

Driven Factors to Sustainable Paddy Farming Production in Malaysia

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Abstract - As the organic food is rising in demand, there are several issues associated with its supply chain capabilities that deserve attention. These include the inadequate supply and increasing cost of rice production. The farmers play a significant role to ensure that the supply of organic products meets the demand of the market, hence understanding the motivation for their practices is crucial. This study explores the driving factors for farmers in sustainable paddy farming in Malaysia. The research is exploratory in nature, using interview and observation approaches. Three sustainability factors are focused in this study; namely the economic, social, and environmental dimensions. The results indicate that early exposure and knowledge, education and experience in sustainable agriculture are the driving force behind shifting attitudes towards sustainable agriculture and sustaining practices. The results of this study are expected to give awareness and motivate the farmers to embark on the alternative practices to sustainable rice cultivation, and also potentially help to optimize the abandoned land for productive farming in the rural areas.

Keywords - production, organic paddy, farmer perception.

1. Introduction

Sustainability has been well accepted as the main agenda throughout the globe, that is the development that can meet the needs of the present generation without compromising the ability of future generations [1]. The notion of sustainable agriculture reflects the ability of a farm to produce food indefinitely, without causing irreversible damage to the ecosystem. Two key issues are biophysical (the long-term effects of various practices on soil properties and processes essential for crop productivity) and socio-economic (the long-term ability of farmers to obtain inputs and manage resources such as labor) [2].

The sustainability in agriculture as the farm's ability to maintain production and offer benefits based on maintaining nature and the environment, accelerating social growth, stabilizing the economy and being a commercially good competitor in the fast changing environment [3]. This is parallel to the Sustainable Development Goals (SDG) No. 2, which underlines that the world needs a transition to more productive, inclusive and sustainable agriculture that promotes biodiversity and that strengthens the quest for poverty alleviation, and the use of weather-resistant crops. Ultimately, this shift requires a strong value chain as a motivation for farmers to move to sustainable agriculture.

Besides, sustainable agriculture management is a system that not only emphasizes on the economics of production to maximize profitability. Instead, it also includes aspects of environmental management and social needs [4],[5]. The main objectives of sustainable agricultural management were to achieve economic viability of the farm, to maintain the socio-cultural system of the peasantry while preserving the stock of natural resources and environmental quality [6],[7]. Therefore, it can be concluded that sustainable agricultural management encompasses three main aspects: economic, environmental, and social.

1.1 Sustainable Agriculture Scenario in Malaysia

Paddy farming is one of the key agriculture sector in Malaysia. The rice production in the country is challenged by various issues, such as inadequate supply, increasing cost of production and serious disease threats. Therefore, sustainable agriculture plays a vital role to address these issues as it could bring a significant impact to the food security of the nation. Currently, the performance of the rice industry in Malaysia is largely influenced by the government's policy. For instance, there are several policy and support related to sustainable agriculture in the Third National Agricultural Policy (NAP3) and National Green Technology Policy [8], promoting Good Agriculture

Practices (GAP) and qualified the sustainable practices through Malaysia Good Plantation Resources Practices System (Sistem Amalan Ladang Baik Malaysia - SLAM) and Malaysia Organic Scheme (Skim Organic Malaysia-myOrganic.) certificate. MyOrganic certification program was launched in 2002 by the DOA and the proposed of certificate is based on FAO/WHO Codex Draft Guidelines for the production, processing, labeling and marketing of organically produced food [9] or namely the Malaysian Standard MS1529:2001. The Malaysian Standard MS1529:2001 was then updated in 2014 to MS1529:2015 [10].

Resources from Department of Agriculture Malaysia in 2015 shows 151 farmers with a total area of 1,848 hectares have registered in myOrganic [11]. However, it can be seen that the table 1 shows that there are only three of farms accredited with myOrganic certification based on rice cultivation with a total area of 118 hectares. Furthermore, Koperasi Agro Belantik Sik Berhad is the only one that obtained myOrganic certification in 2016 with 9.46 hectares and it is still being certified until May 31, 2019 [12].

