Universitas Muhammadiyah Malang, East Java, Indonesia

Journal of Community Service and Empowerment

p-ISSN 2442-3750, e-ISSN 2537-6204 // Vol. 4 No. 2 August 2023, pp. 383-390

Enhancing the productivity of farmer community in producing organic fertilizer and local plant-based pesticide

I Ketut Widnyana [a,1,*], Ni Putu Pandawani [a,2], Putu Edi Yastika [a,3], I GD Yudha Partama [a,4], I Made Wahyu Wijaya [a,5]

[a]Regional and Rural Planning Study Program, Universitas Mahasaraswati Denpasar, Jalan Soka No. 47, Denpasar 80237, Indonesia

[1] widnyanaketut@unmas.ac.id*; [2] pandawani@unmas.ac.id; [3] ediyastika@unmas.ac.id, [4] yudhapartama@unmas.ac.id, [5] wijaya@unmas.ac.id

*** Corresponding author**

ARTICLE INFO

Article history
Received: 2023-06-12
Revised: 2023-06-27
Accepted:2023-07-03
Published: 2023-07-03

Keywords
Batukaang
Organic Fertilizer
Plant-Based Pesticide
Sustainable agriculture

ABSTRACT

These activities are expected to improve the agriculture community resilience in Batukaang Village to achieve a sustainable agriculture practice. Through a training and assisting program, the farmer community will get improved their skill to make their own fertilizer and pesticide by utilizing organic waste and local material. These activities contribute to the achievement of SDG 2: Zero hunger, since agriculture in Batukaang Village is the most sector that support the economics and food security. The activities resulted in increasing the knowledge and skill of farmer community in Batukaang Village. By enhancing the farmers with the knowledge, skills, and resources required to produce their own organic fertilizer and pesticide, they can promote soil health, reduce environmental pollution, and enhance the well-being of agricultural communities as a whole. It support resilient agricultural systems that promote sustainable practices, safeguard natural resources, and enhance farmers' livelihoods in Batukaang Village.

Kata Kunci
Batukaang
Pertanian berkelanjutan
Pestisida Nabati
Pupuk organik

Meningkatkan produktivitas masyarakat petani dalam memproduksi pupuk organik dan pestisida nabati lokal. Kegiatan ini diharapkan dapat meningkatkan ketahanan masyarakat pertanian di Desa Batukaang untuk mencapai praktik pertanian berkelanjutan. Melalui program pelatihan dan pendampingan, masyarakat petani akan ditingkatkan keterampilannya membuat pupuk dan pestisida sendiri dengan memanfaatkan sampah organik dan bahan lokal. Kegiatan tersebut berkontribusi terhadap pencapaian SDG 2: Nol Kelaparan, karena pertanian di Desa Batukaang merupakan sektor yang paling mendukung perekonomian dan ketahanan pangan. Kegiatan tersebut menghasilkan peningkatan pengetahuan dan keterampilan masyarakat petani di Desa Batukaang. Dengan meningkatkan pengetahuan, keterampilan, dan sumber daya yang diperlukan petani untuk memproduksi pupuk dan pestisida organik mereka sendiri, mereka dapat meningkatkan kesehatan tanah, mengurangi pencemaran lingkungan, dan meningkatkan kesejahteraan masyarakat pertanian secara keseluruhan. Ini mendukung sistem pertanian tangguh yang mempromosikan praktik berkelanjutan, menjaga sumber daya alam, dan meningkatkan mata pencaharian petani di Desa Batukaang.

How to cite: Widnyana, I. K., Pandawani, N. P., Yastika, P. E., Partama, I. G. Y., & Wijaya, I. M. W. (2023). Enhancing the productivity of farmer community in producing organic fertilizer and local plant-based pesticide. *Journal of Community Service and Empowerment, 4*(2), 383-390. https://doi.org/10.22219/jcse.v4i2.27092

INTRODUCTION

Batukaang village is one of the villages located in the Kintamani district and has an area of 1.92 km2. The district of Kintamani in Bangli Regency, Bali Island, is a parish area where most of the population works in the agriculture. The agricultural diversity that grows in the Kintamani district are vegetable and fruit plantation, and fishery. The farming commodities that are widely cultivated in the Kintamani district are horticultural commodities such as high-rise vegetables and orange fruits. The cultivated plant commodity is coffee beans, for which Kintamani Coffee has been listed as one of geographical specifically commodity across the island. The fisher community is breeding Nile Tilapia fish as the

fishing commodity in the Batur Lake nearby the village. Those activities should be sustainable by using resources effectively and efficiently through integrated agricultural systems.

