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Organic farming system innovation to improve the welfare of farmers in the highlands

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Abstract: This research departs from the tendency of a healthy lifestyle. This study aims to analyse organic rice production activities and conservation-based agricultural techniques. A qualitative method has been used in the research. The informants consisted of the chairman of the farmer group, members, and the guardian (wali) of the Nagari. The research was conducted in Jorong (hamlet) Bansa, Nagari (village) Kamang Tangah Anam Suku, Kamang Magek District, Agam Regency, West Sumatra. The results and discussions show that organic rice farming activities were generally understood as the process of producing organic rice only. However, after conducting field research, it was found that there was an innovation in organic rice farming carried out by the Sawah Bangsa Farmer Group. Organic rice farming is only one of the links in the organic farming system (sustainable agriculture/circular agriculture). If relying on the organic rice production sales alone cannot prosper farmers, organic rice farming innovations can empower and improve farmers' welfare. The important point of innovation lies in the added value in the form of sales: organic rice, finished compost, two decomposers (compost makers), namely *Trichoderma* and DD Farm, local bio-agents/microorganisms, namely jakaba (*Corallomycetella repens*, eternal lucky mushroom), ecoenzymes, plant growth-promoting rhizobacteria, beuforia, and biosaka which are all produced by the Sawah Bangsa Farmer Group. Theoretically, this research has contributed to the fact that organic rice farming has a long chain. Practically, the results of this study contribute to the idea that organic rice farming is not as difficult as people imagine it to be.

Keywords: conventional agriculture, farmer welfare, innovation, organic farming, sustainable agriculture

INTRODUCTION

This research departs from the tendency of a healthy lifestyle in the community, among others, by consuming organic foods produced by organic farming techniques. The growing interest in healthy lifestyles and health issues is strongly linked to the opportunity to obtain healthy food sources (Valková *et al.*, 2022). Today's modern life needs campaigns and strategies to raise awareness in all community groups, such as families, universities, and communities, about nutrition and organic food to promote a healthy lifestyle and get better health benefits (Jalloun, 2022). Organic food consumers are not only young people familiar with the internet and social media, but villagers are also starting to consume organic food (Fogarassy *et al.*, 2020). Many researchers have studied the relationship between the consumption of organic food products and the ecological values, production, and distribution that contribute to the social study of organic food (Muñoz-Sánchez and Pérez-Flores, 2021). In organic farming, no

chemicals are used in fertilisation, seeding, plant care, or harvesting (Jalloun, 2022). Currently, many farmer activities with the integrated organic agriculture system (IOFS) are farming methods that combine the environment's natural potential with local wisdom in realising health, environmental conservation, and farmer welfare (Selvan *et al*., 2023). After analysis, it turns out that the organic farming system does not cover a large agricultural area as expected and is not widely known worldwide by various levels of society. So, it is necessary to innovate and socialise organic agriculture so consumers become healthy and farmers become prosperous (Calabro and Vieri, 2024). For the organic farming system to be accepted by the community more widely than now, it needs innovations based on the progress of the times and with foresight.

Organic food products such as rice, fruit, or vegetables decorate many modern shopping places and are hunted by consumers even though they are relatively more expensive than non-organic foods. However, some people lack information about organic food and care less about it. Unlike their brothers and sisters in Western countries, it turns out that Romanian people lack significant information about organic food, so they do not understand the importance of organic food for health, and in modern markets, it is also challenging to obtain organic food (Nagy and Dabija, 2020). The study was also conducted using a quantitative method on 190 respondents in the Bihor area, Romania, with various questions that explored organic food consumption behaviour and analysed what beliefs influenced respondents to consume organic food during and after the COVID-19 pandemic and whether they changed their consumption habits (Brata *et al*., 2022). The chain of the distribution system of agricultural products, including organic agriculture in Indonesia, does not seem to be on the side of small farmers, including smallholders of organic food products. This can be seen in modern markets that have not provided space for distributing organic agricultural products for small farmers but have opened the door wider to capital-intensive agricultural companies (Toiba *et al*., 2020). Young people who have a relatively advanced education and have a good job and income, are full of confidence, are familiar with the internet and social media, live in cities, and are used to a healthy lifestyle are consumers who consciously choose to live a healthy life and become part of the innovation discourse in circular agriculture or sustainable agriculture by becoming consumers of organic food that they usually buy in modern shopping places (Fogarassy *et al*., 2020).

