural kebeles of the district, potato is produced in 22 kebeles.

The topography of Jeldu district is mountain, plateau, hills and have three types of soil type such as nitosol, vertisol and sandy soil. Nitosol is the one which accounts for about 36.83% of the district's area coverage and got second place next to vertisol (42.1%). Therefore, most of the district's soil is vertisol which is suitable for production of various crops especially, potato.

According to the 2007 census, the total population of Jeldu district was 202,655 people (CSA, 2008). Out of

the total population, about 190,260 (93.88%) live in the rural areas while the remaining 12,395 (6.12%) live in the urban centers. Regarding the sex composition of the population of the district, about 102,796 (50.70%) were females and the remaining 99,859 (49.30%) were males.

In Jeldu district, agriculture contributes much to meet the major objectives of farmers such as food supplies and cash needs. The sector is characterized by its rain-fed and subsistence and small scale agriculture that is dependent on rainfall. The study area comprises mixed farming where crops are grown for food and cash, and livestock are kept for complementary purpose, as a means of security during food shortage, and to meet farmers' cash needs. The dominant crops grown in the district are wheat, barley, teff, sorghum, maize, field beans, peas, chickpeas, potato, sweet potato, onion, garlic, enset, etc (Getachew, 2015).

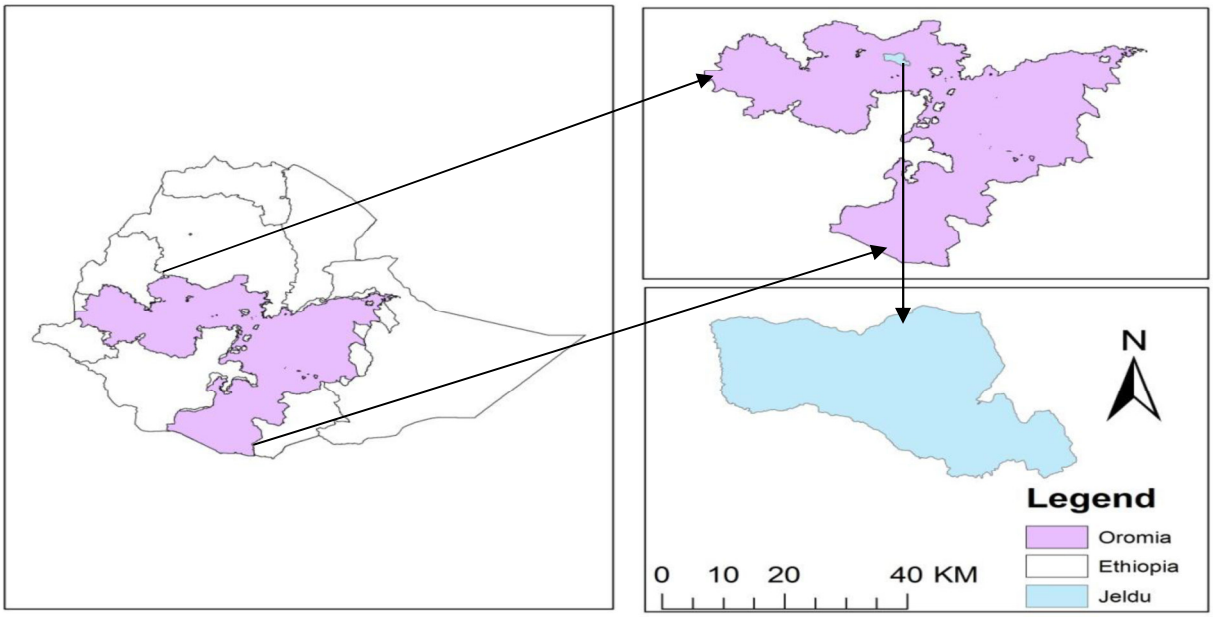

Figure 1: Geographical location of the study area
Source: Adapted from the Ethiopian map (Ethio-GIS)

2.2. Types and Sources of Data and Methods of Data Collection

The study used both primary and secondary data sources. The sources of primary data were potato producer households. Primary data were collected through survey. The survey was undertaken through formal interview with randomly selected households and traders using a pre-tested structured and semi-structured questionnaire for each group. Secondary data sources were the Central Statistics Agency of Ethiopia (CSA), District Office of Agriculture and Rural Development, District Revenue and Custom Authority Office, kebele administrations, published and unpublished journals, websites, internet, etc.

