Economic Valuation Of Horticulture Organic Farming In Getasan, Semarang Regency

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Abstract. Agriculture can also be a source of environmental damage if poorly managed. The use of synthetic fertilizers and pesticides, changes in ecosystems and so on, are some examples of the damages to the environment due to excessive use of chemicals in agriculture. Conventional agriculture is considered easier, but the use of synthetic chemicals in conventional agricultural activities can disrupt biodiversity, soil fertility, ecosystems, and health. This study aims to calculate the economic assessment of organic horticultural agriculture by comparing the phenomenon of two types of horticultural agriculture. The survey was conducted by using random sampling to 70 respondents. The results show that the ratio of the benefits of horticultural organic farming is higher (3.06) compared to the benefits of conventional agricultural cultivation (1.73) with a significant difference. This is due to lower costs for fertilizers and organic plant protection, and also lower selling prices, even though the productivity of organic land is lower, but not significant. It is strongly recommended that conventional farmers move their farming methods to organic, because it will be more beneficial in terms of environmental sustainability as well as of the health of farmers, because it minimizes synthetic chemicals that are less safe for the environment and health, especially with excessive uses. The role of the government is highly expected, because without government support through either policy or assistance, farmers cannot optimally farm organically.

Keywords: Economic valuation, benefit cost ratio, horticulture, organic agriculture and environmental sustainability

1. Introduction
Genetic factors, health services, and behavior affect the degree of human health including the environment as well [1], although it cannot be determined exactly [2]. Environmental modification can result in many deaths due to environmental damage. So it needs cross-sectoral action in maintaining a sustainable environment [3]

Agriculture can also be a source of environmental damage if it is poorly managed [4], where there are a lot of environmental damages due to excessive use of chemicals in agriculture [5] which can
disrupt biodiversity, soil fertility, ecosystems and health [6]. If managed properly, conventional agriculture can also have good benefits [7]. The resistance of plant pests to chemicals disrupts the ecological system, so it is necessary to immediately change the agricultural system [8]. In order to achieve adequate and sustainable agricultures [9], farmers must increase their role in agricultural development and environmental interests [10]. Increased crop yields can provide farmers the motivation in maintaining the environment [11, 12].

Organic technology has been used to conserve land, water, energy and biology resources. Conventional agriculture can be made more sustainable and environmentally sound by adopting some traditional organic farming technologies [13]. Organic agriculture is developed as environmentally friendly agricultural cultivation method, with many benefits compared to conventional agriculture [14, 15] such as preserving the species, natural wealth, and increasing soil fertility [16], reducing agricultural greenhouse gas emissions [7], maintaining agricultural environmental sustainability [4] and conserving the biodiversity [17]. Organic agriculture maintains soil fertility and positive environmental benefits [15, 18].

Compared to the attention received by occupational health and safety, as well as environmental issues [19], economic motives received less attention [20]. Risk analysis is carried out to determine the magnitude of the impact of land management, as a basis for conducting economic assessments [21] on horticultural agriculture. Although it is still felt expensive for some people, awareness of the dangers of pesticides in vegetables causes many consumers to switch to organic agricultural products [22]. Although the overall results of organic systems are lower than conventional, but under certain conditions and with good management, while paying attention to factors that limit organic farming better, it can produce yields according to conventional systems, in addition to assessing social, environmental and economic benefits [4].

Not all farmers have switched to sustainable farming, or farming which is safe for the environment and health. Many farmers are more oriented on the success of the harvest in each of their productions, and are not yet fully considering the conditions of sustainability of nature and also health impacts. This study aims to analyze the benefits compared to the costs between organic and conventional farming.

2. Methods
The purpose of this study was to analyze the benefits of organic and conventional horticultural agriculture, with the Benefit Cost Ratio (BCR) approach. The study was conducted in Batur Village, Getasan District in Semarang Regency which has a suitable area for horticulture farming. The survey was conducted with the sample used in this study amounting to 70 respondents consisting of 35 organic farmer group members and 35 samples taken from conventional farmer groups. Sampling is done by using random sampling.

Data processing was done by conducting statistical tests, to calculate the average, percentage and different test results of this study, which are then used as material for discussion, by adopting a method of comparing production costs and the ratio of benefit costs, to organic and conventional carrot production [23].

2.1 Land Productivity = Yield / Area of Land.

\[ Cp = C_1 + C_2 + C_3 + C_4 + C_5 + C_6 \] (1)

Where;
Y = Yields
Cp = Production costs
C1 = Seed costs
C2 = Cost of synthetic fertilizers / organic fertilizers
C3 = Costs for crop protection
C4 = Labor costs (land preparation and maintenance)
C4 = Irrigation costs
2.2 Benefit Cost Ratio
Gross margin is the difference between income (harvest in rupiah) and total agricultural costs (Gross margin - Production Costs). The benefit cost ratio is the ratio between any gross income and any total production costs. In this study, the benefit cost ratio is calculated using the formula:

\[
BCR = \frac{\text{Gross Margin}}{\text{Production Cost}}
\]

3. Results and Discussions

3.1 Characteristics of respondents
The results in the field show that horticultural farmers are dominated by men as much as 83% with an average age of 56 years. Farmers work on agricultural land where the majority (95%) is owned by their own land and the rest is cultivated land by renting land owned by people who happen to not work as farmers, but have enough land for agricultural cultivation. The types of commodities planted are various types, including broccoli, potatoes, chili, cabbage, tomatoes, mustard greens, and celery. The land for cultivated farmers with an average area of 1,943 m² for organic farming, while for conventional average land area cultivated is 2,446 m².

