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Cabbage farming feasibility study (*Brassica oleracea.*) in Conto Village, Bulukerto District, Wonogiri Regency, Indonesia

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Abstract. Several impacts due to climate change in the last three years have occurred in pest and disease problems in Indonesia, namely escalation, status improvement, and degradation. Especially in Wonogiri, the *Spodoptera litura* attack has become more destructive on cabbage and the status improvement rose from controllable into uncontrollable by the farmer. The precipitation in Wonogiri which is risen in 2020 from 2018 because la Nina stimulates the reproduction of *Spodoptera litura*. The purpose of this study was to analyze the feasibility of a cabbage crop in the dry season during the *Spodoptera litura* attack. The basic method of research is descriptive-analytical. The results showed that the cost spent for cabbage farming in the Sumber Makmur farmer group, Conto Village, Bulukerto District, Wonogiri Regency, with an average land area of 0.26 ha was Rp. 3,505,837; Meanwhile, the revenue was Rp. 10,190,000; And income of Rp 9,236,800; with a profit of IDR 6,684,162. Cabbage farming was feasible to be developed based on the R/C ratio, BEP, capital productivity, and labor productivity. Biopesticides are needed to control *Spodoptera litura* in an environmentally and economically friendly manner because pest control costs are also a dominant cost component in cabbage farming.

1. Introduction

The development of horticulture subsector agriculture which includes commodities of vegetables, fruit, ornamental plants, and biopharmaceuticals is one of the important foreign exchange earnings. Therefore, the horticultural farming business still has promising economic potential [1]. By looking at the various potentials possessed, the cultivation of horticultural crops, especially vegetables, can make a positive contribution to agricultural development in Indonesia. One type of vegetable that can be cultivated and which can contribute to income for farmers is cabbage [2].

Wonogiri Regency was one of the areas that are suitable for developing cabbage vegetables, especially in the Village of Conto, Bulukerto District, because of the geographical conditions with an altitude of 750 m above sea level and with fertile soil and containing sufficient humus making it suitable for cultivating cabbage. In recent years, high precipitation occurred in Wonogiri, especially during the la Nina period. Wonogiri usually has five to six dry month but in 2020 only has two dry months [3]. The changes of a dry month impacted pest and disease problems in cabbage farming where the *Spodoptera litura* becomes more destructive and uncontrollable by farmers. Several impacts due to climate change in the last three years have occurred in pest and disease problems in Indonesia, namely escalation, status improvement, and degradation [4–6]. This study aims to determine the cost of acceptance, income, profit, and feasibility of cabbage farming because the outbreak of The *Spodoptera litura* in Conto Village, Bulukerto District, Wonogiri Regency has an economically direct impact on farmers household.



The benefits of this research are to provide input for cabbage farmers, as information and studies for parties related to agricultural development, as information and reference for those in need.

2. Method

This research was conducted in October 2018 - December 2018 in Conto Village, Bulukerto District, Wonogiri Regency. The basic method used in this research is the descriptive-analytical survey method. Descriptive surveys attempt to explain or record conditions or attitudes to explain what is currently happening [7]. Meanwhile, analytical surveys attempt to describe and explain why a situation exists. The sampling method of respondents in this study was carried out purposively. The number of farmers used as a sample of 30 farmers who are tenant owners who are still actively carrying out cabbage farming activities in Conto Village, Bulukerto District. The data analysis method used in this study is described below:

2.1 Feasibility analysis

$$\text{R/C Ratio: } \frac{\text{TR}}{\text{TC}} \quad (1)$$

Information:

TR: Total Revenue

TC: Total Cost

2.2 Labor productivity

$$\text{Kindergarten productivity: } \frac{\text{Revenue}}{\text{total Labor}} \quad (2)$$

If obtained:

Labor productivity value > prevailing wages, the business is feasible.

The value of labor productivity \leq the applicable wage, the business is not feasible.

2.3 Capital productivity

$$\pi/\text{C ratio: } \frac{\pi}{\text{TC}} \quad (3)$$

Information:

π/C ratio: capital productivity

π : profit

TC: total cost

If obtained:

The value of π/C ratio > the applicable bank interest means the business is feasible.

The value of π/C ratio \leq applicable bank interest means that the business is not feasible.

