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Factors Affecting Maize Productivity: In Case of Bedele District of Buno Bedele Zone, Oromia Regional State, Ethiopia

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Abstract

Though agriculture remains to be the most important sector of the Ethiopian economy, its performance has been disappointing and food production has been lagging behind population growth. This gap between demand for and supply of food can be reduced by improving crop production and productivity. As maize is a significant contributor to the Ethiopian economy, increasing production and productivity in maize production could be taken as an important step in attaining food security. This study was conducted in Bedele district of Buno Bedele zone of Oromia National Regional State with the aim of identifying factors affecting the productivity of maize production. This study used cross sectional data which was collected from a total of 174 farm households which were randomly and proportionally selected from 4kebeles of the Woreda using two stage sampling technique. The primary data were collected through individual interviews of respondents using semi-structure questionnaire. Secondary data was collected from different relevant literatures such as district reports, publications, journals and other documents relevant for the study. Descriptive statistics and Econometric model were used to assess the collected data. The result of Descriptive statistics indicated that the mean amount of maize produced by households in quintal per hectare is about 19.76 quintal. Results of Cobb- Douglas production function revealed that Variability of weather condition, Extension Contact, Land allocated for maize, Mode of sowing, Amount of fertilizer used, Farm Income, labor cost, Number of Oxen, and educational level of household head positively and significantly affected the productivity of maize production. Whereas Soil fertility, occurrence of pests and diseases, over cultivation are negatively and significantly affected the productivity of maize production. Therefore, attention should be given to major factors that affect the productivity of maize production to increase production and productivity of maize.

Key words: Maize, Cobb-Douglas, Productivity

INTRODUCTION

Background of the Study

Agriculture is the corner-stone of Ethiopian economy that accounts for 36.3% of GDP, employees 73% of labor force and over 70% of exports earning [1]. It is still believed to remain

a sector that plays an important role in stimulating the overall economic development of the country in the years to come. In another word, the projected figure of Ethiopian population for the year 2019 was 113.85 million [2]. Thus, growing population requires better economic performance than ever before at least to insure food security. Consequently, in the country, currently about 8.13 million people were food insecure and need of food assistance [3]. Hence, being an agriculturally dependent country with a food deficit, enhancing crop production and productivity are decisive [4].

Maize is a cereal crop grown in various agro-ecological zones, as a single crop or in mixed cropping. It is the third most important cereal in the world, next to rice and wheat and with highest production potentia l among the cereals [5]. It is the second most widely cultivated crop in Ethiopia and is grown under diverse agro-ecologies and socio- economic conditions typically under rain-fed production [6]. It occupies the largest share next to teff in terms of total production, acreage and the number of farms holding and it is used as food, feed and fodder [7]. It is also; maize is considered as a crop where huge productivity can be obtained to boost domestic production and there is huge demand by farmers, and all public and private seed companies are engaged in its multiplication creating competition among these actors [8]. The increases in maize production in Ethiopia resulted more from increases in productivity rather than area expansion - i.e., the yield grew faster than the area [6]. There is evidence that the increased productivity and production of maize is also having a significant positive impact on poverty reduction [9]. The expansion and productivity change in maize production in Ethiopia is attributable to multiple factors; Such as increased availability of modern varieties, increased commitment to enhance farmer access to and use of modern inputs through better research-extension linkages, wider adaptability of the crop and modern varieties, better production conditions and low production risks and growing consumption demand and market access for producers to support market based production to absorb surplus supply[6]. This rapid increase in population in Ethiopia is raising demand for agricultural product. It is also the most important sector of the Ethiopian economy in which its performance has been unsatisfactory and unable to fulfill the requirement of the ever-increasing number of mouths with all development endeavors. This is mainly attributed to the poor use of modern inputs such as fertilizers, improved seeds and extension services which partly explain the less productivity of the sector [10;11]. According to FAO report of the national average maize yield in Ethiopia in 2016 is 3.6 t ha-1; which is by far below the world average of 5.6 t ha-1. This low yield is attributed to physical, institutional and socio-economic factors such as; Weed disease, poor soil quality, and lack of input of production. Therefore: the general objective of the study was to assess the major determinants of the productivity of maize production and to examine factor affecting the productivity of maize in the case of Bedele district of Bunno Bedele Zone.

