

## Research Article

# Production analysis of corn farming (*Zea mays* L) in the Bumi Beringin Village, North Luwuk District, Banggai Regency

## *Analisis produksi usahatani jagung (Zea mays L) di Desa Bumi Beringin Kecamatan Luwuk Utara, Kabupaten Banggai*

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**Abstract:** Corn is a food commodity that is widely cultivated in Bumi Beringin Village. To get high corn production, it is necessary to utilize optimal production factors. This study aims to determine the effect of land area, the number of seeds, amount of fertilizer, and number of workers on maize production (*Zea mays* L), and the correlation between maize farming in Bumi Beringin Village, North Luwuk District. This research was carried out from March to May 2021. The respondents' determination was carried out using a saturated sampling method or census where 22 farmers did corn farming. The analysis used is the Cobb-Douglas production function with variables of land area (X1), the number of seeds (X2), amount of fertilizer (X3), and number of workers (X4), and corn production (Y). The analysis results obtained multiple correlation coefficient values of 0.99%, indicating that corn production with production factors (land area, seeds, fertilizers and workers) has a very strong relationship with a relationship level of 99%.

**Keywords:** Farming, corn, production

**Abstrak:** Jagung merupakan komoditi pangan yang dibudidayakan di Desa Bumi Beringin. Untuk mendapatkan produksi jagung yang tinggi, perlu memanfaatkan faktor-faktor produksi yang optimal. Penelitian ini bertujuan untuk mengetahui pengaruh luas lahan, jumlah bibit, jumlah pupuk, dan tenaga kerja, terhadap produksi usahatani jagung (*Zea mays* L), dan tingkat hubungan korelasi usahatani jagung di Desa Bumi Beringin Kecamatan Luwuk Utara. Penelitian ini dilaksanakan pada bulan Maret sampai dengan bulan Mei 2021. Penentuan responden dilakukan dengan metode sampling jenuh atau sensus dimana terdapat 22 orang petani yang melakukan usahatani jagung. Analisis yang digunakan adalah fungsi produksi Cobb-Douglas dengan variabel luas lahan (X1), jumlah bibit (X2), jumlah pupuk (X3), dan tenaga kerja (X4), serta produksi jagung (Y). Hasil analisis diperoleh nilai koefisien korelasi berganda sebesar 0.99% menunjukkan bahwa produksi jagung dengan faktor produksi (luas lahan, bibit, pupuk dan tenaga kerja) mempunyai hubungan yang sangat kuat dengan tingkat hubungan sebesar 99%.

**Kata kunci:** Usahatani, jagung, produksi

## INTRODUCTION

The role of the agricultural sector in Indonesia's development can be seen from the farm sector's contribution to the national economy (Widyawati, 2017; Siregar & Nugraha, 2017). The agricultural sector consists of the horticultural, forestry, plantation and livestock food crop sub-sectors (Tumangkeng, 2018). Among the four sub-sectors that have an important role, the food crops sub-sector is one of the sub-sectors in providing the main food ingredients for the

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community to support survival. Food crop agriculture consists of two major groups, namely rice and secondary crops; the development of secondary crops are also directed at strengthening food security and eradicating poverty, and one of the secondary crops cultivated by farmers in Indonesia is maize ([Khaerizal, 2008](#)).

Corn is the second food commodity after rice and a source of calories or food substitute for rice and animal feed ([Suhendra, 2020](#)). The need for corn will continue to increase from year to year in line with the increase in people's economic living standards and the progress of the animal feed industry ([Maryam et al. 2017](#); [Ginting & Sihombing, 2018](#)) so that efforts are needed to increase corn production ([Swastika et al. 2011](#)).

Increasing corn production is by optimizing production inputs, including land use, the number of seeds, fertilizers, and workers ([Paidil et al. 2018](#)). Factors that affect corn production are land area ([Erviyana, 2014](#)), number of workers, number of seeds, and fertilizer ([Budiono et al. 2012](#)). To reveal the factors of production, it is necessary to study the technical relationship between the inputs used and the outputs produced. This study examines the effect of land area, the number of seeds, amount of fertilizer and number of workers and their correlation to production in Bumi Beringin Village, North Luwuk District.

## MATERIALS AND METHODS

The research was conducted in Bumi Beringin Village, North Luwuk District, Banggai Regency, from March to May 2021. The respondent's determination in this study used the census method on corn which has a land area of 0.5 to 1 hectare, with a minimum of 5 years of farming experience. The number of respondents according to the above criteria is 22 farmers. Data collected from observations, interviews, and questionnaires include corn production (kg), number of seeds (kg), amount of fertilizer (kg) and number of workers.