2.4 Break-even point

$$\text{Receipt Bep (Rp)} = \frac{\text{FC}}{I - \frac{\text{VC}}{\text{R}}} \quad (4)$$

$$\text{Production Bep(Kg)} = \frac{\text{FC}}{\text{P} - \text{AVC}} \quad (5)$$

$$\text{BEP Price (Rp / Kg)} = \frac{\text{TC}}{\text{Y}} \quad (6)$$

Note:

FC: Fixed Cost

VC: Variable Cost

R: Revenue

P: Price

AVC: Variable Cost Per Unit

TC: Total Cost

Y: Total Production

3. Results and discussion

3.1 The identity of the respondent farmer

Age is the age of the respondent farmer which is stated in the year at the time the research was conducted. The age of the respondent farmers in the study area varied between 31 - 70 years with the age distribution based on the age group showing that 73.34% were <60 years old, while 26.67% > 60 years old.

Education is a process that a person goes through to improve knowledge, skills, and attitudes. Based on the research, it is known that most of the respondent farmers are elementary school graduates, namely 70% of the total respondent farmers, thus it can be concluded that most of the respondent farmers are only able to complete the basic level of education.

The number of family members will affect the level of work of farmers. The more family members, the more active the farmers are to work because they have many dependents in the family. The results showed that the average respondent farmer had 1-2 dependents with a percentage of 66.67%.

The area of land that is owned in cabbage farming is also very influential in the production results. Because the area of land that is owned will greatly affect the revenue, the larger the area of land that is owned will also affect the amount of income that is received. Table 1 is the area of land owned by each respondent.

Table 1. Ownership and land size of respondent farmers in the village of Conto.

No.	Land Area (ha)	Number of Owners	Percentage (%)
1.	0.2 - 0.29	17	56.67
2.	0.3 - 0.39	9	30.00
3.	0.4 - 0.49	4	13.33
	amount	30	100

From the table above it can be seen that the ownership of land area with a range of 0.2 - 0.29 m is 17 farmers or 56.67%, a land area of 0.3 - 0.39 m is 9 people or 30.00. %, the range of land area from 0.4 to 0.49 m is 4 people or 13.33%. So it can be concluded that the largest number of landowners is the land area of 0.2 - 0.29 with 17 farmers or 56.67% of owners.

3.2 Analysis of revenue and income of cabbage farming

3.2.1 *Farming acceptance.* Revenue is obtained from multiplying the product with the prevailing price [8]. Table 2 is the data acceptance of cultivation of purple cassava intercropping with cauliflower in Conto Village, Bulukerto District, Wonogiri Regency.

Table 2. Acceptance of cabbage farming in the village of Conto.

No.	Description	Farming	Per-Hectare
1.	Cabbage Production Price (IDR / kg)		3,000
2.	Total Cabbage Production (kg)	3,396.67	13,064.11
	Revenue Cabbage	10,190,000	39,192,330

From the primary data analysis, it is known that the price of cabbage per kilogram is around Rp. 3,000. This price is the price in Conto Village which determines the price of cabbage as a collector. The average production of cabbage with a land area of 0.26 ha was 3,396.67 kg. With an amount of Rp. 10,190,000.

3.2.2 *Farm income*. Revenue is obtained from deducting receipts with fees paid [9]. Included in the costs paid in this study are input costs, labor costs outside the family, and land taxes [10]. Farm income can be seen in Table 3:

Table 3. Cabbage farming income in the village of Conto.

No.	Description	Farming	Per-Hectare
1.	Total Receipts	10,190,000	39,192,330
2.	Total Costs Paid	953,200	3,666,153.84
3.	Total income	9,236,800	35,526,176.16

From the primary data analysis table above, it can be seen that the income of cabbage farming with an average land area of 0.26 ha is Rp. 9,236,800, this income is obtained from a reduction between the total revenue and the total cost paid.

3.3 Analysis of costs and benefits of cabbage farming in one planting period

Table 4. Cost and profit analysis of cabbage farming in the village of Conto.