2.3. Sampling Method and Sample Size

In order to select a representative sample that represent the population, a two-stage sampling technique was used. In the first stage, in consultation with agriculture and rural development office of the district, out of 22 potato producing kebeles of the district, four kebeles namely Edensa Gelan, Tulu Bultuma, Chilanko and Kolu Gelan were selected randomly.

In the second stage, using the population list of the sample kebeles, 122 potato producer households were selected randomly using probability proportional to number of potato producer households from each sample kebeles (Table 1). The number of sample households was determined by using the following formula given by Yamane (1967).

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

Where: n = is the desired sample size, N = is the total population of potato producer households in the district (14,234), and e = is the level of precision (9%).

Table 1: Distribution of sample potato producer households in the selected *kebeles*

Name of kebele	Number of households	Sample
Edensa Gelan	725	43
Tulu Bultuma	557	33
Chilanko	478	28
Kolu Gelan	310	18
Total	2070	122

Source: District Office of Agriculture and *kebeles'* administration, 2016 and own computation

2.4. Methods of Data Analysis

In this study multiple linear regression model was used to analyze factors affecting quantity of potato supplied to the market by sample households. This model is appropriate when the dependent variable is of a continuous type. Estimates of the parameters of the linear regression model were computed using the OLS estimation procedure.

However, when some of the assumptions of the Classical Linear Regression (CLR) model are violated, the parameter estimates of the above model may not be Best Linear Unbiased Estimator (BLUE). Thus, it is important to check the presence of heteroscedasticity, multicollinearity and endogeniety problem before fitting important variables into the regression model for analysis.

Multicollinearity problem arises due to a linear relationship among independent variables; and becomes difficult to identify the separate effect of independent variables on the dependent variable because of the existence of strong relationship among them (Gujarati, 2004). Variance inflation factors (VIF) has been used to check existence of multicollinearity among independent variables included in the model. The results indicated that there was no severe problem of multicollinearity because the result of VIF is less than 10 for all variables and the mean VIF was 1.49.

Hetroscedasticity is a situation in which variance of the disturbance term is not constant. If there is heteroscedasticity problem in the data set, the parameter estimates of the coefficients of the independent variables cannot be BLUE. In this study, Breusch-Pagan test of heteroscedasticity was employed for detecting heteroscedasticity. The p-value was 0.3899. Therefore, the null hypothesis (constant variance) was accepted, and no hetroscedasticity problem exists in the data set.

The problem of endogeniety occurs when an independent variable is correlated with the disturbance term in the population data generating process, which causes, the ordinary least squares (OLS) estimators of the relevant model parameters to be biased and inconsistent. The source of endogeneity could be omitted variables, measurement error and simultaneity (Maddala, 2001). In this study, Durbin-Wu-Hausman (DWH) test was applied to check the presence of endogeneity. The result shows, Durbin (score) chi2 (1) = 3.9275 with (p-value = 0.0478) and Wu-Hausman F (1,108) = 3.5830 with (p-value = 0.0611). These indicate that the null hypothesis exogeneity of the quantity of potato produced was not accepted. Quantity of potato produced was found to be endogenous. Therefore, to overcome endogeneity problem, two-stage least squares (2SLS) method has been used in identifying the determinants of quantity of potato supplied to the market. Two-stage least squares is similar to OLS except that it uses two completely separate stages during the analysis phase in order to avoid problems of endogeneity (Wooldridge, 2010).