Batukaang village is famous of their orange and coffee production. It becomes one of the local suppliers in the island. In addition to support the growing oranges and coffee, most of farmers are still relying on chemical fertilizer and pesticides. They consider that has better quality, faster and high yield although it would be cost more. In other side, a few farmers are breeding cow or goats in their farms to get the cow dunks to produce their own fertilizer (Dharma, Parining, & Putra, 2021). However, the use of organic fertilizer still needs to be improved due to the environment preservation and sustainable agriculture practice. The farmer community had been supported by the government through an integrated agriculture system named SIMANTRI. The program is developed to connect the animal breeding with the agriculture so both sectors can support each other by providing fertilizer and feed stock. In Batukaang Village, the SIMANTRI program encourage the local farmer to produce fertilizer from cow dunks and urine for the orange and coffee plantation. In fact, only few farmers were following the programs, and most are still using chemical fertilizer. This activity aims to enhance the skill of the local farmer in producing their own organic fertilizer by utilizing the animal's urine and making plant-based pesticides.

Subjects of Batukaang Village have previously received SIMANTRI support from the Government of Bali Province as an effort to encourage subjects to produce organic fertilizers independently to meet the need for fertilizer in the cultivation. In its implementation, it faces several obstacles, such as lack of knowledge related to the multiplication of fermenters used in the processing of organic fertilizers. When the given fermenter is exhausted, they can no longer produce. The other side, the urine is not used, while the nutrient content of the urine was higher than its dung. One method of processing and utilizing waste urine is through bio urine. Bio urine is taken from cattle such as cows, cattle, goats, and others that is fermented to be used as environmentally friendly plant fertilizer. The urine of fresh cattle contains low levels of nutrients as well as pathogenic elements for plants. It is therefore recommended that urine be used after a common fermentation called bio urine. The urine processing technology of cattle is very simple and economically valuable, and it can increase the farmer's own income. Some of the benefits of bio urine, among others, have a good long-term effect on the soil, i.e., it can improve the structure of soil organic content, stimulate the root growth of plants on seeds or seeds, act as organic leaf fertilizer, and prevent the arrival of various plant pests.

Agriculture activities are not independent of the presence of plant-interfering organisms (OPTs), which are a threat that can cause losses, one of which is pests. The easiest way farmers choose to control pests is by using synthetic pesticides. The use of pesticides raises concerns about the exposure of chemicals to food materials that will be consumed by humans. Nowadays, people are starting to consider consuming organically produced foods. Pest control can be done with plant pesticides, which are pesticides made from natural ingredients that are found in our surroundings. The field surveys indicate that in Batukaang Village there are several types of plants that can be used as plant pesticides, including red onions, *Piper betle*, *Cymbopogon citratus, Alpinia galanga*, and so on. These materials can be combined with biourine to become a plant pesticide that can be applied in the oranges and coffee plants owned by the Batukaang village community. This is an implementation of the community's dedication to the use of organic waste in the production of organic fertilizers and pesticides in support of sustainable agriculture in Batukaang village. These activities are expected to improve the agriculture community resilience in Batukaang Village to achieve a sustainable agriculture practice. Through a training and assisting program, the farmer community will get improved their skill to make their own fertilizer and pesticide by utilizing organic waste and local material. The use of organic fertilizer and pesticide will be minimized the consumption of synthetic compound to the plantation. It results the decrease of operational cost for the farmer in maintaining the agriculture meanwhile keeping the resources save, especially for land and water. These activities also contribute to the achievement of SDG 2: Zero hunger, since agriculture in Batukaang Village is the most sector that support the economics of the local community.

METHOD

This community empowerment program has two main activities, which is producing organic fertilizer and making local plant-based pesticide. The activities were held in the village hall with the farmer community as the participant and the author as the trainer and assistant. The village authorities were also joining the activities as support to the farmer community. About 10 farmer community members in Batukaang Village joined the program. They are orange and coffee plantation farmer who are commonly use synthetic fertilizer and pesticide. They have lack of knowledge regarding producing organic fertilizer although have cow dung and urine as the resource around. Through a training and assisting program, it will help the farmer to gain their knowledge also their skill in making the product by themselves. Farmers are given practical procedures for the producing of organic fertilizers and plant pesticides. Pre-test and post-test were used to know the community perspective in using organic waste in producing organic fertilizers and plant pesticides.