RESEARCH METHODOLOGY

Descriptions of the Study Area

Location and Population:

This study was conducted in Buno Bedele zone, Bedele district, Oromia National Regional State of Ethiopia. The district is Geographical located at 483 km far from the south west of Addis Ababa. The district is located between 8°14'30''N to 8°37'53''N and 36°13'17''E to 36°35'05''E It is covers 74497.425 hectares of which 47,986, 9477, and 10,120 hectares are cultivated,

forest and grazing land, respectively (Bedele District Agricultural Office, 2019) Fifteen-year (2006-2020) weather data ion collected at Bedele Meteorology Station show that Bedele has a uni-modal rainfall pattern and mean annual rainfall of 1942.1 mm. The rainy season extends from April to October and the maximum rain is received in the months of May, June, July, August, September and October with the mean monthly rainfall exceeding 315mm. The annual average, mean minimum and mean maximum air temperatures are 19.5, 13 and 26°C, respectively. The area has an altitude ranging from 1013 to 2390 meters above sea level with a humid agro-ecology.

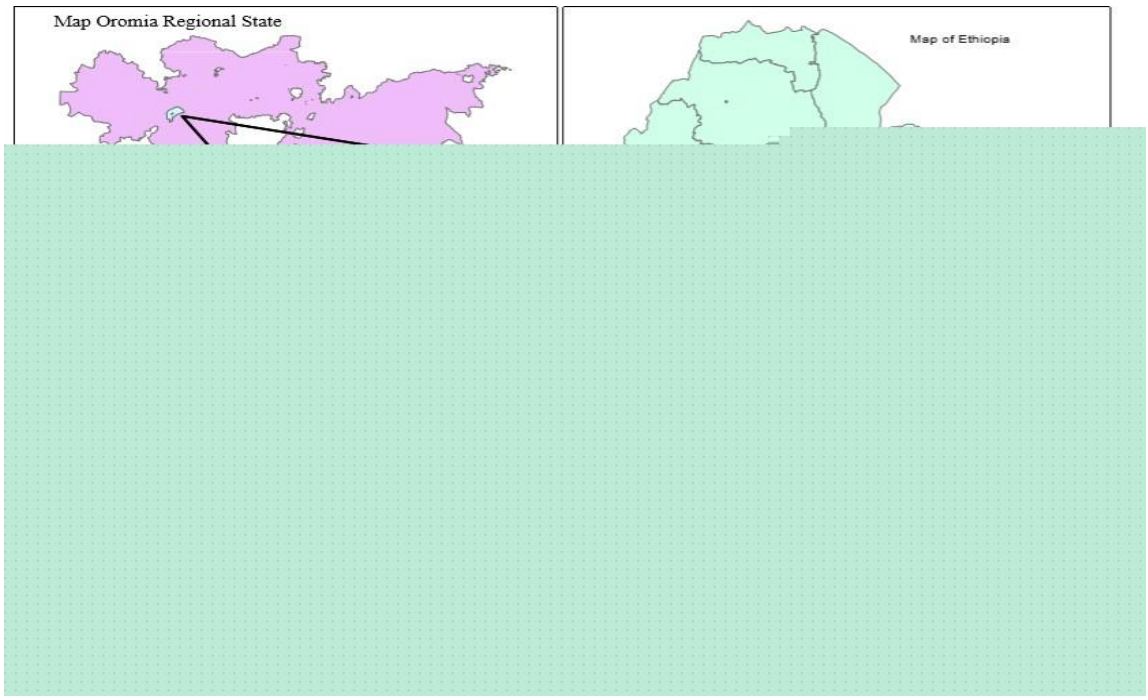


Figure 2. Map of Bedele Woreda
Source: Buno Bedele zone administrative boundaries (2017)

Research Design (Types of research)

The major focus of the study is description of information related to maize productivity by collecting cross sectional data from the study area. So, the research method will use for the study is mixed research design to answer research questions. Moreover, Cobb- Douglas production function model will apply for independent or explanatory variables which show a significant effect on the maize productivity of the farmers.

