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Research Article

The Role of Agricultural Inputs on Crop Productivity: The Case of Zigam Woreda

Assefa Belay Bekele*

Department of Economics, St. Mary's University, Addis Ababa, Ethiopia

Abstract

In spite of the importance of agriculture in Ethiopia, it is characterized by low productivity and has been unable to produce sufficient quantities of output to feed the country's population. In light of this various development strategies has been undertaken to improve the performance of agriculture. Intensification of agriculture through the use of new agricultural technologies has been emphasized over the last three decades. This study attempted to examine the contribution of agricultural input for crop productivity. The data for the study was collected from 91 sample farmers. This study was the study used both primary and secondary data. In this study researcher was used simple random sampling techniques. This research was use cross sectional approach and econometric method of data analysis to investigate the role of age, sex, land size, labor force, fertilizer, improved seed, extension service, and access to credit, education level and pesticides for crop production by collecting data from the household. In econometric method of data analysis researcher was used ordinary least square (OLS) Model. The econometric result show that land size, labor force, improved seed, fertilizer, credit service, extension service and education level have positive and significant effect on crop production. However, pesticide has a negative and significant impact on crop production. From the explanatory variables, education level has a higher coefficient. This indicates education level is more significant for crop production. According regression result R^2 is 0.97, which implies 97% of output function is explained by the selected ten (10) explanatory variables. The policy implication is that to reduce farmers resistant to use farm inputs and to create knowledge about the optimal input use educate and training of farmers is necessary.

Keywords

OLS, ANOVA, Pesticide

1. Introduction

Agriculture is an integral part of the general economic system. It is not means of homogeneous Industry rather a very large heterogeneous industry. It is a composed of complex serious of farms. By producing quality food and fiber at reasonable price to all customers, agriculture is a vital to nation's economy [10] with the emergence of sedentary life; human beings changed their livelihood from animal hunter and grain collector to agricultural productivity. Since the system of production has passed a lot of technical improvement in the last thousands of years resulting a significant increase in yield [2].

Agriculture is the most important and the oldest industries in the world. Most African countries are agrarian. It accounts for about 30% of Africa's Gross Domestic Product (GDP)

*Corresponding author: assefakebede66@gmail.com (Assefa Belay Bekele)

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and 75% of total employment [18]. Agriculture is the backbone of Ethiopian economy. It is the most important sector of poverty reduction in the country. It accounts for about 43.3% of national GDP, 90% of export and 85% of employment [4]. Despite the importance of agriculture in Ethiopian economy, the development of Ethiopian agriculture was given less attention especially, to smallholder's agriculture until 1990s. During the Derg regime (1974-1991) more emphasis and support was given to commercial state farm and cooperative farms. They consumed about 95% of agricultural inputs (improved seeds, fertilizer, pesticides and farm implement). However they contributed only 5% to the total production. Smallholder agriculture accounted for about 95% of total area under crops and for more than 90% of total agricultural output [5]). "In spite of its importance in the national economy, agriculture is largely based on subsistence farm household, whose modes of life and work have remained unchanged for centuries." [6]

The performance of agriculture is low during the Dreg and empirical regime due to political sterile and recurrent of drought and famine as compared to the transitional government of Ethiopia, they give more attention. And the governmental of Ethiopia's (GOE) economic growth sternly, agricultural development lead industrialization (ADLI) formulated since 1994/95 by aiming to have put the agriculture sector in its proper place in the Ethiopian economy. The government attempts to disseminate modern agricultural input through the participatory demonstration and training extension system (PADETES), which was launched in 1994/95. However all this recent experiences shows that the governments initiate of concentrating its efforts on the diffusion of modern farm input is not enough to bring the desired change in the performance of the sector in particular and a fast development of the economy in general Financial institutions expand to give credit to the farmers that increase agricultural output. Extension services also expand for assisting farmers to build their knowledge, use of technology (improved seeds, fertilizer….). These increase their scale of economy in production and marketing for improving their income living standard. However agricultural productivity is still low and subsistence; according to the information obtained from zigam woreda agriculture and rural development report. There are number of factors for this low productivity and subsistence of agriculture. These are inefficient production and distribution of factor inputs, traditional production system, low infrastructural facilities, shortage of financial institution to provide credit etc.

