

Transforming Local Food Security through the Adoption of Organic Farming

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Abstract

Local farmers in Bintuni District do not yet understand cultivation techniques properly, resulting in low agricultural production. The purpose of this training was to provide an understanding of organic farming and improve the skills of farmers from the Meyah tribe in the Bintuni District, Teluk Bintuni Regency, in making organic fertilizers and organic pesticides. The training used discussion and practice methods. During the discussion session, the Unipa PkM team presented agricultural cultivation techniques, organic farming, and pest and disease control. Participants were very enthusiastic in listening to the material presented and provided a lot of feedback regarding obstacles encountered in the field. In the practical session, participants were given the opportunity to make organic pesticides from garlic and papaya leaves. In the final activity, participants made organic fertilizer from weeds, kitchen waste (vegetable scraps, etc.), and organic fertilizer from market waste. Both methods were very effective because they generated community enthusiasm, as can be seen from the responses given. Based on respondent data, there was an 85% increase in understanding of organic farming and cultivation techniques.

Keywords: Waste; Organic Farming; Organic Pesticide; Meyah Tribe Farmer; Organic Fertilizer

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INTRODUCTION

Agricultural challenges in Teluk Bintuni Regency are complex and influenced by various technical, social, and economic factors. One of the main constraints is the limited infrastructure, particularly road access to agricultural land and markets, which slows the distribution of agricultural products and increases the risk of post-harvest losses before they reach consumers (Sari, 2018; Suryawan, 2016). In addition, the agricultural sector is still largely dominated by traditional farming practices, which contribute to low land

productivity ([Palinggi & Puspitasari, 2023](#)) due to the limited adoption of modern agricultural technologies and the heavy dependence on seasonal conditions.

In addition, the limited availability of agricultural inputs, such as fertilizers, improved seeds, and farming equipment, poses a significant challenge for farmers in enhancing agricultural productivity. This situation is further exacerbated by limited human resources, as many farmers still have restricted access to training and technical assistance, while younger generations show relatively low interest in engaging in the agricultural sector. From the perspective of land resources, the presence of marginal soils and the potential for land ownership or customary land rights disputes also present distinct challenges to the sustainable management of agriculture.

The indigenous Meyah people residing in Bintuni District, Teluk Bintuni Regency, are highly familiar with agriculture, as most of them work as farmers. Nearly every household owns a plot of land of at least 50 m², which is used to cultivate food crops such as sweet potatoes, taro, peanuts, and cassava, as well as horticultural crops including mustard greens, water spinach, spinach, chili peppers, tomatoes, and watermelons. However, the farming practices adopted by the community are still largely traditional. This is reflected in the absence of land preparation and fertilizer application. The indigenous Meyah community also continues to practice shifting cultivation because they do not use fertilizers to maintain or improve soil fertility ([Palinggi & Puspitasari, 2023](#); [Rumainum et al., 2024](#)). Food security is one of the fundamental pillars for achieving community well-being. The availability of sufficient, nutritious, safe, and affordable food is essential for maintaining the quality of family life, particularly amid the challenges posed by climate change, fluctuations in food prices, and dependence on certain commodities. One strategic approach to addressing these challenges is to utilize local resources through the development of food crops that are easy to cultivate, possess high nutritional value, and are well adapted to a wide range of land conditions.

According to the Regulation of the Minister of Agriculture No. 2/Pert/Hk.060/2/2006, organic fertilizer is defined as a fertilizer composed wholly or predominantly of organic materials derived from plants and/or animals that have undergone processing and may be in either solid or liquid form, serving as a source of organic matter to improve the physical, chemical, and biological properties of the soil. Organic fertilizers offer numerous benefits, including increased agricultural production, reduced environmental pollution, and the sustainable improvement of land quality ([Simanungkalit et al., 2006](#); [Sunawan et al., 2021](#); [Tiesland Zebua et al., 2025](#)). The long-term use of organic fertilizers can enhance land productivity and help prevent land degradation. In addition, the application of organic fertilizers can promote vegetative growth, thereby supporting generative growth, which ultimately leads to optimal crop yields ([Prabawardani et al., 2023](#)).

