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Community Empowerment through Seaweed-Based Fishball Production Training in Pudai Subdistrict, Kendari City

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ABSTRACT

Pudai Urban Village, Abeli District, Kendari City, is a coastal area with significant potential for fishery products and seaweed. However, the utilization of marine resources in the area remains largely limited to the sale of fresh products. This community service program aimed to empower the local community through training in the production of seaweed-based fish balls as an effort to diversify processed products and increase household income. Fish balls are a popular food among people of all age groups because of their appealing taste. The production of fish balls using skipjack tuna meat represents a form of diversification in fish processing. The use of seaweed as a substitute ingredient in the production of skipjack tuna fish balls aims to increase the nutritional value and improve the quality of the fish ball products. The implementation methods included socialization, theoretical and practical training, packaging education, and evaluation of the program's success. The results of the activity demonstrated an 85% increase in participants' knowledge and skills in processing fishery products into processed food products with high nutritional and economic value. The combination of fresh fish meat and diversified seaweed (*Eucheuma cottonii*) resulted in fish balls that were rich in dietary fiber, highly nutritious, and well accepted based on organoleptic characteristics. This program proved effective in promoting the development of household-scale entrepreneurship in Pudai Urban Village, Kendari City.

Keyword : Empowerment, Fish Meatballs, Seaweed, Pudai Urban Village, Food Diversification.

INTRODUCTION

Coastal areas possess significant potential for the development of an economy based on marine resources. Kendari City, the capital of Southeast Sulawesi Province, has a coastline extending approximately 43 km. Pudai Urban Village is one of the administrative areas within Abeli District, Kendari City, Southeast Sulawesi Province. Geographically, Pudai Urban Village is situated in the coastal area of Kendari Bay, making it an important gateway and strategic buffer area in the eastern part of the city. Its location along the coastline gives the area distinctive characteristics, with a topography predominantly consisting of low-lying coastal terrain and good accessibility to the centers of government administration and economic activities in Kendari City.

The Pudai Urban Village covers an area of approximately 1.25 km², equivalent to 8.11% of the total area of Abeli District. To the north, the area directly borders Kendari Bay. In 2024, the population of Pudai Urban Village was recorded at 1,770 inhabitants, consisting of 903 males and 867 females. These geographical conditions indicate that Pudai Urban Village has close access to coastal resources and has considerable potential for developing economic activities based on fishery products. The presence of Kendari Bay surrounding the area has a significant influence on the livelihoods and economic activities of the local community. Most

residents of Pudai Urban Village depend on the fisheries and marine sectors for their livelihoods, working as capture fishers, aquaculture farmers, fish collectors (*punggawa*), and daily fish traders (BPS Kota Kendari, 2024). In addition to the marine sector, other residents support their household economies by working in the service sector, micro-scale trading, port and industrial labor, while a smaller proportion are employed as government employees.

The natural resource potential of Pudai Urban Village is highly abundant, particularly in terms of the supply of fresh fishery products and other supporting marine commodities, such as seaweed. The abundance of locally available raw materials represents a strategic asset with significant potential to be developed into a variety of high-value-added processed products. The development of household-based and community-group-based marine product processing enterprises is one of the key pillars for improving the welfare and economic self-reliance of the local community. This potential is reflected in the presence of a relatively large fishing community. In 2026, Pudai Urban Village was designated as one of the locations for the development of the *Kampung Nelayan Merah Putih* (Red-and-White Fishermen's Village) program. The program is expected to benefit approximately 425 fishing households in Pudai. Pudai Urban Village is located in Abeli District, Kendari City, Southeast Sulawesi, within the coastal area of Kendari Bay and in close proximity to the Kendari Ocean Fishing Port (*Pelabuhan Perikanan Samudera* [PPS] Kendari). This strategic location provides considerable potential for the marine and fisheries sector, particularly as a coastal urban village with substantial potential for capture fisheries and seaweed cultivation. One of the region's leading commodities is fresh fish and *Eucheuma cottonii* seaweed (Aslan, 2018). However, these marine products are generally sold in fresh form at relatively low prices, with producers remaining highly dependent on middlemen (Asnani et al., 2021).

