

Production Efficiency of Potato Farming in Wonosobo District

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Abstract

Wonosobo Regency is one of the centers of potato production in Central Java, with an altitude of 275 – 1,378 meters above sea level, making Wonosobo Regency suitable for growing potato vegetables. But in reality, potato production tends to fluctuate and this is not followed by maximum production. The aims of this study were to (1) analyze the effect of production factors on potato farming production in Wonosobo Regency; (2) analyzing the level of achievement of technical efficiency, price efficiency, and economic efficiency in potato farming production in Wonosobo Regency. The sampling method in this study used purposive sampling. 70 respondents were found in three villages in Kejajar District. The analytical method used is the Cobb-Douglas function with a stochastic frontier approach using the Frontier application version 4.1c. The results showed that (1) the production factors of land area, seeds, chemical fertilizers, and pesticides had a positive effect, and the production factors of organic fertilizers and labor had a negative effect on potato farming. (2) The value of technical efficiency, price efficiency and economic efficiency are 0.945, 1.76 and 1.66, respectively. These results indicate that the use of production factors in potato farming has not been technically, price and economic efficiency. Farmers are expected to be able to combine production factors in potato farming.

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INTRODUCTION

Indonesia has one of the mainstay sectors, namely the agricultural sector. Most of the Indonesian people work as farmers, so Indonesia is often called an agrarian country.

The agricultural sector is divided into several sub-sectors, namely food crops, horticultural crops, plantation crops, livestock, as well as agricultural and hunting services. Of the various existing agricultural sub-sectors, the horticulture sub-sector has an important role in the economy and life of the Indonesian people. Besides being easy to cultivate, horticultural crops also have high nutritional value and are suitable for a tropical climate like Indonesia.

Central Java Province is one of the provinces that has agricultural potential, especially the horticulture sub-sector. It can be seen in Table 1 below that the province of Central Java has the production of superior vegetables.

Table 1. Superior Vegetable of Central Java Province in 2017 – 2019 (Tons)

Year	Onion Red	Potato	Cabbage	Large Chilli	Carrot	Cayenne Pepper
2017	476.337	269.476	304.187	195.571	144.619	148.139
2018	445.586	290.655	303.690	171.796	153.057	141.771
2019	481.890	294.015	274.478	164.906	160.278	148.750

Source: Badan Pusat Statistik Provinsi Jawa Tengah, 2020

Table 1 shows the data on vegetable production for 3 years in Central Java Province. In table 1, it can be seen that the potato commodity was in the third position after red onion and cabbage from 2017 to 2018. However, in 2019, the production of potato commodities experienced an increase to become the second rank after red onion. The commodity of potato in Central Java has a production movement which is relatively stable compared to other commodities such as red onion or cabbage.

In Central Java Province, potato commodities have produced results which tend to be stable even increasing. It can be proven in table 2 below that from 2018 to 2020 ton the potato production in Central Java continued to increase. Central Java Province occupies the second position with an average production of 297,446.7 tons.

Table 2. Potato Vegetable Crop Production (Tons) by Province in Java

Year	Provinces		
	Central Java	West Java	East Java
2018	290.655	265.536	312.967
2019	294.015	245.418	320.209
2020	307.670	196.856	354.196
Average	297.446,7	235.936,7	329.124

Source : Badan Pusat Statistik, 2021

One of the potato production areas in Central Java Province is Wonosobo Regency. The potato commodity is the leading commodity in the Wonosobo Regency area. It can be seen in table 3 below the production results and potato harvest area in Wonosobo Regency from 2018 to 2020. From table 3, it is known that the harvested area and potato production results in Wonosobo Regency tend to fluctuate. In 2019, it increased then in 2020, it experienced a decrease in production to 533,722 tons and harvested area to 3,461 hectares.

