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Zero Waste Innovation PKM: Utilization of "Talas Togog" towards Food Security in the Pkk Group of Batuan Village, Gianyar-Bali

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A B S T R A C T

"Taro Togog" has a high nutritional content and has the potential to be processed into various economically valuable food products, namely tubers and stems, applying the principle of zero waste, and producing innovative products such as taro flour and chips. The purpose of the community service is to increase production capacity and product quality to support local food security. Issues raised include production efficiency and product quality of Taro Togog, so that it can attract the younger generation to consume and preserve local food. Thus, relevant and straightforward innovations can have a significant impact on food security at the community level. Through training and mentoring, the Batuan Village partner group has the knowledge and skills to process waste into products with market value. This not only reduces environmental problems by implementing the zero-waste concept but also increases local food independence.

Contribution to Sustainable Development Goals (SDGs):

SDG 2: Zero Hunger

SDG 12: Responsible Consumption and Production

SDG 17: Partnerships for the Goals

1. INTRODUCTION

1.1. Research Background

The Batuan Village Family Welfare Group (PKK) has significant potential to develop the "Talas Togog" product. The abundant potential of taro raw materials in the region serves as the main capital, complemented by PKK members' enthusiasm to improve their skills and income. "Talas Togog" is underdeveloped and has not been optimally utilised. "Talas Togog", a local taro variety that grows abundantly in Bali, is often overlooked and considered a wild plant. The tubers, stems, and leaves of the plant have high nutritional content and potential to be processed into various economically valuable food products [1]. Through this program, the Batuan PKK Group is encouraged to utilise all parts of the taro togog plant to the fullest, apply the principle of zero waste, and produce innovative products such as taro flour and chips. It

is hoped that the use of taro togog can increase local food security, create new business opportunities for the community, and reduce agricultural waste [2].

Batuan Village is a lowland with an area of 410 ha. Topographic Conditions of Batuan Village. In general, the topography of Batuan Village is agricultural. The climatic conditions of Batuan Village, like those of other villages in Indonesia, are dry and rainy, which directly influence the existing cropping patterns [3].

Batuan Village, Gianyar, Bali, offers abundant local food resources, particularly "talas togog." Taro togog production faces challenges maintaining the product's taste, texture, and shelf life. This situation affects the local community's food security, as taro togog is an alternative food source with high nutritional value [4].



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Figure 1. Togog taro



Source: <https://www.batuan.desa.id/data-wilayah>

Figure 2. Batuan Village Map

The Family Welfare Movement of Batuan Village, Gianyar, Bali, has significant potential to develop the local food "Talas Togog" to support food security. However, they face several crucial challenges. First, the production process for Taro Togog is still carried out traditionally with simple equipment, resulting in limited production capacity and inconsistent product quality. Second, a lack of knowledge about more efficient and hygienic processing techniques results in a short product shelf life and the risk of contamination. Third, product marketing is still limited to the local scale with unattractive packaging, resulting in low competitiveness. Fourth, the lack of systematic financial record-keeping and management hinders business development.

Improving the quality and efficiency of local food production, including Togog Taro. Through training and mentoring, the Batuan Village Family Welfare Movement group is expected to adopt better processing techniques, maintain food hygiene and safety standards, and extend the product's shelf life. Furthermore, this activity aims to strengthen community food security by maximising the potential of local resources, in this case, taro, to produce value-added products. This is expected to create sustainable food diversification and improve the economic welfare of groups through the development of local food businesses.

Problems in Food Processing (Agriculture):

- 1) "Taro Togog" is not yet considered a raw material, so it tends to be wasted (food loss) or used as animal feed.

- 2) Lack of understanding of the technology for processing "Taro Togog" into "Taro Togog" flour, and the resulting product is not being optimally utilized to supplement family income.
- 3) Improvements are needed to the process of converting traditional "Taro Togog" into high-quality "Taro Togog" flour.
- 4) Lack of understanding of packaging techniques.

Problems in Management and Entrepreneurship (Economics):

- 1) The Batuan Village Family Welfare Movement group has great potential in local food production but lacks adequate business management skills.
- 2) Partners face constraints with capital and rudimentary equipment, preventing large-scale production.

The Community Service Program (PKM) "Improving the Process of Making the Local Balinese Food 'Talas Togog' to Support Food Security in the Family Welfare Movement (PKK) Group in Batuan Village, Gianyar, Bali" prioritizes socio-economic impacts and benefits for the wider community. From a social perspective, this program aims to preserve and enhance the value of the local food "Talas Togog," a Balinese cultural heritage. Improving the production process is expected to enhance the product's quality and competitiveness, thereby attracting younger consumers to consume and preserve this local food. Furthermore, this program empowers the Batuan Village PKK group, improving their food processing skills and strengthening their role in family food security.

