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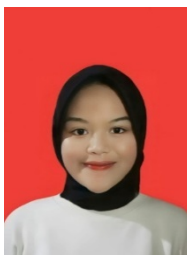
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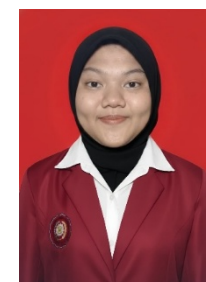


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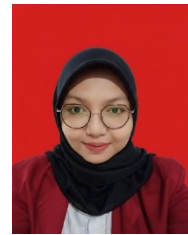
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EMPOWERMENT OF ERGONOMIC FERTILIZER SOWING EQUIPMENT INNOVATION IN FARMER GROUPS TO INCREASE PRODUCTIVITY AND EFFECTIVENESS IN AGRICULTURE AND TEMPEH WASTE MANAGEMENT IN SADASARI VILLAGE

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Abstract.

Background. The Student Work Lecture Program (KKM), held in Sadasari Village, Argapura District, Majalengka Regency, aims to address two main problems faced by the local community. The first problem is the low work efficiency of farmers, who still use traditional fertilizer-sowing tools that are not ergonomic, leading to physical fatigue and reduced agricultural productivity. The second problem is environmental pollution from liquid waste from tempeh production, which is directly discharged into rivers and irrigation canals, even though the waste has significant economic potential if processed properly.

Purpose. To overcome these problems, the KKM team developed two innovative solutions, namely designing an ergonomic fertilizer sowing tool made of PVC and durable materials that are lighter and easier to use, and processing tempeh liquid waste into Liquid Organic Fertilizer (POC) using simple materials such as tempeh waste, EM4, and molasses.

Method. This program is carried out through five systematic stages starting from preparation, problem identification, innovation design, implementation through socialization and practical training to farmer groups and MSME actors, to program evaluation. The socialization activity also involved the Argapura District Agricultural Extension Center (BPP) in providing additional materials and ensuring the sustainability of the program.

Results. The results of this program include increased knowledge and skills among the community in using appropriate technology for agriculture, as well as new skills in processing waste into products of economic value.

Conclusion. This program has not only reduced environmental pollution but also opened new business opportunities for the people of Sadasari Village. With a participatory approach that actively involves the community in every stage.

Implementation. This KKM program is expected to be sustainable, have a long-term positive impact on the welfare of village communities, and serve as a model that can be replicated in other villages with similar problems.

Keywords: empowerment, innovation, ergonomics, tempeh waste, fertilizer



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INTRODUCTION

Sadasari Village, located in Argapura District, Majalengka Regency, West Java, is an area with an area of about 1,400 hectares, which is divided into 5 administrative blocks: the Village Block, Rakkesan Block, Jero Kaso Block, Mount Herang Landeh Block, and Mount Herang Tonggoh Block. The majority of the residents of Sadasari Village make a living as traders and farmers. The village is situated on a mountainous slope, with many rice fields and abundant agricultural products. This makes this village one of the centers of vegetable producers or suppliers in the Majalengka, Cirebon, and surrounding areas.

The main agricultural commodities include rice, palawija, and vegetables such as onions, cabbage, sweet potatoes, and cassava. These agricultural products are distributed to various regions, including Cikopo, Bandung (Jagasatru), and Sumedang. This village is also supported by 7 farmer groups and 1 women's farmers' group. In addition to agriculture, the main potential of this village also lies in the micro, small, and medium enterprises (MSMEs) sector. MSMEs can be found in each block, with typical products that are managed independently by residents, such as geblog (asmun), cucur (jero kaso), rangginang, and flowers (above pareredan). The existence of Village-Owned Enterprises (BUMDes) is also one of Sadasari's economic potentials. The village already has adequate road and internet access, which opens up great opportunities for digital promotion of local products and for improving community literacy.