Organic rice farming activities by a farming community called Sawah Bangsa Farmer Group in Bansa Hamlet, Kamang Mudiak Village, Kamang Magek District, Agam Regency, West Sumatra, are interesting to research. Organic rice farming activities can also be found in various countries. The results of research or findings in China raise attention to the relevance of organic farming systems in efficiently reducing carbon emissions, minimising the impact of carbon dioxide and methane from greenhouse gas emissions, preserving soil fertility with various organic matter, preserving biodiversity, and avoiding pesticides, herbicides, and fungicides from chemicals (Luo and Huang, 2024). This research was conducted in Ca Mau province in the Mekong Delta, Vietnam, and found that while the cost of fertilisers and organic agricultural labour is higher than conventional farming, the income per hectare is also higher. Organic rice cultivation offers more significant benefits than standard rice farming. The challenges of organic rice farming include a lack of market information, technical support, and sales access (Dat *et al*., 2023). To change the mindset of subsistence farming communities into prosperous farming communities through organic farming, the government must intervene, for example, in managerial assistance policies, counselling assistance, mentoring, livestock assistance, and access to marketing of agricultural products so that it is necessary to develop integrated collaboration between bureaucrats, researchers, farmers, and regional-owned enterprises (Ind.: Badan Usaha Milik Desa – BUMD) to increase access to organic agriculture techniques and markets (Achmad *et al*., 2022). This paper examines the role of government officials in promoting the organic farming system to the farming community, educating, assisting, and helping to overcome the problem of farmers' credit, limited land ownership, and young people under 25 years old who do not want to be involved in agricultural activities, all of which are obstacles to the development of the organic rice farming industry in Thailand (Seerasarn, Miller and Wanaset, 2020). Several studies on organic farming activities in advance are relevant to this study, which examines organic farming activities or circular agriculture in Agam Regency, West Sumatra Province, conducted by the Sawah Bangsa Farmer Group.

Modern agriculture today relies heavily on fertilisers and pesticides, factory products that utilise chemical substances that are harmful to humans and the environment, including agricultural land. The modern agricultural system is spurred to increase production by utilising modern tools and chemicals, but it also destroys resources and wastes energy. Agricultural activities use much habitable land and often cause forest damage (Rodríguez-Espinosa *et al*., 2023). Many farmer groups have tried farming organic rice, but not all have succeeded in producing organic rice. In general, the group of organic rice farmers failed because the study's results influenced them to think that the success of organic agriculture was only measured by the increase in economic income. In contrast, education, health conditions, and other living standards did not increase, so the farmers' conditions remained poor (Mutsami and Karl, 2020).

Human resources are not ready for organic rice production and distribution activities. Empowering human resources to enter the organic farming activity system is necessary. To switch to organic farming system, it is necessary to carry out three stages of empowerment by the Sawah Bangsa Farmer Group to its members: awareness, capacity, and empowerment. It turns out that organic rice farming activities (organic rice production and distribution) are only one link in the organic farming system (integrated agriculture/sustainable agriculture/circular agriculture), and there are other links. They assume organic farming is considered risky, too complex, complicated, and the results are not good. Even though after being implemented, it turns out that organic farming is not that bad.

This research is important because it can explain how organic farming activities can improve the welfare of the farming community and why many farmers have not done it. This topic is interesting to research because findings will be obtained. The purpose of this study is to analyse organic rice production activities related to the reasons and objectives of organic rice farming activities that can improve the welfare of farmers and farming techniques based on the conservation and local wisdom of the community.

MATERIALS AND METHODS

STUDY AREA

The research was carried out in Jorong Bansa, Nagari Kamang Tangah Anam Suku, Kamang Magek District, Agam Regency, West Sumatra Province, Indonesia. Jorong Bansa is located at an altitude of 700 m a.s.l., so it is included in the highland area. Agam Regency has a varied geographical area; there are coastal areas, lowlands, and highlands in the foothills of Barisan Mount Singgalang and Marapi. The road trip from Padang City to the research site is about 3 hours to the north through Padang Panjang City and Bukittinggi City, then enters Kamang Magek District, Agam Regency.