3.2 Cost Analysis
Not all elements in the production cost can be compared, because of the variety of cultivated commodities, but there are similar characteristics in the management of horticulture farming for both organic and conventional, namely for fertilizer costs, pest and plant diseases (care) handling, and labor. Because, the three types of elements can be applied to almost all types of cultivated commodities. The results showed that there were differences in the average production costs for organic farming being lower (IDR 5,014,755) compared to the conventional ones (IDR 7,201,310).

Table 1. Average production costs for organic and conventional horticultural agriculture (per 1000 m²)

| Cost                          | Organic (IDR) | Convensional (IDR) |
|-------------------------------|---------------|--------------------|
| Seed Costs (C1)               | 405,836       | 752,586            |
| Fertilizer Fee (C2)           | 601,966       | 971,229            |
| Plant Protection Costs (C3)   | 258,550       | 329,110            |
| Labor Costs (C4)              | 2,552,956     | 3,577,368          |
| Irrigation Costs (C5)         | 122,912       | 108,516            |
| Other Costs (C6)              | 1,072,206     | 1,462,500          |
| **Total Production Costs**    | 5,014,755     | 7,201,310          |

Overall, the cost of organic production is lower than the conventional one, as shown in table 2. For seed costs, differences can occur because the types of commodities planted differ for the purchase price, whereas for the fertilizer costs there is a significant difference due to the conventional agricultural cultivation fertilizer price as the additional fertilizer is more expensive (IDR 971,229) compared to organic fertilizer (IDR 601,966) because it, can be taken from the surrounding environment. Which means, it can reduce the cost of fertilizer purchase, because organic fertilizers can be made by farmers, both independently and in groups. Also included in the treatment of plants is to control plant pests and diseases, conventional agriculture costs more (IDR 329,110) compared to organic farming (IDR 258,550).
Some studies showed that organic fertilizers are safer for the environment and health [4, 24] with the results of this analysis farmers do not need to be afraid to move to organic farming, because the results are indeed better. Hence, government support is very necessary for this to succeed.

Table 2. Yields of, organic and conventional horticultural agriculture (per 1000m²)

| Description                      | Organic | Conventional |
|----------------------------------|---------|--------------|
| Yield (kg)                       | 2,076   | 2,666        |
| Selling Price (IDR)              | 9,810   | 7,367        |
| Gross Income (IDR)               | 20,367,180 | 19,641,704  |
| Land productivity (yield / 1000) | 2.08    | 2.67         |

Based on the table, the yields do not show any significant difference from the two agricultural cultivation, where the organic agriculture produced an average of 2,076 kg of arable land and conventional agriculture 2,666 kg for each 1000 m² of land. The productivity of conventional agricultural cultivation land was higher, with a ratio of 2.67 compared to organic cultivation which was only 2.08. On the other side the selling price of conventional agricultural commodities, which is IDR 7,367 with its gross income of IDR 19,641,705 is comparatively lower than the selling price of organic products which is IDR 9,810 with a total gross income of IDR 20,367,180. Organic farming benefits from having higher selling prices compared to conventional agriculture.

3.3. Cost Benefit Analysis

Cost benefit analysis ratio is a fast and easy method for calculating economic performance. Through this, it can be seen whether the costs incurred are lower than the income received, or even the benefits obtained from the activity [25], because large incomes do not necessarily show benefits more than smaller incomes, because this analysis accounts for the costs incurred.

Table 3. The benefit ratio of organic and conventional horticulture farming

| Description                        | Organic     | Conventional |
|------------------------------------|-------------|--------------|
| Gross margin (IDR)                 | 15,352,755  | 19,641,704   |
| Total production costs (IDR)       | 5,014,426   | 7,201,310    |
| Benefit cost ratio                 | 3.06        | 1.73         |

From this study, it shows that the ratio of the cost of benefits from organic horticulture farming is higher (4.93) compared to the benefits of conventional agricultural cultivation (2.73) with a significant difference. This is due to lower costs for fertilizers and organic plant protection, and also lower selling prices, even though the productivity of organic land is lower, but not by a significant margin.

Based on the interviews for the marketing of horticultural products there were two marketing models for organic farming which are, sold through farmer groups with standard prices in accordance with the sales contract, and sold directly to the market or collectors at market-adjusted prices. As for conventional agriculture, sales are carried out directly to the market and collectors at market-adjusted prices. Often times, there are problems when the harvest takes place, there are risks for price to droplower than the normal price. Whereas, organic prices are more stable but market absorption is limited.

4. Conclusion

This study shows that the ratio of benefit costs of horticultural organic farming, it is better than the conventional agricultural cultivation method. Although in terms of production, it is lower, but the selling price has advantages despite the limited absorption capacity in the market. It is strongly recommended that conventional farmers move their farming methods to organic, because it will be more beneficial in terms of environmental sustainability as well as the health of farmers, because it minimizes synthetic chemicals that are less safe for the environment and health, especially with excessive uses. The role of the government is highly expected, because without government support either through policy or assistance, farmers cannot optimally farm organically.
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