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Strategy for Development of Sustainable Organic Rice Farming: Case Study at Organic Farmers' Association "GATOS" Magelang Regency, Central Java

Eni Istiyanti*, and *Maulana* Ihsan Santoso

Department of Agribusiness, Faculty of Agriculture, Universitas Muhammadiyah Yogyakarta, Jln. Brawijaya, Kasihan, Bantul, Indonesia

Abstract. The demand for organic rice has increased over time. This situation is driven by a sense of security for consumers of organic rice because there is no chemical residue. However, consumer demand has not been able to be met by the Sawangan Organic Farmers Association because of limited land for organic cultivation. The research aims to formulate a strategy for developing sustainable organic rice farming based on internal and external factors. This research was conducted in Sawangan Organic Farmers Association with the consideration was the pioneer of organic rice farmer groups in Central Java, and already had an organic certificate. Respondents were 25 stake holders who had information and experience for the development of organic rice farming including farmer group administrators, people in charge of organic rice production and post-harvest fields, chairman, Agricultural Extension Center, Agricultural Office of Magelang Regency, consumers of organic rice products chosen purposively. The stages in formulating a strategy for developing organic rice farming are data collection stages: IFE and EFE; data analysis stages: SWOT and decision-making stages: QSPM. The results showed that the priority strategy for the development of organic rice farming partnering with restaurants, hotels or hospitals in Magelang Regency and campaigning to the community about the benefits and importance of organic rice certification

1 Introduction

Conventional agriculture, which requires extensive use of chemical fertilizers and pesticides, has a negative impact on the environment. Excessive use of pesticides results in pesticide residues which reduce soil fertility and have a negative impact on the health of farmers and consumers [1]. Organic farming systems can be an alternative environmentally friendly and sustainable farming system [2]. The environmental benefits obtained by implementing organic farming are that it makes it easier to cultivate the land and does not cause environmental pollution. Soil and environmental improvements because of organic farming can achieve technical efficiency [3].

* Corresponding author: eniistiyanti@umy.ac.id

Organic farming practices are very suitable for rice cultivation because they require fewer inputs and produce higher quality rice [4]. The advantages of organic rice are that it does not contain chemical residues, the texture of the rice is fluffier and has a longer shelf life and the selling price of rice is higher [5]. Apart from that, several studies show that the production and income of organic rice is higher than non-organic rice, as is the case in Sambi Boyolali Regency [6] and Serdang Bedagai Regency [7], Nepal [8] Cambodia [9] and Philippines [10].

Organic rice production in Indonesia is still small compared to community needs. In 2018, the land area for organic farming was 251,630.98 hectares out of 8,087,393 hectares of agricultural land. Meanwhile, the land area for organic rice commodities is 53,974.19 hectares [11]. Organic rice has a higher selling price compared to inorganic rice. The high price of organic rice, for some farmers, is one of the drivers for carrying out organic rice farming [12]. Rice derived from organic rice is quite popular with the public because it is considered healthy and safe for consumption [13].

Organic rice farming in Magelang Regency has become a model in the archipelago and several countries in Asia. Apart from large areas of land, farmers also continue to innovate to keep up with developments. In 2021, the area of organic rice land will be 107 ha with production of 535 tons and productivity of 5 tons/ha [14]. Magelang Regency has the Sawangan Organic Farmers Association (*Gabungan Tani Organik Sawangan* or GATOS) which oversees 34 farmer groups with a total membership of 1,730 farmers. GATOS facilitates organic rice farmers by providing seed assistance, providing training in making organic fertilizer and buying farmers' grain at a profitable price.

The development of organic rice is also supported by the development of agricultural technology such as compost processing, biological pesticides, agricultural machinery [15]. The demand for organic rice from time to time shows an increasing trend. This situation is driven by a sense of security for consumers of organic rice because there is no chemical residue. However, consumer demand has not been able to be met in Sawangan District, Magelang Regency because of limited land for organic cultivation and conversion from conventional to organic rice land takes a long time. Therefore, it is necessary to formulate a strategy so that organic rice farming can develop and be sustainable. The research aims to formulate a strategy for developing sustainable organic rice farming based on internal and external factors.