Target Population

Target population is the population that the researcher wishes to generalize the result of the study. [12] define target population as the entire group a researcher is interesting in about which the researcher wants to draw conclusion. According to the records from the district's agricultural office, the four selected District has a population of 4594 household farmers of 2300 males and 2294 females by the year 2019(AOD, 2019). The target population for this study is 4594 Households maize farmers.

Types and Sources of Data

This study used both primary and secondary data. The researchers‟ were collected primary data or firsthand information from maize producer farmers in the proposed kebeles. The process of primary data collection was designed to collect through follow up, to gather timely and reliable information on the overall farming operations in the study area. This was due to the fact that the quality and reliability of the information gathered from the farmers depend on their recalling capacity. On the other hand, secondary data were derived from the findings stated in published and unpublished documents and literatures related to the research problem. These are bases from the recent literatures such as; articles, journals, reports, working papers, books, and internet sources related to maize productivity. Information related to factors influencing maize productivity will collect from secondary sources of data. It also collected from relevant sources such as books, journals and other related documents from Bedele District‟s Agriculture Office and other relevant institutions.

Data Collection Techniques or Instrument

The data were collected using an Interview and structured questionnaire administered by the trained and experienced enumerators. Before starting the actual data collection some preliminary information about the overall farming system of the district as a whole was assessed through informal survey and discussion was held with key resource persons in some of the Kebeles. Pre- testing the questionnaire was also one part of the informal survey so that appropriate improvement and modification in the questionnaire was made. The process of primary data collection was conducted through follow up, which enable to gather timely and reliable information on the overall farming operations in the study area. This was due to the fact that the quality and reliability of the information gathered from the farmers depend on their recalling capacity. [13] indicates that research instruments will the tools that the researchers will use in the collection of data on the phenomenon of the study. The researcher will use questionnaires‟, interview schedule and focus group discussion to obtain reliable firsthand information from the representative‟s population of the study area. These instruments were designed by the researchers to collect data from respondents as follows: structured questionnaire, interview and Focus group discussion.

Questionnaire

The researcher has prepared well-structured questionnaires to collect firsthand data from the sampled population of the study area. These well-structured questionnaires will distribute to the designed respondents specifically to the farmers to collect information on the maize productivity there. Questionnaire included three parts in which part one is general background information, part two is first objective of the study which are Demographic factors affecting maize productivity, second objective of the study which are socio-economic factors, the third objective of the study which are the influence input of production, the fourth objective of the study are the institutional factors affecting maize productivity is questions concerning dependent variable (Maize productivity).

Sampling Techniques and Sample Size

Two stage sampling technique was employed to select sample households for collecting data. In the first stage, four Kebeles were selected from smallholder farmers who are participating

on maize production kebeles using simple random sampling technique together with the Bedele district livestock and fishery office. In the second stage, from list of smallholder farmers who are participating on maize production in the sampled Kebeles, 174 sample maize producers were selected randomly using probability proportional to size using sample size determination formula developed by [14] as shown in the following equation. [14] formula is more appropriate, since the households in the study area are heterogeneous in different aspects. Simple random sampling technique was chosen rather than other techniques due to that it gives equal chances for Kebeles and households to be included within the sample frame. The formula for [14] was written as follows.

$$n = \frac{z\text{^}2p(1-p)}{\text{e}\text{^}2}$$

Where n is sample size, Z stands for standard normal deviation (1.96 for 95% confidence level), e is the level of the desired precision set at 5 percent for this study, p is the estimated proportion of an attribute that is present in the population, in this context, the proportion of households who are participating on maize production in the study area. But, the population proportion of smallholder farmers who are participating on maize production in the study area was unknown. The rule for the sample size determination in this case where variability in p unknown was to assume =0.5[15]. In this study, due to Covid-19'n and budget constraint, the variability in p was taken as 0.13 which was used by [16] depending on the assumption that randomly selected sample is representative of population in Bedele district, based on [14] formula, the sample size was calculated as follows.

$$n = \frac{(1.96)^2(0.13)(0.87)}{(0.05)\text{^}2} = 174$$

Based on the number of populations of maize producers, the following number of sample size was proportionally selected from the population of the four selected Kebeles.

