Factors Affecting Cassava Productivity in Wonogiri Regency

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ABSTRACT

Wonogiri Regency is the main cassava production center in Central Java Province. The obstacle of Wonogiri Regency as a central district is the low productivity of cassava. The low productivity of cassava is caused by several factors. This study aims to determine the influence of fertilization frequency factors, type of fertilizer, type of variety, type of soil, amount of fertilizer, amount of urea and planting distance on cassava productivity in Wonogiri Regency. Data for this quantitative research were obtained by interviewing research samples. The data analysis method used in this study is Multiple Linear Regression. The results showed that the type of fertilizer, the amount of urea and the planting distance had a real effect on the productivity of cassava, while the factors of fertilization frequency, variety type, soil type, and amount of fertilizer had no effect on cassava productivity in Wonogiri Regency. Based on the results of the research, more efforts are needed in cassava cultivation techniques so that they can produce high productivity.

KEYWORDS

Factors influencing productivity; Productivity; Cassava

1. INTRODUCTION

Cassava is one of the food crop commodities that generates the country's foreign exchange through exports in the form of gaplek or chips which is a valuable asset and needs to be preserved, so that it can be used for export development in the future. The prospects for cassava plants in the future in Indonesia are very good because cassava plants are food ingredients for future potential in the order of agribusiness and agro-industrial development (Saputri, 2021)

Central Java Province is the second largest contributor to cassava production in Indonesia with a total production of 2,863,289 tons (BKP Ministry of Agriculture of the Republic of Indonesia, 2022). Wonogiri Regency is the main center of cassava production in Central Java Province which has a total cassava production of 1,106.16 tons in 2022. The obstacle of Wonogiri Regency as a cassava center district is that productivity is still low. Wonogiri Regency is only able to achieve productivity of 288.49 kw/ha with a harvest area of 38.34 hectares. This productivity is still low when compared to the ideal productivity of cassava, which is 20 tons/ha.

The low productivity of cassava is certainly caused by several factors. Factors that affect productivity are land area, seeds, fertilizers and labor (Purnomo & Kusuma, 2022). Considering that Wonogiri Regency is a cassava center in Central Java, this problem must be solved immediately because the declining productivity will affect the position of Wonogiri Regency as a cassava center. Based on this description, researchers need to know what factors cause the decline in cassava production in Wonogiri Regency.

Research on the factors that affecting productivity is often done, such as research conducted Muslimah & Sugandha, (2021) which researches the Analysis of the Influence of Harvest Area and Cassava Productivity in Kebumen Regency Using Multiple Linear Regression. The study only examined the influence of the variable of harvest area on productivity but did not use the variable of soil type as will be done in this study

2. METHODOLOGY

2.1 Location and Time of Research

The determination of the research area was carried out deliberately or *purposively* with the consideration that Wonogiri Regency is the main center of cassava in Central Java Province which has experienced a decrease in productivity. Wonogiri Regency has 25 sub-districts, of which 3 are Pracimantoro, Giritontro, and Giriwoyo Districts which are cassava production centers with declining productivity. The research was conducted in January – June 2024.

2.2 Population and Sample

Population is a generalization area consisting of objects/subjects that have certain quantities and characteristics that are determined by the researcher to be studied and then drawn conclusions (Fauzy, 2019). The population in this study is cassava farmers in Wonogiri Regency. The total pupulation in this study was 182,754 cassava farmers in Wonogiri Regency. The determination of the number of samples in this study used the slovin formula obtained from the results of 100 farmers. The number of samples for each sub-district was taken using a simple proportional random sampling technique with the number of samples, namely Pracimantoro District 48 farmers, Giritontro 21 farmers and Giriwoyo 31 farmer

2.3 Types and Sources of Data

The data used in this study are primary and secondary data. The primary data in this study is sourced from the results of interviews with farmers using questionnaires. The data is in the form of data on farmer characteristics, cassava production, land area, and other data needed in the research. Secondary data in this study were obtained from the Central Statistics Agency of Central Java Province, the Agriculture and Plantation Office of Wonogiri Regency, the Central Statistics Agency of Wonogiri Regency, BPP of Pracimantoro, Giriwoyo, Giritontro Districts in the form of data on harvest area, production, productivity, geographic data and demographics of the research location.