In Africa in general, and in Ethiopia in particular, smallholder farmers dominate crop production [12]. Even though small holder farmers occupy the majority of land and produce most of the crop products; the yields of crop in general, and cereal in particular is very low because of the low adoption of improved agricultural technologies, severe weather fluctuation, climatic change, inappropriate economic price and rapid population growth. Due to these reasons, crop production in developing countries has not been able to satisfy the food requirement of the people [17].

Agriculture is one of the major contributors of nations Gross Domestic Product (GDP). It accounts for about 43% of GDP and plays a great role for economic growth of Ethiopia. At present, the challenge for Ethiopia is to produce sufficient food for its growing population [13]. As agriculture is vulnerable to natural hazard like; drought, erratic rain fall etc... Self-sufficient in food production will become more difficult, if not possible, considerable efforts will be made by the government to achieve self-sufficiency on food production. But still we are far behind the target [10]. Improvement in land productivity can be realized either by increasing cropping intensity (area expansion) or by increasing crop yield per unit of land (increase utilization of fertilizer; improve seeds, pesticides and others [17]. In addition to the above reasons, the production of crop in Ethiopia was severely restricted due to recurrent disaster such as drought, lack of diversity of items and limited accessibility to facilities. In Ethiopia, the severity of food shortage varies from area to area depending up on the type of farming system and socio economic problems related to a particular location. Several factors have been cited as possible reason for the reduction of farm output, which in turn increased level of vulnerability to food insecurity. Food security in Ethiopia has become a burning issue [1]. Similarly, in the study area zigam Woreda), the above problems were common and the problem of cereal crop production has become a crucial issue.

According to Zigam Woreda Agriculture and rural Development Office report, agriculture in zigam Woreda is not much productive. The factor for this low productivity is that inefficient and ineffective utilizing of available technology (fertilizer, improved seed…), low infrastructural facility, shortage of financial institution to provide credit, lack of well-developed extension service which provides knowledge to the farmer about the role of input and how to use them in a best way.

The agricultural inputs have a great significance to increase agricultural production but their contribution to the sector still very low. By realizing this low level of agricultural productivity and considering the determinants of agricultural output in this woreda, the researcher motivation is to assess the role of factor input for agricultural output and how to use them to increase agricultural output in this Woreda. The general objective of the study is to identify the major inputs that affect crop productivity [7].

2. Empirical Literature Review

In this section, we review the empirical literature mainly regarding the determinants of agricultural output.

Conducted a study on small holders, institutional service and commercial transformation in Ethiopia, based on OLS estimation method. The result shows that the use of improved seeds, fertilizer, and household involved in the extension program, literate household, and access to credit are positively related with crop productivity. Distant plots from homestead are negatively related with crop production [22].

Showed that land; modern inputs (fertilizer, improved seed, and pesticides) and value of owned farm implement were found to be significant and positive effect whereas labor and number of oxen turned out to be insignificant. Age and improvement in off farm activities were significant whereas access to credit and gender of farmer found to have no significant impact on output [20].

also conducted a study on commercialization of smallholder agriculture in selected teff growing areas of Ethiopia on cross section data, based on OLS estimation method. The result is that the literacy of the household head, land, labor, credit had positive and significant effect on farm output of teff. Age and sex of the head of the household had insignificant effect on farm output. [18] Also conduct a study on sustainable agricultural practices and agricultural productivity in Ethiopia, under scored the significance of plot and household characteristics, as well as conventional agricultural input (seeds, labor, chemical fertilizer and oxen), are influencing crop productivity. Technology adoption (fertilizer and improved sees) enhance productivity of agriculture [3].

Estimated the determinant of total value of grain output in Maher season by using cross sectional data, based on maximum livelihood estimation (MLE) [6]. The result shows that fertilizer has largest effect on the total value of grain output next to the size of land cultivated [14].