Table 1: The sampling frame and sample size determination

Name of Kebeles	Number of households	The proportion of sampled households (%)	Number of sample householdsusing probability of population proportion size
Raso Yuro	1,662	36	62
Yaya Sota	1,836	40	70
Dorani Teba	513	11	19
Milko Yuro	583	13	23
Total	**4594**	**100**	**174**
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Methods of Data Analysis

Descriptive statistics employed in the process of examining and describing farm household characteristics. The Cobb-Douglas production function model used to identify and estimate the effects of socioeconomic factors on maize productivity. To address the objectives of the research and to analyze the data, both descriptive statistics andEconometric model was employed

RESULTS AND DISCUSSIONS

One of the most challenging or rewarding task in survey research comes after the data have been collected and coding, editing and preliminary processing have been completed. This section contains statistically analysis results and interpretation of the findings.

Summary of Most Important Characteristics of Sample Households

A data from sample of 174 respondents in bedele districts collected to achieve the main objectives of this study. The different characteristics of the sampled population were summarizedby using mean, standard deviation, minimum and maximum for continuous variables. Percent was used to summarize categorical characteristics of the sampled farmers.

Table 2 Summary of some selected continuous variables

Characteristics	Minimum	Maximum	Mean	Std. deviation
Land allocated for maize (ha)	0.12	3.5	1.92	0.995
Amount of maize productivity (quintal/ha)	15	45	19.76	5.67
Education level (grade attained)	0	15	7.94	3.4
Experience of maize farming (year)	0	34	3.4	3.33
Farm income (in birr)	2000	198800	69478	51313.01
Amount of fertilizer used (kg/ha)	25	100	28.49	14.37
Labor cost (in birr/ha)	200	4200	1815.7	1324.8
Extension Contact with DA (number)	0	25	6.4	4.56
Over cultivation (Number)	0	5	2.178	1.052
Oxen owned (Number)	1	12	4.88	1.68

Source: survey data 2020;

As table 1 described that the minimum, maximum and average amount of land allocated formaize production was 0.12, 3.5 and 1.92 hectare, respectively.

The mean amount of maize produced by households in quintal per hectare is about 19.76quntal. According to the result of this survey, on average the sampled household heads have about eightgrades of formal education. On the average, the households had about three years of experiences for engaging in the maizeproduction. The survey result indicated that on average, the annual income from farm activities is about 69478 birr. The result of the survey also indicates that the amount of fertilizer used by households is about 28.49kg per hectare. Labor cost is one of the independent variables that may characterize the behavior of households in terms of increasing the productivity of maize production. According to the result of the survey, the mean amount of costs incurred for labor is about 1815.7birr per hectares. Regarding the extension contact of households with DAs, on average the household‟s makes contacts with DAs about 6.4 days per year. The result of the survey pointed out that on average, the households cultivate their land consequently 2.178 times with same crops. On the average, Households in the study area possessabout five oxen.

Table 3 Summary of categorical variables

Variables	Categories	Percent
Mode of sowing	Row	41.38
	Broadcasting	58.62
Types of seed used	local seed	23.56
	improved seed	76.44
Occurrence pests and diseases	disease occur	58.62
	no disease occurs	41.38
Market accessibility	No market is available	33.91
	Market is available	66.09
Perception of soil fertility	farmland is not fertile	52.87
	farm land is fertile	47.13
Variability of weather condition	Occur	57.47
	Not occur	42.53

Source: survey data, 2020

The (Table 2) above reveals that 41.38% of the respondents sown in row, while 58.62% of the households sown in broadcasting mode of sowings. This implies that farming activities were dominated by broadcasting mode of sowing in the study area. The table also reveals that most of the respondents (58.62%) were reported the occurrence of pests and diseases while some (41.38%) respondents were reported absence of problem of pests and diseases. About 47.13% of the farm land in the study was fertile while 52.87% of the farm land in the study was not fertile respectively. About 57.47% of the respondents reported the occurrence of variability of weather condition while 42.53% of the respondents reported no variability of weather condition. Regarding access to market, of households in the study area that 66.09% of sample households got Market access whereas, 33.91% did not get market access.

