

Millennial Generation's Perception on Organic Rice Farming Sustainability in Yogyakarta, Indonesia

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Abstract. The characteristic of farming in Indonesia and other developing countries is predominantly small-scale farming with family members as the main labor sources. Organic rice farming as an environmentally friendly agricultural effort is also included in this family-oriented farming. Currently, a large proportion of local farmers fall into the category of the elderly individuals. Meanwhile, the young generation or so-called millennials of the rural communities indicates not to continue their parents farm business. This study aimed to determine the perception of the millennial generation towards organic rice farming and analysis the determinant factors. Quantitative descriptive research was carried out by interviewing 40 respondents from millennial generation in Sleman Regency, Yogyakarta. Multiple linear regression analysis was used to determine the factors that influencing the millennial generation's perception to organic rice farming. The results showed that the millennial generation's perception towards organic rice farming was included in the good category. Socialization activities and involvement in farming improved millennials perception towards organic rice farming in the social aspect. Socialization through social media also beneficial for the economic aspect of organic farming according to millennials. Thus, for the sustainability of organic farming, millennials need to get education through the practice of being directly involved in the organic rice farming process and socialization through social media.

1 Introduction

Rice is a type of cereal crop and an essential agricultural commodity that serves as a staple food in the form of rice grains. Rice has strategic roles in stabilizing national food security, economy, and politics [1]. Therefore, rice commodities need an attention in development so that Indonesia's food security can be maintained. In order to achieving food security,

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sustainable agriculture needs to be performed with consideration in several aspects, namely: environmental awareness, economic value, and social characters or social conditions of the community. The need of a sustainable agriculture in Indonesia is being emphasized, as in 2019, the rice production only produced about 54.60 million tons of milled dry grains, which represents a decrease of about 4.60 million tons or 7.76 percent compared to 2018 [2].

Organic farming is an effort to achieve sustainable agriculture, providing a solution to declining conditions of the agricultural environment due to the use of synthetic materials. Organic farming is considered one of the environmentally friendly production processes, which aims to maintain ecological sustainability in accordance with the philosophy of "back to nature" or "in harmony with nature". This approach mainly focuses on agricultural practices that prioritize the utilization of external inputs, which also considering the regional conditions to create locally adjusted systems [3]. In addition to the benefits and sustainability of organic farming, higher quality of the produced rice grain also could improve farmers' income.

Human resources play a crucial role that needs significant attention in the development of sustainable agriculture and food security. The quality of human resources in agricultural sectors can be seen from the high level of productivity of farmers. In addition, the rate of acceleration of human resources affects cost efficiency, net profit, gross income, and other indicators produced [4]. One of the determining factors of the quality of agricultural human resources is the age of farmers [5]. According to the data of Indonesian Agricultural Census between 2003 and 2013, the agricultural labor force was predominantly consisted of individual workers aged 40 years and above, whilst the number of young workers was relatively low and tended to decline rapidly within 10 years [1][6]. The structure of the labor force in agriculture based on age has undergone a shift which proves the decreasing number of young workers in the agricultural sector. Meanwhile, young generations or often referred as millennials (a person born between 1981 and 1996) has less desire to make agriculture as their profession or way of life [7]. The agricultural labor issue bears resemblance to demographic crisis [8]. This issue could have an impact on the sustainability of agricultural development, especially regarding agricultural productivity, market competitiveness, rural economic capacity, and could further threaten the food security and sustainability of the agricultural sector [1].

In Indonesia, the majority of farmers who engaged organic rice farming are elderly farmers. The agricultural labor issue also impacted organic rice farming as the millennial generation, especially the descendant of the current farmers, are willing to choose working outside agricultural sectors such as trade and industry [9]. The declining of young farmers are caused by the dissatisfied of the overall income from the farming business compared to the employment opportunities outside of agriculture, which also need a certain level of education that they could not acquire in the rural areas [10]. Whether the agricultural sector profession is no longer attractive to the younger generation is currently an important issue that need to be discussed. Therefore, the main objective of this study is to determine the millennial generation's perception of the sustainability of organic rice farming. Further exploration of the determinants of perception is expected to be a consideration in encouraging the role of the millennial generation in sustainable agricultural development.