2 Research method

2.1 Technique for collecting respondents

The research was conducted by a survey at the Sawangan Organic Farmers' Association, Magelang Regency, Central Java, which was chosen purposively based on the consideration that GATOS was the pioneer of organic rice farmer groups in Central Java, and already had an organic certificate. Respondents were 25 stake holders who had information and experience for the development of organic rice farming including farmer group administrators, people in charge of organic rice production and post-harvest fields, chairman and representatives of GATOS, Agricultural Extension Center (*Balai Penyuluhan Pertanian* or BPP), Agricultural Office of Magelang Regency, consumers of organic rice products chosen purposively. The data used in this research consists of primary data obtained through interviews based on questionnaires and observations, as well as secondary data obtained by documenting data that has been processed by certain agencies or institutions, namely the Central Statistics Agency (*Badan Pusat Statistik* or BPS), BPP, GATOS and Sawangan District.

2.2 Technical analysis

The formulation of the organic rice development strategy was analyzed based on internal and external factors of the Sawangan Organic Farmers Association (GATOS), Magelang Regency. In formulating a strategy for developing organic rice farming, there are several stages of analysis, including [16] :

2.2.1 Data collection stage

a. IFE Matrix (Internal Factor Evaluation)
Conduct internal factor analysis by identifying the internal environmental factors of organic rice farming, namely strengths and weaknesses. Then the data obtained when identifying internal factors is entered into the IFE matrix in accordance with the steps for creating the matrix.

b. EFE Matrix (External Factor Evaluation)
Conduct external factor analysis by identifying external environmental factors for organic rice farming, namely opportunities and threats. Then the data obtained when identifying external factors is entered into the EFE matrix in accordance with the steps for making the EFE matrix.

c. IE Matrix
The IE matrix is used to determine the position of organic rice farming in GATOS. The position of organic rice farming can be determined by looking at the total score of the IFE and EFE matrices. From this matrix, the x and y axes are then used for the IFE and EFE matrices

2.2.2 Data analysis stage

This data analysis stage uses a SWOT (Strengths Weaknesses Opportunities Threats) matrix, which clearly describes the weaknesses and strengths as well as the opportunities and threats faced by GATOS. Strategy formulation using SWOT analysis will produce four alternative strategies, including:

a. SO strategy, namely a strategy that maximizes strength to obtain opportunities.
b. ST strategy, namely the strategy of using existing strengths to overcome threats.
c. WO strategy, namely minimizing weaknesses to gain opportunities.
d. WT strategy, namely minimizing weaknesses to overcome threats.

2.2.3 Decision making stage

After passing the data analysis stage, alternative strategies will be produced using the QSPM (Quantitative Strategic Planning Matrix). By entering the best results in the IFE and EFE matrices, then identifying them using the Total Attractiveness Score (TAS) with a value range of 1- 4. Based on these results, the development strategy attractiveness score is known. This alternative strategy will produce an appropriate arrangement of priorities produced by TAS, a strategy for developing organic rice farming in GATOS, Sawangan District, Magelang Regency.

3 Results and discussion

3.1 Profile of the Sawangan Organic Farmers' Association

The Sawangan Organic Farmers Association (GATOS) was established on October 22, 2012, with the assistance of the Sawangan District Agricultural Extension Center. In December 2013, it received its first organic rice certification, facilitated by the Magelang Regency Agriculture Service through the Seloliman Organic Certification Institute (LeSOS). This organic rice certification was successfully obtained with certified land covering an area of 250 ha and organic rice certification has been renewed in 2023 with certified land covering an area of 504 Ha. GATOS formed a cooperative which aims to improve the welfare of farmers in Sawangan District through the implementation of organic farming. This cooperative is an economic institution that has the principle of a member base where decision making is based on one person, one vote.

The support of the Magelang district government and its organic rice certification has made organic rice farming increasingly advanced. The number of members is 1,730 farmers and there are 38 farmer groups. GATOS provides facilities such as agricultural equipment such as hoes, tractors, organic liquid fertilizer (*Pupuk Organik Cair or* POC) hand sprayers, rice delivery transportation equipment as well as seed and organic fertilizer production facilities. Farmers are tasked with cultivating and planting rice in paddy fields and the harvest will be purchased by GATOS. The dried grain is then ground into rice using a machine in the cooperative. A superior organic rice farming product called 'Menthik Wangi'. Apart from that, the Sawangan Organic Farmers Association produces innovative organic rice in the form of red rice and black rice.