Table 3. Harvest Area and Potato Production in Wonosobo Regency, 2018 – 2020

Harvest Area (Ha)			Production (Ton)		
2018	2019	2020	2018	2019	2020
3.511	3.523	3.461	542.649	543.58	533.722

Source : Badan Pusat Statistik Provinsi Jawa Tengah, 2021

One of the potato-producing sub-districts in Wonosobo has been consistently in the last few years as shown in table 4 is Kejajar District. In addition, it has the highest production output compared to other sub-districts making Kejajar District as the center for producing potato commodities. Potato cultivation is in the highlands only, so that potatoes only grow in a few sub-districts in the Wonosobo Regency area. Tengah It can be seen in Table 4 below that potato production in several sub-districts in Wonosobo Regency tends to be unstable. Thus, this needs to be considered because if potato production in Wonosobo Regency decreases, then it is quite affecting the contribution to potato production in Central Java Province.

Table 4. Harvested Area and Potato Vegetable Production by District in Wonosobo Regency 2017 – 2019

Sectoral District	Harvested Area (Ha) and Production (Tons) of Potato Vegetables By District in Wonosobo Regency					
	Production (Ton)			Harvested Area (Ha)		
	2019	2018	2017	2019	2018	2017
	Year	Year	Year	Year	Year	Year
Kepil	1.031	0	451	9	0	6
Sapuran	661	0	0	5	0	0
Kalikajar	19.683	23.922	17.681	131	166	118
Mojotengah	905	0	0	6	0	0
Garung	74.240	72.629	77.034	464	455	485
Kejajar	447.060	446.098	462.340	2.908	2.890	2.858
Total	542.549	542.649	557.506	3.523	3.511	3.467

Source : Badan Pusat Statistik Kabupaten Wonosobo, 2020

According to Badan Pusat Statistik Kabupaten Wonosobo (2020), with an altitude of 275 to 1,378 masl makes Wonosobo Regency suitable for planting potatoes. This is due to potatoes will grow optimally in areas with an altitude of 800 – 1,500 meters above sea level (masl) and has a temperature of 15 – 22 degrees Celsius. In addition, potato plants can grow well by getting sufficient sunlight and air humidity between 80-90% (Tim Mitra Agro Sejati, 2017).

Table 5. Average Price of Potatoes (Rupiah) 2016-2019

Year	Average Price of Potatoes (Rupiah) 2016-2019
2016	8.991
2017	10.875
2018	7.750
2019	9.083

Source : Dinas Pangan Pertanian dan Perikanan Kabupaten Wonosobo, 2020

Table 5 shows the average selling price of potato crops from farmers has fluctuated. In 2017, the average price of potatoes in Wonosobo Regency experienced an increase to reach the price of Rp 10,875.00. Later in 2018, it dropped to the price of Rp7,750.00, then there was an increase in the following year to Rp9,083.00. The selling price of these potatoes tends to fluctuate. One of the reasons according to field interviews with one of the key persons, namely the Chairman of the Farmer Group Association (Gapoktan) Patakbanteng Village, Kejajar District, Wonosobo Regency is the weather uncertain, when the weather is not supporting, such as during the rainy season, potato plants are susceptible to disease, so the number of farmers who grow potatoes is not a lot.

In the research conducted by Leslie Pratiwi and Hardyastuti (2018), entitled "Analysis of the Factors Affecting Potato Farming Income on Marginal Land in Kejajar District, Wonosobo Regency" that after 1980 to 2010 potato commodity became the livelihood of farmers since in general, the farmers in Kejajar Sub-district cultivate potato plants every growing season in one year. This causes the basis of land degradation.

In addition, the use of chemicals in the long term, such as chemical fertilizers and pesticides, can also cause decreased soil fertility. Decreased soil fertility will affect potato production produced by the farmers.

However now, after the farmers are aware and know that the cause of marginal land is land degradation because potatoes are constantly being planted, many farmers rotate cropping every planting season with crops

other than potatoes such as cabbage, celery, carrots, and other vegetable crops (Leslie Pratiwi & Hardyastuti, 2018).

