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# TRAINING AND EMPOWERMENT OF BIOSAKA MAKING TO REDUCE DEPENDENCE ON CHEMICAL FERTILIZERS AND PESTICIDES

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**ABSTRACT**

This community service activity was carried out as an effort to increase community capacity in developing environmentally friendly natural fertilizers and pesticides through training in Biosaka making. The activity was carried out at the Nusantara Gymnastics Group (KSN) RT 51, 15 Polos Village, Central Metro District, Metro City, which is an active community in social and environmental activities. The main purpose of this activity is to raise public awareness of the dangers of dependence on agricultural chemicals while increasing their ability to produce and utilize Biosaka independently. The implementation method consists of socialization, training and demonstration stages, field practice assistance, and evaluation of activity results. The results of the implementation showed an increase in public knowledge about the concept and benefits of Biosaka by 85% based on simple pretest and posttest analysis. Qualitatively, the community showed high enthusiasm, was able to practice making Biosaka independently, and was committed to forming small production groups. Another impact felt is the increase in social solidarity and ecological awareness of citizens in managing the green environment. This activity succeeded in fostering community independence in realizing sustainable urban agriculture and strengthening the university's role as an agent of social change.



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## INTRODUCTION

Agriculture is an important sector in the lives of the Indonesian people, but its intensive use of chemical fertilizers and pesticides has had various negative impacts on the environment and human health (Jamin et al., 2024; Telaumbanua et al., 2025; Wijaya et al., 2025). Long-term use of chemicals leads to soil degradation, water pollution, as well as the loss of microorganisms that play an important role in soil fertility (Fikri et al., 2025). The loss of microorganisms that play an important role in soil fertility is a major problem in conventional agricultural systems (Alfarisi, 2025; Nainggolan, 2024; Ngabito & Gaib, 2025). Therefore, there is a need for the development of alternative natural fertilizers and pesticides that are more environmentally friendly and sustainable to improve the condition of the agricultural ecosystem.

Various previous studies have highlighted that the use of chemical fertilizers not only impacts soil and water quality but also poses significant health risks to humans, both directly and indirectly. For example, research has shown that chemical fertilizers contribute to soil degradation, reducing soil fertility by up to 30% over the past few decades (Smith et al., 2020). In agricultural areas heavily reliant on conventional farming practices, the excessive use of these

fertilizers has led to water contamination, with nitrate levels in groundwater exceeding safe limits in over 30% of agricultural regions in Europe and North America (Jones, 2022). Furthermore, diseases linked to chemical exposure, such as cancer and respiratory disorders, are increasingly prevalent in regions where chemical fertilizers and pesticides are widely used (Jamin et al., 2024; Pamungkas, 2017). In addition, agricultural products that contain chemical pesticide residues can have a negative impact on consumers, affecting the quality of the food we consume (Amilia et al., 2016; Sinambela, 2024).

Along with the growing awareness of the importance of environmental sustainability, one of the innovations that has emerged in recent years is Biosaka. Biosaka is a natural biological solution obtained from the fermentation of green plant juice that contains various beneficial microbes for the soil (Jayadi et al., 2025; Melinda et al., 2024). This technology can not only improve soil fertility, but also strengthen plant resistance to pests and diseases, thus reducing dependence on chemicals (Basoka et al., 2025; Harefa et al., 2025; Saputra, 2024). Several studies have shown that the application of Biosaka can significantly improve soil quality, improve soil structure, and restore the balance of soil microorganisms that support plant growth (Nensi et al., 2025; Tjokrodiningrat et al., 2023). This innovation presents a promising solution for supporting eco-friendly agriculture based on local wisdom. Specific indicators of success could include measuring the reduction in the use of chemical pesticides, tracking the increase in public awareness and knowledge about Biosaka, and evaluating the level of success in implementing this technology over a defined period. For example, a measurable decrease in pesticide use by farmers, the number of farmers adopting Biosaka, or improved crop yields could serve as key metrics to assess the effectiveness of this innovation(Cahyanti et al., 2025; Lamondo et al., 2025).

In this context, several studies have shown that the application of microbial-based biofertilizers such as Biosaka has the ability to significantly improve soil quality, reintroduce the balance of soil microorganisms lost, as well as increase plant resistance to pests and diseases (Soekamto et al., 2023). In addition, this technology not only supports soil fertility, but can also increase agricultural yields sustainably at a relatively low cost (Gulo et al., 2024). The use of biofertilizers based on local wisdom is very relevant to the condition of the Indonesian people who have a lot of agricultural potential but still depend on the use of chemicals in their production process (Najib et al., 2024; Zai et al., 2024).