2.4 Data Collection Techniques

The data collection method carried out by the researcher is by using several methods, namely interviews with resource persons, discussions, documentation and recalls. Interviews were conducted directly with farmers using a list of questions through questionnaires. The recall was carried out by recording data on cassava farming in the past. The time range used in this study is one year back.

2.5 Data Analysis Methods

The data analysis used to determine the productivity level of cassava farming is to calculate the productivity value using the following formula:

$$\text{Productivity} = \frac{\text{Jumlah Produksi (ton)}}{\text{Luas Lahan (ha)}}$$

The data analysis used to determine the factors that affect cassava productivity in Wonogiri Regency is a multiple linear regression analysis which is formulated as follows:

$$Y = a + b_1X_1 + D_1X_2 + D_2X_3 + D_3X_4 + b_1X_5 + b_1X_6 + b_1X_7 + \varepsilon$$

Information:
Y = Cassava productivity (tons/ha)
X1 = Fertilization Frequency (times)
D1X2 = Jenis Pupuk (organik + anorganik = 0 ; pupuk anorganik + anorganik = 1)
D2X3 = Type of Seeds (gatotkaca = 1 ; mentho = 2 ; kirik = 3)
D3X4 = Soil Type (grumusol = 1 ; latosol = 0)
X5 = Number of Fertilizer (tons)
X6 = Amount of Urea (kg)
X7 = Planting Distance (m)
B1 = Regression Coefficient
ε = *Disturbance term (error term)*

To meet the criteria for good regression results, the model must be free from classical assumption tests. Normality, multicollinearity and heteroscedasticity tests were performed on the regression model.

3. RESULTS AND DISCUSSION

3.1 Cassava Productivity in Wonogiri Regency

The calculation of cassava productivity of respondent farmers in Wonogiri Regency can be seen in table 1.

Table 1. Cassava Productivity

	Production (tons)	Land Area (Ha)	Productivity (tons/ha)
Total	57,25	67,99	23
Average	0,86	1,03	0,34

Based on table 1, the average cassava production is 0.86 tons with an average land area of 1.03 ha, so the average productivity produced is 0.34 tons per hectare. The productivity is still very low and far from good. The ideal productivity per hectare of cassava according to the Wonogiri Agriculture Office ranges from 20 to 30 tons and can even be higher with the application of advanced agricultural technology. Productivity that is far from ideal productivity indicates that there is a fundamental problem in the cassava cultivation system.

3.2 Factor Affecting Cassava Productivity in Wonogiri Regency

Productivity is influenced by a combination of many factors, namely the quality of seeds, fertilizers, the type of technology used, the availability of capital, the quality of infrastructure and the level of education and knowledge. In addition to these factors, management practices (fertilization, pesticide application and so on) also greatly affect productivity (Putra & Esa Diya Wahyuni, 2024). This study uses the frequency of fertilization, type of fertilizer, type of variety, type of soil, amount of fertilizer, amount of urea and planting distance which is suspected to affect cassava productivity in Wonogiri Regency. Based on table 2, it can be seen that the regression function equation is as follows.

$$Y= -0,042 - 0,008X1 - 0,143X2 - 0,036X3 - 0,040X4 + 0,020X5 + 0,001X6 + 0,762X7$$

Table 2. Results of Multiple Linear Regression Analysis of Fertilization Frequency, Fertilizer Type, Variety Type, Soil Type, Number of Fertilizer, Amount of Urea and Planting Distance

	Coefficients	Standart Error	t-Start	Mr
Intercept	-0.042	0.109	-0.385	0.702
Fertilization Frequency	-0.008	0.028	-0.297	0.768
Types of Fertilizers	**-0.143**	**0.050**	**-2.854**	**0.006**
Varieties	-0.036	0.024	-1.550	0.127
Soil Type	-0.040	0.033	-1.205	0.233
Amount of Fertilizer	0.020	0.022	0.917	0.363
Amount of Urea	**0.001**	**0.000**	**2.627**	**0.011**
Planting Distance	**0.762**	**0.091**	**8.372**	**<,001**
R Square				0.788
Adjusted R Square				0.762
F Statistic (Sig)				<,001
F count				30.790