In addition to soil conditions that can cause a decrease in product quality, the use of seeds with too long generations can also cause the quality of production to decline. According to the statement of Tim Mitra Agro Sejati (2017), in addition to buying potato seeds from domestic nurseries, the farmers also use potato seeds from their own gardens. Domestic produced seeds can usually produce well until the second generation, after which their productivity will decrease drastically.

According to an interview with the key person, who is the Coordinator of Field Agricultural Extension (PPL) Kejajar District, that the use of chemical and organic fertilizers by potato farmers especially in Kejajar District, Wonosobo Regency in one planting season has been excessive or too much a lot. This is due to the farmers still use the customary or traditional system in doing potato farming. The Agricultural Extension Agency (BPP) Kejajar District, Wonosobo Regency itself has given recommendations in planting potatoes, that is, a maximum of only 2 times in one year, due to the rotation of planting with other types of vegetables.

In addition, based on the interviews with a potato farmer, who is the key person as head of the potato farmer group in Tambi Village, Kejajar District, Wonosobo Regency, that the degradation of soil quality has a bad impact on the decline in quality and quantity of potatoes. The decrease in soil quality is caused by planting potatoes without a break every year or 3 times in one year so that in the long term, the soil contains a lot of chemicals and causes the quality of the soil to decline.

According to Badan Pusat Statistik Kabupaten Wonosobo (2020), Wonosobo Regency has a suitable height for planting potatoes. In addition, Wonosobo Regency is one of the centers of potato production in Central Java. However, in reality, the production results still tend to fluctuate and this is not followed with maximum production results. The causes of less maximum and fluctuating production results are the use of production factors that are still habitual or traditional, in particular the use of fertilizers that do not adjust to the nutrient needs of the soil, the use of seeds with generations that have taken too long, and the number of human resources to be involved in potato farming in particular to become labor that is decreasing. This is due to the interest of young people today to become farmers is increasingly scarce. Therefore, there is a need for research on the production efficiency of potato farming in Wonosobo Regency.

METHOD

The type of this study was quantitative descriptive research, which is analyzing data in the form of numbers and then interpreting it in a form that is easier to understand. The data used were primary and secondary data. The collection of data is done by documentation, observation, interviews, and questionnaires.

Based on the purposive sampling method or certain considerations, Kejajar District was chosen as the research area because it is the center and the largest contributor to potato production in Wonosobo Regency every year and has the most potato farmers in Wonosobo Regency by 7,100 people. To get the research area, because the Kejajar District is wide, the purposive sampling method was used again to select 3 villages in the Kejajar sub-district to be the research area based on the number of largest, medium, and the fewest potato farmers, which then The villages of Tambi, Patakbanteng, and Igrimranak were obtained. The sampling based on Sekaran (2006), that in multivariate research (including multiple regression analysis), then the sample size is at least 10 times of the number of variables (independent and dependent) studied. Thus, this study using a sample of 70 potato farmers. The dependent variable (Y) in this study was potato production while the independent variables (X) used were land area, seeds, chemical fertilizers, organic fertilizers, pesticides, and labor. The analytical method used the Cobb-Douglas production function with a stochastic frontier approach to identify the factors that affect the production of potatoes and analyze the efficiency level of potato farming production.

Mathematically, the function of potato farming production by using a stochastic frontier approach in this study is as follows:

$$\ln Y = \ln a + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + u$$

Explanation:

- a = Intercept
- $\ln Y$ = Log natural of production generated (kg)
- $\ln X_1$ = Log natural of land area (hectare)

- $\ln X_2$ = Log natural of seeds (kg)
- $\ln X_3$ = Log natural of chemical fertilizer (kg)
- $\ln X_4$ = Log natural of organic fertilizer (kg)
- $\ln X_5$ = Log natural of pesticide (liter)
- $\ln X_6$ = Log natural of labor (HOK)
- $\beta_1 - \beta_6$ = Regression coefficient
- n = Total factors of production
- u = Bullying error

There are three efficiency tests, namely technical efficiency (ET), price or allocative efficiency (EH), and economic efficiency (EE) that occur when technical efficiency and price efficiency are achieved. This efficiency test is carried out to find out the combination of certain production factors or inputs to get the maximum result or output.