One of the major challenges in agriculture is the attack of pests and diseases, which can significantly reduce agricultural production. Many farmers still rely on chemical pesticides to minimize the impact of pest and disease infestations. However, the excessive use of chemical pesticides can leave residues in the soil and water, which may be transferred to agricultural products, thereby degrading environmental quality and posing risks to human health and other living organisms ([Mubushar et al., 2019](#)). One alternative solution for pest and disease management is the use of botanical pesticides. Botanical pesticides not only help control pest and disease attacks on crops but also preserve the quality of agricultural products and promote environmental sustainability ([Huang et al., 2000](#); [Rola & Pingali, 1993](#); [Sutriadi et al., 2020](#)).

Local farmers in Bintuni District, particularly those from the Meyah tribe, have not received adequate agricultural cultivation training; consequently, their knowledge of farming practices remains limited and has not enabled them to maximize agricultural

production. Although local farmers are aware of the existence of chemical pesticides for pest control, they are not yet familiar with their proper use. This community service program aims to enhance community knowledge of cultivation techniques and organic farming practices, improve skills in producing organic fertilizers and botanical pesticides, and promote the utilization of home gardens to strengthen local food security. It is expected that this program will contribute to the development of sustainable local food security while simultaneously improving community welfare.

METHODS

The local food security strengthening program through organic farming was conducted in October 2025 for the Meyah Tribal Farmer Group. The program took place in Bintuni District, Teluk Bintuni Regency. A total of 21 participants attended the program, consisting of 8 men and 13 women. The characteristics of the participants are presented in Table 1. A total of 16 participants (76%) were primarily engaged in farming as their main occupation, while the remaining 5 participants (24%) practiced agriculture as a secondary occupation.

Table 1 Characteristics of the community service program participants

Gender	Number
Male	8
Female	13
Total	21
Occupation	Number
Farmer	16
Civil Servant	2
Private Sector Employee	3
Total	21
Age	Number
< 25	4
26–45	14
> 45	3
Total	21

The approach adopted in this program was community empowerment. A qualitative descriptive method was employed. The program consisted of three stages: activity planning, program implementation (including discussions and training sessions), and program evaluation. The evaluation was conducted using pre-tests and post-tests to assess the improvement in participants' understanding.

The local food security strengthening program through organic farming was carried out in two stages. The first stage consisted of face-to-face lectures and discussions. The topics covered included: (1) food crop and horticultural cultivation techniques, (2) organic farming, and (3) organic fertilizers and botanical pesticides. The second stage involved hands-on training in the production of botanical pesticides and organic fertilizers. The delivery of the materials and the training activities were documented through photographs as supporting data.

The materials used for the preparation of botanical pesticides included garlic, papaya leaves, liquid soap, and water. The materials used for the production of organic fertilizer consisted of weeds (grass and similar plant materials), vegetable scraps, market waste,

EM4, granulated sugar, and water. The equipment used included a mortar and pestle, knife, strainer, pesticide storage bottles, shovel, machete, tarpaulin, and buckets.

RESULT AND DISCUSSION

The local food security strengthening program through organic farming for the Meyah Tribal Farmer Group, conducted in Bintuni District, was attended by 21 participants. The program was officially opened by the Chairperson of the Meyah District Council Association of Bintuni District (Figure 1).



Figure 1 Opening ceremony of the local food security strengthening program through organic farming

Presentation of Materials and Discussion

The first topic presented was food crop and horticultural cultivation techniques (Figure 2). The participants showed great enthusiasm during the session, as they had traditionally practiced farming without applying proper cultivation techniques. The main crops cultivated by local farmers include sweet potatoes, taro, cassava, bananas, chili peppers, mustard greens, water spinach, and peanuts. However, the farmers do not use either inorganic or organic fertilizers because they still practice a shifting cultivation system. The extensive land owned by the farmers, combined with their limited knowledge of cultivation practices, has contributed to the continued use of this system among the Meyah tribe. Although shifting cultivation can help provide nutrients for crops, it is considered inefficient because it requires new land preparation during each planting season.