3. Research Methodology

3.1. Data Source and Method of Data Collection

The study used both primary and secondary data to gather the required information for achieving the stipulated objectives. The primary data is collected by using questionnaire and interview methods. The study used is undertaken through qualitative and quantitative research methodologies. In order to collect primary data the researcher used survey questionnaire the specific aspects on which data collection will include yield produced per hectare, major agricultural inputs that the respondents will use etc…. The researcher used also collect secondary data that are relevant to the study from the report of the Woreda bureau of agriculture and rural development and from other related theoretical articles.

3.2. Sampling Techniques and Sample Size

The study used is employed household survey method. However, due to finance and time constraints researcher was take sample. So sampling allows the researcher study relatively small number of units representing the whole population. In this study, the researcher used simple random sampling techniques. For this purpose among 20 kebeles in the Woreda only two kebeles, Zezebel Aberach and Akako were randomly selected. To determine the sample size the researcher was considered factors like cost, time etc…so total size of 91 respondents selected randomly. 50 respondents were selected from Zezebel Aberach kebele and 41 respondents were selected from Akako kebele randomly.

3.3. Method of Data Analysis

The researcher was used to apply econometrics models to analyze the collected data. Therefore, for this matter ordinary least square (OLS) estimation technique could be apply in the study to analyze the collected data.

Ordinal least square model was selected because of dependent variable of this study is continuous and used to identify the role of agricultural inputs on crop productivity that derived from Cobb-Douglas production function that express the relationship between input and output in production [15].

3.4. Econometric Model Specification

According [16], the multiple linear regression models are specified as

$$Yi=F\ (X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}) \qquad (1)$$

Where Yi= Crop production
X_1= Sex of household
X_2= Age of household
X_3= Education level of household
X_4= Size of the land
X_5= Labor force
X_6= Fertilizer
X_7= Access of improved seed
X_8= Credit access
X_9= Pesticides
X_{10}= Extension access

Econometric model specification of crop production function I matrix is the following

$$Yi= ßX + Ui \qquad (2)$$

Where: Yi = crop production
B = a vector of estimated coefficient of the explanatory variables
X = a vector of explanatory variables
Ui = disturbance term

3.5. Hypothesis and Definition of Variables

In order to identify factors influencing crop production both continuous and discrete variables was used be hypothesize based on economic theories and the findings of different empirical studies. Accordingly, in order to investigate the determinants of crop production, the following variables were constructed.

Dependent variables

Crop production (Crop production): It is a continuous variable that represents the total crop produced with in the year, which is measured in Kg per hectare.

Independent variables: The explanatory variables expected to influence the dependent variable will be as follows,

Land (land): It is a continuous variable measured in hectare. The variable is expected to have a positive contribution to the agricultural output. This means that, the size of land increase or decrease leads agricultural output to increase or decrease, other thing being unchanged.

Labor force (LF): It is a continuous variable, measured in man equivalent. Labor force is expected to have a positive impact on agricultural output. When household labor force increase or decrease, farm production also increase or decrease, other things remain constant.

Improved seed (IMP SEED): It is a continuous variable. The use of improved seed by farmers is also one contributor for agricultural output, which facilitate the growth and productivity of crops. Therefore, the use of improved seed expected to have a positive impact on agricultural output.

Fertilizer (FERT): It is a continuous variable. It is the total amount of chemical fertilizer used in the production of agricultural output, which is measured in Kg. A more use in fertilizer gets farmer better output in the production of crops. Therefore, the use of fertilizer to output expected to have a positive impact on agricultural output.

Credit (CREDIT): This is a dummy variable, which assumes value of 1 if the farmer will have credit access and 0 otherwise. Access of credit would enhance the financial capacity of the farmer to purchase the necessary inputs and increases output. Therefore, it is hypothesized that access to credit to have a positive influence on the production of agricultural output.

Extension service (EXTEN): It is a dummy variable with value of 1 if a household head has access to extension and 0 otherwise. Its objective is introducing farmers to improved agricultural inputs and to better methods of production. In this regard, extension is assumed to have a positive contribution to farm crop production.

Education level (EDU): It is a dummy variable and refers to the formal schooling of a respondent during the survey period. Those household heads who will have formal education determines the readiness to accept new ideas and innovations, and easy to get supply, demand and this enhances farmers' willingness to produce more and more volume of sales. Therefore, formal education was hypothesized to positively influence on the production of agricultural output.