However, behind its great potential, Sadasari Village faces various challenges both internally and externally. In the agricultural sector, farmers are often constrained by the problem of fertilizers and plant medicines. In addition, the price of vegetables is often set by the bookmaker or middleman, making it difficult for farmers' prices to compete with prevailing standards, and farmers have difficulty setting selling prices independently. On the MSME side, even though the products are distinctive, they do not have halal certification, and marketing is still local and has not optimally utilized social media for wider promotion. Efforts to enhance the capabilities of agricultural products and MSMEs are urgently needed to realize this potential.

Internally, Sadasari Village has a religious community base, with customs called "adat pareresan". Religion in Sadasari Village is very active, with the existence of around 60 kiai. Sadasari Village has more than 30 prayer rooms and 8 mosques spread across each block. One of the religious activities in Sadasari Village is the weekly recitation. In addition, every month there is a recitation at the Buddhist mosque in each block. This village also implements a district program, namely congregational dawn prayers, which must be carried out in each village. The village head wishes to hold a grand tabligh and istighosah together.

Village communities have strong values of mutual cooperation and solidarity, creating a conducive social ecosystem for the implementation of community-based empowerment programs. The village government structure consists of 9 Rukun Warga (RW) and 18 Rukun Tetangga (RT), which serve as the foundation for the management of community life. In addition, the role of youth is quite prominent, as evidenced by the existence of Karang Taruna, which is active through various routine activities, such as volleyball training, indicating the

high participation of the young generation in village activities.

Educational facilities in Sadasari Village include 3 Play Groups (Kober/PAUD), 1 Kindergarten (TK), 2 Elementary Schools (SD), 1 Madrasah Tsanawiyah (MTs), and 1 Madrasah Sanawiyah. In the health sector, there is a Village Health Post (Pustu). This village has a Supplementary Feeding (PMT) program aimed at pregnant women and toddlers as an effort to improve community nutrition. This program is supported by the active role of PKK women and village health cadres. There are six posyandus spread across each block, with one per RT, all of which operate actively and consistently. This shows the village's strong commitment to improving its citizens' health. In addition, the village PKK chairman, who also works as a midwife, strengthens the health sector, especially in maternal and child health services.

Given the complexity of the potential and existing problems, the Student Work Lecture (KKM) program plays a strategic role as a catalyst for development in Sadasari Village. The Ministry of Health is expected to bridge the gap between the potential that has not been optimized and the need to increase community capacity, especially in the economic sphere, through legal frameworks and the addition of MSMEs, as well as by strengthening the agricultural sector. In addition, the KKM can support the sustainability of socio-religious activities and strengthen basic village facilities, in line with the characteristics of the people of Sadasari Village, who are religious and uphold the value of mutual cooperation.

METHODS

Preparation Stage

At this early stage, our group conducted environmental introduction activities through initial observations in Sadasari Village to understand the overall geographical, social, and economic conditions. In addition, we establish communication and build strong togetherness with village officials, community leaders, MSME actors, farmers, and local communities, so we can collect initial data and get a more detailed picture of the potential and problems that exist. After collecting the data, we formulated the program. We prepare work plans, activity schedules, and resource allocations. So that all our activities are scheduled and directed.

Problem Identification Stage

This stage is at the heart of your approach. We conducted in-depth and direct interviews with farmer groups and MSME actors. We actively listen to their complaints and

challenges. We do our best to identify specifically what they need. We found that farmers need more efficient, ergonomic tools to increase productivity, while tempeh producers need solutions to manage waste that pollutes the environment and to open new economic opportunities.

Innovation Design and Development Stage

Based on the data and problems that we have obtained. We started designing innovative solutions and concluded that to solve problems in the agricultural sector, we needed to develop a prototype of an ergonomic fertilizer sower that was lighter, more efficient, and easier to use. The main materials of fertilizer sowing equipment are PVC and dragon. Meanwhile, to address environmental and economic issues, we designed simple formulations and procedures to process tempeh liquid waste into liquid organic fertilizer (POC) that can be sold as a selling point. This innovation is based on the principle of using materials that are easy to obtain and a simple process, so that it can be implemented by the community independently. The materials used to make this POC are tempeh waste (soybean soaking water), M4, molasses/molasses.

