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Environmental Awareness Analysis of Organic and Non-Organic Rice Farmers in Java Island

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ABSTRACT

Rice is a key commodity cultivated by Indonesian farmers and serves as the staple food for the population. In Indonesia, rice is produced using both organic and non-organic farming methods. This study assesses whether there is a significant difference in environmental awareness between organic and non-organic farmers. Conducted in Yogyakarta and Central Java, the research involved 150 organic and 100 non-organic farmers, randomly selected from five districts. Six key indicators were used to measure environmental awareness: knowledge of environmental impacts, water management, soil management, education and environmental support, fertilizer and pesticide use, and future goals. The results showed that the average scores for both groups across all indicators fell within the "High" category. While non-organic farmers continue to use chemical inputs, they remain aware of the environ-

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mental consequences of such practices. Their reliance on chemical fertilizers is likely driven by economic factors, reflecting a tension between productivity and sustainability. The Mann-Whitney test revealed a significance value of 0.000 ($p < 0.05$) across all indicators, confirming a statistically significant difference in environmental awareness. Organic farmers demonstrated greater awareness, highlighting the positive impact of organic farming on sustainability. These findings suggest that organic farming can enhance environmental awareness while addressing the economic challenges faced by non-organic farmers.

Keywords: Environmental Awareness; Organic Farming; Non-Organic Farming; Environmental Impact; Sustainable Agriculture

1. Introduction

Indonesia is a developing country that is advancing in various sectors, with agriculture playing a vital role in supporting the national economy [1]. The agricultural sector is also crucial for agricultural development [2]. Agricultural development, particularly in food crops, aims to increase production, which is essential for meeting food needs and enhancing farmers' Income [3]. Among the significant crops contributing to the agricultural sector is rice [4, 5]. A primary commodity cultivated by Indonesian farmers as a staple food for the population [6]. Rice plays a very important role in the socioeconomic life of the Indonesian people. As the staple food for the majority of Indonesia's population, the sustainability of rice production is a top priority in the agricultural sector. In addition, rice also makes a significant contribution to the rural economy. In Indonesia, rice is cultivated through both organic and non-organic methods.

Organic rice refers to rice produced through organic farming practices [7]. Organic rice is not merely ordinary rice; it is processed and cultivated using organic approaches [8]. If rice farming still involves synthetic fertility inputs or a mix of artificial and organic inputs, it cannot be considered organic farming [9]. Organic rice farming contributes positively to environmental sustainability by reducing chemical runoff into waterways, increasing biodiversity, and improving soil structure over time [10, 11].

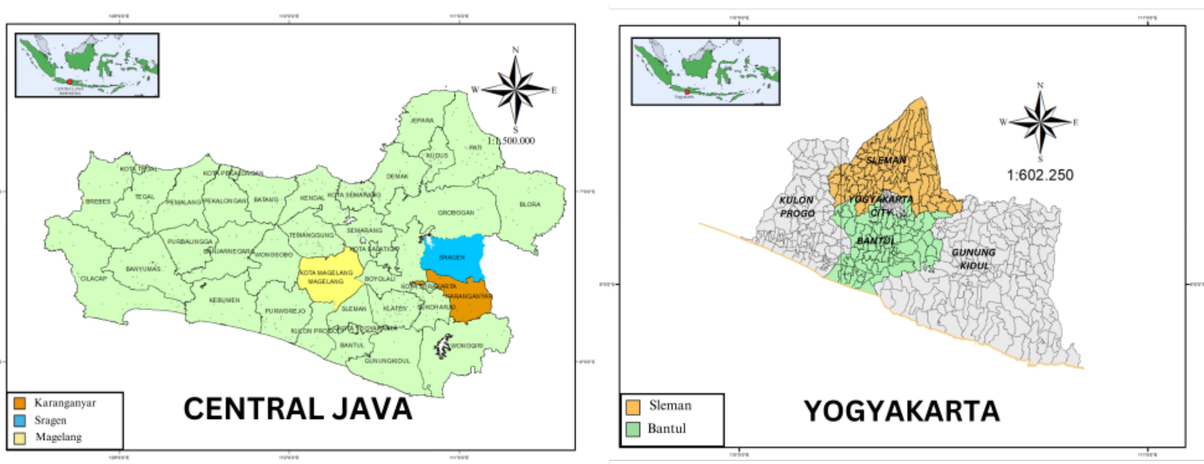
Non-organic rice farming, on the other hand, relies on inputs such as fertilizers, pesticides, and other chemicals [12, 13]. Chemicals play a crucial role in achieving high yields and producing attractive, high-quality products [14]. This often leads farmers to use chemicals excessively, which can negatively impact the environment and human health [15, 16]. The advantages of organic rice farming over non-organic farming include being more environmentally friendly and improving soil fertility [17]. The resulting products are healthier, and organic rice commands a higher price than non-organic rice [8]. Meanwhile, the benefits of non-organic rice farming include the availability of seeds, fertilizers, and pesticides, with quicker visible results from pesticide application [12]. Environmental awareness is essential in both organic and non-organic farming environments [18]. Environmental awareness is a multidimensional construct consisting of cognitive, attitudinal, and behavioral components [19]. The mental component includes individuals' ecological knowledge, covering current environmental issues [20]. While attitudes involve individuals' perspectives toward the environment [21]. Increasing farmers' environmental awareness is a strategic step to improve existing agricultural practices. Educational programs, extension services, and training that integrate sustainability values can help farmers understand the importance of maintaining ecosystem balance. Providing incentives for farmers who adopt environmentally friendly practices, such as subsidies for organic fertilizers or market access for organic products, can more effectively encourage behavioral change.

