



## **Development of Taro-based Products in the Dewi Catur Women's Farmer's Group, Catur Village Kintamani Bali**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

The taro processing is currently growing, producing a variety of products. Empowerment of rural communities to improve knowledge, skills and behavior requires a mentoring program. Catur village is close to Kintamani tourism object. Located 57.8 km from the provincial of Bali, the main livelihood of the Catur community is farming. Taro products that are in great demand. In addition to the nutritional content, the raw materials are also easy to obtain and the price is affordable. This service activity was carried out in the Dewi Catur women farmer group in Catur Village, Kintamani District, Bangli Regency, Bali Province, Indonesia. Taro products have been produced and marketed but are not yet intensive. The solution provides appropriate technology in processing taro products; provide knowledge of good processing methods, sanitation, product packaging, marketing, entrepreneurship and provide equipment assistance. The method used is active community participation and exploratory. The conclusion that can be drawn from this activity is that community service activities have been running smoothly. The group has mastered the technology for making bread, jam, nuggets and taro noodles up to 85%. It is necessary to provide further assistance to the group, the quality of taro product have a longer shelf life.

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## 1. INTRODUCTION

### 1.1 Research Background

Taro (*Colocasia esculenta*) is a popular food crop in recent times. Taro has various common names around the world, namely Taro, Old cocoyam, Abalong, Taioba, Arvi, Keladi, Satoimo, Tayoba, and Yu-tao [1]. Processed taro products are products that are in great demand by the public. The macronutrient and micronutrient components of taro include: energy 98 Cal, protein 1.9 g, fat 0.2 g, carbohydrates 23.7 g, calcium 28.0 mg, phosphorus 61 mg, iron 1.0 mg, vitamin A 3 RE, vitamin C 4.0 mg, vitamin B1 0.13 mg, water 73.0 g, 85% edible ingredients [2]. In addition to the nutritional content, the raw materials are also easy to obtain and the price is affordable [3]. The process of processing taro into innovative products is currently growing rapidly resulting in a variety of processed products that are increasingly diverse [4,5]. Food processing in an effort to empower rural communities is an effort to develop community independence and welfare [6]. The priority of community needs in increasing knowledge, skills, and utilization of resources through mentoring activities is of the essence. Village development is an effort to improve the quality of life and the lives of rural communities [2].

Catur Village is a village located in the Kintamani sub-district, Bangli Regency, Bali province, Indonesia. Catur Village is located close to the Kintamani tourist attraction which is 57.8 km from the capital of Bali Province with a population of 520 families consisting of 2,079 people, namely 1,187 men and 892 women whose main livelihood is farming [2]. The main products are coffee, oranges, rice, vegetables, bananas and taro. The location is a bit far from the crowds so that community activities are only around the area. The Dewi chess women farmer group is one of the groups in the chess village, where their skills in product processing are still lagging behind [2]. This group needs support for empowerment and mentoring in order to foster an entrepreneurial spirit that can help increase income.

The island of Bali is not only rich in arts and culture, it is also rich in various processed foods. Many Balinese snacks or snacks are favored by foreign and domestic tourists. Processed food

has its own charm in its unique shape and taste [7]. Maintaining processed food made from tubers is the duty and responsibility of all parties in reducing or suppressing the use of wheat flour. Processing of taro processed food has better prospects and development opportunities. Conventional food product technology is characterized by a picture where the product is processed with poor sanitation and hygiene levels, uses raw materials with low quality or freshness, food safety is not guaranteed, technology is used for generations, and the business is managed by a family with the level of management ability is inadequate [8].

The result of previous research, the problems faced by the Dewi Catur women's farmer group include: 1) Do not have knowledge of good processing methods. 2) Taro processed food products produced have not varied and need to be improved in quality. 3) Food processing has not been based on the application of the basic feasibility of GMP (Good Manufacturing Practice) and SSOP (Sanitation Standard Operating Procedures). 3) Don't have a good packaging technique yet. 4) Business and financial management is still very simple. 5) Not yet widely marketed, because it is made specifically based on orders.

Therefore, it is necessary to develop taro-based food processing, with several processing improvements. Aspects of quality management and safety of raw materials and products need to be studied for business development and product marketing. With the problem of various processes of processing taro processed food, it is necessary to apply the basic feasibility of GMP (Good Manufacturing Practice) in order to produce quality taro processed food. The training activity on processing taro processed food is expected to be able to produce groups with good packaging processes and market their processed products more broadly.