Figure 2 Presentation of materials by the community service team

Local farmers prefer to cultivate local food crops such as tubers, peanuts, bananas, and leafy vegetables because they are easy to grow and require minimal maintenance. In general, the cultivation of tuber crops begins with land preparation and the construction of ridges ([Haryani et al., 2021](#)). However, in Bintuni District, particularly on local farmers' land, tuber planting materials are planted directly into the soil without the use of ridges. Similarly, for vegetable crops such as mustard greens, chili peppers, and water spinach, local farmers do not establish nurseries as is commonly practiced. As is well known, vegetable seedlings are generally raised in nurseries to produce strong and healthy plants. Vegetable cultivation also typically involves the use of planting beds with a width of 50–100 cm ([Setiawati & Murtiningsih, 2007](#)). Nevertheless, local farmers in Bintuni District do not use planting beds. Crop maintenance practices, such as irrigation, are carried out only during the initial stage of growth, with farmers relying primarily on rainfall thereafter. The control of plant pests and weeds is performed manually, such as by hand weeding.

With their limited knowledge of cultivation techniques, local farmers are only able to cultivate a limited range of specific crops. This condition has contributed to the decline in agricultural production diversification in Bintuni District. In addition, the continuous cultivation of the same crop species on the same land can increase the risk of pest and disease infestations.

The second topic presented was organic farming, which included an explanation of the definition and techniques of organic agriculture, particularly the use of organic fertilizers and botanical pesticides (Figure 2). The participants responded very positively to the material presented. This was evident from the numerous questions raised regarding the preparation of organic fertilizers and methods for controlling pest and disease attacks. Most of the farmers had only a limited understanding of organic farming practices.

Organic farming gained prominence following the Green Revolution of the 1960s as an effort to reduce environmental degradation. It is an agricultural system that relies on natural inputs and avoids the use of synthetic chemicals ([Mayrowani, 2012](#); [Soni et al., 2022](#)). Organic farming offers several advantages, including improving soil fertility, increasing soil organic matter, maintaining soil microbial diversity, preventing soil erosion, and reducing the risk of drought ([Abbasi, 2025](#)). Therefore, it is important for local farmers to understand and apply the principles of organic farming in order to increase agricultural production while preserving soil fertility.

In the third session, the presenter explained the organic management of pests and diseases affecting food and horticultural crops. The pests that commonly attack vegetable crops include leaf caterpillars, aphids, and grasshoppers on spinach and water spinach, as well as fruit flies and thrips on red chili peppers ([Setiawati & Murtiningsih, 2007](#)). Meanwhile, the pests that frequently infest tuber crops are grasshoppers and aphids ([Haryani et al., 2021](#)).

The management of pests and diseases can be carried out not only through chemical methods, as commonly recognized by local farmers, but also through mechanical control and the use of botanical pesticides and insecticides. Pesticides remain one of the primary solutions for controlling pest and disease attacks. They contain chemical substances that can suppress or even eliminate populations of insects, weeds, fungi, rodents, and other harmful pests ([Hakeem et al., 2016](#)). The use of pesticides has continued to increase over the past few decades, giving rise to various environmental concerns. Compared with chemical pesticides, botanical pesticides offer several advantages, including being environmentally friendly and helping to ensure that agricultural products remain safe for consumption ([Sutriadi et al., 2020](#)). Therefore, practical training in the preparation of botanical pesticides is highly important for farmers, particularly those from the Meyah tribe in Bintuni District.

Training on the Preparation of Botanical Pesticides and Organic Fertilizers

In the next session, the participants took part in practical training on the preparation of botanical pesticides and organic fertilizers. The botanical pesticide was made using garlic and papaya leaves as the main ingredients. The first step involved cutting 2–3 papaya leaves and 4–5 cloves of garlic into small pieces (Figure 3). The chopped papaya leaves and garlic were then crushed using a mortar and pestle. After being thoroughly crushed, the mixture was transferred into a bottle, and 500 mL of water along with an appropriate amount of liquid soap was added. The liquid soap functions as an adhesive when the botanical pesticide is sprayed onto plants. In addition, it acts as a surfactant and helps break down the protective layer of soft-bodied insects. The botanical pesticide solution was then allowed to stand before being filtered. Once prepared, the botanical pesticide could be used directly by the farmers.



Figure 3 Training on the preparation of botanical pesticides

The mixture was then stirred using a shovel to ensure that all materials were evenly blended. Afterward, it was covered with a tarpaulin and allowed to ferment for 3–4 weeks. The compost mixture was uncovered every four days to improve air circulation and stirred to ensure uniform fermentation. The finished organic fertilizer was characterized by a dark brown to black color and an earthy smell. Training on making compost is documented in Figure 4.