As the human population grows, rice consumption, whether organic or non-organic, will increase [22, 23]. Hence, the production of both organic and non-organic rice must continue to grow[24, 25]. Central Java and the Special Region of Yogyakarta are among the major rice-producing regions, with a significant output of both organic and non-organic rice[26]. Thus, an analysis of environmental awareness among organic and non-organic[27] rice farmers is necessary to assess the environmental impact of rice farming practices.

2. Research Methods

2.1. Study Location

The location of this study was chosen purposively, considering factors such as the number of organic and non-organic rice farming groups, organic farmland area, and availability of organic certification. The selected locations are Central Java Province include three regencies: Magelang, Karanganyar, and Sragen. Meanwhile, the Special Region of Yogyakarta includes two regencies: Bantul and Sleman (**Figure 1**).



(**a**) Research location map in Central Java

(**b**) Research location map in Yogyakarta.

Figure 1. Study location.

2.2. Sampling Procedure and Data Collection

This study used a descriptive method, and the data were collected through interviews using semi-structured questionnaires. The sampling method applied was random sampling from five regencies. As seen in **Table 1**, 150 organic farmers and 100 non-organic farmers were involved in this study. Detailed information regarding farmers' income, land size, age, and other characteristics was collected to ensure the representativeness of the sample in reflecting the broader population of rice farmers. Data collection focused on assessing environmental awareness through six indicators for both organic and non-organic rice farmers in Central Java and Yogyakarta (**Table 2**). The data collected also include farmer characteristics such as age, education level, land area, and income, as well as all activities or inputs involved in farming, water usage, land usage, and other related aspects.

Table 1. Number of respondents.

Research Location	Number of Respondents		Total
	Organic Farmers	Non-Organic Farmers	
Bantul, Yogyakarta	30	50	80
Sleman, Yogyakarta	30	50	80
Sragen, Central Java	30	0	30
Karanganyar, Central Java	30	0	30
Magelang, Central Java	30	0	30
Total	**150**	**100**	**250**

Table 2. Environmental awareness indicators.

No	Indicator	Detail
1	Environmental Impact Management	The importance of preserving the environment, environmental awareness, the use of eco-friendly products, understanding the need for environmental care, energy conservation at home, preventing illegal deforestation, and efforts to maintain cleanliness and sustainability voluntarily
2	Soil Management	Farmers understand sustainable agricultural management, regularly check soil fertility, apply land conversion, use fertilizers and organic materials, efficiently use pesticides and herbicides, have policies for efficient water use, are willing to participate in soil management training, and improve productivity by managing the land.
3	Water Management	Farmers' understanding of water management, monitoring water usage, using efficient irrigation methods, utilizing agricultural wastewater, scheduling plant watering, and regular maintenance of infrastructure are also integral parts of agricultural sustainability
4	Fertilizer and Pesticide Use	Training in water management skills, understanding the use of fertilizers and pesticides, and knowledge of the correct dosage and timing for applying organic fertilizers and pesticides are key factors in improving agricultural yields.
5	Education and Environmental Support	Compliance with guidelines and regulations on fertilizers and pesticides, understanding the environmental impact risks of using fertilizers and pesticides, and the view of education as a key to agricultural success are supported by government efforts to improve the quality of education, environmental awareness, and government support for adequate education.
6	Future Goal	Government and community support to protect the environment, new initiatives to protect the environment, waste management planning, use of natural pesticides in future agriculture, energy conservation to protect the environment, planning for efficient water use, and planning to create environmentally friendly agriculture

2.3. Analysis Technique

This study employed data analysis techniques with the assistance of SPSS software using the Mann-Whitney Test and the average score on each environmental awareness indicator to identify factors influencing environmental awareness among organic and non-organic rice farmers.