1. Technical Efficiency

Technical efficiency is a quantity that shows the ratio between actual production and maximum production. Technical efficiency can be calculated by the formula (Soekartawi, 2003) :

$$ET = Y_i / \bar{Y}_i$$

Explanation:

- ET = Technical efficiency level (production)
- Y_i = Production size (output) i-th
- $\bar{Y}_i$ = The estimated production size in the i-th observation obtained through the Cobb-Douglas frontier production function

The measurement of the technical efficiency level of potato farming in this study is the output result of Frontier software version 4.1c. The decision-making of technical efficiency is as follows:

- 1) $ET = 1$, if the average technical efficiency is equal to one, it means the farming carried out is technically efficient.
- 2) $ET \neq 1$, if the average technical efficiency is not equal to one, it means that the farming is not technically efficient.

2. Price Efficiency (Allocative Efficiency)

According to Shinta (2011), price efficiency is useful to measure the level of success of farmers in carrying out their farming, the goal is to be able to achieve maximum profit. Price efficiency can be achieved if the farmers can make the Value of Marginal Product (VMP) of each production factor equal to the input price (P_x). Mathematically according to Soekartawi (2002), can be written as follows:

$$\frac{b_i \cdot Y \cdot P_y}{X_i \cdot P_{xi}} = 1 \text{ or } \frac{NPM_x}{P_x} = 1$$

Explanation:

- P_x = Price of factors of production x
- X = Total factors of production X
- b_i = Production elasticity
- Y = Total output
- P_y = Output price

In its practice, the average values of y , P_y , X , and P_x are calculated, so that it can be written as below:

$$\frac{b_i \cdot \bar{y} \cdot \bar{P}_y}{\bar{X}_i \cdot \bar{P}_{xi}} = 1$$

After getting the result of the Value of Marginal Product (VMP) from each input or factor of production, then the next step is to calculate the average price efficiency as follows:

$$EH = \frac{NPM_1 + NPM_2 + NPM_3}{3}$$

According to Soekartawi (2003), in fact, NPM_x is not always the same as P_x , but what often happens is:

- a) $NPM_x / P_x > 1$, this means that the use of factor x is not yet efficient, to achieve efficiency, factor x needs to be added.
- b) $NPM_x / P_x < 1$, means that the use of factor x is inefficient, to achieve efficiency, factor x must be reduced.

3. Economic Efficiency

Economic efficiency is the result of multiplying all technical efficiencies with price efficiency (allocative) of all factors of production or inputs. The economic efficiency of potato farming can be written as follows (Soekartawi, 2003):

$$EE = ET \times EH$$

Explanation:

- EE = Economic Efficiency
- ET = Technical Efficiency
- EH = Price Efficiency

According to Soekartawi (2003), there are three possibilities regarding the concept of efficiency, namely:

- a) If the value of economic efficiency is greater than 1 (one). This means that maximum economic efficiency has not been achieved, so it is necessary to add the use of production factors in order to achieve efficient conditions.
- b) If the value of economic efficiency is less than 1 (one). This means that the efforts are carried out inefficiently, so it is necessary to reduce the use of production factors.
- c) If the value of economic efficiency is equal to 1 (one). This means that the efficient condition has been achieved and has gotten the maximum profit.

RESULTS AND DISCUSSIONS

In accordance with the statement of Soekartawi (2003), that the estimation results of the Cobb-Douglas function will produce regression coefficients that also show the amount of elasticity.