The vision of the Sawangan Organic Farmers Association is to improve the welfare of Sawangan District farmers by maintaining organic farming, caring for natural resources and helping consumers to live healthier lives by consuming chemical-free staple foods. The Sawangan Organic Farmers Association has been equipped with an organizational structure presented in Figure 1.

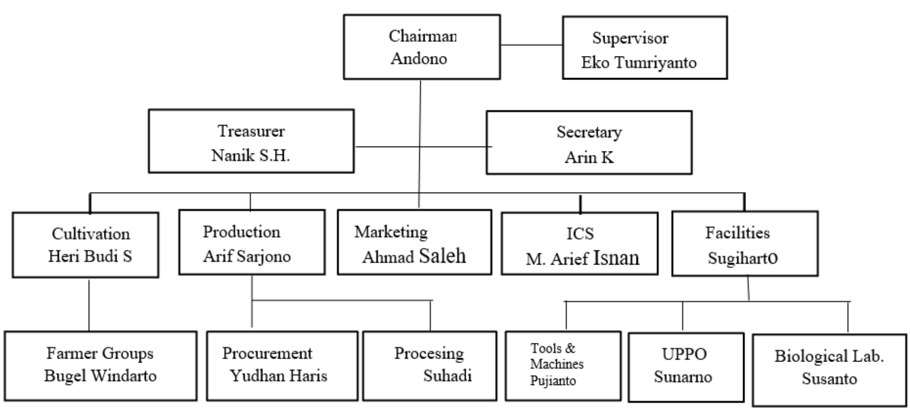

Fig.1. The organizational structure of Sawangan Organic Farmers Association

3.2 Internal factor condition

Internal factor analysis aims to identify the strengths and weaknesses contained in organic rice farming in Sawangan Organic Farmers Association

Table 1. Score of internal factors of Sawangan Organic Farmers Association

No.	Internal Factors	Amount	Ratings	Weigh	Score
Strengths:					
1	Availability of fertilizer quality	93	3.72	0.11	0.40
2	Use and mastery of agricultural machinery technology in production	91	3.64	0.10	0.38
3	Obtained organic rice certification	99	3.96	0.11	0.45
4	Motivation for rice farming organic	83	3.32	0.09	0.31
5	Facilities and infrastructure support	95	3.80	0.11	0.41
6	Production costs are lower than inorganic	93	3.72	0.11	0.40
7	Enough land for organic rice production	92	3.68	0.11	0.39
The total score of strengths					**2.73**
Weaknesses:					
1	Financial management or simple financial reports	39	1.56	0.04	0.07
2	Marketing is less extensive	42	1.68	0.05	0.08
3	Labor is expensive	41	1.64	0.05	0.08
4	Less consistent planting of organic rice commodities	39	1.56	0.04	0.07
5	Lack of education in farming	42	1.68	0.05	0.08
6	Decreased production due to high rainfall	26	1.04	0.03	0.03
The total score of weaknesses					**0.41**
The total score of internal factors					**3.14**

3.2.1 Strengths

Based on the results of the IFE (Internal Factor Evaluation) matrix analysis presented in table 1, it is known that the strength factor that gets the highest score (0.45) is the organic rice certification that it has. This makes it a very influential force in the internal environment of the Sawangan Organic Farmers Association, apart from that it also creates added value in organic rice farming. The weakness factor with the lowest score is the decline in organic rice production due to high rainfall with a score of 0.03. The presence of high rainfall makes organic rice production unstable and declines, so a strategy is needed to overcome the weaknesses presence by the Sawangan Organic Farmers Association.