Based on the results of data processing through SPSS, the determination coefficient in table 2 produced a magnitude of R Square value of 0.788, this means that the variables of fertilization frequency, type of fertilizer, type of variety, type of soil, amount of fertilizer,

amount of urea, and planting distance affect the variable of cassava productivity by 78.8%. The remaining 21.2% was influenced by other variables that were not explained or discussed in this study. Based on the table above, it is known that the F value is calculated at 30.79 with a probability of F (0.001) less than 0.05, meaning that H0 is rejected and H1 is accepted. This shows that the independent variables of fertilization frequency, type of fertilizer, type of variety, type of soil, amount of fertilizer, amount of urea, and planting distance simultaneously or together have a very real effect on the bound variable, namely cassava productivity.

Based on the results of the t-test in table 2, it shows that the variable of fertilizer type (X2) based on the table obtained a t-value of 2.854 > t-table 2.001 and sig. 0.006 < 0.05 at a 95% confidence level thus H0 is rejected and H1 is accepted. This means that partially the type of fertilizer has a significant negative effect on cassava productivity. The elasticity value in this study was -0.143%. This shows that every increase in the use of fertilizer type variables by 1% will decrease productivity by 0.143% assuming that other variables are considered constant. The type of fertilizer is a dummy variable, then, the use of different types of fertilizers (organic + inorganic fertilizer = 0, and inorganic + inorganic = 1) by using the equation Y = -0.042 - 0.143X2, then if the composition of organic and inorganic fertilizers is used, the productivity will decrease by 0.042% while if the composition of inorganic and inorganic fertilizers is used, the productivity of cassava will decrease by 0.185%. Organic fertilizers are generally done as basic fertilizers. This fertilizer will provide nutrients when new plants are planted, in addition to manure improving the chemical and physical properties of the soil so that it will increase the life expectancy of plants and later will increase plant production (Prasetyo, 2020).

The amount of urea (X6) based on the table in the amount of fertilizer obtained a calculated t value of 2,627 > t table 2,001 and sig. 0.011 < 0.05 at a 95% confidence level thus H0 is rejected and H1 is accepted. This means that partially the amount of urea has a real effect on cassava productivity. The value of the regression coefficient in this study was 0.001%. This shows that every additional use of variable urea amount of 1% will increase cassava productivity by 0.001%. This is in accordance with research (Novitaningrum et al., 2022) where urea fertilizer has a real effect on cassava production in Karanganyar Regency.

The planting distance (X7) based on the table at the planting distance obtained a calculated t value of 8.372 > t table 2.001 and sig. 0.001 < 0.05 at a 95% confidence level thus H0 is rejected and H1 is accepted. This means that partially planting distance has a real effect on cassava productivity. The elasticity value in this study was 0.762%. This shows that every additional use of the planting distance variable of 1% will increase cassava productivity by 0.762%. These results are in line with research Darmawan et al., (2024) Where the treatment of spacing had a real effect on the observation of plant height and weight of taro tubers.

The variables of fertilization frequency (X1), variety type (X3), soil type (X4), and fertilizer amount (X5) have a significance of > from 0.05 at a confidence level of 95%, thus meaning that the variables of fertilization frequency, variety type, soil type and amount of fertilizer have no significant effect on cassava productivity in Wonogiri Regency. The results of this t-test analysis mean that the hypothesis decision obtained is that H1 is accepted and H0 is rejected, namely variable factors such as fertilizer type, amount of urea and planting distance affect cassava productivity in Wonogiri Regency.

The results of the classical assumption test were obtained that the data was normally distributed. The multicollinearity test using the VIF value showed a value below 10,

meaning that there was no multicollinearity in the model. Looking at the dots on the scatterplot graph shows that there is no heteroscedasticity in the data

4. CONCLUSION

Based on the results of the study, it can be concluded that the average productivity of cassava in Wonogiri Regency is 0.34 tons/ha where this value is still low. Factors such as fertilizer type, amount of urea and planting distance had a significant effect on cassava productivity in Wonogiri Regency, while factors such as fertilization frequency, variety type, soil type, and amount of fertilizer had no significant effect on cassava productivity. Improvement of the planting system is needed so that cassava production can be maximized so that cassava productivity also increases.

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