Table 6. The Estimation Results of Frontier Stochastic Production

Variables	Coefficient	t – ratio
Constant	4,522	6,616
LX ₁	0,094	1,228
LX ₂	0,564	5,926
LX ₃	0,182	3,533
LX ₄	-0,035	-0,736
LX ₅	0,181	4,230
LX ₆	-0,099	-1,200
Average Value of Technical Efficiency	0,945	
N	70	

Source: Processed primary data, 2021

Estimation Model : $\ln Y = \ln a + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + u$

Estimation Result : $\ln Pr = 4,522 + 0,094 \ln Ll + 0,564 \ln Bt + 0,182 \ln Pk - 0,035 \ln Po + 0,181 \ln P - 0,099 \ln Tk + u$

Based on table 6, it shows that the production factors of land area, seeds, chemicals fertilizers, and pesticides have a positive effect on the production of potatoes in Wonosobo Regency. Meanwhile, the production factors of organic fertilizer and labor have a negative effect on potato production in Wonosobo Regency.

The result of the calculation of technical efficiency which is processed with *Frontier Version 4.1c software* produces an average value of technical efficiency of potato farming of 0.945. With a figure of 0.945, it can be interpreted that the figure is less than 1. This indicates that the use of production factors in potato farming in Wonosobo Regency is not yet technically efficient. Thus, there is still a need for a reduction in the use of production factors of organic fertilizer and labor, as well as increasing the use of the land area, seeds, chemical fertilizers, and pesticides.

The recommendation for the use of organic fertilizers given by the Agricultural Extension Agency of Kejajar District, Wonosobo Regency in one growing season is 10 to 20 tons per hectare. This is not in accordance

with the calculation result of technical efficiency conducted by the researchers. Based on the calculation of technical efficiency, the recommendation given by the Agricultural Extension Agency of Kejajar District, Wonosobo Regency is not technically efficient, so the use of organic fertilizers should be reduced. Since its use, it has overstepped the limit, thus causing technically inefficient.

However, the use of chemical fertilizers needs to be adjusted to the recommendations given by the Agricultural Extension Agency of Kejajar District, Wonosobo Regency, namely 1,000 kg consisting of Urea as much as 300 kg, SP-36 300 kg, and NPK Phonska 400 kg. The recommendation for the use of chemical fertilizers is in accordance with the calculation result of technical efficiency that has been carried out by the researchers, that the additional use of chemical fertilizers is needed.

Based on the calculation, price efficiency in potato farming has a value of 1.76. The result means that the use of production factors in potato farming in Wonosobo Regency has not reached an efficient price since the result shows a number of more than 1. This happens because the farmers have not been capable of maximizing the use of production factors of land area, seeds, and pesticides, and reducing the use of chemical fertilizers, organic fertilizers, and labor.

The state of potato farming in Wonosobo Regency which has not reached the price efficiency is in accordance with the research conducted by Fadliyah & Hani (2019), entitled "The Analysis of Allocative and Economic Technique Efficiency of Watermelon Farming in Mojosari Village, Puger District, Jember Regency". In their research, it is shown that watermelon farming in the area of the study had not yet reached allocative or price efficiency because the average value of the marginal product (NPM) obtained is greater than 1. In addition, it is in line with the research of Adhiana (2020), entitled "The Analysis of Allocative Efficiency of Cassava Farming in Tanjung Morawa District, Deli Serdang Regency, North Sumatra Province" stated that in using the production factors of land area and seeds in cassava farming has not been efficient in price, while for the factor of fertilizer production is no longer efficient in price.

The result obtained from the calculation of economic efficiency in potato farming in Wonosobo Regency is 1.66 so that the value of price efficiency means greater than 1. This means that potato farming in Wonosobo Regency has not yet achieved maximum economic efficiency and it is necessary to increase the use of production factors in order to achieve economic efficiency. This condition occurs since the farmers have not been able to combine the production factors of land area, seeds, chemical fertilizers, organic fertilizers, pesticides, and labor at a fixed price of production factors so that the production of potatoes is not maximized.