### 1.2 Literature Review

Taro (*Colocasia esculenta*) is a popular food crop in recent times. Taro has various common names around the world, namely taro, old cocoyam, abalong, taioba, arvi, keladi, satoimo, tayoba, and yu-tao. The part harvested from taro is the tuber, with harvest age between 6-18 months and is characterized by leaves that begin to turn yellow or dry out. Taro generally thrives in

tropical countries. These foodstuffs have a contribution in maintaining food security and also have the potential as export goods that can generate profits. Its marketing is not only in fresh form, but also in frozen tuber form [9]. Indonesia as one of the taro producing countries has two taro planting centers, namely in the cities of Bogor and Malang. The type of taro that is usually cultivated is bentul taro because it has high productivity and has a delicious and fluffier tuber taste.

Taro tubers often cause itching, burning sensation, and irritation of the skin, mouth, throat, and gastrointestinal tract when consumed. Taro contains oxalic acid which affects the absorption of calcium in the digestive tract, namely by the formation of calcium bonds that are insoluble in water. Calcium oxalate is in the form of needle-like crystals. In addition to calcium oxalate, taro also contains oxalic acid which can form complexes with calcium. Oxalic acid is soluble in water, while calcium oxalate is insoluble in water but soluble in strong acids. Oxalates are not evenly distributed in the taro tubers. To be safe for consumption, the oxalic acid in taro must be removed. The boiling process can be carried out to reduce the amount of dissolved oxalate if the cooking water is removed, because these compounds are dissolved in the boiling [2]. In addition, soaking in warm water, germination, and fermentation can also be done to reduce dissolved oxalate levels. The itching feeling when consuming taro is caused by the puncture of calcium oxalate crystal needles which are wrapped in a transparent capsule filled with fluid that is between the tuber cells. These capsules are called raffids. These raffids are embedded in the dividing wall between the two vacuoles in the tuber tissue and their ends are in the vacuole. If the tuber is peeled or cut into pieces, the water-filled vacuole due to the difference in tension between the two vacuoles causes the capsule wall to break. As a result, calcium oxalate crystals protrude to the surface and pierce the skin. These punctures cause itching in the mouth, throat, or skin of the hands [5].

Taro tubers are foodstuffs that have good nutritional value. The macronutrient and micronutrient components contained include protein, carbohydrates, fat, crude fiber, phosphorus, calcium, iron, thiamine, riboflavin, niacin, and vitamin C [1,5]. The chemical composition varies depending on several factors, such as the type of variety, age, and level of

maturity. Climatic factors and soil fertility also contribute to differences in the chemical composition of taro tubers. The added value of taro tubers is the ease with which the starch is digested. This is caused by the size of the starch granules which are quite small and the starch contains amylose in considerable amounts (20-25%). In addition, taro is also free of gluten, so processed food from taro can be used for the diet of individuals who have an allergy to gluten. The macronutrient and micronutrient components of taro include: energy 98 Cal, protein 1.9 g, fat 0.2 g, carbohydrates 23.7 g, calcium 28.0 mg, phosphorus 61 mg, iron 1.0 mg, vitamin A 3 RE, vitamin C 4.0 mg, vitamin B1 0.13 mg, water 73.0 g, 85% edible ingredients [2].

There has been a vast growth in patron hobby in sourdough bread in latest years because of its nutritional, fitness and technological benefits. Spontaneous sourdough fermentation has been historically implemented to the manufacturing of conventional sourdough bread which has a one-of-a-kind flavor and flavor in numerous places across the world. Sour-dough is classed into 3 types, primarily based totally at the era implemented [10]. Type I, Type II and Type III are sparkling sourdough, business kind of sourdough and dry sourdough strains, respectively. Type III sourdough is produced both as spray-dried or freeze-dried for correct stabilization of kind I sourdough [10]. Production of conventional sourdough bread the use of kind I sourdough is expensive, volatile and time consuming. Stabilization of kind I bitter dough through drying will lessen operational fees and assist standardize sourdough bread products. Drying strategies inclusive of spray drying and freeze drying may be used to offer an extended shelf existence of sourdough and flip it right into an inventory product till similarly use [11].

Jam is one of the people's favorite foods today [12]. Besides its good taste, jam also has a good nutritional profile and is eaten with bread [13,14]. Appropriate technology is needed to process taro into products. The innovation of processed products from taro that have the potential to be developed is jam, which is the current favorite food of the community [15]. Jam can be made from pulp or juice, with the addition of sugar and water, and concentrated until it reaches the consistency of jelly [13]. Apart from tasting good, jam also has a good nutritional profile and is consumed with bread. The physicochemical characteristics of jam are largely determined by the basic ingredients. Research on the basic

ingredients in this case the types of by-products of cherry husks, cherry pulps, and parchment skin on the characteristics of the jam is very limited. The process of making jam can also be added with thickening agents, citric acid, and food additives [16].

