E3S Web of Conferences **595**, 04012 (2024) https://doi.org/10.1051/e3sconf/202459504012
IConARD 2024

Feasibility of Environmentally Friendly and Conventional Shallot Farming in Kulon Progo Regency

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Abstract. Shallots cultivated by farmers in the Daerah Istimewa Yogyakarta, especially Bantul Regency and Kulon Progo Regency, have implemented environmentally friendly farming, apart from conventional farming. This research aims to analyze the costs, income, profits and feasibility of environmentally friendly and conventional shallot farming in Kulon Progo Regency. This research was conducted in Srikayangan Village, which is a center for shallots in Kulon Progo Regency, both environmentally friendly and conventional. Simple random sampling was used by drawing lots using Microsoft Excel, then 30 environmentally friendly farmers and 26 conventional farmers were chosen. Data analysis used costs, revenue and profits by testing using the independent sample t-test in the SPSS application. Quantitative descriptive analysis to analyze feasibility of farming using R/C. The research results showed the production costs of conventional shallot farming are lower than environmentally friendly shallot but not significantly. However, the income and profit of conventional shallot farming is higher than environmentally friendly farming. This is due to crop failure in environmentally friendly shallot production. Environmentally friendly and conventional shallot farming were feasible with an R/C value of more than one. Although conventional shallot farming was more profitable, it occurred due to crop failure on environmentally friendly shallots farming.

1 Introduction

Horticultural commodities that include vegetables, fruits, ornamental plants, and medicines are one of the leading commodities in the agricultural sector because they can contribute significantly to the country's foreign exchange, even some commodities such as shallots, red peppers, and cayenne peppers are commodities that affect the inflation rate [1]. Shallot (*Allium ascalonicum* L) is a strategic commodity driving the development of national horticultural crops and has high economic value and good market opportunities. Almost all dishes use shallots because they have a distinctive spicy taste and aroma. Shallot production

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in Indonesia in 2021-2022 is in five production center areas, namely Central Java, East Java, West Nusa Tenggara, West Sumatra, and South Sulawesi[2][3]. Statistical data processed by BPS 2021-2022, the production of shallots in 2022 in the five production centers contributed 82.57 percent of Indonesia's national production.

The conventional agricultural system is an agricultural system that still uses chemical fertilizers or pesticides. The occurrence of Plant Pest Organisms (OPT) attacks at the field level is the reason why farmers continue to use chemical pesticides. The use of pesticides has become a farmer's mentality due to farmers' misunderstanding. Such ways of using pesticides can have an impact on the decline in the quality of the agricultural environment and the products produced. The organic farming system is a holistic production management system to improve and develop agroecosystem health, including biodiversity, biological cycles, and soil biological activities [4]. An environmentally friendly agricultural system is a sustainable agricultural system that aims to increase and maintain high productivity by maintaining the supply of nutrients from the use of organic matter, minimizing dependence on inorganic fertilizers, improving soil biota, controlling plant pests based on ecological conditions, and diversifying crops.

Daerah Istimewa Yogyakarta is not included in the national production center because it only contributed 1.50% (298,087 quintals) in 2022 [3]. DIY shallot production centers are in Bantul Regency and Kulon Progo Regency which are presented in Table 1 [5].

Table 1. Harvest area, production and productivity of shallots in the Special Region of Daerah Istimewa Yogyakarta in 2021

District/City	Harvest area (ha)	Production (ku)	Productivity (ku/ha)
Sleman	26	2,269	87.95
Bantul	1,645	169,008	102.74
Gunung Kidul	210	18,037	85.86
Kulon Progo	1,139	108,772	95.46
Yogyakarta	0	0	0
Daerah Istimewa Yogyakarta	3,020	298,086	98.69

Bantul and Kulon Progo Regencies as Daerah Istimewa Yogyakarta shallot centers, farmers have implemented environmentally friendly agriculture, namely in shallot cultivation has reduced the use of synthetic fertilizers and pesticides. Selopamioro Village, Imogiri District, Bantu Regency is famous as an environmentally friendly shallot-producing area. Shallots in Selopamioro Village as the center of shallot production in Kulon Progo Regency, both conventional and environmentally friendly agricultural systems. The term "environmentally friendly system" is deemed more appropriate than "organic system" because farmers have not fully implemented the organic farming system. It is only limited to the use of organic fertilizers and vegetable pesticides, but the land is not yet free from chemical residues from fertilizers and pesticides. This is because farmers still apply conventional farming systems to the cultivation of rice plants, which are planted before shallots.