Di sisi lain, masyarakat urban seperti di Kelurahan 15 Polos, Metro Pusat, memiliki lahan sempit However, there is a high potential in green yard management. Unfortunately, most people still rely on agricultural chemical products due to limited knowledge about natural alternatives. Based on the results of initial observations, the Nusantara Gymnastics Group (KSN) RT 51 showed great interest in developing green activities in their environment, but it required systematic training.

This service activity aims to provide training and empowerment of the community in making Biosaka, so that they are able to produce, apply, and utilize Biosaka independently. Through this activity, it is hoped that the community will be able to increase environmental awareness, reduce dependence on chemicals, and create a healthy and productive environment.

## IMPLEMENTATION METHOD

The service activity was carried out from August 23 to September 1, 2025 within the Nusantara Gymnastics Group (KSN) RT 51, 15 Polos Village, Central Metro District, Metro City. The service team consists of lecturers and students of the Mathematics Education Study Program and Guidance and Counseling Education Universitas Muhammadiyah Metro.

There are 4 stages or steps taken to implement solutions to specific problems faced by partners that can be shown in Figure 1.

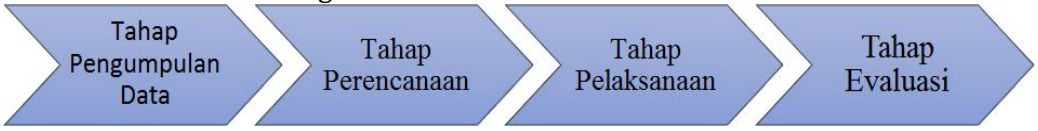


Figure 1. Stages of Service

1. The first stage of service is the data collection stage carried out by the service team by visiting the head of RT 51 to ask for permission to conduct Socialization and Education for the Women of the RT 51 Nusantara Gymnastics Group. And looking for information about the habits of mothers in the surrounding environment. This activity was carried out 1 time by making a direct visit to see the problems that occurred in the environment.
2. The planning stage is to be able to recommend several solutions so that they can solve the partner's problems based on the data collection that has been carried out. Planning includes discussions about the schedule for the implementation of Socialization and Education. And prepare materials. In addition, equipment is needed such as the preparation of a draft MoU between LPPM and KSN RT 51 RW 08 partners, Kelurahan 15 Polos Metro Central.
3. The implementation stage is by providing Training and Empowerment in Biosaka Making to the women of the Nusantara Gymnastics Group, as well as the practice of making it according to the schedule.
4. Evaluation Stage, at this evaluation stage, the service team conducts group evaluation activities on how the activities have been carried out, the shortcomings and the parts of the activities that must be improved. The sustainability of the program in the field after the PKM activities are completed, namely the service team will upload on youtube and instagram which contain images and videos that can be learned directly by the mothers.

## RESULTS AND DISCUSSION

The results achieved from the implementation of this program are very satisfactory, especially in terms of increasing the knowledge and skills of the participants. Through counseling and practice sessions, the participants, who numbered 25 women who were members of the gymnastics community, now have a deep understanding of what Biosaka is, its benefits, and how it is made. The success of this program can be measured from several aspects:

1. Increased Knowledge: The participants managed to master the theory and practice of making Biosaka, which was previously unfamiliar to them.
2. Improvement of Practical Skills: Participants not only understand the concept, but are also able to produce Biosaka independently.
3. Participants' Enthusiasm: High enthusiasm can be seen from their activeness in asking questions and trying on their own, some even "scream with excitement" when they succeed in stirring it. This shows that the method used is effective and interesting.
4. Positive Feedback: Participants gave excellent testimonials, such as "It's great as a substitute for chemical fertilizers," "it's easy to make," and "it's efficient and storeable." They also understand that the longer it is stored, the better the quality of Biosaka. This feedback proves that the program meets expectations and provides real benefits.

The output of this community service activity is a Complete Community Service Report which includes all stages, results, and evaluation of the program. In addition, as a form of documentation and dissemination, we also produce Photo and Video Documentation that records every important moment of this activity. This report and documentation is clear evidence that this program has been implemented and successfully achieved its objectives. Mass Media Publications is presented in Figure 2.