Econometric Results

Prior to model estimation, a test was made for multicollinearity among the explanatory variables using the Variance Inflation Factor (VIF). In a production function analysis, correlation between some of the explanatory variables was expected and collinearity among economic variables was an inherent and age-old problem leading to problems of multicollinearity. Some, therefore, have suggested that multicollinearity is not necessarily a problem unless it is very high [17]. However, the values of VIF for all variables entered into the model were very low and below 10, which indicated the absence of severe multicollinearity problem among the explanatory variables. In addition, Breusch-Pagan test was also used to detect the presence of hetroskedasticity and the test result indicated that there was no problem of hetroskedasticity (P- value=0.145) in the models. Omitted variables were also tested by using Ramsey RESET test, the test result showed that there were no omitted variables (P-value=0.21) from the models.

Determinants of Maize Productivity

The dependent variable of the estimated Cobb Douglas production function was amount of maizeproduced (qt) produced in 2019/20 production season and the independent variables used in the analysis were Soil fertility, pest Diseases, Variability of weather condition, Over

cultivation, Extension Contact , Market access, Land allocated for maize, Farm Experience, Mode of cultivation , Amount of fertilizer used, Farm Income, Availability of Labor ,Number of Oxen , Seed Type, and Educational level of household head. The result shows that twelve out of fifteen independent variables included in the Cobb-Douglas production function are significantly determine maize productivity in the study areas. The coefficient of determination (R^2) and the adjusted R^2 values are 0.8511and 0.8370, respectively.It implies that about 85.11% of the variation in the dependent variable is explained by the independent variables, indicating relatively high explanatory power (goodness of fit) of the model.

Table 4 Estimates of the Cobb Douglas production function

Variable	Coefficient	Std error	t-value	p-value
Ln (FARMLAND)	.0598765	.0077014	7.77	0.000
LN(EDUCATION)	.0048371	.0018336	2.64	0.009
LN(MAIZE FARMING EXPERIENC)	.0020822	.0016147	1.29	0.199
LN(EXTCONTACT WITH DAs)	.0026588	.0011181	-2.38	0.019
LN(SEEDTPYES)	-.0136945	.0113059	-1.21	0.228
LN(FERTILIZER)	.0857583	.0237165	3.62	0.000
Ln(LABORCOST)	.0475055	.0152466	3.12	0.002
LN(MODSOWING)	.0724613	.0143421	5.05	0.000
Ln(FARMINCOME)	.0107857	.0065042	-1.66	0.099
Ln(NUMBEROFOX)	.0045005	.0026742	1.68	0.094
Ln(PESTANDDISEASE)	-.0273191	.0100568	-2.72	0.007
LN(OVERCULTIVATION)	-.0141938	.0043271	-3.28	0.001
LN(MARKETACCESS)	.0108837	.0093529	1.16	0.246
LN(VARIABLITYOFWEATHERCON)	.0167894	.0091073	1.84	0.067
LN(SOILFERTILIT)	-.0199254	.0092699	-2.15	0.033
Cons	9005785	.0612475	14.70	0.000

Source: Model output, 2020

Land Allocated for Maize Production:

Land allocated for maize production had a positive and significant relationship with maize productivity at 1% significant level and in line with the expected hypothesis. The result of the survey indicates that maize output increases with increase in size of land under maize production. That means as farm size under maize production increases by one hectare, the productivity of maize production increased by 5.988 percent keeping all other independent variables constant.

Education Level of Household Head:

Education level of the household had a positive and significant relationship with maize productivity at 1% significant level. This finding is similar with the finding of [18] that shows education has positive effect with maize productivity and statistically significant. The result of the survey indicated that as the education level of household increase by one year, the productivity maize production per hectare increases by 0.484% percent keeping all other

independent variables constant. This indicates that as education level of household increase the capability of interpreting the information, and understanding what they read, heard and analyze the condition of household heads would be increased.