Pesticides (PEST): It I a continuous variables. The use pesticides to the production of agricultural output expected to have a negative impact. This means that, the pesticide increase or decrease leads to the agricultural output decrease or increase, keep other things constant [8].

Age (AGE): It is a continuous variable, will be taken as one of the explanatory variables. The expected sign will be positive as age is one of the parameters of human capital. As an individual stays long, he will have better knowledge and will decide to allocate more of size of land, produce more supply more.

Sex (SEX): This is a dummy variable that will take value of 1 if the household head is male and 0 otherwise. Male households have been observed to have a better tendency than female household in the production of agricultural output.

4. Data Analysis and Interpretation

4.1. Econometric Result

In this part, the researcher tried to analyze the trends of regression result and its interpretation. Cross-section data is used to estimate the parameters of the given regression model, ordinary least square (OLS) estimation method is applied using STATA 12 version.

The OLS estimation result for farm output presented in the following table.

K = number of independent variables including constant = 11.

Table 1. *Econometric Result.*

Variables	Coefficients	Standard error	T	P> / t /
Constant	2.09	0.64	3.26	0.002**
Age	0.04	0.02	1.99	0.050*
Sex	0.36	0.19	1.89	0.063*
land size	1.76	0.46	3.80	0.000***
labor force	0.49	0.12	3.89	0.000***
improved seed	0.80	0.35	2.28	0.025**
Fertilizer	3.37	0.52	6.40	0.000***

Variables	Coefficients	Standard error	T	P> / t /
credit service	0.0003	0.0001	2.32	0.023**
extension service	0.29	0.34	0.84	0.403
Education level	0.42	0.35	1.20	0.235
Pesticides	-0.11	0.27	-0.43	0.668
Prob > F = 0.0000				
R-squared = 0.9769				
Adj R-squared = 0.974				

*show statistically significant at 10% level of significance.
** show statistically significant at 5% & 10% level of significance.
√ *** show statistically significant at 1%, 5% & 10% level of significance.

Model has the following specification

Output (Y) $=\alpha+\beta_1$Age+ $\beta_2 D_1+\beta_3$land size+$\beta_4$laborforce + $\beta_5$improvedseed+$\beta_6$fertilizer+$\beta_7$creditservice+$\beta_8 D_2+\beta_9 D_3+\beta_{10}$ pesticides.

Where D_1, D_2 and D_3 are dummy variables that stand for sex, extension service and education level respectively. From the above OLS estimation result the following regression model is obtained.

$$Y = 2.09 + 0.04\,\text{age} + 0.36\,d1 + 1.76\,\text{land size} + 0.49\,\text{labor force} + 0.80\,\text{improved seed} + 3.37\,\text{fertilizer} + 0.0003\,\text{credit service} + 0.29\,d2 + 0.42d3 - 0.11\,\text{pesticides} \quad (3)$$

$$t = (3.36)\ (1.99)\ (1.89)\ (3.80)\ (3.89)\ (2.28)\ (6.40)\ (2.32)\ (0.84)\ (1.20)\ (0.43) \quad (4)$$

Discussion of the result

From the above regressed model, the research found out that it is, for the dependent variable except extension service, education level, and pesticides all independent variables has impact on the dependent variable (output). But extension service, education level, and pesticides are already insignificant at 5% level of significance. That is output/ crop production is not affected by extension service, education level, and pesticides.

Among the explanatory variables that affect output level, only pesticides has negative/ inverse relationship, whereas the remaining factors has positive relationship with crop production. Now the researcher tries to interpret all of the significant variables to the crop production (output) and tries to test the research and interpret the overall level of significance.

Given the result of the model, to know whether the estimated partial regression coefficients are statistically significant or not testing the significance of each explanatory variable is necessary. The regression result shows that all the coefficient of variable is significant at 5% level of significance (using 95% confidence interval test).

The constant term of the above model is 2.09. This shows that, the average yearly agricultural output of farmers is 2.09 quintal when the farmer is employed one unit of land size, household labor force, improved seed, fertilizer, age of heads of house hold, credit service and pesticides is one, whereas sex of heads of house hold if female, farmers do not get extension service and they are uneducated. This means that, other explanatory variables remain one; the average yearly agricultural output of female heads of household who is uneducated and not getting extension service is 2.09 quintal per annul.