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## 1. Mass Media Publications (screenshots and links)


Figure 2. Mass Media Publications

Figure 2 shows the atmosphere of the activities of Work Program 2 in the context of community service carried out by a team of lecturers and students of the University of Muhammadiyah Metro together with the Nusantara Gymnastics Group (KSN) RT 51 on August 23, 2025. The activity entitled "Training and Empowerment of Biosaka Manufacturing to Reduce Dependence on Chemical Fertilizers and Pesticides" was attended by KSN members with high enthusiasm. The photo depicts the spirit of togetherness between the participants and the service team after the Biosaka making training was completed. This documentation reflects the success of the activities in fostering public awareness of organic agriculture and strengthening partnerships between universities and the community in the application of environmentally friendly technology based on local potential. The link to the activity: https://www.instagram.com/p/DOaC25RiTs8/?igsh=bTFmN2JpYXpzcXU2. Biosaka manufacturing training is presented in Figure 3.

## 2. Biosaka manufacturing training

Figure 3. Biosaka manufacturing training

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Figure 3 shows the training process of making Biosaka which was attended by members of the Nusantara Gymnastics Group (KSN) RT 51 in 15 Polos Village, Central Metro District. In this activity, participants actively participated in explanations and demonstrations guided by a team of lecturers and students of Muhammadiyah Metro University. The participants seemed enthusiastic about paying attention to every step of making Biosaka, from the selection of green leaf ingredients to the initial stirring and fermentation process. This activity not only provided practical experience, but also fostered participants' awareness of the importance of using natural ingredients to support organic farming and reduce dependence on chemical fertilizers and pesticides. Distribution of biosaka that is ready to use is presented in Figure 4.

### 3. Distribution of biosaka that is ready to use

Figure 4. Distribution of biosaka that is ready to use

Figure 4 shows the moment of distributing Biosaka that is ready to be used to trainees from the Nusantara Gymnastics Group (KSN) RT 51 in 15 Polos Village, Central Metro District. In the picture, one of the service team members handed over the results of Biosaka fermentation to the participant representatives as a symbol of the success of the training activities. This moment reflects the enthusiasm and pride of the community after successfully producing natural organic fertilizers independently. The distribution of Biosaka is not only a form of appreciation for the active participation of participants, but also as the first step of direct implementation in their environment, so that the benefits of community service activities can be felt in real life in community-based agricultural and reforestation practices. Documentation of Training and Empowerment of Biosaka is presented in Figure 5.

### 4. Photo of the Training and Empowerment of Biosaka making activities

Figure 5. Documentation of Training and Empowerment of Biosaka

Figure 5 shows documentation of the Training and Empowerment of Biosaka Making to Reduce Dependence on Chemical Fertilizers and Pesticides carried out by the service team of the University of Muhammadiyah Metro together with the Nusantara Gymnastics Group (KSN) RT 51 in 15 Polos Village, Central Metro District. This photo shows the togetherness between the team of lecturers, students, and trainees after the practical activity of making Biosaka was completed. The enthusiastic expressions of the participants described the success of the activity in building the motivation and spirit of community mutual cooperation to apply organic agricultural technology independently. This documentation is proof that service activities not only produce Biosaka products, but also strengthen social relationships, strengthen ecological awareness, and foster a sense of shared responsibility in preserving the environment.

Some of the obstacles faced during the implementation of the program are:

1. Technical Difficulties of Manufacturing: The manufacture of Biosaka requires very meticulous stirring techniques. The implementation team even failed twice before finally succeeding. The solution taken is to ask for guidance from someone who is experienced in making Biosaka.
2. Schedule Adjustment: The activity schedule must be adjusted to the routine schedule of mothers' gymnastics which sometimes changes suddenly. The solution to this problem is to establish intensive and proactive communication with the management of the gymnastics community.