Figure 4 Training on the preparation of compost fertilizer

The participants showed great enthusiasm throughout the practical training on the preparation of botanical pesticides and organic fertilizers. In addition to actively

participating in the hands-on activities, they also asked numerous questions regarding the techniques and raw materials used in the production of botanical pesticides and organic fertilizers. The participants expressed a high level of satisfaction with the training provided and committed to adopting the use of organic fertilizers and botanical pesticides in their farming practices.

Program Evaluation

At the beginning of the training, the participants were given a questionnaire (pre-test) to assess their understanding of organic farming. A total of 18 participants (85%) had no prior knowledge of organic farming (Table 2). This finding indicates the lack of outreach and education provided to local farmers regarding agricultural cultivation practices. One of the factors limiting agricultural productivity in Teluk Bintuni Regency is the limited knowledge of local farmers, which restricts them to cultivating local commodities such as sweet potatoes, cassava, taro, and peanuts, whose cultivation is relatively simple. Therefore, improving the capacity of local farmers should become a priority for the local government to enable them to produce a more diverse range of agricultural products.

Table 2. Results of the Program Evaluation Based on the Pre-Test and Post-Test

No	Question	Before				After			
		Yes	%	No	%	Yes	%	No	%
1	Have you ever heard the term organic farming?	2	9.52	19	90.48	21	100.00	0	0.00
2	Do you know the benefits of organic farming?	0	0.00	21	100.00	21	100.00	0	0.00
3	Do you know agricultural crop cultivation techniques?	7	33.33	14	66.67	21	100.00	0	0.00
4	Do you know the benefits of applying cultivation techniques to crops?	7	33.33	14	66.67	21	100.00	0	0.00
5	Do you know how to prepare organic fertilizer?	2	9.52	19	90.48	21	100.00	0	0.00
6	Do you know the benefits of organic fertilizer?	3	14.29	18	85.71	21	100.00	0	0.00
7	Do you know how to prepare botanical pesticides?	0	0.00	21	100.00	21	100.00	0	0.00
8	Do you know the benefits of botanical pesticides?	4	19.05	17	80.95	21	100.00	0	0.00
9	Do you know post-harvest management techniques?	2	9.52	19	90.48	21	100.00	0	0.00
10	Do you know the benefits of post-harvest management?	4	19.05	17	80.95	21	100.00	0	0.00
Average		3.10	14.76	17.90	85.24	21.00	100.00	0.00	0.00

After the program, a post-test using the same set of questions was administered, and the results showed that all participants had gained an understanding of organic farming (Table 2). The presentations and discussions conducted during the program helped the participants understand the cultivation techniques required to improve agricultural production. In addition, the practical training on the preparation of organic fertilizers and botanical pesticides greatly assisted the participants in understanding the functions and roles of these agricultural inputs.

This community service program has addressed the needs of local farmers by improving their knowledge and skills in organic farming practices. The participants committed to

adopting organic farming by producing and applying organic fertilizers to increase agricultural production without the need to practice shifting cultivation. In addition, they committed to using environmentally friendly botanical pesticides as an alternative to chemical pesticides for managing crop pests and diseases.

CONCLUSION

Local farmers from the Meyah tribe in Bintuni District have a limited understanding of agricultural cultivation practices. This is evident from the fact that their farming activities are still largely traditional in nature. The farmers continue to practice shifting cultivation and do not apply cultivation techniques such as fertilizer application and the management of crop pests and diseases. Following the training program, the participants' level of understanding increased by 85% compared to their pre-training level. Therefore, local farmers from the Meyah tribe in Bintuni District require continuous assistance and guidance in the cultivation of food and horticultural crops to maximize agricultural production in Bintuni District, Teluk Bintuni Regency.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTIONS STATEMENT

Conceptualization, IMR and RN; methodology, AM, N, MMM, and OW; formal analysis, VLT and YP; writing—preparation of the original draft, IMR.

AI DISCLOSURE STATEMENT

The authors declare that this research was prepared, researched, written, and edited without the aid of artificial intelligence (AI) techniques.

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