Implementation Stage

This stage is the core of this entire series of service programs, where all the plans prepared are put into practice through direct community involvement. We carry out Socialization and Practical Assistance to the community, farmers, and MSME actors, especially tempeh producers. The farmers received socialization about the importance of ergonomic fertilizer sowers. Farmers know the advantages and disadvantages of these tools. Farmers and local communities are also taught how to assemble, use, and care for the ergonomic fertilizer sowing equipment that has been designed. In addition to socialization, we also conduct experimental practice training on agricultural land. In addition to farmers, MSME actors, especially tempeh producers, receive socialization and education on the dangers of tempeh waste to the environment and the economic potential it contains. In addition, we demonstrate the steps for creating a POC in a simple, practical way. The community is directly involved in the entire process, from collecting liquid waste and adding ingredients such as molasses and local microorganisms (EM4) to fermentation and packaging the final product. This assistance is provided intensively to ensure they master each stage and can produce POC independently. During socialization activities, we also invited the Argapura

District Agricultural Extension Center (BPP). The Bpp also added and helped provide material on liquid organic fertilizers and fertilizer sowing tools. At this event, a question-and-answer session was also held to determine whether they understood the material.

Evaluation and Reporting Stage

Once all implementation activities are completed, we evaluate the program to assess the level of success and impact achieved. The evaluation was carried out by interviewing several farmer groups, local communities, and MSME actors to get direct feedback on the benefits they felt. We then analyze the information we have obtained to assess its effectiveness in solving problems. The results of this evaluation are then summarized and documented in the final report as a form of accountability and as a reference for the development of similar programs in the future.

DISCUSSION

The success of a community service program is largely determined by a well-planned method. The Student Work Lecture Program (KKM) is designed with a participatory approach, placing the people of Sadasari Village as active subjects throughout the series of activities. The goal is to ensure that the solutions offered are not only theoretical but also practical, sustainable, and truly address the problems in the field. To carry out this service program, you must carefully prepare. We, all members of the MOH, conducted an initial survey to understand the characteristics of the village as a whole, from its geographical aspects to its economic potential. We also undergo intensive communication and build cooperation with village officials, community leaders, MSME actors, farmers, tempeh producers, and the community. We designed this program to be on target and problem-solving.

Based on the initial analysis, we agreed that this program focuses on two main issues: agricultural inefficiency caused by conventional tools and environmental pollution from unmanaged waste. To overcome these problems, we designed an implementation method structured into five stages. Each stage is designed to complement, ensuring that each step taken is based on data and on active community participation.

General Portrait of Partners

Sadasari Village, located in Argapura District, is a village that has an area of about

3.35 km² and is inhabited by 3,542 people. In villages with fertile land, the majority of the population works as farmers and in Micro, Small, and Medium Enterprises (MSMEs). This village has great potential, with superior agricultural products such as leeks and local MSME products (bitter melon, cucur, etc.), which are pillars of the village economy. Demographically, Sadasari Village has an active population and great development potential. However, this potential has not been fully utilized due to several interrelated challenges.

Identify Problems and Potentials

Based on observations and interviews with Farmer Groups and MSME actors in Sadasari Village, several key problems were identified that hinder productivity and economic sustainability.

Problems in the Agricultural Sector:

The agricultural sector in Sadasari Village faces significant challenges related to limited tools and technology. Farmer groups are still very dependent on traditional fertilizer sowing tools that are less efficient. Using these conventional tools not only takes a long time but also causes excessive physical fatigue due to their poor ergonomics. As a result, this has a direct impact on low productivity and crop quality. This condition not only hinders work efficiency but also increases the risk of injury, ultimately reducing the overall enthusiasm and effectiveness of farmers' work.