Extension Contacts:
Accordingly, the result of this study, extension contact positively and significantly affected the productivity of maize production at 5% significant level. This finding is similar with the finding of [19] that shows the more the farmer is being visited by an extension agent in a given time; there would be more exposure to information about technology, which implies that more contacts with extension agents increase farmers‟ adoption of technologies. The result of the study showed that households who have got more extension service from extension agent are more producers of maize outputs which are the result of maize productivity per hectares.

Labor Cost:
labor cost was found one of the factors affecting maize productivity positively and significantly at 1% significant level. This result is consistent with studies by [20;21] that shows the larger the amount of birr spends on labor, the larger the amount of maize productivity. This might be that households having invested more birr for labor force more weeding naturally gather their post harvesting timely before damaging with rain and other problems.

Method of Sowing:
Method of sowing which is measured as a dummy variable (i.e., 0 for broadcasting and 1 for row planting) has positively contributed to maize productivity at 1% level of significance. This implies that increasing the extent of use of row planting would significantly increase maize productivity. However, as the result of descriptive statistics depicts, about 58.62% of households in the study area use traditional (broadcasting) method of planting.

Over Cultivation:
it is negatively and significantly affecting the productivity of maize production at 1% significant level. This might be that cultivating the same land more than one times consequently with same crops makes infertile the land. This may be the crops consume the same mineral and food.

Farm Income:
Farm income was positively and significantly affecting the productivity of maize production at10% significance level in line with hypothesis. This result is consistent with studies by [20]. As a result, there might be positive relationship between productivity and the amount of income that shows farming income is significantly and positively associated to maize productivity [20]. This is due to the fact that households having or got more farm income might be purchase more agricultural inputs to increase the productivity of maize production they cultivated.

Pests and Diseases:
The estimated coefficient for the occurrence of pests and diseases was negative as expected showing that land allocated for maize production is negatively determined by pests and diseases occurrence. According to [22] shows that about 91% of farmers correctly identified pest and diseases such as fall armyworm and others reported it as the most important maize

pest during 2016/2017 cropping season, it is negatively affecting the maize productivity nearly half of cultivated area. Farmers are lacking knowledge on the agronomic practices to control pests and disease.

Variability of Weather Condition:
The results of the study showed that the farmers‟ expectations of rainfall conditions significantly affect the productivity of the maize in the study area. The results of the study done [23] showed that the farmers‟ expectations of rainfall conditions significantly and negatively affect the productivity of the maize in the study area But, the result of this study, shows that Variability of weather condition positively and significantly affecting the productivity of maize production at 10% significance levels which is contradicted with the expected sign. Climate variability is accounted for the observed low productivity. On the contrary, there still is huge potential to increase the existing national average yield level of 3.2 t/ha to 8.0t/ha under well-managed farm conditions of better maize innovations, improved extension and marketing system.

Number of Oxen:
The number of oxen owned in the study area was positive and significant in determining maize productivity at 10% significant level. This implies that the use of oxen power in farm operations such as land preparation, planting and weeding was highly increases maize productivity and land under it. This result also suggests that, those farmers who owned more oxen have better chance to use improved maize technology than those who have owned small number of oxen. Therefore, farmers need to own at least one pair of oxen to prepare maize land.

Perception of Soil Fertility:
Households‟ perception of soil fertility negatively influenced maize productivity at 5 percent level of significance. This result confirms the hypothesis that maize productivity is negative/positive influenced by households‟ perception of soil fertility. The result of the research done [24] is similarly indicate that the productivity of maize has been declining due to many problems ranging from declining soil fertility to lack of basic inputs for their production Therefore, efforts that increase soil fertility and improved soil fertility management practices would lead to increased land productivity and hence maize productivity in the study areas.