Tools and Material

The tools which are used in producing organic fertilizers and plant pesticides are drums, clamps, mixers, filters, trays, knives, blenders, and plastic socks. The materials used are taken from local material, such as are fermenters, molasses, terraces, bio urine, clean water, and plant pests (Red onions, *Piper betle*, *Cymbopogon citratus,* and *Alpinia galanga*).

Activity 1: Social Campaign

Organic waste recovery operations in the production of organic fertilizers and plant pesticides start with the campaign of the organic waste potential to support sustainable agricultural cultivation activities. The potential obtained with organic waste, primarily farm waste, was shown in campaign including economic potential, social potential, and environmental potential. The true economic potential is the savings in fertilizer cost that farmers can make because they can create their fertilizer independently using livestock manure. The social potential gained through the cooperative exploitation of farm waste processed into organic fertilizer in sub-institutions can raise members' familiarity in order to promote knowledge of effective farming cultivation. The environmental benefits of converting organic waste into organic fertilizer are the reduction of the risk of pathogenic bacteria spreading during the degradation process, which can harm the health of humans or livestock; the absence of odor pollution; and the spread of pests caused by partially contaminated organic waste (I. K. Sumantra, Widnyana, & Pandawani, 2021). In campaign activities, it was also stressed the need to utilize nature's ability to undertake environmentally friendly horticulture. Farmers can use local microorganisms (MOLs) found in nature as fermenters to produce organic fertilizers. Natural materials such as kitchen spices (Red onions, *Piper betle*, *Cymbopogon citratus,* and *Alpinia galanga*) that contain active pesticide chemicals can be employed in the treatment of plant pests, primarily to prevent the development of attacks that hurt farmers.

Activity 2: Training

The demonstration and direct practice of the community start with making fermenters and plant pesticides made of raw Red onions, Piper *betle*, *Cymbopogon citratus,* and *Alpinia galanga* mixed with bio urine will provide the training stage on the utilization of organic waste in production of organic fertilizers and plant pesticides. It is intended that through this direct demonstration, the farmer group would be able to produce plant pesticides on their own and apply them to farming land. The following practice including:

a. Introduction and Preparing the Fermenter
   A fermenter is a bio activator made up of microorganisms that aid in the composition or decomposition of organic molecules. The fermenter is multiplied by preparing 18 liters of clean water, 1 liter of fermentation, 1 liter of molasses, and a drum with a minimum capacity of 20 liters. How to manufacture it: wipe the surface of the drum or touch it, introduce clean water and molasses mixed to a flat, insert at least a 1-liter fermenter, mix once every 2 hours, and harvest after at least 4 days.
b. Production of liquid organic fertilizers and plant pesticides use bovine urine and culinary components to fertilize plants while also protecting them from plant disruptors (pest, fungi, and bacteria). Red onions, *Piper betle*, *Cymbopogon citratus,* and *Alpinia galanga* were employed as pesticide ingredients. Red onions can be used as a natural insecticide to kill fox and ulcer bugs, as well as mushrooms on plants. Acetogenic chemicals are found in red onions. The bug is unwilling to consume. *Alpinia galanga* is a type of root plant whose active components can be utilized as a plant insecticide, and its extracts can be used as a fungicide. *Piper betle* leaves can be used to make plant insecticides as basic ingredients. The essential oils in *Piper betle* leaves contain germ-killing essential oils, antioxidants, and fungicides, including anti-fungus triterpenes and tannins. The method of preparation of all materials is: smooth and sprinkle until the liquid is out and diluted; dilute the fermenter with molasses and clean water; insert the result of the drawing that has already been splintered in the water into the drum that has been filled with bio urine; insert a fermentation (50:50); mix every afternoon; and at least after 1 week, it can be harvested, filtered, and stored in a clean sprinkling.
c. Determine the needs: Begin by determining the specific needs and requirements of the local farming community. Understand the local pests and diseases, as well as the crops that are grown. This information will be used to tailor the training program to the farmers' specific challenges.
d. Hands-on training: Arrange for practical, hands-on sessions to allow farmers to learn by doing. Set up demonstration plots or community gardens where participants can learn about and practice organic pest management methods. This hands-on approach provides farmers with confidence and practical skills that they can immediately apply to their own farms.
e. Demonstration: Schedule specific training sessions to demonstrate the preparation of organic pesticides. Teaching farmers how to extract plant extracts, make fermented solutions, or culture beneficial microorganisms is one example. Demonstrate the steps, explain the ingredients and proportions, and emphasize safety precautions during preparation and application.
f. Field visits and case studies: Arrange for farmers to visit successful organic farms or community projects to see firsthand the effectiveness of organic pest management practices. To inspire and motivate participants, case studies and success stories from local farmers who have switched to organic pesticides can be shared.