Taro nuggets are one of the processed foods of taro with the addition of chicken meat that has a certain taste, usually golden yellow. Currently, taro nuggets are one of the processed products that are growing rapidly, favored by consumers because apart from being practical, nuggets can also be used as snacks. The raw materials for nuggets are: taro that has been peeled, washed and finely chopped (500 g), minced chicken (250 g), red onion (6 cloves), garlic (3 cloves), thinly sliced scallions, sliced celery leaves, thin, egg (1 grain), chicken seasoning flour (250 g), msg (1/2 teaspoon). In industrial processing, taro nuggets go through several stages. First of all, the taro and chicken are ground until smooth. Then, the mill is mixed with emulsifier, flour, spices, and water so that it becomes an emulsion. Furthermore, the emulsion is given a wet coating and a dry coating. Next, the emulsion that has been given this coating is fried, until cooked. Once cooked, taro nuggets are frozen at very low temperatures until frozen. The final product is then packaged. In storage, this food requires special treatment, which is always stored in frozen conditions. This is because taro nuggets are processed products that are easily damaged by micro-organisms [17].

Noodles originally came from China and then developed and spread to Japan, Korea and East Asian and Southeast Asian countries. Noodles began to be known and developed in mainland Europe because they were brought from China by Marco Polo, the traveler from Italy [18]. The types of noodles are as follows:

- a. Fresh Noodles (raw noodles): are noodles that do not undergo a heating process after cutting or molding. This noodle has a fairly high-water content, around 35%. The high-water content and the condition of the product that is not cooked make fresh noodles spoil quickly. In general, fresh noodles are white, slightly yellowish and covered in flour. Before use, the noodles need to be boiled first [18].
- b. Mie Wet: are fresh noodles that have gone through the boiling process. Usually, wet noodles after boiling are given a little oil to prevent the noodles from sticking together.

Moisture content of wet noodles reaches 52% so that the shelf life is relatively short, which is only 40 hours at room temperature. Before use, wet noodles simply brewed with hot water or washed with boiled water to remove the remaining oil [19].

- c. Dry noodles are fresh noodles that have gone through the steaming process and then the water content is dried to reach 8-10%. Drying is generally done by drying in the sun or in an oven. The relatively low moisture content of dry noodles causes a relatively longer shelf life and is easy to handle [20].
- d. Instant noodles are dry noodle products that must be cooked or brewed with boiling water before they are ready to be consumed. In its manufacture, instant noodles have gone through a process of steaming, shaping and drying. Instant noodle water content reaches 5-8% so it has a long shelf life. The drying process can be done by frying the noodles in oil or using hot dry air. Instant noodles are generally packaged per serving, complete with vegetable oil, spices and dried chilies. Currently, many instant noodles have been given the addition of dry vegetables to their products [19]

### 1.3 Research Objective

The objectives of this community service activity include: 1) Increasing the income of the Dewi Catur farmer women's group. 2) Help provide appropriate technology for processing bread, jam, nuggets and taro noodles. 3) Help provide knowledge about good packaging and labeling. 4) Help provide knowledge about marketing and entrepreneurship. 5) Help facilitate the manufacture of taro processing equipment so that the processing can run well, more efficiently in time and according to GMP and SSOP and can increase profits.

## 2. MATERIALS AND METHODS

### 2.1 Materials and Equipment

The raw material used is taro (*Colocasia esculenta*) with a harvest age of 6 months, which is obtained from Catur village. Additional ingredients such as flour, sugar, yeast, chicken eggs, corns starch is obtained from shops around the Kintamani subdistrict. The

equipment's used are noodle printing machines, ovens, and several other types of equipment. We provide learning modules to help impart knowledge about good packaging, labeling, marketing and entrepreneurship. We assist the community in the practice of making noodles, nuggets, bread and taro jam and are evaluated several times. When the PKM activities are completed, we distribute several tools such as noodle press machines and ovens to support the business.