Problems in Tempeh Waste Management:

The tempeh-producing MSME sector in Sadasari Village faces serious challenges in waste management. Liquid waste from the production process is often discharged directly into rivers, irrigation canals, or simply dumped into the ground. These actions not only cause environmental pollution and unpleasant odors but also have the potential to damage ecosystems.

Another major problem is the lack of public knowledge about the potential of such waste. Tempeh producers have not realized that the waste they dispose of contains highly nutritious material and can be processed into a product of economic value: liquid organic fertilizer (POC). This lack of understanding is a major obstacle to turning waste into a profitable resource.

1. Community needs. Based on the problems identified from observations and in-depth

interviews with Farmer Groups and MSME actors in Sadasari Village, it can be concluded that there is a very urgent, interrelated need to improve the community's welfare and sustainability. This need comprises two main aspects: increasing agricultural productivity and promoting economic empowerment through waste management.

2. **Increased Agricultural Effectiveness and Productivity:** Our observations show that farmers are still heavily reliant on conventional methods and tools, such as traditional fertilizer sowing tools that are operated manually. According to the farmer we interviewed, this tool is inefficient and very time- and energy-consuming, which often results in excessive fatigue. Therefore, the main need identified is a simple, ergonomic technological innovation. These innovations, such as better-designed fertilizer sowing tools, are expected to reduce farmers' physical workload, speed up sowing, and ultimately significantly increase productivity and crop quality.
3. **Economic Empowerment and Environmental Management:** Interviews with tempeh MSME producers revealed that they do not have an adequate understanding of the potential of the liquid waste they produce. This waste, which is rich in nutrients, has been discharged directly into waterways, causing serious environmental pollution and causing an unpleasant odor. The urgent need is knowledge and skills to process waste into something of value. Therefore, the necessary interventions are training and assistance in the manufacture of Liquid Organic Fertilizer (POC). This solution not only addresses environmental problems but also opens up new business opportunities that can increase people's income and economic independence in a sustainable manner. This program is specifically designed to address both needs in an integrated and holistic manner through the provision of relevant tool innovation, training, and mentoring. Based on observations and direct interviews with the community in Sadasari Village, we identified several major problems that hinder their economic progress and productivity. These problems can be grouped into two main sectors:

1. **Agriculture Sector:**

Farmer groups in Sadasari Village are still heavily dependent on conventional methods and tools, especially traditional fertilizer-sowing tools. The use of this tool is not only less efficient and time-consuming but also not ergonomic, leading to excessive physical fatigue for the farmer. This condition directly impacts low productivity and crop quality.

2. **MSME and Environmental Management Sector:**

Many home tempeh producers lack knowledge of liquid waste management. Waste from

the tempeh production process is often dumped directly into rivers or irrigation canals, causing environmental pollution, bad odors, and potentially damaging water ecosystems. In addition, MSME actors do not realize that waste has significant economic potential when processed into Liquid Organic Fertilizer (POC).

Solution

To address the identified problems, we create solutions that integrate a participatory approach, with the community actively involved at every stage. The proposed solutions are as follows:

Appropriate Technology Innovation: Providing ergonomic fertilizer sowing equipment innovations to farmer groups. This solution is designed to answer the problem of inefficiency and physical fatigue. With farmers' active participation in the trial and use of the tool, it is hoped that they can experience the benefits firsthand, enabling the adoption of this technology to run sustainably.

Empowerment-Based Training and Assistance: Carry out a structured training and mentoring program to process tempeh liquid waste into Liquid Organic Fertilizer (POC). This activity involves the active participation of MSME actors, starting from the introduction of simple ingredients, manufacturing practices, to the packaging process. This solution not only aims to address environmental problems, but also to open up new business opportunities and increase people's income.