g. Training materials and resources: Create training materials like handouts, pamphlets, or digital resources for farmers to use after the training. These materials should include step-by-step instructions on pesticide preparation, application techniques, dosage recommendations, and safety precautions. Provide information on reputable organic input suppliers as well as resources for further learning.

RESULTS AND DISCUSSION

Understanding of Organic Waste Utilization

Through dedication to the use of organic waste in the manufacture of organic fertilizers and plant pesticides, there has been an increase in the understanding of the community of Batukaang village related to the manufacturing of organic fertilizer and plant pesticides. This can be seen in the results of the pre-test and post-test performed during the service activities (**Figure 1**). The pre- and post-test results are as follows:

Table 1. Result of Understanding of Organic Waste Utilization

No	Question	Pretest (%)		Posttest (%)	
		Yes	No	Yes	No
1	Do you know about organic fertilizer?	77.78	22.22	100	0
2	Do you know the material to produce organic fertilizer?	44.44	55.56	100	0
3	Do you know the process to make organic fertilizer?	22.22	77.78	100	0
4	Do you know the process to make organic fertilizer by using cattle urine?	22.22	77.78	100	0
5	Have you made organic liquid fertilizer by using cattle urine?	22.22	77.78	100	0
6	Do you know the material to produce bio urine?	22.22	77.78	100	0
7	Do you know the benefit of bio urine?	22.22	77.78	100	0
8	Do you know about plant-based pesticide?	0.00	100.00	100	0
9	Do you know about the material to make plant-based pesticide?	0.00	100.00	100	0
10	Have you made plant-based pesticide?	0.00	100.00	100	0

The pre-test results showed that the majority of participants knew what organic fertilizer meant, but only half knew what ingredients could be used as organic, and most did not know about bio urine or plant pesticides. After socialization and practice on the use of organic waste in the manufacture of organic fertilizers and plant pesticides, all participants learned about organic fertilizers, bio urine, and plant pesticides. Commitment to the community through the demonstration of organic fertilizer production plus plant pesticides improves the group's skills in producing organic and plant-based fertilizers that can be used to improve the productivity and quality of the orange and coffee crops grown in Batukaang Village (Suanda, Budiasa, Suta, Ariati, & Widnyana, 2021).

Figure 1. Campaign and learning about the organic fertilizer and pesticide

It is supported by documentation in the form of photographs and video tutorials on the practice of making organic fertilizers and plant pesticides carried out directly by the community. Society has never previously done the manufacture of plant pesticides; through this dedication, society practices directly and knows the materials that can be used as plant pesticides that can then be applied in their respective lands. The obstacle to the implementation of the dedication to the community of training for the use of organic waste in the production of organic fertilizers and plant pesticides is the small number of training participants. The Batukaang Village community that was present in the training of organic fertilizer and plant pesticide production was a sub-representative, a representative of the countryside, and a PKK representative, with a total of 10 people. The small number of participants becomes an obstacle to the widespread dissemination of information, while most of the people in Batukaang Village are farmers. Of course, the information provided when training for the production of organic fertilizers and plant pesticides is needed by most of the community. However, this can be addressed by increasing the role of subordinate representatives, villagers, and the PKK in spreading information.

Producing Organic Fertilizer and Local Plant-Based Pesticide

In this program, the farmer community is encouraged to be able to produce their own fertilizer and pesticide. The trainer help the community to identify the natural material that could be used to make fertilizer and pesticide. The materials were commonly used in the local community in their daily life. The training includes introduction of material, demonstration, and hands on practice by the local farmer. Some local material used to make the plant-based pesticide are Allium cepa Piper betle, Cymbopogon citratus, and Alpinia galanga (**Figure 2**).The activities of producing organic fertilizer and local plant-based pesticide can be seen on **Figure 3**.