Mann-Whitney Test Formula:

$$U_1 = n_1 n_2 + \frac{n_1(n_1+1)}{2} - R_1 \tag{1}$$

$$U_2 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2 \tag{2}$$

$U_1 U_2$ Information:

U_1 = Mann-Whitney U statistic for group 1

U_2 = Mann-Whitney U statistic for group 2

n_1 = Number of samples in group 1

n_2 = Number of samples in group 12

R_1 = Sum of ranks for group 1

R_2 = Sum of ranks for group 2

Table 3 shows the average scores and criteria used for environmental awareness analysis. In addition, the first analysis used is the Normality Test. This test is conducted to examine six indicators between organic and non-organic farming to determine whether the data are normally distributed or not. This is done to ensure that the data meets the basic assumptions of parametric statistics, allowing for more accurate and relevant advanced analysis. Normality Test Criteria can be seen in **Table 4**.

Table 3. Environmental awareness scores and criteria.

Criterion	Value
Low	1.00–2.33
Moderate	2.34–3.67
High	3.68–5.00

Table 4. Normality Test Criteria 1.

If the Sig. (P-Value) < 0.05: The data are not normally distributed, and the Mann-Whitney Test is used.	If the Sig. (P-Value) > 0.05: The data are normally distributed, and the Independent Sample T-Test is used.

Once it is confirmed that the data are not normally distributed, the next step to determine whether there is a significant difference in environmental awareness between organic and non-organic farmers is to use the

Mann-Whitney Test. The Mann-Whitney Test is a non-parametric statistical test used to compare two independent groups when the assumption of data normality is not met. In the analysis using the Mann-Whitney test, the data from both groups are ranked as the basis for comparison. The Mann-Whitney test will then provide a U-statistic value, which will be tested against a critical value or used to calculate the p-value (**Table 5**).

Table 5. Decision-making criteria.

If the Asymp. Sig. (2-tailed) value < 0.05: There is a significant difference in environmental awareness between organic and non-organic farmers.	If the Asymp. Sig. (2-tailed) value > 0.05: There is no significant difference in environmental awareness between organic and non-organic farmers

3. Result and Discussion

3.1. Farmers Characteristics

3.1.1. Age

Age is a measurement that affects a person's physical condition [28]. As people age, their decision-making behavior becomes more prudent, as older individuals are more cautious about excessive spending, which could otherwise become burdensome [29]. This study shows that in total, most are at the age of 60–76 years, while the most organic rice farmers are at the age of 44–59 years with 44.7%, and non-organic rice farmers at the age of 60–76 years with 50% (**Table 6**). In general, farmers in Indonesia are old, many young people are reluctant to work as farmers. This issue is important in future agricultural development efforts.

Table 6. Farmer age.

No	Age (years)	Organic Rice		Non-Organic Rice		Total	
		Freq	Percent	Freq.	Percent	Freq.	Percent
1	28–43	17	11.3	3	3.0	20	8.0
2	44–59	67	44.7	47	47.0	114	45.6
3	60–76	66	44.0	50	50.0	116	46.4
Total		**150**	**100.0**	**100**	**100.0**	**250**	**100.0**

3.1.2. Educational Level

The level of education refers to the formal educational attainment recognized by the Department of Education as a means for individuals to develop their potential in terms of spirituality, self-control, personality, intelligence, noble character, and necessary skills for personal and societal benefit [30].

Many farmers in Indonesia today are not highly educated, in fact, many of them have only graduated from elementary school. In this study, in total, elementary school and senior high school have the same percentage of 32.8% (**Table 7**). Organic rice farmers showed the most in elementary schools with 34.7%, while non-organic rice farmers in senior high schools with 35%. This is quite unique in showing the distribution of different education levels between organic and non-organic rice farmers.

Table 7. Farmers education level.