The data obtained were analyzed using Cobb-Douglas production function analysis; namely, the input variables include land area (X1), number of seeds (X2), amount of fertilizer (X3) and number of workers (X4) on the output variable, namely corn production (Y), with the equation is converted into a linear form which is logarithmic referring to [Soekartawi \(2005\)](#):

$$\text{Ln}Y = \text{Ln} b_0 + b_1 \text{Ln}X_1 + b_2 \text{Ln}X_2 + b_3 \text{Ln}X_3 + b_4 \text{Ln}X_4 + e$$

Information :

bo = Intercept

bi = regression coefficient of the *i* variable estimator

Y = Corn production produced (kg)

X1 = Land area (ha)

X2 = Number of seeds (kg)

X3 = Amount of fertilizer (kg)

X4 = Number of workers

e = Error or nuisance

The proof of the analysis is done using a partial t-test to show how far the influence of one input variable individually explains the variation of the output variable. To determine the magnitude of the relationship between input variables and output variables and how close the correlation coefficient is, the correlation coefficient (R) and determination coefficient (R<sup>2</sup>) tests are carried out using SPSS 16 software.

## RESULTS AND DISCUSSION

### Factors of production

Land area is one of the determinants of high and low maize production (Habib, 2013). Total farmers who became respondents were 22 people, where the number of respondents who had a land area of 0.5 ha was 7 people or (32%) and a land area of 1.0 ha were 15 people or (68%). The number of seeds is one of the determining factors for the success of corn farming (Hoar & Fallo, 2017). The average number of corn seeds used by farmers for a land area of 0.5 ha is 6.71 kg, and for a land area of 1.0 ha as much as 14.46 kg. According to Khotimah (2016) that the need for corn seeds per hectare reaches 20-40 kg/ha. This shows that farmers' average number of seeds is still less than the general need for seeds.

The use of fertilizer has a significant effect on corn production (Antara, 2010). The average fertilizer requirement used by corn farmers for a land area of 0.5 ha is 73.57 kg, and for a land area of 1.0 ha as much as 150 kg. The use of fertilizer at the farm level is still relatively low, and this affects corn production. Based on the survey results at the research site, the average corn production for 0.5 ha is around 1.43 tons/ha, and for 1 ha, the land area is about 3.66 tons/ha. The use of fertilizers is relatively low at the farmer level due to limited costs, so farmers generally only use subsidized fertilizers in limited quantities.

The number of workers dramatically affects the amount of corn production (Wahyuningsi et al. 2018). The number of workers used for a land area of 0.5 ha ranges from 10-12 people, and for a land area of 1 ha, it goes from 18-22 people. According to Tomy (2013) that the average number of workers needed per hectare is 60 people. This indicates that the average number of workers used in corn farming in the research location has not been maximized

### Cobb-Douglas production function analysis

The multiple linear regression analysis (Table 1) shows that the variable number of seeds and fertilizers significantly influences corn production, while land area and number of workers have no effect. The equation model for estimating the Cobb-Douglas production function is as follows:

$$\text{Ln}Y = 3.327 - 0.012 \text{ Ln } X_1 + 0.529 \text{ Ln } X_2 + 0.690 \text{ Ln } X_3 - 0.018 \text{ Ln } X_4 + e.$$

**Table 1.** Results of multiple linear analysis of factors that affect corn production:

Model	Coefficients <sup>a</sup>				
	Unstandardized		Standardized		
	B	Std. Error	Beta	T	Sig
1 (Constant)	3.327	1.583		2.102	.051
Land area (X <sub>1</sub> )	-.012	.277	-.009	-.042	.967
Number of seeds (X <sub>2</sub> )	.529	.134	.465	3.949	.001
Amount of fertilizer (X <sub>3</sub> )	.690	.361	.558	1.910	.073
Number of workers (X <sub>4</sub> )	-.018	.050	-.013	-.368	.718

a. Dependent variable : Production (Y)

Based on the equation of the production function, it can be said that the constant value of 3.327 means that if the variables of land area (X<sub>1</sub>), number of seeds (X<sub>2</sub>), amount of fertilizer (X<sub>3</sub>), and number of workers (X<sub>4</sub>), the value is 0, then corn production will increase by 3,327 units. Two variables have a positive direction, namely the variable coefficient of the number of seeds and the amount of fertilizer, while the coefficient of the variable that has a negative trend

is two, namely the variable area of land and number of workers. The land area has increased by 1%, while the number of seeds, fertilizers and work is considered constant, it will cause a decrease in corn production by 0.012%. This is probably due to the soil conditions at the research site being unsuitable for maize. [Faddwiwati and Tahir \(2013\)](#) said that land area is a determinant of production factors. The addition of land area is not always positively proportional to corn production if the land conditions are not fertile. The soil fertility level is also a determining factor for maize production ([Larosa et al. 2014](#)). The addition of the number of seeds by 1%, while the land area, the amount of fertilizer and number of workers are considered constant, will experience an increase in corn production by 0.529%. [Setiawan and Prajanti \(2011\)](#) explained that using seeds is the production factor that has the most significant influence in determining the amount of production in the business.