The reason for not achieving economic efficiency in potato farming is due to the use of production factor of land area. In general, the land area used by the potato farmers is dominated by small farmers who have small capital, with a land area less than 0.25 to 0.5. Thus, the farmers find it difficult to rent or buy new land for potato farming. In the production factor, average seed in an area of 0.65 hectares of land, 708.21 kg of seeds used with improvised seeds from the previous planting generation which is too long. In general, there are more than the second generation and some farmers also buy new seeds if they feel lack, but in small quantities. Then, there is no recommendation regarding the amount of use of seeds from the relevant government, only adjusted with the capital owned by the farmers. In accordance with the statement of Tim Mitra Agro Sejati (2017), the use of seeds with generations that are too long, exceeding the second generation can also lead to decreased production quality. In addition, the use of labor by the farmers is too much in one planting period especially when the harvest arrives, the average is 281 HOK, with the average price of labor is Rp44,428.57 per HOK.

The use of production factors in potato farming in Wonosobo Regency which has not yet achieved economic efficiency is in accordance with the research conducted by Eliyatiningsih dan Mayasari (2019), entitled "Efficiency of the Use of Production Factors in Red Onion Farming in Wuluhan District, Jember Regency". This research proves that red onion farming in Wuluhan District is not yet economically efficient because it gets a calculation result of 1.49. Likewise, the research conducted by Sufyadi and Apidianur (2020), with the title "Efficiency of the Use of Production Factors in Oyster Mushroom (*Pleurotus Ostreatus* Jacq.) Farming". The result of this study shows that five production factors have a value of more than 1 which means that they are not efficient, namely land, seeds, polybags, lime and paralon rings, and seven other production factors are inefficient.

CONCLUSIONS

Based on the results of research regarding production efficiency and strategy for increasing potato farming in Wonosobo Regency can be concluded as follows: Production factors of land area, seeds, chemical fertilizers, and pesticides have a positive effect on potato production in Wonosobo Regency. Meanwhile, the production factors of organic fertilizer and labor have a negative effect on the production of potatoes in Wonosobo Regency.

The average value of technical efficiency in the use of production factors in potato farming in Wonosobo Regency is 0.945. The value of 0.945 means that the use of production factors in potato farming in Wonosobo Regency is not yet technically efficient because the value of the calculation result of technical efficiency is less than 1. Thus, to achieve technical efficiency, it is still necessary to reduce the use of factors production of organic fertilizers and labor. In addition, it is necessary to add factors production of land area, seeds, chemicals fertilizers, and pesticides. The recommendation for the use of organic fertilizers given by the Agricultural Extension Agency Kejajar District, Wonosobo Regency, is not in accordance with the result of technical efficiency calculations performed by the researchers so that the use of organic fertilizers should be reduced. This is because the use exceeds the limit, thus causing inefficient technically. On the other hand, the farmers need to follow the recommendation of the Agricultural Extension Agency for Kejajar District, Wonosobo Regency for the use of chemical fertilizers. This is because the recommendation for the use of chemical fertilizers is in accordance with the calculation result of technical efficiency that has been carried out by the researchers, that it is necessary to add the use of chemical fertilizers to increase production results.

The average value of efficiency price is 1.76 which means the acquisition of the value is not yet efficient in price because the result shows a number more than 1. To be able to carry out efficient potato production in terms of price, the potato farmers in Wonosobo Regency must maximize the production factors of the use of land are, seeds, and pesticides, and reduce the use of chemical fertilizers, organic fertilizers, and labor.

The value of economic efficiency based on the calculation gets a value of 1.66 which means it has not reached economic efficiency, because it is larger than 1. Thus, to achieve the value of economic efficiency of potato farmers in Wonosobo Regency, it is necessary to add the use of production factors.