Based on the Internal Factor Evaluation (IFE) analysis, it can be concluded that the total score of internal factors is 3.14 with a total strength score of 2.73, while weaknesses get a total score of 0.41. The total score of internal factors in GATOS is higher than in the Putra Mandiri Farmers Group in Linggarraja Village which has internal total score of 2.85 [17], higher than in Al Barokah Organic Farmers Association of Susukan District, Semarang which an internal total score of 2.69 [18] and higher than in Mitra Organik Farmer Group, South Lampung Regency which internal total score 2,93 [19]

The sustainability of the organic rice farming business of the Sawangan Organic Farmers Association is determined by the availability of production facilities, especially quality organic fertilizer, and the Magelang Regency government has helped with organic fertilizer. Apart from that, the government also helps in the form of a rice grinding machine that uses 4.0 technology with a large capacity so that when rice production is very large, it can be ground into rice quickly. This situation is profitable for farmers because they can immediately sell their organic rice.

The Sawangan Organic Farmers Association has had an organic certificate since 2013. Certification is a way to guarantee that the products produced comply with established standards. This certification aims to protect consumers and producers from unfair trade, counterfeiting and the use of inappropriate labels [20]. Having this certificate can increase consumer confidence so that it can expand market share and increase product prices.

Farmers' motivation in carrying out organic rice farming is quite high, and farmers are very consistent in planting organic rice. Motivation in cultivating organic rice is influenced by age, education level, land area and farming experience [21]. Farmers who are members of Sawangan Organic Farmers Association are given access to facilities and infrastructure for cultivating organic rice in the form of equipment such as hoes, pest sprayers, liquid organic fertilizer sprayers, and transportation to transport the harvest. This will make it easier for farmers to cultivate organic rice.

The production costs of organic rice are lower than inorganic because organic rice farming does not use chemical fertilizers and pesticides and cultivates the land organically, namely through minimal tillage [18]. This situation is in line with research conducted by [22] in East Lombok, [23] in Ende Regency, [24] in Nepal and [25] in Pakistan.

3.2.2 Weaknesses

The financial management implemented at the Sawangan Organic Farmers Association is still simple and manual. This is because administrators are generally old, and their education level is relatively low. Financial audits become difficult to carry out by external parties. Therefore, it is necessary for administrators to be given training in financial management.

The marketing of organic rice is still focused on regular customers, namely retailers, culinary souvenir businesses and households. Marketing is still done offline, so its reach is limited. If the Sawangan Organic Farmers Association can take advantage of advances in information technology and digital marketing to increase market share and promotional activities [26].

Organic rice farming requires more labor than non-organic rice. This situation will affect the large labor costs in organic rice farming. Labor costs in organic rice farming are the largest component, as is the case in Pakistan [25], Nepal [24] and Ende Regency[23]

During the Covid-19 pandemic, several members of the Sawangan Organic Farmers Association were less consistent in carrying out organic rice farming. Farmers substitute other commodities that are more needed by consumers, including ginger, chilies and cassava. This has an impact on reducing the supply of organic rice so that consumer demand cannot be met. Farmers do not receive enough education in farming, causing farmers to be unable to adopt modern technology and better agricultural methods. Farmers do not have adequate access to the latest information and knowledge on efficient and sustainable agricultural practices.

High rainfall has an impact on organic rice farming, because high rainfall and strong winds cause the rice to break so that the quality of the rice is not good, the selling price is low- and farming-income decreases. This situation also occurs in Deli Serdang Regency, where rainfall affects rice production and productivity [27].

3.3 External factor condition

External factor analysis aims to identify the opportunities and threats contained in organic rice farming in Sawangan Organic Farmers Association. Based on the EFE (External Factor Evaluation) matrix, the opportunity that gets the highest score is government support for organic farming, with the provision of quality seeds with a score of 0.40. Having quality seed assistance makes it easier for farmers to cultivate organic rice. The highest score for threats is fluctuations in input and output prices with a score of 0.28. An increase in input prices will increase production costs and can have an impact on decreasing farmer income.