Description	Physical	The number of costs
a. Fees paid		
1. Seed (sachet)	5.13	102,666.67
2. Fertilizer (kg)		
- Phonska (kg)	50.00	120,000.00
- Urea (kg)	93.33	186,666.67
- Za (kg)	61.00	223,666.67
3. Pesticide		
- Round up (l)	0.37	32,266.67
- Abacel (l)	0.09	33,833.33
4. TKLK (HKO)	3.87	232,000.00
5. Land Tax (ha)	0.26	22,100.00
amount		953,200.00
b. Cost Calculated		
1. TKDK (HKO)	28.38	1,703,000.00
2. Land lease	0.26	802,083.00
3. Depreciation (Rp)		
- Hoe	2.30	22,520.84
- Sickle	2.90	4,054.16
- Sprayer	1.00	20,979.16
amount		2,552,637.00
Total cost		3,505,837.00
c. Revenue		10,190,000.00
d. Income		9,236,800.00
e. Profit		6,684,162.00

The primary data analysis table data above (Table 4) shows that in one planting season with an average area of 0.26 ha, the respondent farmers spend a total of Rp. 3,505,837 obtained from the sum of the fees paid of Rp. 953,200 with the calculated cost of Rp. 2,552,637. The income obtained by the

respondent farmers from the farming business is Rp. 10,190,000 and an income of Rp. 9,236,800. This income is a reduction between the revenue and the fees paid, while the profit earned is Rp. 6,684,162 where the profit is obtained from income minus the calculated costs.

3.4 Cabbage farming feasibility

Table 5. Analysis of cabbage farming in the village of Conto.

No.	Note	Farming
1.	BEP Revenue	Rp.93,873,539
2.	BEP Production	31.31
3.	BEP Price	1,740.05
4.	R / C ratio	1,732
5.	π / C	72.35%
6.	Labor Productivity	IDR 315,968,992

From the Table 5, it can be seen that the BEP calculation of farm revenues during one planting season is Rp.93,873.539 smaller than the cabbage farm revenue of Rp. 10,190,000. In other words, every farm revenue is Rp.93,873,539 then the farming does not experience loss or gain profit and it can be said that it is feasible to be cultivated.

Production BEP 31.31 Kg, which means that every 31.31 kg production in cabbage farming in one growing season will not gain or lose, because the amount of production is 3,396.67 Kg > BEP, it means that farmers get profit and can it is said that farming is feasible to be cultivated. The BEP price for cabbage farming in one growing season is 1,740.05 / kg. This means that if the selling price of cabbage is 1,740.05 / kg the farmer will not gain or lose, then the selling price should be more than that price. In the research area in Conto Village, Bulukerto District, Wonogiri Regency, the selling price of cabbage at the time of the study was Rp. 3.000 > BEP, which means that the respondent farmer gets a profit and it can be said that it is feasible to be cultivated.

From the table it is known that the R/C ratio is 1.732, meaning that each Rp. 1.00 spent will generate Rp. 1.732. Based on the criteria, that farming can be said to be feasible if it has an R/C value ≥ 1 , then cabbage farming in Conto Village, Bulukerto District, Wonogiri Regency can be said to be feasible to run.

From the table, it is known that the π/C ratio of 72.35% > the applicable bank interest is 7% effective per year on local BRI Bank loans, so the sub-district business in Conto Village, Bulukerto District, Wonogiri Regency is said to be feasible to run. From the table, it can be seen that the labor productivity of Rp. 315,968,992 and the prevailing wage rate per HOK is Rp. 60,000. So it can be concluded that the labor productivity value > the prevailing wage level. So farming can be said to be feasible to work on.

4. Conclusion

Based on the results of the research that has been done, it can be concluded that the amount of costs spent for cabbage farming in the Conto Village, Bulukerto District, Wonogiri Regency with an average land area of 0.26 ha is Rp. 3,505,837; Meanwhile, the revenue was Rp. 10,190,000; And income of Rp 9,236,800; with a profit of IDR 6,684,162. Cabbage farming is feasible to be developed, based on the R/C ratio, BEP, capital productivity, and labor productivity during a high attack of *Spodoptera litura*. to deal with further waves of attack due to weather changes with high rainfall intensity, manual and biological control is highly recommended. Biopesticides are needed to control *Spodoptera litura* in an environmentally and economically friendly manner because pest control costs are also a dominant cost component in cabbage farming.

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