Pesticides derived from red onions Plant pesticides are used as an alternate control to address the issues of pesticide resistance, toxicity, and inefficiency in pesticide application. Furthermore, plant pesticides are more environmentally benign, ensuring that the ecosystem remains balanced. Plant insecticides derived from red onion skin waste components could be used to control grey worms that damage plants (NP Putu Pandawani & Widnyana, 2021). Acetogenic chemicals found in high concentrations in red onions can diminish insect appetite, causing insects to avoid plants that have already been treated with red onion skin insecticides. Meanwhile, acetogenic chemicals in low concentrations might poison the pest's stomach, leading to death. Furthermore, the skin of red garlic contains squamocin compounds, which can interfere with the respiratory system of insect cells by blocking electron transport. The bug will then die slowly since it will not acquire nourishment (Layali Damanik et al., 2022). The elements in red onion skin, which act as pesticides, also offer additional benefits that can help plants grow.

Figure 2. Preparing material for producing plant-based pesticide

Organic fertilizers contribute to the general health and fertility of the soil. They enhance organic matter content, which promotes soil structure and aeration. This, in turn, increases root development and nutrient intake by plants. The presence of organic matter also supports the establishment of beneficial soil microbes, which play a critical role in nutrient cycling and disease suppression (Ulhasanah et al., 2022; Widnyana, Sukerta, Wiswasta, & Limantara, 2019). It helps sustainable agriculture practices by avoiding environmental impacts. Unlike synthetic fertilizers, organic fertilizers do not include toxic chemicals or additions that might seep into water sources or cause soil degradation (Cokorda, Wijaya, & Paramita, 2022). They are biodegradable and contribute to the long-term enhancement of soil health, lowering the dependency on external inputs over time. Organic fertilizers can release nutrients slowly, minimizing the danger of nutrient leaching and runoff. Because of their slow-release nature and enhanced soil structure, help keep nutrients in the root zone, decreasing the loss of important nutrients and lowering environmental pollution (Widnyana et al., 2019). Organic fertilizers can be produced on-farm or locally sourced and minimizing the requirement for costly external inputs. For example, farmers can compost agricultural wastes, animal dung, and other organic materials to make nutrient-rich

compost that can be used as fertilizer. This reduces the expense of acquiring synthetic fertilizers and minimizes waste by recycling organic materials that would otherwise be thrown away (Rai, Ashiya, Singh Rathore, & Professor, 2007). In summary, the benefits of utilizing organic fertilizers include better soil health and fertility, prolonged nutrient release, fewer environmental impacts, enhanced plant health and quality, cost-effectiveness, and compliance with organic certification standards (Gd et al., 2022; K. Sumantra & Widnyana, 2022). By introducing organic fertilizers into their farming techniques, farmers may promote sustainable agriculture, protect the environment, and achieve long-term agricultural productivity.

Figure 3. Producing organic fertilizer and plant-based pesticide

Organic pesticides are made from natural ingredients and offer various advantages over synthetic pesticides. Organic pesticides are intended to be less hazardous to the environment than synthetic pesticides. They are usually composed of naturally occurring compounds such as plant extracts, minerals, or helpful microbes. These chemicals degrade more quickly and have less permanence in the environment, lowering the danger of contamination of water supplies, soil, and non-target creatures (Ni Putu Pandawani, Listihani, Widnyana, Ariati, & Selangga, 2022; Suanda et al., 2021). Organic insecticides are typically regarded as less hazardous to human health. Synthetic pesticides frequently contain harmful compounds that endanger farmers, consumers, and wildlife. Farmers can reduce their exposure to potentially toxic compounds and the health hazards linked with pesticide use by utilizing organic alternatives. Organic pesticides are sometimes more selective in their pest targeting, which aids in the preservation of beneficial insects, birds, and other organisms in the ecosystem.