The first variable is age. The regression result shows that age is positively affect agricultural output. The elasticity or responsiveness of output with respect to age is 0.04. This shows that other things remain constant, as age increases by one year, output of farmers increase by 0.04 quintal. This means that, as age increase or decrease leads agricultural output to increase or decrease, other things being unchanged.

The second variable is sex. The dummy variable, which is male, is significant at 10% level of significance and their coefficient is positive. That is sex is positively affects the agricultural output. The elasticity or responsiveness of output with respect to sex (d output/ d sex) is 0.36. It tells keeping other things remain constant farmers which is, male can increase their productivity by 0.36 quintal.

The third variable is land size. The regression result shows that land size is positively affect agricultural output. The elasticity or responsiveness of output with respect to land size (d output/d land size) is 1.76. This show that other things remain constant, a 1 unit /hectare change in land size leads to on average about 1.76 unit/quintal increases in the output of farmers. This means that, the size of land increase or decrease leads agricultural output to increase or decrease, other things being unchanged.

The forth variable is labor force. According to the analysis of the data, household labor force is positively related with output. The elasticity or responsiveness of output with respect to household labor force (d output/d labor force) is 0.49. This means a 1 unit/person change in household labor force leads to 0.49 unit (quintal) change in output in the same direction, other things being unchanged. When household labor force increase or decrease, farm production also increase or decrease, other things remain constant. Generally, the result shows that a household labor force is one of the most important inputs which increase agricultural production and productivity.

The fifth variable is improved seed. As other independent variables include in the model, use of improved seed have positive effect on agricultural output from regression result. The elasticity or responsiveness of output with respect to improved seed (d output/ d improved seed) is 0.80. This show that, other things remain constant; a 1 unit (quintal) change in the use of improved seed leads on average about 0.80 unit (quintal) change in the output of farmers in the same direction. These shows the uses of improved seed by farmers are also one contributor for agricultural output, which facilitate the growth and productivity of crops. Improved seeds are critically important technology required for higher yield and productivity of farm activities.

The sixth variable is fertilizer. The coefficient of fertilizer to output is positive from the above result. The elasticity of output with respect to fertilizer is 3.37. It tell us a 1 unit (quintal) increase or decrease of use of fertilizer leads 3.37 unit (quintal) increase or decrease of output, other things remain constant. This shows that the use of fertilizer by farmers increases their agricultural output. The use of fertilizer enhances the fertility of the soil to replace the chemical elements taken from the soil by the previous crop year. This increase farm production and productivity. The distribution and use of fertilizer by farmers play a great role to increase land productivity and farm output.

The last variable is credit service. It is significant at 5% level of significance and its coefficient is positive. The responsiveness of output with respect to credit service is 0.0003. This show that, other things remain constant, a 1 unit (birr) change in credit service causes 0.0003 units of quintals change in the output of farmers in the same direction. This shows the role of credit on agricultural productivity is less important.

Generally from the above analysis fertilizer has higher positive effect on agricultural output compared to the other determinant that include in the model. On the other hand credit service has lower positive role for agricultural output compared to the rest variables.

Test of the model In this part, hypothesis testing and diagnostic test were employed.

Hypothesis testing /ANOVA test

To examine whether regression model is statistically significant or not /whether explanatory variables jointly have explanatory power f-test is crucial. F-test is the measure of the overall significance of the model and test of significance of R ²

H0: βi=0 (all explanatory variables have not explanatory power or the model is over all insignificant)

H1: H0 is not true.

From the previous regression result f calculated is 338.85 and p-value is 0.0000. This show that reject H0:βi=0 and accept alternative hypothesis. That means the coefficient of all independent variables affect the variation of output is statistically significant.

Goodness of fit of the model

As the above regression result table shows that $R^2 = 0.97$, which implies 97% of output function is explained by the selected ten (10) explanatory variables. In other words 97% of variation of the dependant variable is due to the variation of the independent variable which are included in the model and the remaining variation 0.03 (3%) is explained by the variable which are not included in the model. If the value of adjusted R^2 is higher, the greatest the goodness of fit of the regression plan to be the sample observation. Therefore, the adjusted R^2 obtained in the regression model reveals that there is good fitness of values for a given result.