However, two-stage least squares is appropriate if we have valid instrumental variables. Weak instrumental variables cannot solve endogeneity problem. Hence, testing the validity of the instruments is very important before applying 2SLS method. In this study, estat firststage STATA command after ivregress was used to check whether the instruments are weak or not. The F-statistics was found to be 83.923; the general rule of thumb is F less than 10 indicate presence of weak instrumental variables. The null hypothesis presence of weak instruments is not accepted since the calculated F-value is greater than the critical value. Therefore, the instruments are not weak and hence valid instruments. Over identifying restrictions test was also applied using Hansen-Sargan test and Basmann test using estat overid STATA command after ivregress. The result of Sargan test shows a p-value of 0.4478 and Basmann test shows a P-value of 0.4741. These indicate that the model is correctly specified and the instruments are valid.

Econometric model specification of supply function is the following:

$$Y_i = \beta_o + \delta Y_{1i} + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \beta_9 X_{9i} + \beta_{10} X_{10i} + U_i \quad \textbf{(1)}$$

This is structural equation, where:

Y_i = quantity of potato supplied to the market by household i

Y_{1i} = quantity of potato produced by the i^{th} household

X_{1i} = sex of the household head i

X_{2i} = education level of the household head i

X_{3i} = family size (in adult equivalent) of the household i
X_{4i} = distance to the nearest market by the household i
X_{5i} = membership to cooperative (s) of the i^{th} household
X_{6i} = area allocated for potato production by the i^{th} household
X_{7i} = access to credit by household i
X_{8i} = access to extension services by household i
X_{9i} = livestock size of household i
X_{10i} = off/non-farm income of household i
X_{11i} = potato farming experience of the i^{th} household
X_{12i} = quantity of fertilizer applied to potato land by the i^{th} household
U_i = disturbance term, and $\beta_0, \beta_1, \beta_2, \ldots, \beta_{10}$ and δ are parameters to be estimated (i = 1, 2, 3, …, 122)

In the first stage of 2SLS, quantity of potato produced was regressed over all independent variables including instrumental variables (experience in potato production and quantity of fertilizer applied). The reduced equation is given below.

$$Y_{1i} = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \alpha_3 X_{3i} + \alpha_4 X_{4i} + \alpha_5 X_{5i} + \alpha_6 X_{6i} + \alpha_7 X_{7i} + \alpha_8 X_{8i} + \alpha_9 X_{9i} + \alpha_{10} X_{10i} + \alpha_{11} X_{11i} + \alpha_{12} X_{12i} + V_i \quad \textbf{(2)}$$

Where, Y_{1i} represents quantity of potato produced and harvested by household i, and $\alpha_0, \alpha_1, \ldots, \alpha_{12}$ represent parameter estimates of independent variables included in the reduced equation, and V_i is the disturbance term.

In the second stage of 2SLS, quantity of potato supplied to the market was regressed over predicted value of the dependent variable of the reduced equation (quantity of potato produced) and independent variables included in the model excluding instrumental variables (potato farming experience and quantity of fertilizer applied). The second stage 2SLS is given as follow:

$$Y_i = \beta_o + \delta Y^*_{1i} + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \beta_9 X_{9i} + \beta_{10} X_{10i} + U_i \quad \textbf{(3)}$$

Where, Y_{1i}^* represents predicted value of quantity of potato produced for the i^{th} household

2.5. Variables Selection, Definitions, Measurements and Working Hypotheses

Dependent variable

Quantity of potato supplied to the market (QPSM): It is a continuous dependent variable measured in quintals. It represents the amount of potato supplied to the market in quintals during the survey year.

Independent variables

Based on the review of literature, the independent variables expected to determine the quantity of potato supplied to the market were hypothesized as follows:

Sex of the household head (SEXHH): It is a dummy variable that takes a value of zero if male and one if female. Ayelech (2011) argued that due to obstacles such as lack of capital, access to credit and extension services female households supply less as compared to male. However in the present study, it is hypothesized to affect the quantity of potato supplied to the market either positively or negatively.

Distance to the nearest market (DISTNM): Distance to the market is a continuous variable measured in walking hours from the household's residence to the market centers. The closer the residence of the household to the market centers, the more would be quantity of potato supplied to the market (Abraham, 2013). Contrary to this, Addisu (2016) reported that distance to the nearest market has a significant and positive relation with the quantity of potato supplied to the market. In this study, this variable is hypothesized to have an inverse relationship with the quantity of potato supplied to the market.