EXPERIMENTAL DESIGN

At the research site, data collection techniques were used by observing the activities of farmer groups. Aspects observed include the way of producing organic rice, finished compost, two decomposers (makers/decomposers of compost) namely tricoderma and DD Farm, biological agents/local microorganisms namely jakaba (*Corallomycetella repens*, eternal lucky mushroom), ecoenzymes, plant growth promoting rhizobacteria (PGPR) or growth stimulants, beuforia, and biosaka. Organic rice fields, livestock drums, and farmer group meetings were also observed.

The observation data was developed and deepened into research questions for in-depth interviews with the informants. The data from the in-depth interviews were cross-checked with observational participation techniques so that the data became valid. Researchers play a role in the activities of the informants while conducting follow-up observations.

DATA COLLECTION

This activity is research using a qualitative method, so the source of information is called an informant. There are 10 informants consisting of farmer group leaders, farmer group members, and Nagari guardians (Ind.: wali Nagari).

Data on organic farming activities and techniques are collected daily through observations, in-depth interviews, and observational participation. The main informant and also the key person is the head of the nation's rice farmers group, who used to be a fellow student at Gadjah Mada University. After the interview with the head of the farmers the search for informants was developed using the now ball sampling technique, 4 informants who were active members of farmer groups and 4 informants who were former members of farmer groups were obtained. The Nagari guardian (Ind.: wali Nagari) is not a member of a farmer group but he understands the problems being researched so he is also interviewed in depth. The data from the interview with the Nagari guardian is very important in this study.

The researchers also used document study techniques to explore data on community empowerment based on agricultural land conservation but still prioritise informants' opinions and ideas. The research team stayed for several days in July 2024 at the Sawah Bangsa Farmer Group secretariat to more effectively dig up observation data and in-depth interviews in the morning, afternoon, or evening. Data were analysed using descriptive analysis techniques, and data validity was assessed using triangulation techniques.

RESULTS AND DISCUSSION

ORGANIC RICE

From the primary data, the type of rice plant is chosen for the production of organic agricultural products because, in general, rice is a staple food of the people. It is possible that in the future, this farmer group can also produce organic vegetables (including potatoes) or fruits. The chairman of the Sawah Bangsa Farmer Group is a key figure in the formation and activities of farmer groups.

AVOID THE USE OF CHEMICALS

The process of producing organic food is to avoid using chemicals for fertilisation, pest eradication, processing methods, and other things that can affect the level of human health consumed. The oyster production process is carried out to control the flow of nutrients at the production site, simultaneously increasing oyster production and reducing the local environmental impact of oyster cultivation. This approach exemplifies effective tactics to improve the sustainability of primary food production processes (Hatakeyama *et al*., 2024). Monitoring the food production process has become more publicly accessible and has a higher level of objectivity in decisions, allowing potential buyers and certification bodies to assess the quality of organic food products with great precision (Kononets *et al*., 2024). Therefore, developing genetic resistance is one way to avoid using chemical insecticides (Xiang *et al*., 2023). The use of environmentally friendly strategies, such as the use of plant growth support bacteria, to improve crop yields and quality has become necessary to meet the ever-increasing demand for food and to avoid the use of chemical fertilisers and pesticides (Tommonaro *et al*., 2021). Many countries are trying to achieve national health levels, such as China is doing with its national "Healthy China 2030" program (Zhu *et al*., 2024). The results of this study prove that statistically and causatively, in the evaluation of organic food consumption, it turns out that organic food significantly impacts human health (Rahman *et al*., 2024). Studies have been carried out on the sources of pollution and the level of contamination of vegetable garden products in urban areas or areas often passed by fossil fuel vehicles that have impacted the health level of local consumers (Gao *et al*., 2021). Organic farming systems are not only related to using organic ingredients and avoiding chemicals but also avoiding the impact of pollution and contamination from the organic food production environment.