Socialization and Education: Hold socialization to increase public awareness about the importance of waste management and the benefits of POC. This education also includes guidance to develop marketing skills, so that the POC products produced can be marketed effectively and reach a wider target market. Through this approach, the community becomes not only a beneficiary but also an agent of change, able to independently manage the potential of their village.

The implementation of the Student Work Lecture (KKM) in Sadasari Village, Argapura District, Majalengka Regency, has been carried out in accordance with the plan prepared since the planning stage. The group's main program focuses on two core activities, namely *Empowering Innovation of Ergonomic Fertilizer Sowers in Farmer Groups* and *Tempeh Waste Management into Liquid Organic Fertilizer (POC)*. These two programs complement each other, as one side focuses on increasing agricultural effectiveness, while the other side focuses on environmental management to be more friendly and sustainable

Description of Program Implementation Results

Innovation of Ergonomic Fertilizer Sower

The main problem faced by farmers in Sadasari Village is the use of manual methods in sowing fertilizer. This condition has caused several complaints, including:

1. The farmers, most of whom are elderly, experience physical fatigue from having to bend over for long periods of time.
2. Manual sowing of fertilizer is often uneven and risks hitting plant stems, so it can cause spoilage due to the chemical content of fertilizers.
3. The sowing process takes a long time, so the working efficiency is low.

To overcome these problems, KKM students designed ergonomic fertilizer sowing tools using simple materials, including PVC pipes, wood, and used tire rubber. This tool is designed to be lightweight, easy to use, and able to sow fertilizer evenly.

The series of activities carried out includes:

1. Identify target farmer groups and their needs.
2. Socialization of tools and delivery of benefits and ways of working.
3. Training on the use and maintenance of the tool with farmers.
4. Direct assistance on agricultural land to ensure effectiveness.
5. Evaluate the results of use through comparison with manual methods.

The results of the evaluation show that the use of ergonomic tools can reduce working time, reduce fatigue, and improve the evenness of fertilizer distribution. However, some elderly farmers still need assistance because they are not used to it, and the equipment cannot be used for liquid fertilizer.

Management of Tempeh Waste into Liquid Organic Fertilizer (POC)

In addition to the agricultural sector, Sadasari Village has many household-scale tempeh producers. Liquid waste from tempeh production has been dumped directly into rivers or irrigation canals, causing unpleasant odors and environmental pollution. In fact, the waste actually contains nutrients that can be used as liquid organic fertilizer.

Through this program, KKM students introduce the making of POC from tempeh waste as an alternative solution. The stages of the activity include:

- 1 Socialization to the public about the dangers of tempeh liquid waste and the benefits of processing it.

- 2 The POC manufacturing training uses tempeh, EM4, molasses, and water waste.
- 3 The practice of fermentation is directly with the community, starting from waste collection to packaging.
- 4 Intensive assistance so that the community is able to repeat the manufacturing process independently.

From this activity, the community produced a POC, which was then tested on several vegetable plants. Preliminary results show the potential to increase soil fertility while reducing environmental pollution.

Products Produced

Physical Products

1. Ergonomic fertilizer sowing tools made of PVC and wood, which have been tested on agricultural land.
2. Liquid Organic Fertilizer (POC) from fermented tempeh waste is packaged in simple bottles to be used on plants.

Non-Physical Products

1. Modules/guides for the use and maintenance of fertilizer sowers.
2. A simple guide to making a POC that can be practiced independently by the community.
3. Increasing community capacity through training, socialization, and mentoring.

The Impact Felt by the Community

1. Physical Impact, The presence of ergonomic fertilizer sowing tools that can be used sustainably. The availability of environmentally friendly liquid organic fertilizers as an alternative to chemical fertilizers.
2. Non-Physical Impact: Farmers gain new skills in the use of simple technology. The efficiency of working time increases, the farmer workforce is lighter. Public awareness of the importance of waste management is increasing. The establishment of synergy between students, farmer groups, tempeh producers, and village officials.