From an economic perspective, improving the production process for "Talas Togog" is expected to increase productivity and production efficiency, thereby boosting the PKK group's income. With better product quality, the market potential for "Talas Togog" will also increase, opening new business opportunities and improving community welfare. Overall, this PKM program has had a significant impact and benefit for the wider community, both socially and economically, by strengthening food security and preserving Balinese cultural heritage.

1.2. Literature Review

This group consists of 10 housewives with great potential to develop local food products. The main goal of this partnership is to increase the production capacity, product quality, and competitiveness of "Talas Togog", thereby supporting local food security and improving the economic welfare of the Batuan Village PKK group [3].



Figure 3. Batuan Village Family Welfare Movement

"Asta Cita" preserves Bali's culinary heritage and empowers local communities. Point 2, which strengthens the nation's defence and security system and promotes national independence through self-sufficiency in food, energy, and water, as well as the creative, green, and blue economies, utilises waste materials to reduce food loss and promote national independence through food self-sufficiency. This project contributes to local food diversification and reduces dependence on imported food. Furthermore, Point 5, which increases quality employment, encourages entrepreneurship, develops creative industries, and continues infrastructure development, creates quality jobs and fosters entrepreneurship, which can create jobs and increase local incomes, particularly in Batuan Village.

This Student Activity Program on Improving the Process of Making Local Food, a Balinese speciality called "Talas Togog," focuses on food and the National Research Master Plan (RIRN)'s goal of strengthening national food security through sustainable local food development.

This PKM focuses on supporting food security. Issues addressed include production efficiency, product quality, and increasing the added value of Talas Togog. Through a participatory approach, this PKM seeks to provide innovative and sustainable solutions in taro processing, thereby increasing the income of PKK groups and strengthening local food security.

2. MATERIALS AND METHODS

2.1. Socialization

The training was conducted to provide a theoretical understanding of how to improve the Taro Togog production process, including the importance of food security and the product's nutritional value. Additionally, group discussions and question-and-answer sessions were conducted to facilitate the exchange of ideas and address any problems that may arise during implementation. This socialization method also utilized visual media, such as posters and leaflets, to reinforce key messages and facilitate understanding [5].

2.2. Training

The training covered the importance of food security and the potential of Taro Togog as a local, high-nutritional-value food source. Furthermore, demonstrations and hands-on practice were conducted on proper Taro Togog processing techniques, including raw material selection, peeling, washing, and cooking, resulting in high-quality, varied processed Taro Togog products. Furthermore, the training covered aspects of product packaging and marketing, to ensure that processed Taro Togog products have added value and are competitive in the market. This training method was participatory and interactive, allowing Family Welfare Movement (PKK) group members to actively engage in the learning process and share their experiences, thereby improving partners' understanding and skills in processing Taro Togog.

2.3. Technology Application

The approach to implementing science and technology for partners reflects the basic needs of community engagement: Partners' basic need is an innovation in processing togog taro into flour, resulting in a longer shelf life. Making togog taro flour is

necessary because partners require flour in addition to rice for Balinese snacks during ceremonies. This step will provide a more varied supply of raw materials without the need for purchasing. Togog taro flour can also be processed into functional porridge to improve digestion and diet.

2.4. Process Evaluation

Modern processing equipment, such as slicing machines, dryers, and vacuum packaging, is used. Furthermore, more hygienic and standardized processing techniques are introduced across raw material selection, boiling, and final packaging. The application of this technology aims to increase productivity, extend shelf life, and maintain the nutritional quality of togog taro, thereby supporting local food security and increasing the product's economic value for the Batuan Village community.

2.5. Economic Sustainability Approach

The program's economic sustainability approach focuses on increasing the added value of Togog Taro products through improved production and packaging processes, thereby making them more attractive and competitive in the market. The program also seeks to build networks with local businesses and modern markets to expand market access and increase sales volume. Thus, it is hoped that Family Welfare Movement (PKK) groups can sustainably increase their income and contribute to family food security and the village economy [6].

2.6. Environmental Sustainability Approach

The program's environmental sustainability approach in this community service program is implemented through several strategic steps. These include implementing efficient, environmentally friendly processing techniques, such as using energy-efficient, low-waste cooking utensils. Training is provided on how to manage production waste into compost or animal feed, thereby reducing negative environmental impacts. Thus, this program not only improves the skills and well-being of PKK groups but also contributes to environmental conservation and local food security.