Credit access (CREDIT): This is a dummy variable taking a value of one if the household takes loan and zero otherwise. Alemnewu (2010) and Muhammed (2011) found that if pepper and *teff* producer gets credit, the amount of pepper and *teff* supplied to the market will increase. Therefore, access to credit is hypothesized to affect quantity of potato supplied to the market positively.

Non/off-farm income (NFI): It is a continuous variable measured in birr. Off-farm income represents the amount of income household earns in the year out of own farm activities. Non-farm income is the amount of income generated from activities other than crop and livestock production. Households engaged in off-farm and non-farm activities are better endowed with additional income. Additional income improves the households' financial position that in turn enables them to invest in purchasing the needed amount of food and farm inputs (Debela, 2013). Therefore, this variable is hypothesized to have a positive influence on the quantity of potato supplied to the market.

Access to extension service (AEXT): This is a dummy variable that takes a value of one if the household had received extension services during the survey year or zero otherwise. It is expected that extension service widens

the household's knowledge with regard to the use of improved technologies and has a positive impact on the quantity of potato sales. Ayelech (2011) found that if fruit producer gets extension, the amount of fruits supplied to the market increases. Therefore, this variable is hypothesized to influence the quantity of potato supplied to the market positively.

Education of the household head (EDHH): It is a categorical variable and takes 1 if illiterate, 2 if attended primary school (1-8 grade), 3 if attended secondary school (9-12 grade) and 4 if earned certificate and above. Formal education enhances the information acquisition and adjustment abilities of the producer, thereby improving the quality of decision making (Fakoya *et al*., 2007). Astewel (2010) found that if paddy producer gets educated, the amount of paddy supplied to the market increases, which suggests that education improves level of sales. Therefore, this variable is hypothesized to influence the quantity of potato supplied to the market positively.

Farming experience (FMEXP): It is a continuous variable measured in terms of the number of years spent in potato production and marketing. Abbay (2007) found as producers' experience in tomato production increased, quantity supplied to the market also increased. Similar to this, experience in potato production is expected to have a positive relation with the quantity of potato supplied to market.

Area allocated to potato production (AAPP): The total land used for potato production is measured in terms of number of hectares a household allocates for potato production. Mebrat (2014) and Yeshitila (2012) found that landholding had a significant and positive relation with quantity of tomato and potato supplied to the market, respectively. Hence, this variable is anticipated to have a positive influence on the quantity of potato supplied to the market.

Livestock holding Size (LSTH): This is a continuous variable measured in Tropical Livestock Unit (TLU). Households who have a number of livestock are expected to specialize in livestock production so that they allocate large share of their land for pasture. Study by Rehima (2006) on pepper marketing showed a negative relationship between the size of livestock holding and the quantity of pepper sales. Here, this variable is hypothesized to affect the quantity of potato supplied to the market negatively.

Quantity of potato produced (QPP): It is a continuous variable measured in quintals. It refers to the amount of potato produced by sample households during the survey year. If a higher amount of potato is harvested, the more will be supplied to the market. Ayelech (2011) found that the quantity of avocado and mango produced affect positively the amount of avocado and mango supplied to the market. Debela (2013) also found that the quantity of onion produced positively affects the quantity of onion supplied to the market by smallholder farmers of Fentalle district, East Shewa zone of Oromia National Regional State. Hence, this variable is expected to affect the quantity of potato supplied to the market positively.

Family size (FAMSZ): This is a continuous variable and refers to the family size of the household in adult equivalent. Abraham (2013) pointed that, as vegetable production is a labour intensive activity, vegetable production in general and market supply of vegetable products in particular is a function of labour, among others. Thus, in this respect, family size is expected to have a positive influence on the volume of sales. But larger family size requires larger amounts for consumption. Thus, family size is hypothesized to affect the quantity of potato supplied to the market either positively or negatively.