Comparison of Targets and Realization

Table 1. Comparison of Targets and Realization of KKM

Program Targets	Realization in the Field	Obstacles/Obstacles
Socialization of ergonomic fertilizer sowing tools	It was held at the Sadasari Village gor with the participation of farmer groups, village heads, Rt, Rw, and other residents who were present	Some farmers were absent due to the busyness of farming
Tool training	Farmers try to understand how to use	Elderly farmers need extra assistance
Ready-to-use tool prototype	Successfully built and tested	Not yet suitable for liquid fertilizer
Socialization of tempeh waste management	Education is carried out with farmer groups, village heads, Rt, Rw, and other residents who attended	At first, it was a bit doubtful about the benefits of POC from the tempeh water waste material
POC manufacturing training	Making POC fertilizer together in the gor	Fermentation takes a long time (± 14 days)
Utilization of POC for plants	POC tested on vegetable crops	Long-term results need further testing

Application of Technology and Innovation Products (Hard and Soft)

Hard Technology Products (Physical)

1. Ergonomic Fertilizer Sower: Made of simple materials (PVC, wood, used tire rubber) that are lightweight and easy to use. This tool is designed to sow fertilizer more evenly and efficiently, reducing the physical burden on farmers, especially the elderly.
2. Liquid Organic Fertilizer (POC) "Ecogrow": The product of processing tempeh liquid waste using EM4 and molasses. Packaged in simple bottles as an environmentally friendly fertilizer alternative that improves soil fertility.

Soft Technology Products (Non-Physical)

1. A simple guide to making a POC that can be practiced by the community independently.
2. Participatory training-based learning model (socialization, hands-on practice, discussion).
3. Skill transfer through socialization, education, and intensive assistance to farmers and tempeh producers.

Application of Technology and Innovation to Society

The application of innovative products is carried out directly to the people of Sadasari Village through several stages:

Socialization

1. Farmer groups received training on how fertilizer sowers work, their advantages, and maintenance.
2. Tempeh producers and the public are educated about the dangers of tempeh liquid waste and its economic potential if processed into POC.

Field Practice

1. Farmers tried the use of fertilizer sowing equipment on the land, with student assistance.
2. Tempeh producers and students practice making POC, starting from waste collection, the fermentation process, and product packaging.

Community Participation

1. Farmer groups are actively trying to provide input for tools
2. Tempeh producers play a direct role in the POC manufacturing process, even donating liquid waste as the main ingredient.
3. The Argapura District Agricultural Extension Center (BPP) was also present to provide material reinforcement.

With this participatory approach, the community is not only the recipient but also an active actor able to master this simple technology.

Impact (Usefulness and Productivity)

The impact of the implementation of technological innovation on the people of Sadasari Village includes:

Agriculture

1. Improved fertilization working time efficiency.
2. Reduction of the physical burden on elderly farmers due to ergonomic tool design.
3. The distribution of fertilizers is more even, so as to improve the quality of agricultural products.

Environment and Economics

1. Reduced river/irrigation pollution due to tempeh liquid waste.
2. The availability of organic fertilizer alternatives that are cheap, environmentally friendly, and economically valuable.
3. New business opportunities through the production and sale of POC "Ecogrow".

Social Sector and Community Capacity

1. Increasing people's skills and knowledge in using appropriate technology.
2. The creation of a new mindset for tempeh producers from simply "disposing of waste" to "managing value-added waste".
3. Collaboration between students, farmer groups, MSMEs, village officials, and BPP.

Overall, this program has a positive impact, increasing agricultural productivity, improving environmental management, and creating new economic opportunities that support village sustainability.