REFERENCES

- Adhiana. (2020). Analisis Efisiensi Alokatif Usaha Tani Ubi Kayu di Kecamatan Tanjung Morawa Kabupaten Deli Serdang Provinsi Sumatera Utara. *Jurnal AGRIFO*, 5(2), 151–158.
- Badan Pusat Statistik. (2021). *Produksi Tanaman Sayuran kentang (Ton) Menurut Provinsi di Pulau Jawa 2016 - 2020*. Badan Pusat Statistik. <https://www.bps.go.id/subject/55/hortikultura.html#subjekViewTab5>
- Badan Pusat Statistik Kabupaten Wonosobo. (2020a). *Kabupaten Wonosobo Dalam Angka 2020*. BPS Wonosobo. <https://wonosobokab.bps.go.id/publication/2020/04/27/41af71106bf0d65990173f63/kabupaten-wonosobo-dalam-angka-2020.html>
- Badan Pusat Statistik Kabupaten Wonosobo. (2020b). *Luas Panen dan Produksi Sayuran Kentang Menurut Kecamatan di Kabupaten Wonosobo 2017 – 2019*. Badan Pusat Statistik Kabupaten Wonosobo. <https://wonosobokab.bps.go.id/subject/55/hortikultura.html#subjekViewTab5>
- Badan Pusat Statistik Provinsi Jawa Tengah. (2020). *Statistik Pertanian Hortikultura Provinsi Jawa Tengah 2017-2019*. CV. Surya Lestari. <https://jateng.bps.go.id/publication/2020/11/13/3a0ac5aa456ac9a9eda64778/statistik-pertanian-hortikultura-provinsi-jawa-tengah-2017---2019.html>
- Badan Pusat Statistik Provinsi Jawa Tengah. (2021). *Luas Panen dan Produksi Kentang Menurut Kabupaten/Kota di Jawa Tengah, 2018 – 2020*. Badan Pusat Statistik Provinsi Jawa Tengah. <https://jateng.bps.go.id/indicator/55/731/1/luas-panen-dan-produksi-kentang.html>
- Dinas Pangan Pertanian dan Perikanan Kabupaten Wonosobo. (2020). *Harga Rata - Rata Kentang Kabupaten Wonosobo 2016-2019*. Dinas Pangan, Pertanian dan Perikanan Kabupaten Wonosobo.
- Eliyatiningih, & Mayasari, F. (2019). Efisiensi Penggunaan Faktor Produksi Pada Usahatani Cabai Merah di Kecamatan Wuluhan Kabupaten Jember. *Agrica (Jurnal Agribisnis Sumatera Utara)*, 2(1), 7–16.
- Fadliyah, R. R., & Hani, E. S. (2019). Analisis Efisiensi Teknis Alokatif dan Ekonomi Usahatani Semangka di Desa Mojosari Kecamatan Puger Kabupaten Jember. *Jurnal Sosial Ekonomi Pertanian*, 12(3), 22–33.
- Leslie Pratiwi, L. F., & Hardyastuti, S. (2018). Analisis Faktor-Faktor Yang Mempengaruhi Pendapatan Usahatani Kentang Pada Lahan Marginal Di Kecamatan Kejajar Kabupaten Wonosobo. *Berkala Ilmiah Agribisnis AGRIDEVINA*, 7(1), 14–26. <https://doi.org/10.33005/adv.v7i1.1127>
- Sekaran, U. (2006). *Metodologi Penelitian untuk Bisnis*. Salemba Empat.

- Shinta, A. (2011). *Ilmu Usahatani*. Universitas Brawijaya Press (UB Press).
- Soekartawi. (2002). *Analisis Usahatani*. Universitas Indonesia Press.
- Soekartawi. (2003). *Teori Ekonomi Produksi Dengan Pokok Bahasan Analisis Fungsi Cobb-Douglas* (Edisi Revi). PT Raja Grafindo Persada.
- Sufyadi, D., & Apidianur, C. G. (2020). Efisiensi Penggunaan Faktor Produksi Pada Usaha Tani Jamur Tiram (*Pleurotus ostreatus* Jacq.). *Jurnal Pemikiran Masyarakat Ilmiah Berwawasan Agribisnis*, 6(1), 309–321.
- Tim Mitra Agro Sejati. (2017). *Budi Daya Kentang* (T. M. A. Sejati (ed.)). CV Pustaka Bengawan.