Research related to the feasibility of conventional and environmentally friendly shallot farming has been carried out in previous studies. Research by [6],[7] feasibility of environmentally friendly and conventional shallots in Bantul Regency are feasible to cultivate. Another study, the feasibility of environmentally friendly shallot farming in Tegal Regency is feasible [8], and research results [9] in Anggeraja District, Enrekang Regency that the use of environmentally friendly technology in shallot farming is feasible. Another research by [10], states that shallot farming in three production centers in Brebes, Cirebon and Tegal is feasible for farmers.

From the above explanation, it is important to conduct research with the aim of knowing the differences in costs, profits, and feasibility of environmentally friendly shallot farming with conventional shallot farming in Kulon Progo Regency. The results of this study will be very useful as material for consideration in making decisions about the use of shallot farming technology, given that there are not many shallot cultivation systems that are organic or environmentally friendly, especially in Indonesia. In addition, there are not many scientific publications related to shallot farming that do not use chemical pesticides.

2 Research method

2.1 Location research

The highest center for shallot production is in Kulon Progo Regency in Sentolo District, which is presented in Table 2.

Table 2. Shallot Production in Kulon Progo Regency by District in 2021-2022

District	**2021**	**2022**
	Production (ku)	**Production (ku)**
Temon	6,669	3,017
Wates	8,051	7,120
Panjatan	15,496	14,049
Galur	4,853	4,430
Lendah	14,858	20,821
Sentolo	**53,078**	**42,522**
Pengasih	4,847	4,615
Kokap	193	390
Girimulyo	98	146
Nanggulan	434	98
Kalibawang	195	0
Samigaluh	0	0
Amount	**108,772**	**97,209**

This research was conducted in Kulon Progo Regency, Daerah Istimewa Yogyakarta. The location of this research was determined purposively in accordance with the research objectives. An environmentally friendly and conventional system in Srikayangan Village, Sentolo Districts.

2.2 Sampling technique

The basic methods used in this research were descriptive analytical methods. The descriptive analysis method was used to provide an overview of the costs, income, and profits obtained by the farmers of environmentally friendly shallot and conventional shallot farming based on the facts obtained directly. The determination of the sample of farmers was carried out using proportionate stratified random sampling[11]. In the first stage, samples were taken from farmers spread across eight farmer groups from 15 farmer groups in Srikayangan Village. In the second stage, the eight farmer groups selected included 302 environmentally friendly shallot farmers and 262 conventional shallot farmers. The number of samples taken was 10 percent based on the youth table [12], so the sample of environmentally friendly shallot farmers was 30 farmers and 26 conventional shallot farmers. The farmer sample was determined using simple random sampling using Microsoft Excel.

2.3 Data analysis

Data analysis using descriptive analysis and T-test used to the differences in costs, revenues, profits, and feasibility of environmentally friendly and conventional shallot farming. Cost, profit, and feasibility formula for R/C as follows:

$$TC = TEC + TIC \tag{1}$$

Where *TC* was the total cost, *TEC* was the total explicit cost, and *TIC* was the total implicit cost

$$\pi = TR - \mathrm{TC} \tag{2}$$

$$TR = P.Q \tag{3}$$

Where π was profit, *TR* was total revenue, *TC* was total cost, *P* was product price, and *Q* was the amount of production (kg) calculated on a land area of conversion 2,500 m^2.

$$RC\ Ratio = \frac{TR}{TC} \tag{4}$$

Data analysis uses descriptive analysis and T-test to determine the cost, income, and profit of shallot farming. Feasibility of farming using the R/C approach with the following criteria: if R/C > 1, then shallot farming is feasible to cultivate, if R/C <1, then shallot farming is not feasible to cultivate, and if R /C = 1, then shallot farming is not profitable or not loss [13].