As a form of sustainability of the Biosaka Manufacturing Training and Empowerment activities to reduce dependence on Chemical Fertilizers and Pesticides, the service team with partners planned several follow-up steps as follows:

1. Continuous Mentoring and Monitoring
   The team of lecturers and students will provide regular assistance to the women of the Nusantara RT 51 Gymnastics Group to ensure the sustainability of the practice of making and using Biosaka in their environment. Monitoring is carried out every two months to evaluate the results and constraints in the field.
2. Advanced Training of Organic Products
   Follow-up activities were carried out in the form of training in making liquid fertilizers and natural pesticides based on other local ingredients. This activity aims to expand community skills in developing various environmentally friendly products.
3. Replication of New Programs and Partnerships
   The program will be replicated to other areas in Metro City through collaboration with the Agriculture Office and LPPM UM Metro, so that the benefits of Biosaka training can be felt more widely by the community and become part of the university's sustainable empowerment agenda.

Biosaka manufacturing training aims to provide an understanding of the benefits of natural ingredients that can be used as organic fertilizers and natural pesticides. Biosaka is made from a mixture of organic materials such as compost, husks, organic waste, and microbial active materials that function to improve soil quality and reduce plant pest attacks. In addition, the manufacture of biosaka also involves a fermentation process that enriches soil microorganisms, increases fertility, and encourages healthy plant growth.

This training educates mothers on how to make biosaka in a simple and effective way. In the training process, the participants will be guided by experienced agricultural experts and practitioners to ensure that the biosaka produced is of optimal quality. This training not only focuses on the manufacturing aspect, but also on the application and supervision of its use in the field. This is important to ensure farmers understand how to apply properly and can reduce the negative impact of the use of chemical fertilizers and pesticides on the environment. In addition, community empowerment also includes aspects of continuous mentoring and supervision after training. Trained farmers will be guided in conducting experiments on their own land, so they can see firsthand the positive impact of biosaka use on agricultural products. By reducing dependence on chemicals, biosaka provides benefits for farmers in the form of reduced production costs, environmental sustainability, and increased long-term crop yields.

Biosaka production training shares similarities with the farmer empowerment program in West Java, which aims to reduce dependence on chemical fertilizers by promoting the use of organic fertilizers. Both programs emphasize community empowerment through direct training and support to farmers in adopting environmentally friendly agricultural technology, such as compost-based organic fertilizers or microbial-active ingredients in Biosaka. Despite the different technical approaches Biosaka utilizes biotechnology and microbial fermentation, while the West Java program focuses on simple organic materials both programs aim to improve soil fertility, reduce environmental impact, and provide sustainable economic benefits by lowering production costs and increasing long-term agricultural yields. However, challenges were encountered during the training process, including limited availability of materials and tools necessary for consistent Biosaka production, as well as varying levels of prior knowledge among participants. To address these issues in future programs, it would be beneficial to provide more comprehensive training kits, including essential tools and resources for production, and to offer pre-training assessments to tailor the level of instruction to participants' needs. Regular follow-up support and refresher courses could also ensure that farmers can maintain quality production and effectively implement the techniques learned (Suprapti et al., 2023).

This training and empowerment will also raise awareness about the importance of environmentally friendly agriculture and support national food security. By continuing to explore the potential of science and technology-based agricultural technology, farmers are not only consumers, but also producers of sustainable solutions for the future of Indonesian agriculture. On the other hand, the success of the program will inspire farmers in other areas to join the organic farming movement and reduce the negative impacts of excessive chemical use. To further support this, participants will be provided with measuring tools and additional raw materials to help them maintain the quality of Biosaka. This ongoing support will be delivered through regular site visits and follow-up online training sessions, ensuring that farmers continue to improve their practices and sustain the benefits of Biosaka technology.

## CONCLUSIONS AND SUGGESTIONS

Service activities through Biosaka manufacturing training have succeeded in achieving their goal, which is to increase public knowledge, skills, and awareness of the importance of natural agriculture. Participants are able to create and apply Biosaka independently and show a commitment to continue activities in a sustainable manner. The impact felt is not only on the technical, but also social and environmental aspects, where these activities strengthen the solidarity of citizens and broaden their horizons about ecological sustainability.

For the sustainability of the program, it is recommended that follow-up assistance be carried out for at least six months to monitor the development of results and ensure that the quality of Biosaka produced by the community remains in accordance with standards. In addition, it is necessary to develop advanced training that focuses on the diversification of organic products, such as the manufacture of natural pesticides and liquid fertilizers from advanced fermentation, so that community skills can develop continuously. Similar service activities are also recommended to be replicated in other areas with the support of the Agriculture Office and through the Thematic Real Work Lecture (KKN) program of the Universitas Muhammadiyah Metro so that the impact is wider and more sustainable.

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