2 Research Method

The determination of the study location was carried out using purposive sampling techniques. Sleman Regency, Special Region of Yogyakarta, was selected as the research location considering the number of certified organic rice farmer groups in this location is higher than the other regencies in Yogyakarta. Farmer sampling was carried out using purposive sampling techniques where the sample of respondents was specifically selected based on the

category of millennial generation related to rice farming including organic rice farmers and families of organic rice farmers in Sleman Regency. In total there are 40 respondents consisting of millennials aged between 22 and 42 years, including organic rice farmers and farmer's descendant, from five farmer groups in four sub-districts in Sleman Regency, namely Sleman, Cangkringan, Pakem, and Berbah Districts.

The research method was using quantitative descriptive method, which utilizes collective numerical data in the analysis to describe and provide an overview of the perceptions of the millennial generation towards organic rice farming in Sleman Regency. Primary and secondary data from the Sleman Regency were used in the research study. Primary data was obtained by directly interviewed respondents or resource persons using a list of questions (questionnaires). The questionnaires included several aspects of organic rice farming sustainability, including social, economic, and environmental aspects. Secondary data included the general state of the study area, economic, and social circumstances.

In this study, a descriptive analysis was carried out to determine the perceptions and attitudes of the millennial generation towards organic rice farming by making 5 categories, namely: very good, good, good enough, bad, and worst. low.

The interval formula used in measuring with categories of indicators was:

$$\begin{aligned} \text{Range (R)} &= \text{Highest score} - \text{lowest score} / \sum \text{Category} \\ &= (5-1)/5 \\ &= 0.8 \end{aligned} \quad (1)$$

The factors that influence the millennial generation's perception of organic rice farming in Sleman Regency were analyzed using multiple linear regression model as follows:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + d_1 D_1 + d_2 D_2 + d_3 D_3 + d_4 D_4 + e \quad (2)$$

Information:

Y_1 = Social perception

Y_2 = Economic perception

Y_3 = Environmental perception

β_0 = Population intercept

β = Regression coefficient

X_1 = Age

X_2 = Education level

X_3 = Use of social media

X_4 = Socialization

D_1 = Dummy gender $\square \square D_1=1$ male, $D_1=0$ female

D_2 = Dummy parents' employment status $\square \square D_2=1$ Farmer, $D_2=0$ Non farmer

D_3 = Dummy parents' land ownership $\rightarrow D_3=1$, Owning land, $D_3=0$ Not owning land

D_4 = Dummy farm involvement $\rightarrow D_4=1$ ever, $D_4=0$ never

e = Error

3 Results and Discussion

3.1 Millennial Perceptions

The perception of the millennial generation is a point of view, response, or assessment given by the millennials regarding the implementation of organic farming system. In this study, the perception of the millennial generation towards organic rice farming was measured by three indicators, namely social, economic, and environment. The results of the millennial

generation's perception analysis were presented in Table 1. According to the results, in the social aspect, the support of organic rice farming by the social environment scored an average good score of 3.60 value. This result indicated that the social neighbourhood surrounding organic rice farming location supported millennials to engage organic rice farming. In the economic aspect, there were three indicators that obtained *good enough* category, including high farm income, high farm profits, and low capital. Consumers are willing to pay for organic products at higher prices because the products are considered higher quality and safe for consumers [11]. Moreover, the result in Table 1 also showed that organic rice farming provides high farm income from the millennial generation's perception. Meanwhile, in the environmental aspects, all indicators resulted in *good* category, meaning that organic rice farming will improve environmental quality, especially soil fertility for sustainable agriculture [12].