Membership to primary potato producers' Cooperative (COOP): It is a dummy variable that takes a value of one if the household is member of a cooperative engaged in potato business, and zero otherwise. It is believed that cooperatives improve understanding of members about the market and strengthen the relationship among the members (Abraham, 2013). Households belonging to a cooperative have also a better bargaining power and may receive a better price than others. Therefore, this variable is expected to affect the quantity of potato supplied to the market positively.

Quantity of fertilizer applied (FQTTY): It is a continuous variable measured in quintals. It represents the quantity of chemical fertilizer applied to potato production per hectare of land. Obviously, fertilizer increases the productivity of land. Hence, this variable is hypothesized to affect the quantity of potato supplied to the market positively.

Table 2: Summary of variables measurements and the expected signs

Dependent variable is the quantity of potato supplied to the market during the survey year				
Variables	Description of the variables	Type	Values	Expected sign
SEXHH	Sex of the household head	Dummy	0 if male, 1 if female	+ve/-ve
DISTNM	Distance to the nearest market	Continuous	Hours	-ve
CREDIT	Credit access	Dummy	1 if can access, 0 otherwise	+ve
NFI	Non/ off-farm income	Continuous	Birr	+ve
AEXT	Access to extension service	Dummy	1 if received, 0 otherwise	+ve
EDHH	Education of the household head	Categorical	1 if illiterate, 2 if (1-8) grade, 3 if (9-12) grade, 4 if above	+ve
FMEXP	Farming experience	Continuous	Year	+ve
AAPP	Area allotted for potato production	Continuous	Hectare	+ve
LSTH	Livestock holding size	Continuous	TLU	-ve
QPP	Quantity of potato produced	Continuous	Quintal	+ve
FAMSZ	Family size	Continuous	Adult equivalent	-ve/+ve
COOP	Membership to primary potato producers' cooperative	Dummy	1 if a member, 0 otherwise	+ve
FQTTY	Quantity of fertilizer applied	Continuous	Quintal	+ve

Source: Own hypotheses based on review of the literature, 2016

3. RESULTS AND DISCUSSIONS

Determinants of Quantity of Potato Supplied to the Market

To analyze the determinants of quantity of potato supplied to the market, 2SLS method was employed. In the first stage, quantity of potato produced was regressed over twelve independent variables including instrumental variables. The result shows that sex of the household head, experience in potato production and quantity of fertilizer applied affected positively and significantly quantity of potato produced. The predicted value of quantity of potato produced was saved to be used as independent variable in the second stage of 2SLS method. Experience in potato production and quantity of fertilizer applied were used as instruments for quantity of potato produced.

In the second stage of 2SLS method, quantity of potato supplied to the market was regressed over predicted value of quantity of potato produced and hypothesized independent variables excluding instrumental variables. The result shows that four variables namely, quantity of potato produced, education level of the household heads, membership to primary potato producers' cooperatives and area allocated to potato production affected positively and significantly quantity of potato supplied to the market. Contrary to these, livestock holding (measured in TLU) affected quantity of potato supplied to the market negatively and significantly (Table 3).

Table 3: Determinants of quantity of potato supplied to the market (2SLS result)

Variables	Coefficients	Standard errors	t-value
Quantity of potato produced	0.010***	0.001	4.98
Sex of the household head	-0.045	0.093	-0.49
Education level of the household head*			
Attended primary school			
Attended secondary school	0.180***	0.062	2.87
	0.179*	0.093	1.92
Family size (Adult equivalent)	0.015	0.016	0.98
Distance to the nearest market	0.039	0.043	0.91
Membership to cooperatives	0.184***	0.074	2.47
Area allocated to potato production	2.621***	0.136	19.14
Access to credit	0.055	0.063	0.86
Access to extension services	-0.071	0.068	-1.05
Livestock holding	-0.015**	0.007	-2.00
Off/non-farm income	-0.003	0.006	-0.53
Constant	0.696***	0.257	2.70
Number of observations	122		
F (12, 109)	76.26		
Probability > F	0.0000 ***		
R-square	0.8936		

Note: Dependent variable is logarithm of quantity of potato supplied to the market
***, ** and * are significant at 1%, 5% and 10% significance levels, respectively
Source: Own analysis results based on survey data, 2016