No	Education	Organic Rice		Non-Organic Rice		Total	
		Freq	Percent	Freq.	Percent	Freq.	Percent
1	No School	9	6.0	5	5.0	14	5.6
2	Elementary School	52	34.7	30	30.0	82	32.8
3	Junior High School	38	25.3	25	25.0	63	25.2
4	Senior High School	47	31.3	35	35.0	82	32.8
5	University	4	2.7	5	5.0	9	3.6
Total		**150**	**100.0**	**100**	**100.0**	**250**	**100.0**

3.1.3. Land Area

Land area refers to the total area used for planting or carrying out farming processes, which determines the yield obtained by farmers [31]. If the land area increases, the farmer's Income will also increase, and conversely, if the land area is small, the Income obtained will be lower.

Table 8 illustrates the land area owned by organic and non-organic rice farmers. Among organic rice farmers, 23.4% have land areas of less than 1,000 m^2, and 37.3% have above 2,501 m^2. As for non-organic rice farmers, it is dominated by a land area of more than 2,501 m^2. In Indonesia itself, the majority of farmers own small land, even under 1,000 m^2. Small land conditions hamper efforts to increase production or apply technology.

Table 8. Farmers land area data.

No	Land Area (m^2)	Organic Rice		Non-Organic Rice		Total	
		Freq	Percent	Freq.	Percent	Freq.	Percent
1	<1,000	35	23.4	25	25.0	60	24.0
2	1,000–1,500	28	18.7	23	23.0	51	20.4
3	1,501–2,000	23	15.3	9	9.0	32	12.8
4	2,001–2,500	8	5.3	7	7.0	15	6.0
5	>2,501	56	37.3	36	36.0	92	36.8
Total		**150**	**100.0**	**100**	**100.0**	**250**	**100.0**

3.1.4. Farmers Income

Income refers to the total earnings received by the producers in the form of money from the sale of goods they produce. Income is calculated by multiplying the quantity produced by the selling price of the product. The majority of farmers in Indonesia are classified as underprivileged groups with relatively small incomes. The study shows that both organic rice farmers and non-organic rice farmers, are dominated by income of IDR 1,650,001–IDR 9,020,000 with 50.0% and 71.0% respectively (**Table 9**).

Table 9. Income farmers data.

No	Income (IDR)	Organic Rice		Non-Organic Rice		Total	
		Freq	Percent	Freq.	Percent	Freq.	Percent
1	<1,650,000	57	38.0	3	3.0	60	24.0
2	1,650,001–9,020,000	75	50.0	71	71.0	146	58.4
3	9.020.001–16,390,000	10	6.7	11	11.0	21	8.4
4	16,390,001–23,760,000	5	3.3	9	9.0	14	5.6
5	>23,760,000	3	2.0	6	6.0	9	3.6
Total		**150**	**100.0**	**100**	**100.0**	**250**	**100.0**

3.2. Environmental Awareness

Farmers' awareness of environmental sustainability is essential to achieving sustainable agriculture. As the primary actors in land management, farmers hold significant responsibility to ensure that their agricultural activities not only meet food production needs but also protect the surrounding ecosystems.

Unsustainable agricultural practices, such as excessive use of chemical fertilizers and pesticides, burning fields, or deforestation without reforestation, can lead to soil degradation, water pollution, and loss of biodiversity. Conversely, adopting environmentally friendly agricultural practices such as using organic fertilizers, crop rotation, and water conservation can enhance productivity while maintaining ecosystem balance [32].

3.2.1. Average Score Environmental Awareness

The average score obtained is an accumulation of all the scores achieved for each environmental awareness indicator. This score provides a general overview of farmers' attitudes and perceptions toward sustainable rice farming practices, as well as their level of concern for environmental aspects in the agricultural process.

The table shows the different scores for each of the seven indicators. For environmental impact knowledge, organic farmers scored an average of 4.77, while non-organic farmers scored 4.05, both in the high category (**Table 10**). For soil management, organic farmers scored 4.49, and non-organic farmers scored 4.12, both high. In water management, organic farmers scored 4.54, while non-organic farmers scored 4.22, both high. For the use of pesticides and fertilizers, organic farmers scored 4.81, while non-organic farmers scored 4.18, both high. In education and environmental support, organic farmers scored 4.66, and non-organic farmers scored 4.21, both high. Lastly, in future goals, organic farmers scored 4.77, and non-organic farmers scored 4.22, both high. Overall, although both groups of farmers achieved high scores, organic farmers demonstrated a greater commitment to sustainability and environmental protection. Organic farming practices offer various long-term benefits for water, soil, and air quality, as well as human health.