IMPROVING MEMBER WELFARE

The Sawah Bangsa Farmer Group seeks to empower the community and improve the welfare of its members by seizing opportunities in the form of market demand for organic rice, which is relatively expensive. The analysis of the economic welfare of peasant families that is underestimated is a trigger in empowering farmer groups with the ultimate goal of improving

the welfare of peasant families (Xu *et al*., 2022). In organic farming activities, one of the characteristics of independent farmer groups is that farmer groups must be able to meet their own seed needs, organic rice farming must come from organic nurseries belonging to farmer groups or other farmer groups with the same vision, and in activities that prioritise local wisdom (Maman *et al*., 2022). Empowerment of farmer groups can be done by advancing research according to the needs of the group, improving the quality of seeds, smoothing the flow of agricultural information, strengthening the role of farmers in the agricultural distribution chain, and building consumer awareness about the importance of consuming organic agricultural products (Meldrum *et al*., 2018). This study shows that increasing the offer and advertising of agricultural products is an effective way to promote the welfare of members of farmer groups. One of these cases is the commercialisation of rabbit livestock for sale, urine and faeces (animal manure) can be made into organic fertiliser that can be used by themselves or sold to other farmers (Mutsami and Karl, 2020). The social life of the farming community is influenced by various internal and external elements; opting to farm organic rice is not an easy choice even though the profits can be higher (Rozaki *et al*., 2020). In organic agriculture, especially in this study, the organic rice production system is considered to preserve the environment, maintain soil fertility, present a healthier life, and prosper farmers compared to conventional rice farming systems (Amirahmadi *et al*., 2022).

Organic rice produced by the Sawah Bangsa Farmer Group with the trademark "PERA" and "BERASA" is an opportunity that can continue to be developed by improving the marketing process to make it better. Five types of rice based on morphological features, shape, and colour should have five different trademarks, even if they are produced by the same party or institution (Cinar and Koklu, 2022). Marketing the product will involve large or small traders who form a chain of distribution that can be short or long (Yuliarini *et al*., 2020).

The final product of organic rice farming is organic rice, which must be marketed to generate income for farmers. Organic rice is the root of marketing challenges in organic rice farming in the Sawah Bangsa Farmer Group. Currently, there are not so many consumers of organic rice in Indonesia. This is because the price of organic rice tends to be more expensive than conventional agricultural rice. In addition, the Indonesian people are not fully aware of the benefits of consuming organic rice. The lack of consumers will complicate the marketing of organic rice from the organic rice farming of the Sawah Bangsa Farmer Group. So, the Sawah Bangsa Farmer Group must market by door-to-door and online marketing through social media, which has not been able to be marketed in large quantities.

INNOVATION OF MATERIALS FOR MAKING ORGANIC FERTILISERS AND ORGANIC PESTICIDES

Other business units have introduced innovations in implementing organic rice farming run by the Sawah Bangsa Farmer Group in the form of organic fertiliser and organic pesticide production. Various kinds of products and materials exist for making organic fertilisers and pesticides. Innovative products made by the Sawah Bangsa Farmer Group can be used as materials for making organic fertilisers and organic pesticides.

The innovative products made by the Sawah Bangsa Farmers Group as ingredients for making organic fertilisers and organic pesticides are: eco enzyme, *Corallomycetella repens*, *Trichoderma*, biosaka, PGPR (growth regulator), beuforia, DD Farm (decomposer) and finished solid fertiliser products that are ready to be used with animal manure.

The Sawah Bangsa Farmer Group has now succeeded in producing organic fertiliser products and plant-based pesticides based on the empowerment carried out by its group members to improve the farmer group's welfare. Another business unit that provides an excellent opportunity for organic rice farmers to become more prosperous is the cattle or buffalo business. Animal manure from cows or buffaloes is the most widely used material for making solid organic fertiliser because, in quantity, cows or buffaloes can produce a large amount of animal manure. In addition, organic rice farming also requires large quantities of organic fertilisers made from animal manure, which is around 3 $Mg \cdot ha^{-1}$ of organic rice farmland. Meeting the needs of many fertilisers will undoubtedly be more effortless if farmers have their cattle or buffaloes.

Organic agriculture solves agricultural problems because of its basic principles of running that consider many important elements in the farming process. The organic agriculture paradigm prioritises local ideas or wisdom in activities by utilising objects around, sustainable activities, and the welfare of farmers (Walthall *et al*., 2024). Problems in complex agricultural activities concern many countries because the agricultural sector can affect food security and economic growth. Agricultural problems can be sorted by modelling three common agricultural problems through optimisation techniques: water-scarce areas with surface resources and overexploited groundwater due to over-pumping for irrigation (Garcia and Alamanos, 2022).