Table 1: The number of farms accredited with myOrganic certification based on commodities from 2002 – 2015.

Commodity	myOrganic certification	
	Number of farms	Hectare
Fruits	36	321
Vegetables	44	125
Rice	3	118
Others including mushrooms and herbs	68	1283
Total	151	1848

Source: (DOA, 2015).

1.2 SRI in Malaysia

The System of Rice Intensification (SRI) is one of the techniques to manage organic farming. SRI was developed in Madagascar in 1983 as a revolutionary paddy cultivation method to achieve very high yields with reduced resources such as irrigation water, fertilizers and chemicals [13]. The history of the introduction of SRI techniques in Malaysia began in 2009 when Norman Uphoff, a professor from Cornell University, was invited by a group of SRI researchers in Malaysia to discuss SRI techniques. Then, the first trial was conducted in Beranang where yields of five to seven tonnes / ha for the MR219 (MR - Malaysian Rice) and UKMR2 varieties were very promising. Meanwhile, similar experiment at Tanjong Karang also recorded satisfactory yield of about four tonnes / ha.

In the same year, farmers at Bandar Baru Tunjung, Kelantan and Sik, Kedah also started using the SRI method. In 2014, there were 18 SRI farmers in Peninsular Malaysia, covering

five (5) active areas in Peninsular Malaysia [14]. Subsequently, participation in this method increased. Record of field information registered from March 2019 to Feb 2, 2020 by the Association of non-governmental organizations (SRIMas), there are 14 areas in Malaysia monitored using the SRI method covering 40 acres.

In a nutshell, review of the current scenario in Malaysia expose that despite the growing awareness of sustainable agricultural practices among farmers, it is relatively new and still considered at its infancy [8]. Overall, the number of farmers practicing sustainable agriculture particularly organic rice in Malaysia remains low [15]. Furthermore, not much scholarly works have been dedicated to understand why the farmers adopted sustainable rice farming, while it is not a mainstream practice. This study attempts to bridge this gap by exploring the driven factors that affect the farmers to uptake sustainable paddy farming in Malaysia. Consequently, it hopes to expand the knowledge about sustainable paddy farming and encourage more practitioners to adopt such practice.

2. Materials and Methods

Preliminary research through literature review was conducted to gain an understanding of sustainable paddy scenario in Malaysia. This study uses case study design for sustainable rice farmers. Case study design was used to provide narrative and descriptive information regarding farmers' willingness to use sustainable methods in rice cultivation.

The scope of the study covered a number of SRI practitioners in Malaysia involving five productive cultivating areas. The respondents of this study involved farmers who have practiced the use of organic method in paddy farming for more than five years. This time span allows the farmers to have extensive knowledge and experience.

Data collection and analysis for this study was performed from March 21, 2018 to March 5, 2020. The data from interview, online survey, observation and written notes were also analyzed for emerging themes and to compare and contrast the data obtains from the participants.

3. Result

The findings of the study began with the profile of location and demographic background and perception of the respondents, continue with driven factors that influence sustainable farming practices among the farmers.

3.1 Demographic background and perception of the respondents

This study involved farmers at five paddy cultivation areas in Malaysia, who adopted sustainable farming practices. The demographic information of the five locations and key

respondents involved in this study are explained below.

3.1.1 *Srilovely Farm*

Srilovely Farm is located in Sik district in Kedah state. The 9.4 hectare area is planted with MRQ 74 type rice (R1c, 20 Jan. 2020). Prior to SRI project, it was an abandoned paddy cultivation area for the past 30 years due to infrared and pest control (animal) factors. The paddy crop project has been carried out since 2009 with the support of Kedah State's agency, aimed at increasing the income of the locals through the redevelopment of the abandoned rural areas. The management of the project was done through the establishment of the Cooperative on December 24, 2009 and the co-operative members are comprised of the landowners, local and nearby villagers. The rice cultivation area has been leased for 15 years.