The Student Work Lecture Program (KKM) implemented in Sadasari Village has produced tangible outputs that benefit the community, particularly in the agricultural and environmental management sectors. These outputs are not only physical products but also human resource capacity-building and sustainable empowerment models. Here is a breakdown of the outputs that were achieved:

Product Innovation Produced

As the core of the service program, two innovative products have been successfully created that directly address the problems identified in Sadasari Village:

Ergonomic Fertilizer Sower: This innovation was born from the needs of farmers, especially the elderly, who still use inefficient, physically exhausting manual fertilization methods. This tool, made from simple materials such as PVC pipes and jerrycans, is designed with ergonomic principles to ensure that it is light in weight and that its use does not strain the posture. Its simple working mechanism allows fertilizers to be distributed precisely and evenly, thereby improving time and effort efficiency, reducing fertilizer waste, and maximizing nutrient availability for plants.



Figure 1. Ergonomic Fertilizer Sower

"Ecogrow" Liquid Organic Fertilizer (POC): This product is a zero-waste solution to address environmental pollution caused by liquid waste from tempeh production.

Waste that was previously disposed of and caused an unpleasant odor was successfully processed into high-value fertilizer through a fermentation process using EM4 decomposers and molasses. POC "Ecogrow" contains macronutrients (N, P, K) and good microbes that are useful for fertilizing the soil.



Figure 2. 'Ecogrow' POC Products in Bottle Packaging

This innovation not only addresses environmental problems but also provides farmers with cheap, environmentally friendly fertilizer alternatives and opens new entrepreneurial opportunities for tempeh producers.

1. Publication Articles



Figure 3. MSME Product Articles



Figure 4. Tool Prototype Article

Learning/Training Model

To ensure the program's sustainability, knowledge transfer is carried out through a participatory, community-centered training model. This approach was chosen so that residents are not only passive recipients, but also active actors who understand and master the innovations introduced. The methods used include:

1. Live Demonstration: The MOH team demonstrated in detail and stages the entire process, from how to assemble each component of the fertilizer sowing tool to the steps of mixing the ingredients and preparing the fermenter for the manufacture of POC.
2. Hands-On: After the demonstration, the community is given the opportunity to engage directly in the practice. They try to assemble tools and make their own POC dough accompanied by students, so they gain practical experience that strengthens their understanding.
3. Discussion and Q&A: This interactive session is a forum for the public to ask questions, clarify doubts, and share views. The presence of representatives from the Agricultural Extension Center (BPP) in this session also provided validation and reinforcement of the material from an expert perspective.



Figure 5. Socialization of POC Product Making Demonstration 'Ecogrow'



Figure 6. Socialization and Demonstration of Making Ergonomic Fertilizer Sowers

Bahan Utama Ecogrow

- Kaya protein nabati, karbohidrat, dan sedikit lemak.
- Mengandung unsur hara makro (N, P, K)

10L Limbah tempe

- Berfungsi mempercepat proses fermentasi, memecah bahan organik menjadi unsur hara yang mudah diserap tanaman.
- Memperkaya energi karbon untuk meningkatkan aktivitas mikroba, sehingga hasil fermentasi lebih cepat dan maksimal

300ML Molase / Tetes tebu

- Berfungsi mempercepat proses fermentasi, memecah bahan organik menjadi unsur hara yang mudah diserap tanaman.
- Meningkatkan kesuburan tanah, memperbaiki struktur tanah, dan menekan patogen.

500ML EM4

- Mengandung mikroba menguntungkan (bakteri fotosintetik, lactobacillus, ragi, actinomycetes). Berfungsi mempercepat proses fermentasi, memecah bahan organik menjadi unsur hara yang mudah diserap tanaman.
- Meningkatkan kesuburan tanah, memperbaiki struktur tanah, dan menekan patogen.