Use of Fertilizer:
The amount of fertilizer used by households in increasing maize production positively and significantly affecting maize productivity at 1% significant level similar to hypothesis. The reason beyond the model result may be, timely availability of fertilizer related with availability of cash on hand. Most of the time farmers save some amount of cash for the purpose of buying inputs for the coming season. If the fertilizer is not available on time they are likely to spend the money on other things. Fertilizer plays a vital role in maize productivity since no matter how large and small the farm size is, if it is applied properly, yields will increase. Smallholder farmers tend to have difficulties in obtaining fertilizer as they lack financial means. This again opened the way for provision of credit service supply at low interest rate to make the farmers

more productive. Therefore, there is a positive relationship between fertilizer and maize productivity [20]. Moreover, fertilizer unavailability on time forces farmers to drop totally the use of improved maize.

CONCLUSION AND RECOMMENDATIONS

In this study factors affecting maize productivity were analyzed. The empirical findings show that maize productivity was affected by some variables such as Soil fertility, pest Diseases, Variability of weather condition, over cultivation, Extension Contact, Market access, Land allocated for maize, Farm Experience, Mode of sowing seed, Amount of fertilizer used, Farm Income, Labor cost, Number of Oxen, Seed Type, and educational level of household head. Among the factors that determine maize productivity, are land allocated for maize production, educational level of household head, Amount of fertilizer used, Labor cost, Mode of sowing seed, pest Diseases and Over cultivation, were the most important variables since they were significantly affecting the productivity of maize at 1% significance level. Total farmland size was a key variable influencing the land devoted for maize production. Extension programs that target farmers with larger farms are more likely to bring about the improvement in maize productivity. Likewise, policies that could increase farm size per household, by either strengthening the resettlement programs or absorbing the underutilized labor in these areas to off-farm opportunities, could be taken as an alternative to realize high maize productivity. Educational level of household heads positively and significantly affected maize productivity. This implies that households with more education level have better opportunity for source of information, and become more efficient in evaluating and interpreting information about the utilization agricultural inputs to increase maize productivity than households having less education level. Hence, the existing provision of formal education should be strengthened and expanded to rural areas of the Woreda. The Bureau of agriculture should strengthen learning opportunities of households through farmers training centers in rural areas of the Woreda. Furthermore, there should be households teaching centers that aimed to promote their educational levels in all issues related with increase maize productivity.

Extension contacts affected positively and significantly the productivity of maize production. This implies that extension visits help to reinforce the message and enhance the accuracy of the implementation of increase of productivity of maize production. In addition, the influence of extension agents can counter balance the negative effect of lack of years of formal education. Therefore, extension exposure should be expanded by providing frequent training for development agent about maize productivity. In addition, the extension coverage should be widened by establishing additional extension centers. The district should deploy adequate number of extension workers in order to solve the problem of covering households‟ home due to shortage of labor. Oxen power augments labor input and enhances its productivity by reducing the time and drudgery needed to accomplish farm operations. Thus, it is recommended that initiatives that improve oxen holding of farmers such as improved animal health service, feeding and management practices as well as improved farm implements have to be introduced to attain gains in maize production. Method of sowing was a significant variable that positively determining maize productivity. Most sample households in the study areas have less or no education background and training in farming. This has made majority to rely on their local farming practices (broadcasting method of sowing and the other traditional

practices) which does not generate more output compared to the modern technologies (use of row planting, improved seeds, fertilizers and other modern practices). Even though large percent of sample households in the study area followed traditional broadcasting method of sowing, increasing the extent of use of row planting would significantly increase maize production and productivity. Households‟ perception of pests and diseases occurrence was negative and significant variable as revealed in the result of this study. This shows that land allocated for maize is negatively determined by pests and diseases occurrence. Thus, it is recommended that households should apply prevention methods such as adjusting cropping (crop rotation) and management practices which helps to ensure the required soil fertility and controls weeds, insects and plant diseases. Furthermore, as its sole responsibility, the government should develop the program me that identify and develop early and medium maturing varieties that have good grain quality and are resistant/tolerant to the major pests and diseases of maize for the study areas.

Households‟ perception of soil fertility was a significant determinant of maize productivity. This indicates that perceiving good soil fertility has a positive contribution to the maize productivity. Therefore, soil fertility improvement programs such as introducing appropriate and improved soil fertility management practices and application of organic and/or inorganic fertilizers would be of crucial importance in increasing the productivity of smallholder maize producers in the study areas.

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