Table 10. Farmers' average scores of environmental awareness.

No	Indicator	Farmer Scores and Criteria			
		Organic Rice	**Criterion**	**Non-Organic Rice**	**Criterion**
1	Environmental Impact Knowledge	4.77	High	4.05	High
2	Soil Management Indicators	4.49	High	4.12	High
3	Water Management	4.54	High	4.22	High
4	Use of Pesticides and Fertilizers	4.81	High	4.18	High
5	Education and Environmental Support	4.66	High	4.21	High
6	Future Goal	4.77	High	4.22	High

3.2.2. Normality Test

The normality test is used to determine whether a dataset follows a normal distribution. This test is particularly important in statistical analysis because many statistical methods, such as parametric tests, assume that the data used must have a normal distribution. By conducting a normality test, researchers can ensure that these assumptions are met, making the analysis results more valid and reliable. If the data does not follow a normal distribution, researchers may consider data transformation or using non-parametric statistical methods as an alternative.

Based on the Shapiro-Wilk test results, all indicators (Environmental Impact Knowledge, Land Management, Water Management, Use of Fertilizers and Pesticides, Education and Other Support, and Future Goal) show a significance value of 0.000 (**Table 11**). This value is smaller than the commonly used significance level of 0.05. Understanding that the data is not normally distributed, subsequent analyses, such as the Mann-Whitney Test, will provide deeper insights into comparing the two groups of farmers. The results of this analysis are crucial for designing more inclusive policy strategies, such as improving education and training for farmers, as well as interventions that support sustainable agricultural practices across various regions.

Table 11. Result normality test.

Indicator	Sig (Shapiro-Wilk)
Environmental impact knowledge	0.000
Soil management	0.000
Water management	0.000
Use of fertilizers and pesticides	0.000
Education and other support	0.000
Future goal	0.000

3.2.3. Environmental Impact Knowledge Indicator

Table 12 shows the Mann-Whitney test results for the environmental impact knowledge of organic and non-organic farmers. This test is used to compare the knowledge levels between the two groups, helping to assess whether there are significant differences in their understanding of the environmental effects of agricultural practices. The results presented in the Table 12 highlight whether organic and non-organic farmers differ in their awareness of the environmental consequences associated with their farming methods [33].

Table 12. Environmental impact knowledge indicator results from SPSS.

Environmental Impact Knowledge Indicator	
Mann-Whitney U	2294.000
Wilcoxon W	7344.000
Z	−9.462
Asymp. Sig. (2-tailed)	**0.000**

For the Environmental Impact Knowledge indicator, the results obtained from the Mann-Whitney test show an Asymp. Sig. (2-tailed) value of 0.000. Based on the testing criteria, since the significance value is less than 0.05, it can be concluded that there is a significant difference between the two groups. Organic farmers are generally more educated and have a deeper understanding of environmental sustainability, often engaging in more environmentally friendly agricultural practices. Conversely, non-organic farmers tend to have less awareness of the long-term impacts of using non-organic fertilizers on the environment. In many cases, they may focus more on short-term yields without considering the ecological consequences

3.2.4. Soil Management Indicator

Farmers' understanding of soil management is crucial in maintaining agricultural sustainability. This includes knowledge of how to preserve soil fertility, prevent erosion, and manage nutrient levels to ensure long-term agricultural productivity. Effective soil management practices, such as crop rotation, composting, and the use of organic fertilizers, contribute to maintaining soil health and enhancing crop yields while minimizing environmental degradation [34].

For the land management indicator, the test shows an Asymp. Sig. value of 0.000, the same as the previous indicator, which means it is less than 0.05. This indicates a significant difference in environmental awareness between organic and non-organic farmers for the environmental awareness indicator (**Table 13**). Organic farmers often use methods such as crop rotation, natural compost fertilizers, and practices that emphasize biodiversity and the integration of nature into their farming systems. These approaches enrich and sustainably maintain soil quality. In contrast, non-organic farmers frequently employ techniques that, when continued over time, lead to soil fertility decline and soil quality degradation.

Table 13. Farmers Soil Management Indicator results from SPSS.