Organic rice farming (ORF) is one of the agricultural systems currently too unfamiliar to farmers using conventional rice farming systems. The emergence of organic rice farming in one community group has caused many perceptions. The ORF is increasingly receiving attention from many parties because conventional rice farming (CRF) creates environmental problems, and public awareness of healthy food is increasing. Organic rice farming is considered dangerous because it utilises bacteria that can harm humans (Rozaki *et al*., 2020). Many views about food quality are shaped by the perception of who the consumers are. The perception of organic farming refers to the assumption that one of the important keys to understanding the quality of organic rice is the transfer of positive information about organic rice by consumers, farmers, and stakeholders (Petrescu, Vermeir and Petrescu-Mag, 2020).

When farmers are invited to switch to an organic farming system, this conventional farming mindset is difficult to change. They assume that organic farming is considered risky, too complex and complicated, and the results are not good even though after it is implemented, it turns out that it is not that bad. The solution is to improve the mindset about the spirit of establishing farmer groups. The demand for organic rice is high, but many farmers do not have a mindset. The study results show that farmers have a mindset that is used in conventional farming due to the spread of the green revolution movement, which is marked by agricultural modernisation with modern tools, chemical fertilisers, and chemical pest killers. They feel well-

established and comfortable with the conventional farming mindset, buying seeds, chemical fertilisers, chemical herbicides, and chemical pesticides that are all in the farm store. This conventional farming mindset is difficult to change when invited to switch to an organic farming system.

By raising cattle or buffaloes, farmers will have two businesses that are run simultaneously and are equally profitable. The need for organic fertilisers can be met well by the manure of cattle or buffalo owned, and farmers will also benefit from the livestock they live in. Livestock can be sold after meeting economic value. Therefore, organic rice farming while raising cows or buffaloes is an opportunity to continue to be carried out and developed so that organic rice farming continues to run well and farmers can be more empowered and prosperous.

CONCLUSIONS

At first, organic rice farming activities were generally understood as the process of producing organic rice only and could improve the welfare of farmers. However, after conducting field research, it was found that there was an innovation in organic rice farming carried out by the Sawah Bangsa Farmer Group. Organic rice farming (organic rice production and distribution) is only one of the links in the organic farming system (sustainable agriculture/circular agriculture). If relying on the sales of organic rice production alone, it cannot prosper farmers, while organic rice farming innovations can empower and improve farmers' welfare. The important point of innovation lies in the added value in the form of sales: organic rice, finished compost, two decomposers (compost makers/decomposers), namely *Trichoderma* and DD Farm, local bio-agents/microorganisms, namely *Corallomycetella repens*, ecoenzymes, PGPR or growth stimulants, beuforia, and biosaka which are all produced by the Sawah Bangsa Farmer Group.

Another business unit that provides an excellent opportunity for organic rice farmers to become more prosperous is the cattle or buffalo farming business because animal manure from cows or buffaloes is the most widely used material for making solid organic fertiliser. After all, in quantity, the manure of the two animals is quite large. In addition to animal manure for organic fertiliser, animal labour can be used to plough rice fields, and the meat can be sold or consumed.

The results of this study theoretically have the benefit that organic rice farming innovations have a long chain, not just producing organic rice. Practically, the results of this study show that organic rice farming is not as difficult as people who have never done organic farming have imagined. This research has limitations. Namely, it is only focused on analysing organic agriculture innovations, thus opening up opportunities for further research with the topics: 1) the potential of farmers and agro-tourism, 2) the potential of the Sawah Bangsa Farmer Group as a centre for organic agriculture training and community empowerment.

ABBREVIATIONS

DD Farm = a decomposer – Dewi and Deri farm (Dewi and Deri are the creators' names)

Jakaba = *Corallomycetella repens*, eternal lucky mushroom (Ind.: jamur keberuntungan abadi)

PGPR = plant growth promoting rhizobacteria (Ind.: ZPT – zat perangsang tumbuh)

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CONFLICT OF INTERESTS

All authors declare that they have no conflict of interest.

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