Table 2. Score of external factors of Sawangan Organic Farmers Association

External factors		**Amount**	**Ratings**	**Weigh**	**Score**
Opportunities:					
1	Government support for organic farming	93	3.72	0.11	0.40
2	The selling price of organic rice is high	74	2.96	0.09	0.25
3	Training and research	86	3.44	0.10	0.34
4	Innovation in developing organic rice	85	3.40	0.10	0.34
5	Public awareness of organic products	70	2.80	0.08	0.23
6	Government assistance through the provision of seeds	87	3.48	0.10	0.35
7	Public confidence in organic products	85	3.40	0.10	0.34
The total score of opportunities					**2.25**
Threats:					
1	Reduced market demand	63	2.52	0.07	0.18
2	Pests and diseases	71	2.84	0.08	0.23
3	Fluctuations in input and output prices	77	3.08	0.09	0.28
4	Business competition with similar products	71	2.84	0.08	0.23
The total score of threats					**0.93**
The total score of external factors					**3.17**

Based on Table 2, the total score for external factors of opportunity is 2.25, while for threats the total score is 0.93. It can be concluded that the opportunities are greater than the threats faced, so the Sawangan Organic Farmers Association can take advantage of opportunities to be able to face threats. The total score on external factors was 3.17. This value is higher than the total external score in the Organic Partners Farmers group in South Lampung Regency with a score of 3.04, in the Al Barokah Organic Farmers Association, Susukan District, Semarang Regency with a score of 2.54 [18] and in the Putra Mandiri Farmers Group in Linggaraja Village, Sukaraja District, Tasikmalaya Regency with a score of 2.35 [17].

3.3.1 Opportunities

The Magelang Regency Government strongly supports the development of organic rice by helping in the form of quality rice seeds. The government plays a role in providing infrastructure and facilities that support organic seed production, including research and development facilities, as well as incentive programs for farmers who switch to organic farming. The price of organic rice, which is more expensive than non-organic, is a driving factor for farmers to cultivate organic rice. The price of organic rice is also more expensive in Linggasela District, East Lombok Regency [22].

Effective training provides farmers with practical knowledge and skills to make good use of organic farming methods. This training program covers aspects of soil management, selecting appropriate rice varieties, organic pest control, and other sustainable agricultural practices. Training can increase harvest yields and ensure the sustainability of organic production. Organic rice research aims to increase the efficiency and effectiveness of organic farming methods, including the development of rice varieties that are resistant to disease and certain environmental conditions, the optimal use of organic fertilizers, and the identification of environmentally friendly soil management techniques.

Innovation in developing organic rice is an opportunity to increase productivity, sustainability and competitiveness of the agricultural sector. Some of the main innovations of the Sawangan Organic Farmers Association, namely the development of superior organic rice varieties and innovations such as red rice and black rice, make it a special attraction for consumers.

Public awareness of the dangers of chemicals to health and the environment encourages the development of environmentally sound and sustainable agricultural systems. An organic farming system is an agricultural system that is environmentally friendly and sustainable [2]. Public confidence in organic products is an opportunity for growth in the organic rice market. The more people understand the health benefits contained in organic rice products, the greater their confidence in sustainability and food safety. This factor is reflected in the trend of increasing consumer demand for organic products produced through environmentally friendly agricultural practices and without the use of pesticides and synthetic chemical fertilizers.

3.3.2 Threats

Pests and diseases are still a threat to organic rice farming, especially the stink bug which causes the quality of the rice to be poor, namely the rice looks wrinkled and brown, so the taste becomes unpleasant. Therefore, we need to be serious about eradicating pests and diseases because they affect consumer confidence.

Business competition for similar products is a threat factor that influences consumer choices for organic rice. Currently, consumers have wider access to various organic rice products available on the market. Competition between manufacturers causes consumers to tend to compare product quality before making purchasing decisions. This situation is in line with research conducted by [19] that increasing competition in the organic rice business is also a threat to the development of organic rice in the Mitra Organic Farmers Group in South Lampung.

3.4 Internal- external (IE) matrix

Internal-external (IE) matrix analysis is used to determine the current position of the Sawangan Organic Farmers Association, so that the resulting strategy can be more accurate. This analysis uses the total score contained in the IFE (Internal Factor Evaluation) total score of 3.14 and EFE (External Factor Evaluation) of 3.17. Based on the mapping of the total IFE and EFE scores, it is known that the position in quadrant 1, namely growth and build strategy. According to [28] quadrant 1 strategies that are suitable for this zone are intensive (market penetration, product development). The market penetration strategy is to expand market share in existing markets, with the aim of increasing market share which is carried out intensively through an approach that focuses on increasing marketing and promotional activities to reach a wider target market.