Soil Management Indicators	
Mann-Whitney U	5128.000
Wilcoxon W	10178.000
Z	−4.254
Asymp. Sig. (2-tailed)	**0.000**

3.2.5. Water Management Indicator

Good water management is crucial for agricultural sustainability and meeting the needs of the community [35]. This includes the use of irrigation techniques to optimize water usage, reduce waste, and monitor water quality to maintain health and environmental standards. Proper water management ensures that agricultural activities do not deplete water resources or negatively impact the ecosystem, while also ensuring that there is enough clean water for future generations. Effective strategies, such as rainwater harvesting, drip irrigation, and water recycling, can significantly improve water use efficiency in farming.

The value obtained from the Asymp. in the Mann-Whitney test is 0.000, which means it is less than 0.05. Based on the Mann-Whitney test criteria, this indicates a significant difference in environmental awareness between organic and non-organic farmers (**Table 14**). Organic farmers often adopt sustainability principles such as water-efficient irrigation, rainwater harvesting, and farming practices that reduce the risk of water pollution. In contrast, non-organic farmers, who rely more on chemical fertilizers and pesticides, may not fully consider the impact of chemical use on water quality. Excessive use of pesticides and chemical fertilizers can pollute waterways, degrade groundwater quality, and increase dependence on intensive irrigation systems, which can deplete water resources unsustainably.

Table 14. Water Management Indicator results from SPSS.

Water Management Indicators	
Mann-Whitney U	4757.000
Wilcoxon W	16082.000
Z	−4.948
Asymp. Sig. (2-tailed)	**0.000**

3.2.6. Fertilizer and Pesticide Use Indicator

The use of fertilizers and pesticides requires attention in farming, as farmers' awareness of this is crucial [36]. Knowledge of the correct dosage and timing for applying fertilizers to the crops, as well as adhering to guidelines related to organic or chemical fertilizers and pesticides, is essential [37].

For the indicator of fertilizer and pesticide use, the Asymp. Sig. (2-tailed) value is 0.000. Based on the testing criteria in the Mann-Whitney test, this means there is a significant difference in environmental awareness between organic and non-organic farmers for this indicator (**Table 15**). Organic farmers, who prioritize sustainability and environmental health, tend to avoid the use of chemical fertilizers and synthetic pesticides. They prefer using organic fertilizers, such as compost or green manure, and manage pests naturally through methods such as crop rotation, the use of natural predators, or integrated pest management (IPM) techniques. On the other hand, non-organic farmers often rely on chemical fertilizers and synthetic pesticides to increase their agricultural yields. While these methods can boost productivity in the short term, excessive use of chemicals can damage soil structure, reduce soil fertility in the long term, and pollute air and water. If not carefully managed, these practices can lead to harmful environmental impacts, such as soil degradation, waterway pollution, and a loss of biodiversity.

Table 15. Fertilizer and pesticide use indicator results from SPSS.

Indicators of Fertilizer and Pesticide Use	
Mann-Whitney U	150.000
Wilcoxon W	11475.000
Z	−13.614
Asymp. Sig. (2-tailed)	**0.000**

3.2.7. Education and Environmental Support Indicator

Education and environmental support are drivers of transformation toward sustainable agriculture [38]. Education and environmental support bridge knowledge gaps, supporting sustainable practices across various sectors, including agriculture [39]. By strengthening education and support, we can encourage farmers to shift from conventional farming methods, which often harm the environment, to more sustainable approaches that can maintain ecosystem balance in the long term. **Table 16** shows the data related to the impact of education and environmental support on the adoption of sustainable farming practices by farmers.

Table 16. Education and environmental support indicator results from SPSS.

Education and Other Support Indicators	
Mann-Whitney U	951.500
Wilcoxon W	6001.500
Z	−11.818
Asymp. Sig. (2-tailed)	**0.000**

For the education and environmental support indicator, the Asymp. Sig. (2-tailed) value is 0.000, which, based on the Mann-Whitney test criteria, is less than 0.05. This indicates a significant difference in environmental awareness between organic and non-organic farmers for this indicator. Organic farmers tend to receive more education and support related to sustainable farming practices, such as training and extension services on environmentally friendly agricultural techniques, which support the efficient management of natural resources. In contrast, non-organic farmers often have limited access to education that emphasizes sustainability and are more focused on increasing yields through the use of chemicals. This difference highlights the importance of enhancing education for non-organic farmers so they can adopt more environmentally friendly and sustainable methods.

3.2.8. Future Goal Indicator

Planning for future goals is crucial, as it helps determine the objectives to be achieved in the future [40]. Farmers use environmentally friendly products as a step toward better sustainable agriculture. In the context of agriculture, good planning allows farmers to set long-term goals that support their sustainability and well-being, as well as the surrounding environment.