Table 1. Millennial Generation's Perception of the Sustainability of Organic Rice Farming

No	Perceptual Indicators	Average Score	Category
<i>Social</i>			
1	Get assistance from extension workers	3.18	Good enough
2	Support for organic rice farming by families	3.38	Good enough
3	Support for organic rice farming by the social neighborhood	3.60	Good
4	Ease of access to extension workers	3.30	Good enough
<i>Economic</i>			
1	High farm income	2.80	Good enough
2	High farm profits	2.93	Good enough
3	Low capital	3.28	Good enough
4	More affordable facilities and infrastructure	3.58	Good
5	The price of organic rice products is stable	3.38	Good
<i>Environment</i>			
1	Soil conditions are favorable	4.08	Good
2	Favorable watering conditions	4.00	Good
3	Favorable climatic conditions	3.98	Good
4	Positive influence on the environment	4.10	Good
	Sum	45.55	Good
	Average	3.50	Good

3.2 Factors related to millennial perceptions.

The determinants of millennial perceptions estimated in this study were age, education, socialization, social media use, gender, parents' occupation and parents' land ownership. The results of multiple regression analysis were presented in Table 2.

The coefficient of determination (Adj R-Squared) value on the millennial's perception of organic rice sustainability in the the social aspect was 0.568. This showed that the social aspects of organic rice farming sustainability can be explained by about 56.8% using the independent variables while the remaining 43.2% is explained by other variables that are not included in this study. This result was the highest compared to the other two aspects, economic and environment, which scored about 0.411 and 0.047 for the Adj R-Squared, respectively. The results of F-test on social and economic aspects show that the independent variables simultaneously have a significant effect on the social and economic aspects of organic rice farming sustainability derived from the perception of the millennial generation (significance value < 0.05). Meanwhile, the variables were insignificant to the environment

aspect of the organic rice farming sustainability according to millennials perception (significance value > 0.05).

Table 2. Determinant Factors of Millennial Perception on Organic Rice Farming Sustainability

Variables	Social		Economic		Environment	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
Age	-0.287	0.432	0.247	0.547	-0.027	0.889
Education level	0.575	0.281	-0.258	0.665	-0.196	0.487
Socialization	0.504	0.006***	0.516	0.012**	0.154	0.102
Use of social media	0.049	0.655	0.241	0.060*	0.000	0.994
Dummy gender	0.614	0.467	-1.199	0.211	0.012	0.978
Dummy parents' occupation	0.792	0.411	-0.308	0.775	0.645	0.210
Dummy parents' land ownership	0.602	0.595	-0.310	0.808	0.476	0.429
Dummy farm involvement	2.267	0.024**	0.337	0.756	-0.227	0.658
R-Squared		0.657		0.531		0.243
Adj R-Squared		0.568		0.411		0.047
F-test		7.410		4.395		1.243
Prob (F-test)		0.000		0.001		0.308

Remarks: *** Significant at $\alpha = 1\%$; ** Significant at $\alpha = 5\%$; * Significant at $\alpha = 10\%$

3.2.1 Perception of sustainability of social aspects

The variable of socialization has a significant effect on the social aspect of organic rice farming sustainability according to millennial generation (T-test analysis P-value < 0.05) (Table 2). These results show that socialization to the millennial generation have a positive and significant influence on the social aspects of organic rice farming in Sleman Regency. Socialization about agricultural practices especially the organic approach improves the perception of millennials towards agricultural sector. In contrast, youth and men, unmarried people, people without mobile phones, youth who do not participate in community development initiatives, and youth without leadership roles have a higher tendency to have doubt in organic farming sustainability [13].

The involvement in farming using dummy variable also had a significant effect the social aspect of organic rice farming sustainability according to millennial generation. This is indicated by a significance value of $0.024 < 0.05$ with a confidence level of 95% (Table 2). The agricultural training or involvement for millennial generation positively affect better perceptions of them towards organic rice farming sustainability.