4.2. Diagnostic Test

In this section, multicollinearity, heteroscedasticity, omitted variable/Ramsey reset / test were employed by the researcher. In this part, the way how multicollinearity, heteroscedasticity, normality and omitted variable test can be shown.

4.2.1. Multicollinearity Test

Multicollinearity is the relation of explanatory variables with each other or it is the problem that arises due to the presence of perfect linear relationship among explanatory variables. Since the presence of multicollinearity affects the OLS estimators and make them inconsistence, the problem of multicollinearity must be tested. This test shows the testing of interdependence of explanatory variables. The interdependence of explanatory variables examined by variance Inflating factor (VIF). VIF is between 1 and positive infinite (∞). 1<VIF< ∞If VIF=1, nocollinearity. This means explanatory variables are independent If VIF= ∞, Perfect multicollinearity, which means it is impossible to determine the individual impact of explanatory variables on dependent variables. When VIF is greater than or equal to ten (VIF ≥ 10) or tolerate (1/ VIF) is less than or equal to 0.10, accept alternative that is multicolinearity [19].

When VIF < 10 or tolerance (1/VIF) greater than 0.10, accept the null hypothesis. That is no multicollinearity The presence of multicollinearity affects the OLS estimators and makes them inefficient and inconsistence. There for the problem of multicollinearity must be tested. In this study variance inflating factor (VIF) was employed to test multicollinearity of independent variables. VIF shows how the variance of an estimator is influenced by the presence of multicollinearity. The result of the test as follows;

Table 2. *Multicollinearity test.*

Variable	VIF	1/VIF
Labor force	18.80	0.063
Age	12.80	0.078
Improved seed	7.92	0.126
Land size	7.90	0.129
Fertilizer	6.14	0.162
Extension service	5.16	0.193
Education level	4.87	0.205
Pesticides	2.66	0.375
Credit service	1.62	0.617
Sex	1.04	0.963
Mean VIF	6.57	

From the above result VIF is less than 10 for all independent variables that include in the model. From this, the conclusion is that there is no multicollinearity problem between explanatory variables. It is possible to estimate the individual effect of each variable on dependent variables.

4.2.2. Heteroscedasticity Test

The assumption of hetroscedasticity states that the variation of each random terms around its zero mean is not constant and changes as the explanatory variable changes regardless of the sample size that whether it increase, decrease or remain constant, but does not mean that it affects the unbiasedness and consistency properties of OLS estimators rather it results the variance of coefficient of OLS to be incorrect and inefficient. By taking in to consideration, one of the assumptions in regression analysis which is the error ui has a common anceδ^2. If the error term does not have constant variance, there is a heteroscedasticity problem [9]. This is the test of the variance of the error term /disturbance term/ under classical linear regression model assumptions error are homoscedasticity (constant variance). The nature of the variance of the error term is judge by Breusch-pagan test. The decision rule is that, if the p- value is sufficiently small, that is, below the chosen significance level (10%) then we reject the null hypothesis of homoscedasticity (constant variance). Otherwise, reject the alternative hypothesis; that is no constant variance.

If p- value is higher, accept the null hypothesis of no omitted variable otherwise accept that alternative hypothesis of omitted variable.

Hypothesis

H0: constant variance

H1: not constant variance

To detect this problem the researcher utilize Breusch-pagan (cook-weiberg) test for heteroscedasticity. Our result shows that, the p-value of Chi^2 obtained from its calculation is sufficiently low, then one can reject Ho (constant variance/ homoscedasticity). That is p-value of $\text{Ch}i^2$; prob > $\text{Ch}i^2$ = 0.033 is less than the level of significance = 0.05. So that accepts the alternative hypothesis. Therefore, there is variation in the size of the values of the explanatory variable, which signifies that there is a problem of heteroscedasticity. (To avoid the problem of the heteroscedasticity, the researcher used robust standard error correction. As a result the model was free of heteroscedasticity problem.