3 Results and discussion

3.1 Farmer Profile

All farmers in this study are male, the age of environmentally friendly shallot farmers is the majority younger (Figure 1), higher education than conventional shallot farmers (Figure 2).

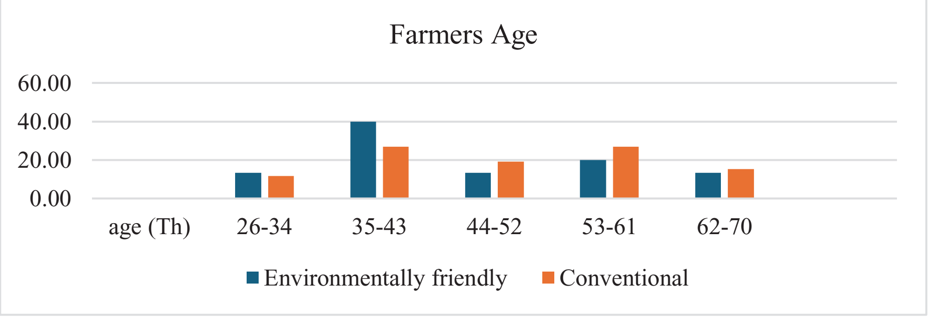

Fig. 1. Farmer age of respondent

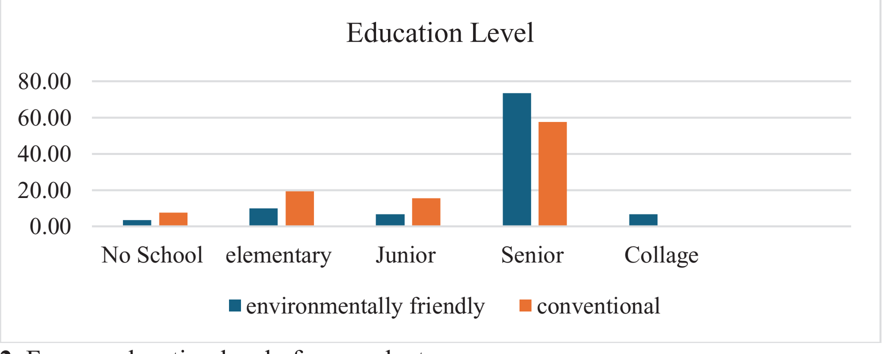

Fig. 2. Farmer education level of respondent

The land tenure of environmentally friendly shallot farming is still below 5,000 m^2 while conventional shallot farmers are more evenly distributed with wider land tenure. The average land area of environmentally friendly shallot farming is 2,245 m^2 and conventional is 2,789 m^2. The larger the cultivated land, the more it will affect the cost and amount of shallot production produced (Figure 3).

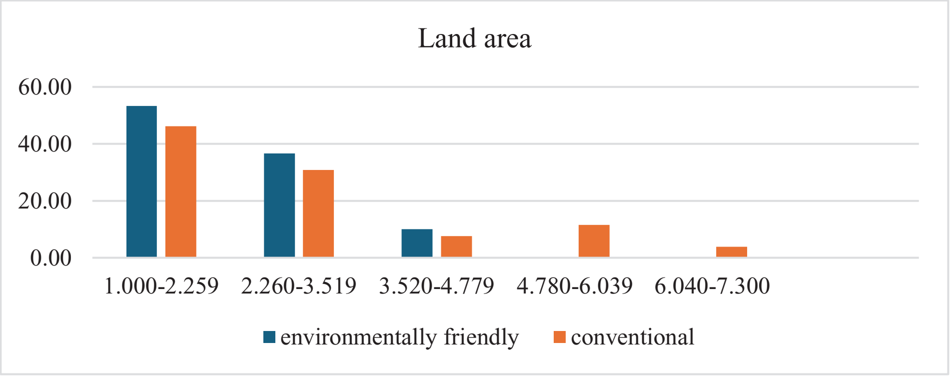

Fig. 3. Cultivated land area of shallot farmers

The status of land tenure cultivated by farmers is divided into three, namely own ownership, land rent and *sakap*. Most of the shallot farmers are environmentally friendly (88.46%), conventional shallot farmers are *sakap* land (77.66%). The self-owned land of environmentally friendly shallot farmers is 6.16% more than conventional shallot farmers.