This area is operated by R1b and assisted by three permanent employees including R1 and R1c. R1b received an organic rice cultivation course at Nagrah Organic SRI Center (NOSC) on 21 to 27 January 2011 with 24 people comprising villagers and five Kedah State agency officers. This six-day course at a training center in Indonesia has led to organic rice cultivation using the SRI Lovely method of Rice Intensity System (SRI).

The first respondent (R1) of this study is a 35 years old man, Muslim and from Malay ethnic. He has been working with R1b since Srilovely farm started in 2008. He is a local resident in the village. He recalled that his early exploration with SRI is indeed an exceptional and a memorable journey (R1, March 5, 2020). R1 received information and education from R1b and an Indonesian farmer for six months.

R1 strongly believed that this method could ensure the safety and health of food for his entire family. R1 also felt that it was his responsibility to maintain sustainable rice cultivation in the area and that sustainable rice cultivation should be carried out with patience and persistence. He also pointed out that the exposure to sustainable methods was less widespread, which led the farmers to consider the current practice of paddy cultivation as good and easy.

3.1.2 *Merbuk Paddy Farm, Kedah*

The second area is a rice farm located in Kg. Sg. Do, Merbok, Kedah. The area covers of 0.6 acres and has been cultivated for seven (7) years, without using chemical based fertilizers and control (Jan 22, 2020). The type of crop variant during the study was MRQ 103 in an area named GM 1989. Sustainable paddy crops were used for his family consumption and shared with his close friends. Respondent 2 (R2) is a 52 old years Muslim and Malay man. His prime profession is a medical doctor and owned a clinic. He runs this part-time paddy plantation and has other conventional paddy cultivation areas and uses natural fertilizers and controls.

R2 was exposed to organic rice cultivation technique from his extensive readings, internet references and knowledge sharing with SRI organic farmers. He has high confident that the sustainable farming method is better suited to the environment and promotes self-sustained among farmers, who are currently too dependent on government subsidies (February 4, 2020).

R2's passion in sustainable agriculture was driven by his self-reflection during a visit to Germany. According to him, one Professor asked him to ponder how trees in the mountains and forests could be self-sustained? He deeply understood that The God has created the nature and sustain them with a great ecosystem, therefore it inspires him to protect the ecosystem through sustainable practices that could protect the environment and mankind at large.

3.1.3 *Tanjong Ipoh, Kuala Pilah Farm*

The next farm is Tanjong Ipoh, located in the district of Kuala Pilah, Negeri Sembilan. It belongs to Respondent 3 (R3), a 58 years old Muslim and Malay man. R3 has been the SRI rice cultivation coach at Felcra Trading Sdn Bhd, Perak since 2009. Based on his past experience as an organic SRI rice cultivator, he was motivated to work on his own farm in 2017 in Tanjong Ipoh, Negeri Sembilan.

R3 declared that the cultivation of organic SRI paddy bring low yields for his farm in the first season, for example the experiment in Tanjong Ipoh gained 100 kilos only on 2.5 acres. The second season is estimated at 4.5 tonnes per hectare and the highest potential yield is 8 tonnes per hectare. R3 also believed that the rice cultivation in Peninsular Malaysia differs from that of other countries due to land and labor factors (February 22, 2020). Cultivation of rice using manpower is the best because it successfully reduces weeds and stress or surprises the paddy. The paddy that was grown using the Transplant machine took two days to recover. R3 also observed that the organic rice cultivation taking longer period than conventional cultivation using fertilization and chemical control.

Given his knowledge and experience in cultivating organic SRI rice, he is currently working extensively in Ulu Bendul Kuala Pilah, in a 15-acre farm (R3a, January 20, 2020) and the Semadong area in Perlis since 2019.

3.1.4 *Seligi, Kelantan Farm*

The farm in Kampung Seligi, Kelantan is owned and monitored by Respondent 4 (R4). R4 is a 45 years old, Muslim and Malay lady. She has been involved in rice cultivation with other farmers in Seligi since 2019 under the programme funded by Small Grants, Environment Facility United Nations (SGP GEF, UNDP). Previously, R4 works on rice farming at the Tawar Wakaf Village, Bachok and Sunnah Farms in Tunjung and started cultivating rice using SRI approach since 2010. She learnt from an Indonesian

farmer nearby her area.