3. RESULT AND DISCUSSION

3.1. Preparation and Socialization Phase

In this phase, the implementation team coordinated intensively with the Batuan Village Family Welfare Movement (PKK) group. The initial socialization aimed to introduce the zero-waste concept and the potential uses of Togog Taro. The response from the PKK women was enthusiastic, laying the foundation for the program's sustainability. The team also conducted an initial survey to identify raw material availability and the specific needs of the target group.

3.2. Training and Education Phase

This phase is the core of the activity, during which the team provides intensive training in Togog Taro processing techniques. The materials covered include:

- 1) Understanding the characteristics of Togog Taro and its nutritional value.

- 2) The process of processing Togog Taro into food products, namely Togog Taro Porridge Flour and Togog Taro Chips.
- 3) Hygienic drying and flouring techniques for producing Taro Porridge Flour.
- 4) Proper slicing, soaking, and frying methods for taro chips.
 - Education regarding food hygiene and safety standards.

3.3. *Mentoring and Production Stage*

After the training, the team directly assisted the PKK women in the initial production process. This stage ensured that each participant could correctly apply the material taught. Participants were invited to process Togog Taro from upstream to downstream, from washing and peeling to packaging the final product. This mentoring also served as an evaluation stage to correct any technical errors.

3.4. *Marketing and Branding Stage*

The products, including Togog Taro Porridge Flour and Togog Taro Chips, were not only processed but also professionally packaged. The PKM team provided mentoring on marketing and branding strategies. Discussions were held to determine the product name, attractive packaging design, and marketing methods through social media or local market networks. This aimed to ensure the product had high sales value and could be marketed sustainably.

3.5. *Evaluation and Sustainability Stage*

In the final stage, a comprehensive evaluation was conducted to assess the program's success. Production results were tested, and feedback from the PKK group was recorded. Overall, this activity demonstrated very positive results. The PKK women now have new skills in processing Togog taro and have produced two flagship products: Togog taro porridge flour and Togog taro chips. The program's sustainability is expected to be achieved through the formation of independent entrepreneurial groups focused on Togog taro processing, thereby increasing family income and strengthening food security in Batuan Village.

The first meeting (I) of the community service team was held on Thursday, July 31, 2025, and involved an exploratory phase with partners. The meeting was attended by the chair of the Batuan Village Family Welfare Movement, the Batuan Village Head, and the Community Service Program team, consisting of two lecturers and three students. The objectives of the exploratory meeting were to identify potential and challenges, analyze the needs of the target group, map local skills, determine appropriate food products, and build communication and partnerships. In other words, the main objective of this exploratory meeting was to ensure that the program to be implemented was truly targeted, relevant, and sustainable, reflecting the actual needs and conditions in Batuan Village.

The second meeting, held on Friday, August 1, 2025, involved planting Togog taro seedlings around Batuan Village. Wild Togog taro is often underutilized. Systematic and sustainable planting education is expected to transform Togog taro from a wild plant into a food commodity with economic value and reliability. This is the first step towards promoting food independence at the village level.

The third meeting was held on Sunday, August 3, 2025. Participants were given education, training, and equipment.

Equipment handover was carried out. Training regarding the manufacture of Togog Taro Porridge and Chips Flour Products by using more hygienic and safe storage techniques. Partners were guided by instructor Ni Luh Putu Putri Setianingsih, S.Si, M.Si, who is a lecturer in the Food Technology and Agricultural Products Study Program, Faculty of Agriculture, Science and Technology, Warmadewa University. Partners followed the training well. At each meeting, activity evaluation and monitoring were conducted to identify deficiencies and errors, which were corrected immediately at the next meeting. The implementation of the activity can be seen in Figure 4.

The training, attended by representatives of the Batuan Village Family Welfare Movement members, included the following activities:

- 1) An opening ceremony by the Team Leader, who delivered remarks and guidance to ensure the event ran smoothly.
- 2) A welcome speech and explanation from the Batuan Village Leader regarding the planned training activities, ensuring a shared understanding and smooth operation for all participants and instructors.
- 3) A handover of training and production equipment, which will be donated to partners in Batuan Village, Sukawati, to support product creation and production after the training.
- 4) A planned activity schedule was prepared and discussed with the Batuan Village partners who will be participating in the training to ensure they can schedule their activities according to plan, efficiently manage time, and adapt to the participants' activities.
- 5) A discussion and Q&A session regarding the problems partners faced was held to ensure the activity could be well planned and to identify solutions to the issues.