4.2.3. Normality Test

The model assumes that the random variable u has a normally distributed. Symbolically: $u \sim N(0, \delta^2 U)$, which reads as: u is normally distributed around zero mean and constant variance $\delta^2 u$. This means that small values of u's have a higher probability to observed than large values. This assumption is necessary for constructing confidence intervals. If the assumption of normality is violated, the estimates of parameters are still unbiased but the statistical reliability by the classical tests of significance of the parameters cannot be assessed because these tests are based on the assumption of normal distribution of the u. The normality test adopted Shapiro-wilk test for normal distribution. This test computes the skewness and kurtosis measures of the OLS residuals and it follows the chi square distribution [16]. The null hypothesis is that has normal distribution against the alternative hypothesis that the u is not normally distributed.

The model assumes that the random variable u has a normally distributed. Symbolically: u~N (0, δ^2 U), which reads: u is normally distributed around zero mean and constant varianceδ^2, U.

Hypothesis

H0: ß1=0 (The error term follows a normal distribution).

H1: ß1 ≠0 (The error term does not follow a normal distribution)

The nature of normal distribution in this model was tested by Shapiro wilk w test and the result shows higher p-value prob > z=0.25>0.05, which implies that the residual (error term follows) a normal distribution, So that we can accept there is normal distribution of null hypothesis [21]

Goodness of fit of the model

The goodness of fit of the model is measured by coefficient of determination, which measures the percentage of the total variation in independent variable. Therefore output in this case explained by the regression model. Since the researcher use multiple linear regression model analysis, adjusted R-squared is taken in to account in order to measure the explanatory power of independent variables.

5. Conclusion and Recommendation

5.1. Conclusion

Agriculture is the most important activity and carried throughout the world. It is the main economic activity, especially, in developing countries. Starting from the very beginning of the study, several issues have been rose about the role of inputs for agricultural output. The general objective of this study is to identify the major inputs that affect crop productivity. In order to achieve the desired agricultural output, the availability of inputs is mandatory. The empirical analysis was based on cross sectional data. The researchers employed the ordinary least square (OLS) model to ensure the relationship between inputs and output [11].

From the regression result except age and sex, all independent variables (fertilizer, improved seed, land size, household labor force, credit service, extension service and education level of respondents) are, positively related with crop production; whereas, pesticides has negative relationship with crop production. This shows that the increment of use of inputs increase crop production, further leads to improve food security, avoid poverty and improve economic growth and development in Ethiopia. Educational level, use of fertilizer, household labor force, extension service, pesticides, improved seed and land size has statistically significant impact on output. However, age of heads of household, sex of house hold and participation in credit market are statistically in significant impact on crop production.

The study also shows that the change in education level followed by household labor force leads more change in crop production, compared to other inputs, which included in the model. were as credit service has a smaller significance for crop production.

Generally, the researcher concluded that the availability of inputs such as: fertilizer, improved seed, labor force, land size, extension service, etc. is important to expand crop production.

5.2. Recommendation

Based on the result of the regression and data analysis the following policy implications are drawn:

Agricultural output are highly depend on inputs such as education level, fertilizer, improved seeds, labor force, land size, extension service, etc. Therefore the government should expand the farmer training center and extension system, which provide know how to the farmers about the role of inputs and how to use them in a best way.

Governmental and non- governmental organizations should focus more on promoting the use of modern inputs and should provide these inputs in appropriate manner.

The regression result shows that participation in credit market is positively related with output but statistically insignificant. What expected from the government is to conduct and invest on research and development. Besides this, rural financial institutions should be expanding in order to achieve rural agricultural credit.

Farmers should developed the habits of use of inputs and increase their efficiency in order to expand crop production.

More numbers of technologies such as improved seeds, fertilizer, credit service etc. should develop and disseminated to farmers at required amount and at right time.

Abbreviations

OLS	Ordinary Least Square
VIF	Variance Inflating Factor
Ho	Null Hypothesis
HI	Alternative Hypothesis

Author Contributions

Assefa Belay Bekele is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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Research Fields

Assefa Belay Bekele: Economics Researches, Economics and Finance Researches, Economics and Business management Researches, Management Researches, Econometric Researches, statistics researches