Prior to her extensive involvement in rice cultivation, R4 was a member in many local environmental and organic organizations, such as the Kelantan Organic Association (PUOK) and the Malaysian Agroecological Association (SRI-Mas). Her journey as an activist was strongly inspired by her aunt who observed a strong passion in healthy and organic foods. Therefore, she would like to promote the organic food awareness in society. Moreover, after witnessed his uncle's death due to high levels of poison in the body, she realized that the conventional food consumption that contain a lot of toxic should be abandoned. This has led to greater efforts in promoting healthy food (February 22, 2020). R4 is also actively involved in consultations including lectures, briefings, practical training and field coaching on organic cultivation and control.

3.1.5 Tambatuon Rice Farm, Sabah

The Tambatuon Rice Farm is owned by Respondent 5 (R5). R5 is a 47 years old Christian female from Dusun ethnic. She runs a rice plantation in Sabah under the management of the Tambatuan Resident Cooperative (KOPETA) in Kampung Tambatuan. Tambatuan is a valley at the foot of mount Kinabalu, the highest mountain in Malaysia. The area is known for its traditional rice varieties such as Wangi Keladi (White Rice, Red Rice, and Black Rice) and Borneo Rice. On July 3, 2019, she runs a two (2) acres of Red Rice Paddy plant at her farm, called Dodokuton Plot and two (2) acres at rented field called Plum Gerimpang for White Rice and Black Rice.

R5 began her journey in organic rice cultivation when she was introduced by R2 and his friend through an organic rice cultivation course (4 days, 3 nights) in 2013 under the PACOS Trust, a community-based organization. Starting in 2014, she and her husband used the method and produced more exciting results. She also noted the differences between post- and pre-organic rice cultivation and believed that organic methods were more beneficial in terms of rice safety, quality and resistance to crops' diseases. This method also received a lot of favorable responses from the surrounding community when they realized her farm's outstanding output. Subsequently, PACOS Trust sent two farmers to the SRI International Conference (SEASRI) in 2015 to better understand the methods of SRI cultivation. To date, she and 22 local farmers who were trained in organic rice cultivation continues practicing SRI at their farm. R5 and her husband were also recognized as SRI trainers by the Malaysian Agroecological Society (SRI-Mas).

In conclusion, the summary of location profiles and respondents is summarized in Table 2.

3.2 Driven factors that influence sustainable farming practices among the farmers

The data discover that sustainable rice cultivation techniques used are mostly partial and full SRI methods. Further analysis reveals that there are several factors that drive the farmers to practice paddy sustainable farming, as explained below.

3.2.1 Relative advantage

Knowing the relative advantages of certain practices is an important factor in determining the acceptance of new innovations [16]. The perception of excess relative to innovation is positively related to the level of acceptance. The findings show that all respondents have confidence in the advantages of SRI method. Their confidence is influenced by the belief that there is a relative advantage in this farming method. The first respondent (R1) stated that the method was sustainable, easy, safe and risk-free. While the second respondent (R2) stated that the advantages of this system were the increased rice yield, abandoned the use of toxic and chemical pest and reducing costs. The cost is greatly reduced because the fertilizers are made organically by farmers. This view is similar to all other respondents. The first respondent (b) (R1b) and second (R2) also added that the advantages of this system in terms of Islamic principles and do not dependent on government subsidies.

3.2.2 Suitability

All the respondents agreed that sustainable methods were appropriate in their farm area. They also think sustainable methods can be practiced in all areas despite water problems. Sustainable methods can be provided with ongoing training and education. All the respondents have a similar view that the use of technology in sustainable agriculture can facilitate managing their farm better.