Lengkuas (Alpinia galanga) is easily obtained in Indonesia as well as acts as an anticancer and antibacterial agent. The methanol fraction has an activity of inhibiting microbial growth in vitro in some species of bacteria and fungi. Infusion of ethanol extract containing essential oils inhibits the growth of several species of pathogenic mushrooms, namely Tricophyton, Mycrosporum gypseum, and Epidermo floccasum (Widiastuti, Simarmata, & Sumardiyono, 2021). Additionally, the extracts of shrimp have antifungal activity against Fusarium moniliforme and Aspergillus spp. Alpinia galanga extract has the potential as a plant fungicide against grapefruit leaf disease (P. euvitis). The antifungal material contained in the extract is volatile so research on formulations to suppress the volatility of active compounds is important to develop. As for the qualities of Piper betle,, one can prevent the attack of the pest Tritip (Plutella xylostella) because its bioactive content is identical to Serai, namely saponins, flavonoids, and polyphenols, as well as essential oils. The qualities of the Piper betle, leaves are utilized to evict the pest and bugs. The methanol extract from its leaves can also kill several species of insect larvae, while the active chemical compound composition is also strong against fox-destroyers and other pests. The extracts of Piper betle, leaves also proved to be efficient in killing the entire S. litura instar (Tumonglo et al., 2017).

Community empowerment in the production of organic fertilizer and local-based pesticides holds tremendous potential for sustainable agriculture and environmental stewardship. It can transform farmers into active participants in the protection of soil health, biodiversity, and the well-being of their communities by engagement and education. The advantages of community empowerment in organic fertilizer production are numerous, including less waste and improved soil fertility. Furthermore, empowering communities to generate locally based pesticides enables farmers to address pest and disease concerns in a sustainable manner by utilizing natural resources such as plant extracts, beneficial microbes, and biopesticides. By sing local resources promotes self-sufficiency and decreases dependency on costly external inputs, which benefits farmers economically.

This activity provides a road to sustainable agriculture, ecological balance, and improved livelihoods. Governments and institutions should offer incentives, subsidies, and technical assistance to promote the use of organic methods. Investing in research and development, as well as spreading knowledge, will help advance the field. Market linkages and certification programs can help farmers gain access to premium markets while also providing financial incentives for their efforts. The village authorities can encourage resilience, promote self-sufficiency, and create a brighter future for farming communities and the world by providing farmers with the information, resources, and networks they need to shift to organic and environmentally friendly techniques.

CONCLUSION

The activities which was conducted has result in increasing the knowledge and skill of farmer community in Batukaang Village. Community empowerment in the production of organic fertilizer and pesticides is a crucial component of sustainable agriculture and environmental preservation. By enhancing the farmers with the knowledge, skills, and resources required to produce their own organic fertilizer and pesticide, they can promote soil health, reduce environmental pollution, and enhance the well-being of agricultural communities as a whole. Utilizing local organic materials, increasing soil fertility, and decreasing reliance on synthetic inputs are some of the benefits of community empowerment. In addition, supportive policies, infrastructure development, and market links are essential to enable farmers to access markets, receive equitable prices for their produce, and reap the full benefits of their labor. By embracing community empowerment in producing their own organic fertilizer and pesticide, it can construct resilient agricultural systems that promote sustainable practices, safeguard natural resources, and enhance farmers' livelihoods in Batukaang Village. These activities also contribute to the achievement of SDG 2: Zero hunger, since agriculture in Batukaang Village is the most sector that support the economics and food security of the local community.

ACKNOWLEDGEMENT

The authors thank to Batukaang Village authorities for supporting this community empowerment program. This program was organized by the member and postgraduate student of Rural and Regional Planning Study Program, Postgraduate Program, Universitas Mahasaraswati Denpasar.

REFERENCES

Cokorda, J., Wijaya, I. M. W., & Paramita, A. A. I. I. (2022). Produksi kompos melalui pengelolaan sampah rumah tangga menggunakan composter bag di Desa Ayunan, Kabupaten Badung. *Lumbung Inovasi: Jurnal Pengabdian Kepada Masyarakat, 7*(4), 479–488. doi: 10.36312/linov.v7i4.824

Dharma, I. G. N. K. S., Parining, N., & Putra, I. G. S. A. (2021). Pemberdayaan petani jeruk di Desa Batukaang Kecamatan Kintamani Kabupaten Bangli. *Jurnal Agribisnis Dan Agrowisata, 10*(2), 473–482.