The Sawangan Organic Farmers Association can carry out an intensive market strategy by promoting organic rice products widely in collaboration with well-known shops or hotels in Magelang. The intensive product development strategy that can be carried out by GATOS is to focus on cultivating organic rice that is resistant to pests and diseases, as well as extreme weather by using quality seeds. The production process is carried out by utilizing agricultural technology such as soil sensors, smart irrigation, or technology-based agricultural applications to increase the efficiency of resource use and monitor plant health. This situation is different from the organic rice development strategy of the Madya Jayan Farmers Group in Imogiri District, Bantul where the IE matrix shows quadrant II or the conditions in which the farmer group is growing and must be developed. An intensive strategy is carried out by means of market penetration, market and product development [29].

		IFE		
		Strong (3.0 - 4.0)	Average (2.0 – 2.99)	Weak (1.0 – 1.99)
EFE	Tall (3.0 -4.0)	I	II	III
	Currently (2.0 –2.99)	IV	V	VI
	Law (1.0 -.,99)	VII	VIII	IX

Fig. 2. Internal-External Matrix of Sawangan Organic Farmers Association

3.5 Priority strategy

Before determining strategic priorities, a SWOT analysis needs to be carried out to formulate strategic alternatives based on strengths, weaknesses, opportunities and challenges. Alternative strategies include the SO strategy namely a strategy that maximizes strength to obtain opportunities, ST strategy namely the strategy of using existing strengths to overcome threats, WO strategy namely minimizing weaknesses to gain opportunities, WT strategy namely minimizing weaknesses to overcome threats.

Strategic priorities are analyzed using QSPM (Quantitative Strategic Planning Matrix), based on alternative strategies that have been formulated. The results of the QSPM matrix analysis are presented in Table 3.

Table 3. QSP matrix of organic rice farming in Sawangan Organic Farmers Association

Alternative strategy	Linkages	TAS
1. Partnering with high-scale restaurants, hotels and hospitals	S6, O1, O2	6.69
2. Campaigning to the public about the benefits and importance of organic product certification	S3, O3, O5	6.18
3. Use seeds that are resistant to extreme weather	W6, O1, O6	5.62
4. Improving farmers' welfare through organic rice farming	W4, O3, O4	5.61
5. Partner with a well-known franchise or store	W3, T1	5.35
6. Increasing the participation of millennial farmers in organic rice farming	S4, T3	5.30
7. Improve financial administration training	W1, O3	5.23
8. Carry out organic fertilizer production in a sustainable manner	S1, T4	4.82
9. Implementing sensors and automatic monitoring	S2, S5, T2	4.76

Information: TAS: Total Attractive Score

Determining strategic priorities in the QSPM is sorted based on priority development factors Sawangan Organic Farmers Association, Magelang Regency. The first strategy prioritized is partnerships with high-scale hotels, restaurants and hospitals with a TAS (Total Attractive Score) value of 6.69. The second priority is the campaign on the importance and benefits of organic rice certification with a score of 6.18. The first and second priorities show that the strategy is closely related to marketing. The Sawangan Organic Farmers Association needs to carry out a marketing strategy based on product, price, place and promotion [30].

The third priority is to use seeds that are resistant to extreme weather such as heavy rain, drought and strong winds. Extreme weather can reduce rice production both in quantity and quality. Very high rainfall can reduce rice production and productivity [31]. Ciherang variety of rice seeds, which are widely planted on the islands of Java, Sumatra, Kalimantan and Sulawesi, are quite resistant to strong winds [32].

4 Conclusion and recommendation

The internal factor that becomes the main strength in Sawangan Organic Farmers Association is obtained organic rice certification, while the main weakness is decreased production due to high rainfall. External factors that become the main opportunities are government support for organic farming and the main threat is reduced market demand. The priority strategy for developing organic rice in the Sawangan Organic Farmers Association is to partner with restaurants, hotels or hospitals in Magelang Regency and campaigning to the community about the benefits and importance of organic rice certification.

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