3.2.3 Simplicity

When a new method is perceived as relatively easy to practice, the chances of acceptance usually enhanced. In this study, all the respondents stated that organic or SRI method was easy to implement in controlling rice disease. However, Respondent 3 (R3) suggests that the labor force is needed to assist the large farming area especially during planting and weeding. The respondents also perceived that this sustainable method will be well accepted if the farmers are given appropriate awareness and training.

3.2.4 Reliability

The adoption of a particular innovation could be enhanced if

people, or consumers are given a chance to experience its reliability. Similarly, all the respondents in this study have experienced practicing the sustainable farming within the range of six to 10 years, and they are still passionate in doing it.

3.2.5 Observability (Risk)

The respondents who perceived the sustainable method in rice cultivation as a low-risk management techniques are expected to be more receptive to such innovation. The analysis shows all the respondents agree that SRI method is a reliable approach, in terms of lowering the safety risk of using chemical and toxic substances and promote healthy food. They are satisfied with this method and accepted organic as their life style. However, their only concern for sustainable farming method is the large number of workforce needed during the weeding and planting stage.

4. Discussion

The findings suggest that the five factors identified, namely relative advantage, suitability, simplicity, reliability and perceived risk could be classified into two broad categories- the individual and situational factors. The individual factors are mainly related to exposure and early awareness, education and experience in sustainable agriculture. Consequently, knowledge will have influence on the belief and attitude. An individual's beliefs influence the attitude, and in turn develop the intention that will result in the behavior. Based on these factors, it is seen that attitude have influenced farmers to be prepared to adopt sustainable practices. The farmers are also encouraged by this method because they are cost effective, easy to practice, and in accordance to the Islamic principles (prohibit the harmful practices to the nature).

Apart from that, the technical factors (external) are also significant. It was found that respondents with experience in sustainable farming raised their concern about manpower. The dependent on high number of labor during planting and weeding could be reduced if appropriate technical supports are available. Among the suggestions addressed are the need for infrastructure (tools and machines) (Respondent 5) and adopt available technology from other countries (Respondents 2 and 3). The respondents noted that government support was found to be important in maintaining continuity of readiness using sustainable methods. Meanwhile, R5 (February 23, 2020) stated that machine aid for packing facilities was needed as the packaging was now widely plagiarized by many sellers causing the dumping of paddy crops. In addition, R3 (February 22, 2020) urges that all agencies need to provide ongoing promotion and support for organic products.

5. Conclusion

To sum up, SRI technique in Malaysia recorded higher paddy production and the cost of production is lower compared to conventional technique under Paddy Estate Project, Lembaga Kemajua Pertanian Muda (MADA) [16]. The study seeks to explore the driven factors that encourage farmers to adopt sustainable agriculture practices in paddy farming. Accordingly, the findings denote that relative advantage, suitability, simplicity, reliability and perceived risk are the important factors that associate with intention to practice sustainable farming. These factors are mainly influenced by the exposure and early awareness, education and experience in sustainable agriculture. Moreover, the value chain in organic paddy cultivation [17] also plays a significant role to support the practices efficiently. The study conveys practical implications for the government, non-government and private agencies to support the sustainable agriculture agenda through various initiatives such as awareness campaigns, training and incentives. Education and awareness are very important to promote the attitude change among the farmers, and public at large because healthy food does not only help to preserve the environment, but also the life of future generations.

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References

- [1] Brundtland, G. H. Report of the World Commission on Environment and Development: Our Common Future. Published as an Annex to U.N. General Assembly document A/42/427. New York, NY: The United Nations. 1987
- [2] Othman, Z. Information and Communication Technology Innovation as a tool for promoting sustainable Agriculture: A Case Study of Paddy Farming in West Malaysia. 2012.
- [3] Ismail, M. R. *Pertanian Lestari*. Kuala Lumpur: Dewan Bahasa dan Pustaka. 2006.
- [4] Azima, A. M., Choy, E. A., Saad, S., Selvadurai, S., Lyndon, N. and Husain, M. Y. Keterlibatan penduduk lokal dalam pembangunan pertanian: kajian kes di daerah Kuala Pilah, Negeri Sembilan. *GEOGRAFIA OnlineTM Malaysia Journal of Society and Space 9 Issue 1 (24 - 33)* © 2013, ISSN 2180-2491, 1(1), 2013, pp. 24–33.