The addition of the use of the amount of fertilizer by 1%, while the land area, number of seeds and number of workers are considered constant, the corn production will increase by 0.690%. [Purwanto et al. \(2015\)](#) explain that fertilizer is a very influential production factor in determining the amount of output in the business. The addition of the number of workers by 1% while the area of land, the number of seeds and the amount of fertilizer are considered constant, will cause a decrease in corn production by 0.018%. This is also in line with the research results by [Kilo et al. \(2018\)](#) that the number of workers harms corn production. This is due to workers who still do not understand good corn cultivation techniques to get maximum results. [Rahim and Retno \(2007\)](#) said that businesses with small-scale land sizes are usually called small businesses and typically use family workers and have expert workers.

### Partial Test (t-Test)

Based on the results of the partial Test ([Table 1](#)), it shows that the variable land area ( $X_1$ ) is -0.042 smaller than the t table, which has a value ( $\alpha 0.01 = 2.56693$  and  $0.05 = 1.73961$ ), meaning that statistically, the variable area land ( $X_1$ ) does not affect the level of production (Y). This means that the variable area of land partially does not affect the level of corn production.

The variable number of seeds ( $X_2$ ) is 3.949, which means it is greater than the t table, which has a value ( $\alpha 0.01 = 2.56693$  and  $0.05 = 1.73961$ ), which means that it has a statistically significant effect on the level of corn production (Y). This means that the seed variable is partially very influential. The variable amount of fertilizer ( $X_3$ ) is 1.910, which means it is greater than the t table, which has a value ( $\alpha 0.01 = 2.56693$  and  $0.05 = 1.73961$ ), which means that it has a statistically significant effect on the level of corn production (Y). This means that the fertilizer variable is partially very influential on the level of corn production. The labor variable ( $X_4$ ) is -0.368 smaller than t table which has a value ( $\alpha 0.01 = 2.56693$  and  $0.05 = 1.73961$ ) meaning that it statistically has no effect on the level of corn production (Y). This means that the number of workers variable partially does not affect the level of corn production.

### Correlation Coefficient (R) and Determination Coefficient (R<sup>2</sup>)

To find out the magnitude of the relationship between variables X and Y variables and to find out how the average level of a correlation coefficient has been used, the guidelines in [Table 2](#) are below:

**Table 2.** Correlation Coefficient (R) and Determination Coefficient (R<sup>2</sup>) test results

Model	R	R Square	Adjusted R Square	Std. Error Of The Estimate
1	.999 <sup>a</sup>	.999	.999	.01600

- a. Predictors : (Constant), Number of workers ( $X_4$ ), Land area ( $X_1$ ), Number of seeds ( $X_2$ ), Number of fertilizers ( $X_3$ )

The results of the analysis of the production function have a correlation coefficient (R) and a coefficient of determination ( $R^2$ ) of 0.999, which means 99.9%, corn production in Bumi Beringin Village is influenced by the variables of land area ( $X_1$ ), the number of seeds ( $X_2$ ), amount of fertilizer ( $X_3$ ), and number of workers ( $X_4$ ). In comparison, the remaining 1% is influenced by other variables not included in this study, such as pesticides (Korlina *et al.* 2015) and climate (Herlina & Prasetyorini, 2020).

## CONCLUSIONS

Factors that significantly influence corn production are seeds and fertilizers, while land area and labour have no effect. The variables of land area ( $X_1$ ), number of seeds ( $X_2$ ), amount of fertilizer ( $X_3$ ), and number of workers ( $X_4$ ) have a significant value of 0.000, less than the value ( $\alpha = 0.01 = 2.56693$  and  $= 0.05 = 1.73961$ ) which means that it has a significant and positive effect on maize production in Bumi Beringin Village, North Luwuk District. The production factors of land area ( $X_1$ ), number of seeds ( $X_2$ ), amount of fertilizer ( $X_3$ ), and number of workers ( $X_4$ ) has a solid relationship to production with a relationship level of 99%.

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