Gd, I., Partama, Y., Ayu, A. A., Andriyani, D., Made, I., Wijaya, W., & Denpasar, U. M. (2022). PKM: Penyusunan paket wisata lintas desa dalam mewujudkan desa wisata kerambitan terintegrasi PKM : Preparation of packages for cross-village tours in realizing an integrated Kerambitan Tourism Village I Dewa Gede Agung Pandawana 2 Dewa Gede Agung Gana Kumara 3 Ni Made Dwi Puspitawati 4. doi: 10.30645/.v1i1

Layali Damanik, D., Novianti, S., Anola Ifana, C., Firmansyah, L., Wandira, S., Fauzillah, R., (2022). Perikanan dan ilmu kelautan, f. (n.d.). pestisida nabati berbahan baku limbah kulit bawang merah (Allium cepa L.) untuk mengatasi hama penting pada tanaman asparagus (Asparagus officinalis) (Vegetable Pesticides with Waste Skin Shallots (Allium cepa L.) to Overcome Important Pests on Asparagus Plants (Asparagus officinalis)). In *Jurnal Pusat Inovasi Masyarat Oktober* (Vol. 2022).

Pandawani, Ni Putu, Listihani, L., Widnyana, I. K., Ariati, P. E. P., & Selangga, D. G. W. (2022). High impact of Clerodendrum paniculatum leaf extract to suppress zucchini yellow mosaic virus infection in zucchini plants. *Biodiversitas, 23*(6), 2914–2919. doi: 10.13057/biodiv/d230618

Pandawani, NıP Putu, & Widnyana, I. K. (2021). Identification of virus causes of mosaic diseases in zucchini plants in the Bali Island of Indonesia. *Journal of Tekirdag Agricultural Faculty, 18*(3), 411–418. doi: 10.33462/jotaf.707645

Rai, N., Ashiya, P., Singh Rathore, D., & Professor, A. (2007). Comparative study of the effect of chemical fertilizers and organic fertilizers on eisenia foetida. *International Journal of Innovative Research in Science, Engineering and Technology (An ISO Certified Organization), 3297*(5), 12991–12998. Retrieved from www.ijirset.com

Suanda, I. W., Budiasa, I. M., Suta, I. N., Ariati, P. E. P., & Widnyana, I. K. (2021). Pemberdayaan kelompok tani melalui pelatihan pestisida nabati dan pupuk organik di Dusun Kembang Sari, Desa Tukadaya, Kecamatan Melaya, Jembrana Bali. *Jasintek, 2*(2), 131–139.

Sumantra, I. K., Widnyana, I. K., & Pandawani, P. (2021). Reduction of inorganic fertilizer and application of organic fertilizer in rice plant. *International Journal of Applied Science and Sustainable Development, 3*(2), 62–65.

Sumantra, K., & Widnyana, K. (2022). Pembuatan pupuk organik cair berbahan keong mas plus (pocmas-plus) dan aplikasinya pada tanaman rosella pada fase seedling. *Jurnal Abdi Insani, 9*(4), 1441–1449. doi: 10.29303/abdiinsani.v9i4.784

Tumonglo, S. I., Purwanto, B., Diana Mual, C., Kehutanan, D., dan Perikanan KabKaimana, P., & Sekolah Tinggi Penyuluhan Pertanian Manokwari, D. (2017). Evaluasi penyuluhan pemanfaatan daun sirih sebagai pestisida nabati dalam mengendalikan hama ulat tritip (Plutella xylostella) pada tanaman sawi di Kampung Wamesa Distrik Manokwari Selatan Kabupaten Manokwari. *In Jurnal Triton* (Vol. 8).

Ulhasanah, N., Sarwono, A., Yosafaat, M., Filippi, D., Suryawan, I. W. K., & Wijaya, I. M. W. (2022). Composting of banana leaves and coconut leaves using EM4 bioactivator. *Advances in Tropical Biodiversity and Environmental Sciences, 6*(1), 8. doi: 10.24843/atbes.2022.v06.i01.p02

Widiastuti, A., Simarmata, R. F., & Sumardiyono, C. (2021). Potensi ekstrak lengkuas sebagai fungisida nabati untuk mengendalikan penyakit karat daun anggur (Phakopsora euvitis). *Jurnal Fitopatologi Indonesia, 16*(3), 135–143. doi: 10.14692/jfi.16.3.135-143

Widnyana, I. K., Sukerta, I. M., Wiswasta, I. G. N. A., & Limantara, L. M. (2019). The role of rizobacteria Pseudomonas alcaligenes, Bacillus sp. and mycorrhizal fungi in growth and yield of tomato plants. *International Journal of GEOMATE, 17*(61), 174–180. doi: 10.21660/2019.61.49587