- [5] Othman, Z., Othman, S. N., and Ab Hamid, K. Pengurusan Pertanian Lestari di Luar Bandar: Kes Projek Agropolitan di Kawasan Terbiar. *Prosiding PERKEM VIII, JILID 2*, 2013, pp. 790-795.
- [6] Buttimer, A.. (ed) Sustainable landscapes and lifeways. Cork University Press, Ireland. 2001.
- [7] Ghazali, R. & Othman, F. Pembangunan Indikator untuk Penilaian Kelestarian Sektor Padi Indicator Development for Sustainable Padi Sector Evaluation. *Prosiding PERKEM VI, JILID 1 (2011) 331 – 347 ISSN: 2231-962X Pembangunan, 1*, 2011, pp.331–347.
- [8] Abdul Aziz, M. F., Mispan, M. S. and Doni, D. Regulatory Issues in Organic Food Safety in the Asia Pacific, 2020, pp 151-170.
- [9] Ahmad F. Sustainable agriculture system in Malaysia. In: Regional workshop on Integrated Plant Nutrition System (IPNS), development in rural poverty alleviation. United Nations Conference Complex, Bangkok, 2001, pp 18–20.
- [10] Hoyaali, S., Othman, Z., Anas, I., and Shafie, S. M. The Implementation of MyOrganic: A Case study of Koperasi ABSB. *Journal of Technology and Operations Management*, 13(2), 2017, pp.78-87.
- [11] Department of Agriculture Malaysia. *Reports on the progress production for organic certified farm*. Jabatan Pertanian Malaysia. Putrajaya. 2015
- [12] Department of Agriculture Malaysia. *Senarai penerima SOM*. 2016. Retrieved on 29th November 2017 from <http://pertanian.kedah.gov.my/index.php/2013-12-08-08-03-59/pensijilan-skim-organik-malaysia-som>
- [13] SRI-RICE (SRI International Network and Resources Center). (2013). SRI Project around the world. Diakses pada 1 Jun 2013 di <http://sri.ciiifad.cornell.edu/aboutsri/aboutus/projects/index.html>
- [14] Zaman, N. B. K., Ali, J. and Othman, Z. Faktor Penerimaan Teknik Penanaman Padi secara Intensifikasi Padi. *Jurnal Dunia Perniagaan*, Vol. 1, No. 2, 2019, pp. 11-20.
- [15] Othman, Z., and Muhammad, A. Design strategies to persuasive learning for promoting sustainable practices in paddy farming. *American Journal of Economics and Business Administration*, 3(1), 2011, pp.197-202.
- [16] Kamarul Zaman, N. B, Ali, J. and Othman, Z. (2017). Cultivation Management: System of Rice Intensification (SRI) for Higher Production. *International Journal of Supply Chain Management*, 6(), pp.235-242.
- [17] Othman, S.N., Othman, Z. and Yaacob, N.A., 2016. The Value Chain of System of Rice Intensification (SRI) Organic Rice of Rural Farms in Kedah. *International Journal of Supply Chain Management*, 5(3), pp.111-120.

Table 2. Background of locations and respondents

Location	Sik, Kedah	Merbuk, Kedah	K. Pilah	Kelantan	Sabah
Area wide	9.4 hectare	0.6 hectare	2.5 acre at Tanjung Ipoh, 15 acre in Ulu Bendol and 1.5 acre di, Semadong, Perlis	1.2 acre	4 acre
Variety of Paddy	MRQ 74, Rubi	MRQ103	MRQ74	UKM RC8	Wangi Keladi (Red, white and black)
Respondent	R1	R2	R3	R4	R5
Ages	35	52	58	45	47
No. years of planting	10 years	7 years	10 years	10 years	6 years
Property of land	No	Yes	Yes Ulu Bendol: Rent	No	Yes