For this lecture, the committee provided a training module containing the lecture material and the training module. This method is expected to provide the Batuan Village, Sukawati, and Family Welfare Movement partners with a comprehensive understanding of the lecture material on entrepreneurship and to provide files that can be accessed at any time if they forget the theory or training materials. The material was presented in a way that broadened participants' horizons and encouraged them to participate. The learning modules were distributed to ensure a smooth learning and participation process.

Furthermore, the fourth meeting, held on Saturday, August 22, 2025, provided mentoring in the form of monitoring and evaluation to maintain continuity and achieve the target outputs of this Community Partnership Program. The community service team continued to motivate partners to maintain enthusiasm and cohesiveness within Batuan Village, Sukawati, and the PKK. The results of this monitoring and mentoring were evaluated and reviewed to enable comprehensive improvements to the Community Partnership Program.

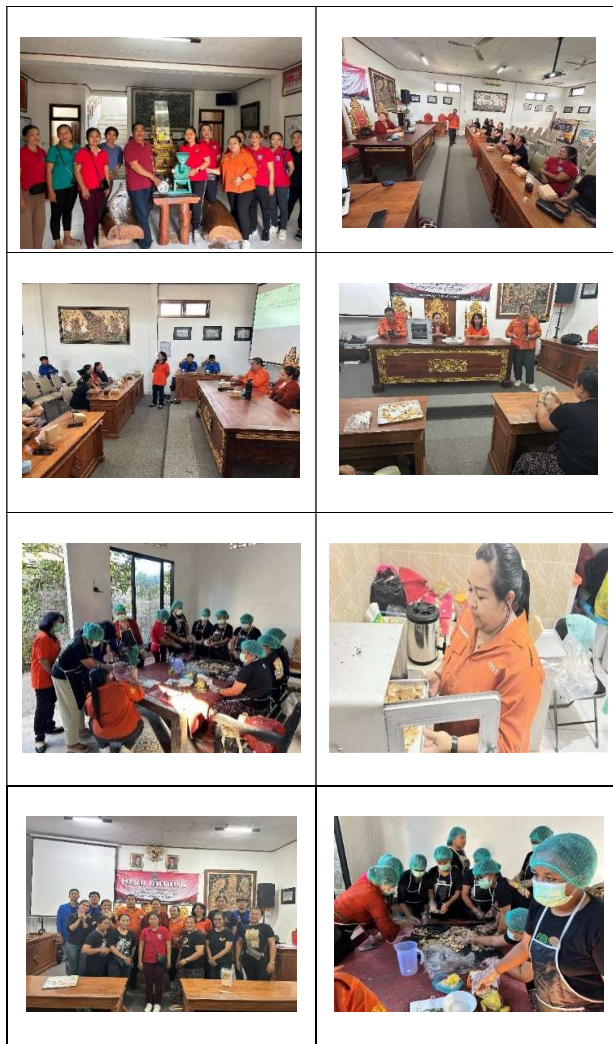


Figure 4. Implementation of training and practical activities for making Togog Taro Porridge and Chips Flour Products

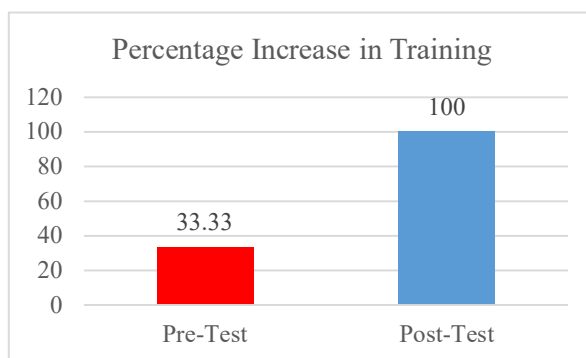


Figure 5. Percentage results of the evaluation of training on making products from Togog taro

3.6. Implementation of Technology and Innovation in the Community

3.6.1. Relevance

The technology taught, although simple, enabled the women to create two main processed products: Togog Taro Porridge Flour

<https://doi.org/10.29165/ajarcde.v9i3.787>

and Togog Taro Chips. This is not only about creating new products but also about addressing waste issues and improving the local economy. The relevance of this program lies in its ability to support local food security and economic independence. By processing previously unused waste, the community now has an additional source of income and can reduce dependence on commercially processed products. The implementation of this technology is a clear example of how simple innovations can have a significant impact, shifting community waste-disposal practices from disposal to processing while simultaneously building a stronger economic and food foundation for Batuan Village.