According to these results, the millennial generation who dominate the working age in Indonesia can maximize their role in the agricultural sector in rural areas through the development of entrepreneurship based on the use of internet networks [14] as digital-based agricultural cultivation become the preference for the younger farmers [15][15]. Millennials and Gen Z (people born between 1996 and 2010) generations is undeniably the most active in using the internet for social media [16]. Therefore, several efforts are needed to encourage young people to work in the agricultural sector through socialization and education about agriculture and introducing technological innovations and cultivation to anticipate the impact of climate change on the agricultural sector [17].

Innovative models developed with a new perspective on the needs of the millennial generation with new creations and new meanings are expected to have an impact on sustainability which indirectly strengthen their character [18]. The character of the millennial generation must have independence, competence, and innovation so that they work for achievement, appreciation, responsibility, honesty, and cooperation [19]. The requirements for the success of these farmers as entrepreneurs are due to their creativity, innovation, and ability to collaborate [20], even it is suggested that a paradigm shift should focus on implementing collaboration strategies [21]. Therefore it is necessary to take more intense rejuvenation measures of the old farmer generation, through national rural development programs [22].

3.2.2 Perception of sustainability of economic aspects

Socialization variables have a significant effect on the economic aspect of organic rice farming sustainability according to millennial generation (Table 2). Agriculture-based activities, in addition to generating employment, contribute directly and indirectly to the revitalization of other sectors as one of the key element in regional development [23]. However, most youth have a fairly good perception in terms of income, social status, and job comfort in the agricultural sector, but still in doubt about career development and future life security. The youth are concerned about the lack of careers and future life guarantees if they work in the agricultural sector. However, current young generation has better potential to be labor resources to develop agricultural development in the future [17]. These conditions cause the youth to migrate from rural to urban areas for searching of better job opportunities, from agricultural to non-agricultural sectors, as the former is physically demanding and resilient despite its high potential of generating employment through value chains [24].

The variable use of social media has a positive effect on the perception of sustainability in the economic aspect. Millennials are leveraging aspects of social media to influence how and where millennials leverage income [25]. Therefore, it is necessary to optimize the millennial generation by several steps: adopting a digital mindset, using new models, formulating new strategies, implementing effective strategies, and generating sustainability [26]. In addition, it is necessary to develop applications that work as a guide to help millennial farmers in decision making. The application framework can also be further enhanced to develop new features related to education, market information, and selling goods [27]. This needs to support a better understanding of the role of innovation in facilitating entrepreneurial-oriented farmers to perform better when facing dynamic markets [28].

3.2.3 Perception of sustainability of environmental aspects

According to the results in Table 2, there were no variables that have significant value to the environmental aspect of organic rice farming sustainability according to millennial generation. The available independent variables were not reliable enough to explain the environmental aspects, as none of the predictors were related to the environment. Environmental aspects should have a significant part of sustainable agriculture that must be understood by the younger generation. Therefore, sustainable farming typically has characteristics of higher incomes, applying more advanced technology, and more sustainable than the conventional farming. This suggests that a shift from conventional rice production to more diversified production systems using innovative technologies is necessary to sustain agricultural success and retain young people in the agricultural sector. [10]. In addition, the development of rural agrotourism businesses in the new generation of farmers has a significant positive impact on their willingness to participate in the development of rural tourism [29]. Therefore stakeholders need to build positive perceptions by improving existing

agricultural programs, training and incentives for young people [30]. In addition, education has a positive influence on young farmers to preserve their farm business [31].

4 Conclusions and Recommendations

Overall, the millennial generation's perception towards organic rice farming sustainability was included in the good category (overall score = 3.51). Factors that need to be considered in building a good perception for the millennial generation towards organic rice farming are socialization, and their involvement in organic rice farming activities. Their socialization activities and involvement in farming will improve their perception of organic rice farming in the social aspect. Socialization through social media will be better in improving their perception of economic aspects. Thus, for the sustainability of organic farming, millennials need to get education through the practice of being directly involved in the process of organic rice farming and socialization through social media. In addition, the millennial generation needs training in agribusiness innovation and entrepreneurship based on information technology and digital innovation in agriculture.

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