## 2.2 Implementation

This community service activity program is carried out by means of training through lecture and discussion methods, demonstrations and training, as well as questions and answers. a) Lecture and Discussion Method: This PKM activity will begin by giving lectures and counseling to housewives who are members of the Dewi Catur Women Farmers Group. These women were gathered in a room with the implementation team to give lectures on the material for the activities. The material provided is related to the processing of taro into taro bread and jam, taro nuggets, and various types of taro noodles. This activity aims to provide theoretical knowledge to mothers about the material for the activities to be carried out. The activity then continued with the Discussion method to deepen the respondents' understanding of processed taro products, learning media. During the implementation of this activity, more pictures and explanations of processed taro products were shown into taro bread, and taro jam, taro noodles, taro nuggets, with the hope that respondents could understand more quickly. Demonstration and Training Methods: Demonstration and training activities are follow-up activities carried out by PKM implementers to the lectures and discussions that have been carried out. This activity was carried out by demonstrating the process of processing taro into taro noodles, taro nuggets, taro bread, and taro jam. We go directly to the field to practice how to make noodles, nuggets, bread and taro jam to good packaging and labeling techniques so that product quality is maintained. We evaluate several times, until the group can independently practice making the various taro preparations until they are able to package them properly. We donate some tools such as a noodle printing machine and an oven to support the business. Evaluation is carried out by giving questionnaires to participants to determine the level of success of this activity. The

implementation of community service activities is expected to run smoothly, participants are enthusiastic and active in participating in the training from start to finish so that they can motivate the housewives of the training participants to be able to process taro into various processed products.

## 3. RESULTS AND DISCUSSION

### 3.1 Results

The community service program activity entitled Development of Taro Processed Products at the Dewi Catur Women Farmers Group, Catur-Kintamani Village, Bali, has been running smoothly. The activity was carried out on Thursday, May 19, 2022 in the form of counseling or theoretical studies to provide an understanding of appropriate technology materials for processing taro product, providing equipment assistance, providing knowledge about packaging, and labeling products for bread, jam, nuggets and taro noodles, marketing and entrepreneurship. (Fig. 1). The implementation of the activities is complemented by pre and post tests on respondents' knowledge of good packaging and labeling, as well as marketing and entrepreneurship. The success of the intervention can be seen from the increased knowledge of respondents. The activity then continued with hands-on practice of making bread, jam, nuggets and taro noodles. The participants who attended this activity were 20 people from the Dewi Catur Women's Farmer Group, Catur Village. The extension team also donated tools and materials for making bread, jam, nuggets and taro noodles. This community service activity has been published on electronic media.

### 3.2 Outcomes

In detail, the outcomes achieved from this community service activity include: appropriate technology, mass media publications, videos of activities and bakery products, jams, nuggets and taro noodles.

### 3.3 Benefit

The group gains skills in developing bread, jam, nuggets and taro noodles. From the 20 people group, 16 people have mastered the technology of making bread, jam, nuggets and taro noodles so that 85% can make bread, jam, nuggets and taro noodles.



Fig. 1. Bread, jam and noodles of taro products



Fig. 2. (a) Training participants with the head of the Catur village, (b) Delivery of production equipment assistance

### 3.4 Partner's Contribution to Implementation

Partners are very enthusiastic in participating in the training process. All partners (100%) actively participate in direct practice in activities and partners expect continuous assistance in the development of bread products, jams, nuggets and taro noodles.

### 3.5 Implementation of Community Service

In the implementation of service activities, the inhibiting factor is the condition of the Covid-19 Pandemic. This condition makes it difficult to find

a schedule for the implementation of activities. The supporting factor in this activity is the group's great desire to participate in further training on the development of healthy bread, jam, nuggets and taro noodles products and have a long shelf life. In addition, in the midst of the covid-19 pandemic which has made tourism quiet, members can earn additional income by producing bread, jam, nuggets and taro noodles and selling them online. Obstacles encountered in the implementation of service can be overcome by communicating with group leaders and village officials. Counseling activities and direct practice can take place smoothly on Thursday, May 19, 2022, which is attended by 20



**Fig. 3. Implementation of the Dewi Catur Women Farmer Group Activities at Catur Village**

group members. The activity was carried out in accordance with the Covid-19 prevention health protocol. Furthermore, the service team will continue to assist in the development of bread products, jams, nuggets and taro noodles to obtain p-IRT. The strategic steps to realize the next plan are assisting the group in managing the p-IRT permit and assisting in completing the administration so that the p-IRT permit can be owned by the group.

#### 4. CONCLUSION

The conclusion that can be drawn from this activity is that community service activities have been running smoothly. 1) The income of the female farmer group of Dewi Catur increased. 2) Appropriate technology for processing bread, jam, nuggets and taro noodles can be applied. 3) Knowledge of packaging and labeling is well understood. 4) Knowledge of marketing and entrepreneurship is applied. 5) The processing of taro can run well, more efficiently in time and according to GMP and SSOP and increase profits. It is recommended that this activity be carried out continuously and provide assistance to the group so that the group can independently make bread, jam, nuggets and taro noodles and be able to market them.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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