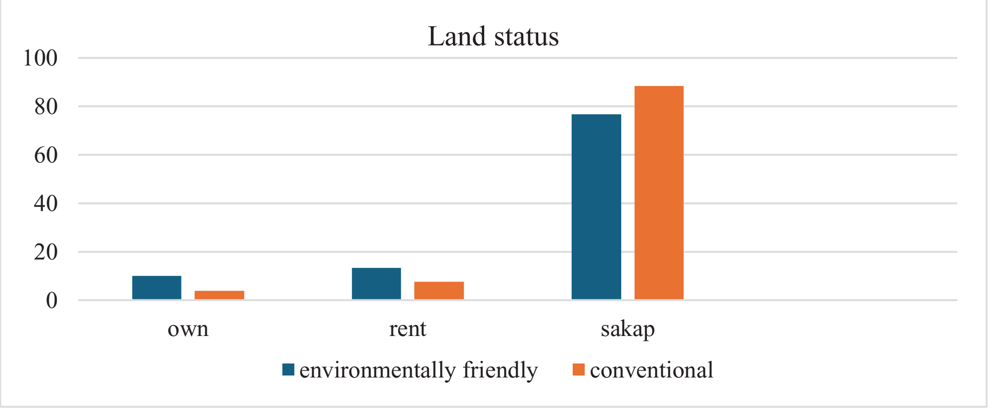

Fig 4. Farmers' land status

3.2 Farming analysis

3.2.1 Production cost

The largest production cost in environmentally friendly and conventional shallot farming was the cost of seeds and then labor both outside and within the family. The number of seedlings is more, and the price is more expensive on environmentally friendly shallots. In accordance with research in Tegal Regency by Mardiyanto, the price of environmentally friendly shallot seeds is more expensive [8] Environmentally friendly shallot farmers use seeds of the Header variety whose tonnage is heavier than the Srikayang variety. Supported by a study of the variety and size of shallot bulbs on yield productivity has been carried out at the Margahayu Experimental Garden, Vegetable Crop Research Institute, Lembang [14].

The proportion of costs in environmentally friendly shallot farming in Kulon Progo Regency was the seed production factor. The same results can also be seen in conventional shallot farming, where the seeds occupy the largest portion of production costs. This finding is in accordance with many other research results which state that the cost of seeds generally occupies the largest portion of the costs of farming shallots[8],[15],[16].

The second largest cost is labor cost for both environmentally friendly and conventional, but the proportion is greater for environmentally friendly shallots. This result is different from the labor cost in shallot farming in Batu City which occupies the largest position, which is 47.31% [9]. This is also happen for environmentally friendly shallot in Tegal Regency, where labor cost is in the third position which is 23.68% [8]. This shows that shallot farming is a type of farming which is quite labor intensive

Table 3. Costs of environmentally friendly and conventional shallot farming per 2.500 m^2

Cost Items	**Environmentally Friendly**		**Conventional**	
	Cost (IDR)	**Percentage (%)**	**Cost (IDR)**	**Percentage (%)**
Explicit				
Land rent	2,283,125	5.91	1,500,000	4.64
Seeds	12,488,197	**32.34**	6,676,156	**20.67**
Fertilizer	3,296,894	8.54	4,368,566	**13.52**
a. organic	2,969,992	7.69	0	0.00
b. Compost	326,902	0.85	0	0.00
Active ingredients	217,277	0.56	0	0.00
Pesticide	1,344,285	3.48	1,253,699	3.88
Family labor cost	4,393,254	**11.38**	5,345,800	**16.55**
Depreciation	1,289,505	3.34	1,236,113	3.83
Machine rent	362,5	0.94	528,462	1.64
Irrigation fuel	2,164,562	5.61	2.238.600	6.93
Other cost	726,143	1.88	601.932	1.86
Amount	**28,632,621**		**23,906,019**	
Implicit				
Land rent	2,391,250	6.19	2,391,250	7.40
Biological agency	2,539,315	6.58	0	0.00
Family labor cost	4,620,167	**11.97**	5,619,906	**17.40**
Capital interest	429,489	1.11	358,59	1.11
Amount	**9,980,221**		**8,398,095**	
Total	**38,612,842**	**100**	**32,304,114**	**100**