For the future goals indicator, the Asymp. Sig. (2-tailed) value is 0.000, which is less than 0.05. Based on the Mann-Whitney test criteria, this indicates a significant difference in environmental awareness between organic and non-organic farmers for this indicator (**Table 17**). Access to information and training related to sustainable agriculture can also influence farmers' future goals. Organic farmers are more often involved in communities that promote environmentally supportive farming and receive deeper education on how to maintain ecological balance in the long term. In this regard, higher awareness and understanding of the importance of sustainability can guide them to make more environmentally friendly choices for the future.

In this future goal, we can see that organic farmers play a significant role in supporting global agricultural sustainability trends by using organic materials as production inputs. The use of organic materials, such as compost, organic fertilizers, and biological pest control techniques, not only maintains ecosystem balance but also reduces reliance on chemicals that can harm the environment. Organic farmers contribute to sustainability by minimizing negative impacts on soil, water, and air, while simultaneously enhancing soil fertility and biodiversity.

Table 17. Future goal indicator results from SPSS.

Future Goal Indicator	
Mann-Whitney U	187.500
Wilcoxon W	5237.500
Z	−13.315
Asymp. Sig. (2-tailed)	**0.000**

On the other hand, non-organic farmers also have the opportunity to adopt aspects of sustainability from organic farming. Although they may still rely on chemical fertilizers and pesticides in some areas, they can incorporate sustainable practices from organic farming. For instance, by-product outputs or waste from organic farming, such as rice straw, can be repurposed as a valuable resource. Rice straw, often considered agricultural waste, can be processed into biochar, which helps improve soil quality by adding organic carbon. Additionally, rice straw can be used to produce biogas, a renewable energy source that reduces reliance on fossil fuels.

By adopting these methods, non-organic farmers can not only reduce agricultural waste but also contribute to more efficient and environmentally friendly resource management. This approach opens opportunities for creating a more sustainable agricultural system, where agricultural waste is not wasted but can be repurposed to produce useful and profitable products. Therefore, both organic and non-organic farmers play a role in driving the shift toward more environmentally friendly and sustainable farming practices.

The support from the Karanganyar Regency government for organic farming, such as providing organic fertilizer facilities and certifying farmland, is an example of policies that support agricultural sustainability. These policies not only facilitate farmers in adopting organic farming but also provide economic incentives that encourage them to shift to more environmentally friendly practices. In the context of global agricultural sustainability, this highlights the importance of integrating policies and economic incentives to address environmental challenges. With the right policies, the government can encourage farmers to adopt sustainable farming practices that support ecosystem balance and long-term yields [41].

4. Discussion

This study shows significant differences in environmental awareness between organic and non-organic farmers in Java, as shown by the results of the Mann-Whitney analysis. Factors such as environmental impact knowledge, soil and water management, fertilizer and pesticide use, environmental education and support, and future goal planning provide consistent results, where organic farmers score higher [42]. This can be explained by organic practices that directly support environmental sustainability, while non-organic farmers often still rely on chemical inputs to maintain productivity (7). These results emphasize the importance of an ecosystem-based approach in increasing environmental awareness [43].

However, economic challenges are the main obstacle for non-organic farmers in adopting environmentally friendly practices. The economic sustainability of organic farming often depends on better market access and premium prices that are not necessarily accessible to all farmers [44]. Additionally, factors such as the small size of the land, education level, and lack of training can limit farmers' ability to make the transition to organic practices. The study shows that although non-organic farmers have high environmental awareness, they still face a dilemma between meeting market demand and minimizing environmental impact.

In the context of policy, these results open up opportunities for government intervention to increase support for non-organic farmers in reducing the use of chemicals [45]. Training programs, economic incentives, and subsidies for green inputs can help accelerate the adoption of sustainability practices. Instead, the success of organic farmers needs to be replicated through community-based learning and the development of a broader marketing network. Increasing education and environmental awareness at the community level can also be a long-term strategy to support the sustainability of the agricultural sector in the region.

This study demonstrates that organic farming practices significantly enhance environmental awareness compared to non-organic methods. In an international context, these findings are particularly relevant to developing countries, such as India and Nigeria, which face environmental degradation challenges due to intensive chemical-based agriculture. The environmental awareness training strategies and policy support implemented in Central Java—such as subsidized organic fertilizers and land certification—can serve as a model to accelerate the global transition toward sustainable agricultural systems, aligning with the Sustainable Development Goals (SDGs), particularly Climate Action (Goal 13) and Life on Land (Goal 15) [46].