2L Air bersih

- Pelarut sekaligus media hidup mikroba agar proses fermentasi berjalan lancar dan menghasilkan pupuk cair yang berkualitas

Figure 7. Visual material on the main ingredients and composition of the 'Ecogrow' POC used during the training

ALAT DAN BAHAN

No	Nama	ukuran	Fungsi
1.	Jerigen Plastik	25 liter	Menyimpan pupuk.
2.	Selang PVC	65 cm	Saluran dari jerigen ke pipa keluaran
3.	Paralon 1 1/2 inch	80 cm	Pipa pengarah aliran utama
4.	Paralon 1/2 inch	22 cm	Ujung keluaran dekat tanaman
5.	V-cok/ sambungan 1 1/2 inch	1 buah	Perubahan sudut/alur aliran

ALAT DAN BAHAN

No	Nama	ukuran	Fungsi
6.	DOP 1 inch	1	Penutup/penahan ujung pipa
7.	Strap ransel	1 set	Membawa jerigen secara ergonomis
8.	Lem pipa	secukupnya	Mencegah kebocoran sambungan
9.	Klem selang	1-2 buah	Kontrol bukaan/debit keluaran
10.	Peralatan bantu (bor/cutter)	opsional	Mekubangi jerigen dan penyesuaian diameter

ALAT DAN BAHAN

No	Nama	ukuran	Fungsi
11.	Pipa 1/2 inch	17 cm	Ujung keluaran dekat tanaman
12.	Sambungan pipa Tree-Y	1 buah	Untuk menyambungkan pipa utama dengan pipa bawah dan menyambungkan selang yg ke jerigen
13.	Per/pegas	1 buah	Membantu saat di tekan
14.	Kayu	3 cm	Untuk membantu keluarnya pupuk saat ditekan

Figure 8. Visual Materials Regarding Key Tools and Materials

Partner Capacity Building

The most important outcome of this program is the growth of the capacity and independence of partner communities. This improvement is evident in two main groups:

1. **Farmer Capacity Building:** Farmer groups now have not only new tools, but also a better understanding of the importance of efficiency and ergonomics in work. They master the technical skills to maintain tools and understand how simple technology can significantly increase their farm productivity.
2. **Capacity Building of MSME Actors:** Tempeh producers have experienced a change in mindset, from viewing waste as a problem to seeing it as a resource. They now have skills in simple biotechnology and waste management, which empower them to become more environmentally friendly while unlocking additional revenue potential through POC products.

Evidence of Program Sustainability

The sustainability of this program is not only an expectation, but is supported by a strong foundation that has been built during the implementation of the KKM:

1. **Adoption and High Enthusiasm:** The positive response and active participation of the community during the training are the main indicators that the innovations offered are accepted and considered relevant to their needs.
2. **Technological Independence:** The use of inexpensive and easily accessible materials locally ensures that people can re-manufacture tools and POCs without relying on outside parties.
3. **Economic and Environmental Incentives:** The immediate benefits, such as reduced physical fatigue, a cleaner environment, and potential economic benefits, are a strong internal motivation for the community to continue with this program.
4. **Institutional Support:** BPP's involvement in activities provides legitimacy and paves the way for the community to get long-term technical assistance, even after the KKM program is completed.

CONCLUSION

Based on the entire series of community service activities that have been carried out, it can be concluded that the Student Work Lecture (KKM) program in Sadasari Village has succeeded in achieving its goals effectively and has had a significant positive impact.

1. This program has successfully implemented two solutions to appropriate technological innovations, namely ergonomic fertilizer sowing tools to improve agricultural efficiency, and Liquid Organic Fertilizer (POC) "Ecogrow" as a waste management solution with economic value. These two innovations directly answer the real problems faced by the community.
2. Through a participatory and applicable training model, this program has succeeded in increasing the capacity, knowledge, and skills of the community. This increase is not only technical, but also fosters independence and innovative mindset in farmer groups and MSME actors, which are the main capital for sustainable development.
3. Overall, these MOH activities have been a positive catalyst, proving that synergy between academia and society can produce real and empowering solutions. The program leaves behind not only physical products, but also a legacy of knowledge that drives Sadasari Village towards more advanced, efficient, and sustainable environmental practices and management.

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