3.6.2. Community Participation

Active community participation, particularly the Batuan Village PKK Group, is key to the success of this program. From the beginning, we directly involved participants in every stage, from planning to implementation. This involvement ensures that the technology and innovation implemented are truly suited to local needs and context. The Batuan Village Family Welfare Movement group demonstrated high enthusiasm in learning how to process "togog" taro waste into economically valuable products. They actively participated in training sessions, hands-on practice sessions on making Togog Taro Porridge Flour and Togog Taro Chips, and discussions on product marketing. This high level of participation reflects a spirit of cooperation and a willingness to learn new things to improve the well-being of their families and communities.

3.6.3. Impacts:

First, from an economic perspective, this program creates a new source of income for Family Welfare Movement (PKK) members. By converting agricultural waste from "taro togog" into Taro Togog Porridge Flour and Taro Togog Chips, they now have a marketable product. This directly improves their families' well-being and financial independence.

Second, from a food security perspective, these processed products provide a nutritious local food alternative. Taro togog flour and chips increase household dietary diversity, reduce dependence on commercial food ingredients, and support healthy eating patterns.

Third, from an environmental perspective, this program supports the principles of a circular economy and waste reduction. Optimal utilization of agricultural waste helps reduce organic waste and creates a more environmentally friendly production system.

Overall, this program provides sustainable benefits by empowering communities through innovation, creating economic opportunities, strengthening local food security, and promoting environmentally friendly practices.

3.6.4. Productivity:

This PKM program has had a significant impact on increasing productivity within the PKK Group in Batuan Village, Gianyar, Bali. Through innovative processing of taro togog agricultural waste, the team successfully transformed previously uneconomical materials into two high-value processed products:

Taro Togog Porridge Flour and Taro Togog Chips. This increased productivity is evident in several aspects: Raw Material Productivity: The community now has a way to utilize all parts of the taro plant, from the tuber to the stem and

fronds (taro togog). This creates a more efficient and sustainable production system, reducing waste to zero.

Economic Productivity: With the new products, Family Welfare Movement (PKK) members have an additional source of income. This encourages increased economic activity at the household and group levels, opens new business opportunities, and improves well-being.

Skills Productivity: The program also enhances PKK members' skills in processing, packaging, and marketing products. This new knowledge empowers them to be more productive and independent, not only in making products but also in managing small businesses.

Overall, the impact of this program is the creation of a holistic productivity cycle in which waste utilisation not only produces products but also increases community income, skills, and independence in a sustainable manner.



Figure 6. Togog Taro Porridge and Chips Flour Products that have been packaged and are ready to be marketed

3.7. Next Stage Plan

After successfully implementing this Community Service Program and achieving positive results, the next stage will focus on sustainability and scaling up the business. This plan aims to ensure that the "Talas Togog" innovation is not just a fleeting project but develops into a self-sufficient, sustainable, and productive economic activity for the Batuan Village Family Welfare Movement Group.

3.7.1. Product Development and Marketing

The team will assist the Group in standardising product quality for both Taro Togog Porridge Flour and Taro Togog Chips. This includes advanced training on attractive and hygienic packaging, determining competitive selling prices, and obtaining a distribution permit (PIRT) to enable wider product marketing. In addition, we will facilitate marketing through social media and local e-commerce platforms, and collaborate with souvenir shops and hotels in Gianyar to reach a wider target market.

3.7.2. Increasing Production Capacity

To meet greater market demand, we will plan to increase production capacity. This could include acquiring more efficient production equipment, such as a slicing machine or a small-scale flouring machine, to speed up the manufacturing process and maintain product consistency. We will also hold follow-up workshops to train other members who are not yet involved so that this knowledge and these skills can be disseminated more widely in the village.

3.7.3. Continuous Monitoring and Evaluation

We are committed to conducting regular monitoring and evaluation over the next 6-12 months. This stage is crucial for measuring the program's economic and social impact, identifying

potential challenges, and formulating collaborative solutions. With this approach, we will ensure this zero-waste innovation delivers long-term benefits and serves as a model for other villages in Bali. environmentally friendly production system.

Overall, this program provides sustainable benefits by empowering communities through innovation, creating economic opportunities, strengthening local food security, and promoting environmentally friendly practices.

4. CONCLUSION

Relevant innovations can significantly improve the economy and food security at the community level. Through training and mentoring, the Batuan Village Family Welfare Movement group now has the knowledge and skills to process waste into marketable products. This not only reduces environmental problems by implementing a zero-waste concept but also creates new sources of income and increases local food self-sufficiency. Overall, this program demonstrates that collaboration between universities and the community can produce practical, sustainable solutions, transform challenges into opportunities, and empower communities to achieve greater well-being.

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