This topic presents an interesting discussion to explore further, highlighting the important issue of the low awareness among non-organic farmers about the benefits and potential of organic farming. This discussion opens up opportunities to delve deeper into how education can be improved for non-organic farmers to become more open to sustainable farming practices, as well as how government policies can facilitate this transition. Additionally, the opportunity for organic farmers to expand into international markets through organic certification is another relevant and engaging topic to discuss, especially considering the importance of policy support in promoting agricultural sustainability.

Finally, this study makes an important contribution to highlighting the relationship between agricultural methods and farmers' environmental perspectives [47]. The difference in scores across all indicators shows that the transition to greener agriculture requires a holistic approach, covering social, economic, and technical aspects. For further study, it is important to explore other structural factors such as the influence of policies, supporting infrastructure, and consumer preferences towards eco-friendly products. This effort will strengthen understanding of the dynamics between agricultural practices, environmental awareness, and long-term sustainability in the agricultural sector.

5. Conclusions

Environmental awareness among organic and non-organic farmers was evaluated using six key indicators: knowledge of environmental impacts, land management, water management, environmental education and support, the use of fertilizers and pesticides, and future goals. Both groups demonstrated high average scores across all indicators, suggesting that, despite the continued use of chemicals by non-organic farmers, they recognize the importance of environmental conservation. This highlights a growing awareness of the connection between agricultural practices and ecosystem sustainability, even though the implementation of sustainable practices remains limited. Economic constraints often present a major challenge for non-organic farmers in adopting environmentally sustainable methods. Many face a difficult trade-off between maintaining crop productivity to meet market demands and minimizing environmental harm. In contrast, organic farmers consistently apply eco-friendly practices, as these align with the core principles and philosophy of organic farming. This distinction underscores the role of farming methods in shaping environmental practices. The results of the Mann-Whitney test, conducted using SPSS, revealed a significance value of 0.000 for all indicators, indicating a final result of < 0.05. like, the support from the Karanganyar Regency government for organic farming, such as providing organic fertilizer facilities and certifying farmland, exemplifies policies that support agricultural sustainability. These policies not only facilitate the transition to organic farming but also provide economic incentives that encourage farmers to adopt more environmentally friendly practices. In the context of global agricultural sustainability, this highlights the importance of integrating policies and economic incentives to address environmental challenges. With the right policies, the government can motivate farmers to adopt sustainable farming practices that support ecosystem balance and long-term agricultural yields. This confirms a statistically significant difference in environmental awareness between organic and non-organic farmers. These findings provide robust empirical evidence that farming practices directly influence farmers' perspectives and behaviors regarding environmental issues. Overall, the study emphasizes the need for targeted interventions to address the economic challenges faced by non-organic farmers, enabling a broader adoption of sustainable practices. It also highlights the potential of organic farming as a model for promoting environmentally conscious agriculture.

Author Contributions

Conceptualization, Z.R., N.R., T., H.W.P., R.L. and Y.E.F.; methodology, Z.R., and N.R.; formal analysis, R.A.A.; investigation, Z.R. and R.A.A.; resources, Z.R.; data curation, R.A.A.; writing—original draft preparation, Z.R.

and R.A.A.; writing—review and editing, Z.R. and R.A.A. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board (or Ethics Committee) of Research and Innovation Institute, Universitas Muhammadiyah Yogyakarta (Letter No: 963/D.2-VIII/LRI/XII/2024 on 1 July 2024).

Informed Consent Statement

Informed consent was obtained from all participants involved in this study, including farmers, traders, and consumers. Prior to participation, each participant was provided with a detailed explanation of the research objectives, the methods employed, the potential benefits, and any risks that might arise. Participants were given sufficient time to understand the information and ask questions before voluntarily agreeing to participate. All data collected during the study were securely stored to ensure participant confidentiality and were used solely for academic purposes in accordance with the consent provided.

Data Availability Statement

The data supporting the findings of this study are available upon reasonable request to the corresponding author. This includes anonymized data to ensure the confidentiality of participants, such as farmers, traders, and consumers. The available data comprise interview results, survey responses, and statistical analyses utilized in this study. However, raw data such as personal information or identifiable data of participants are not publicly accessible due to privacy and ethical considerations. Any requests for data access will be evaluated based on the purpose of the data use and its alignment with the consent provided by participants.

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Conflicts of Interest

The authors declare no conflict of interest.

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