3.2.2 Income and Profit

The income of conventional shallot farmers is greater than the income of environmentally friendly shallot farmers. Low farmers' income is due to lower production, which at the time of harvest floods due to rain. The land was submerged in water which caused some of the shallots to rot. Meanwhile, conventional shallot land has been harvested early. In addition, the explicit costs incurred by conventional shallot farmers are smaller than those of environmentally friendly shallot farmers, so it can also affect farmers' income.

Table 4. Income and Profit Environmentally Friendly and Conventional Shallot Farming per 2.500 m^2

Items	Environmentally Friendly	Conventional
Production (kg)	3,409	3,745
Price (IDR)	17,470	17,946
Total revenue (IDR)	**53,630,256**	**60,262,107**
Total explicit cost (IDR)	28,632,621	23,906,019
Total implicit cost (IDR)	9,980,221	8,398,095
Total Cost (IDR)	**38,612,843**	**32,275,765**
Total Income (IDR)	**24,997,635**	**36,720,088**
Profit (IDR)	**15,017,413**	**28,350,342**

The total income of conventional shallots is greater than that of environmentally friendly shallots, which is not in accordance with research in Tegal Regency which shows that the income of conventional farmers is smaller than that of environmentally friendly systems[8] This is because in shallot farming, the environmentally friendly system receives a larger income than conventional farming, even though the total costs incurred by environmentally friendly farmers are larger.

Tabel 5. Analysis of costs, income and profits of environmentally friendly and conventional shallot farming with sample independent.

Items	F count	Sig	t	df	Sig (2-tailed)
Cost	.952	.334	.181	54	.857
			.179	49.706	.859
Revenue	0.001	.979	-2.850	54	.006
			-2.833	51.322	.007
Profit	0.010	.921	-3.022	54	.004
			-3.002	51.066	.004

Based on the independent T-test, there is no difference in the cost of environmentally friendly and conventional shallot farming. But income and profit, there is a difference between environmentally friendly and conventional shallot farming according to the results of previous research [6],[7],[8] and [17].

3.2.3 Farming Feasibility

The R/C value per farming obtained in conventional shallot farming is higher than that of environmentally friendly shallot farming, which is with a difference of 0.83. This is because the production of environmentally friendly shallots is lower than conventional shallots, due to crop failure due to floods. However, both farming businesses are worth pursuing. The results of this study support previous studies related to environmentally friendly agricultural systems, especially shallot farming.[7] [8] [17] However, the R/C value of environmentally friendly shallot farming in Kulon Progo Regency is lower than environmentally friendly shallot farming in Bantul Regency with an R/C value of 2.22 [7]

Table 6. Feasibility of environmentally friendly and conventional shallot farming

Items	Environmentally Friendly	Conventional
Total revenue (IDR)	47.708.687	74.437.275
Total cost (IDR)	35.748.747	34.397.374
R-C ratio (R/C)	**1.33**	**2.16**

4 Conclusion

Production costs of conventional shallot farming were lower than environmentally friendly shallot farming, but not significantly different. The production costs of both farming systems were mostly seed costs, labor costs, and fertilizer costs. However, the income and profit of conventional shallot farming was higher than environmentally friendly farming. This is due to crop failure in environmentally friendly shallot production. Furthermore, environmentally friendly and conventional shallot farming were feasible with an R/C value of more than one, but conventional shallot farming was more profitable.

Acknowledgment. We would like to thank the Research and Innovation Institute (LRI)-UMY which has provided full support to carry out research to publication, and support lecturer research funds.

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