Results in Table 3 show that the model is significant at 1% significance level. The null hypothesis (all the coefficients are simultaneously zero) is not accepted. The coefficient of multiple determination (R-square) indicates, about 89.36% of the variation in the quantity of potato supplied to the market among sample households was explained by independent variables included in the model. Even if there is no rule of thumb to say the model is a good fit, R-square value greater than 50% is considered as a good fit. Therefore, this model is good in explaining the relationship between dependent variable and independent variables included in the model. The independent variables significantly affecting quantity of potato supplied to the market are briefly discussed below:

Quantity of potato produced: As hypothesized**,** quantity of potato produced by the households during the survey year indicated positive and significant relation with quantity of potato supplied to the market at 1% significance level. Debela (2013) found that quantity of onion supplied to the market was significantly and positively affected by quantity of onion produced. The coefficient of quantity of potato produced shows an increase in the quantity of potato produced by one quintal resulted in 1% increase in the quantity of potato supplied to the market, keeping other variables constant.

Education level of the household head: As expected education level of the household head showed significant and positive relation with quantity of potato supplied to the market. The coefficient implies that compared to illiterate households, households who have attended primary education supplied 18.0% more to the market at 1% significance level, keeping other variables constant. The coefficient also shows that compared to illiterate households, households who have attended secondary education supplied 17.9% more to the market at 10% significance level, keeping other variables constant. Previous studies (for example, Habtamu, 2015; Christoprher *et al.,* 2014; Yeshitila, 2012) argued that education level of the household heads had significant and positive relation with quantity of potato supplied to the market.

Membership to cooperatives: As expected this variable had significant and positive relation with the quantity of potato supplied to the market at 1% significance level. The coefficient of this variable implies, being a member of cooperatives results in 18.4% increase in the quantity of potato supplied to the market as compared to households who are not members to cooperatives, keeping other variables constant. Similar to this study, Bizualem *et al.* (2015) found that households who are member of coffee cooperatives supplied more to the market as compared to households who are not member to coffee cooperatives.

Area allocated to potato production: As hypothesized, this variable indicated significant and positive relation with the quantity of potato supplied to the market at 1% significance level. This implies that those households allocated more land to potato production have managed to supply more product to the market. The coefficient shows an increase in the area allocated to potato production by one hectare would result in 262.10% increase in the quantity of potato supplied to the market. Similar to this result, Mebrat (2014) and Yeshitila (2012) found

landholding to have significant and positive relation with the quantity of tomato and potato supplied to the market, respectively.

Livestock holding: As expected, this variable has turned out to have a significant and negative relation with the quantity of potato supplied to the market at 5% significance level. This is because, households who own more livestock allocate their land to cereal crops to produce feed as a joint product. They also fallow land for grazing which could decrease land available for potato production. The coefficient indicates as livestock holding increases by one TLU, the quantity of potato supplied to the market decreases by 1.5%, keeping other variables constant. Similar to this result, Efa *et al*. (2016) found that livestock holding has significant and positive influence on the quantity of *teff* supplied to the market.

4. CONCLUSIONS AND IMPLICATIONS

The study was undertaken in the central highland of Ethiopia. Two stage least square econometric model was employed to analyze the data. Econometric model result revealed that quantity of potato produced affect quantity supplied to the market significantly and positively. Therefore, quantity of potato produced should improve. Hence, disease resistant varieties seed, fertilizers and effective chemicals should distributed timely at affordable prices. Furthermore, universities and research institutions should give strong attention in identifying and disseminating high yielding and disease resistant potato varieties seed and new technologies.

It has become clear that the quantity of potato supplied to the market is affected by the educational level of household heads significantly and positively. Education is believed to build knowledge about improved inputs, new technologies and marketing of the product. Therefore, provision of formal and informal education should improve.

The quantity of potato supplied to the market is affected by area allocated to potato production positively and significantly. Given the limited land available to farmers, it would be very difficult to expand area allocated to potato production. Instead, it is strongly recommended to intensify inputs of production on the available land to increase productivity to the possible maximum level.

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