Low value-added fisheries products are one of the factors contributing to poverty in coastal areas. Fish catches and seaweed harvests are generally sold directly in fresh or raw dried forms at relatively low prices at the buyer level (Badarusman & Astuti, 2021). This condition is further compounded by the limited knowledge and technical skills of local communities in diversifying processed food products based on marine resources (Nur et al., 2022). In fact, through product diversification, the economic value of fisheries products can be increased by three to five times. The diversification of marine-based products into popular food products, such as seaweed-based fish meatballs, therefore represents a strategic solution. Meatballs are processed meat products that are highly popular among various segments of Indonesian society (BSN, 2014). The incorporation of seaweed into fish meatball formulations not only improves texture by naturally enhancing elasticity and extends shelf life, but also increases the content of dietary fiber,

micronutrients, and iodine, which are beneficial to human health (Suryani & Hambali, 2019; Ningsih & Rahayu, 2020).

Seaweed is a highly nutritious food source, containing dietary fiber, minerals, and bioactive compounds such as phenolic compounds and ascorbic acid. The addition of 10–15% seaweed to fish meatball products can increase the protein content to 21.58–21.85% and the crude fiber content to 3.91–5.20% (Lekahena, 2015). In addition to enhancing nutritional value, seaweed also functions as a natural binding agent, thereby improving the elasticity and chewiness of the meatball texture.

Fish-based processed products have considerable potential for further development, as fish is a source of animal protein with high nutritional value and favorable functional properties for the formation of texture in processed food products. One of the most popular fish-based products is fish balls, which are characterized by their elastic texture and savory taste and offer opportunities for further development through the incorporation of innovative food ingredients. In the context of food technology, the texture of fish balls is influenced by the gelation of myofibrillar proteins during heating, which forms a gel structure and determines the elasticity of the final product (Park, 2013). Therefore, the utilization of locally available food ingredients as additives represents an innovative strategy that not only improves product quality but also supports food diversification based on local resources. One potentially suitable additive is the seaweed *Eucheuma cottonii*, which is known to be rich in carrageenan, a hydrocolloid compound that functions as a thickening, stabilizing, and texture-forming agent (Campo et al., 2009). In addition, seaweed contains dietary fiber and bioactive compounds that contribute to improving the nutritional value and functional quality of food products (Cofrades et al., 2010). The incorporation of *Eucheuma cottonii* puree into fish balls has the potential to improve texture elasticity, water-holding capacity, and dietary fiber content, thereby providing added value as a locally based food innovation.

The problems faced by the community in Pudai Urban Village include: (1) limited skills in processing marine resources into value-added products, (2) limited knowledge of food diversification based on seaweed, and (3) the absence of business groups that collectively manage marine resources. This activity is grounded in Ife's Community Empowerment Theory (2013), which emphasizes three dimensions: personal empowerment, group empowerment, and structural empowerment. Through training, the program is expected to enhance individual capacity. In addition, Rogers' Diffusion of Innovations Theory (2003) is applied, whereby the seaweed fish meatball innovation is introduced through stages ranging from knowledge acquisition to implementation. A previous study conducted in Kendari City demonstrated that following meatball-making training, participants' understanding increased from 27.55% to 98.25%, and the activity generated profits of IDR 3,135,000 per month (Ejoin, 2021). Therefore, this training is

expected to serve as a solution for strengthening the economic empowerment of the coastal community in Pudai Urban Village. Through this community empowerment program, training and mentoring in the production of seaweed fish meatballs were conducted in Pudai Urban Village. The program is expected to promote local-based food diversification, increase household economic income, and foster an entrepreneurial spirit based on coastal micro, small, and medium enterprises (MSMEs) (Nur et al., 2022).

IMPLEMENTATION METHOD

The activity was conducted in Pudai Urban Village, Abeli District, Kendari City, in March 2026. The method employed was Participatory Rural Appraisal (PRA), which consisted of the following stages:

Table 1. Implementation and Methods of Community Service Activities

No	Tahapan	Kegiatan
1	Identification	Focus Group Discussions (FGDs) with village officials and community members to identify problems and explore existing potentials
2	Planning	Preparation of training materials, equipment, and ingredients
3	Implementation	Theoretical and practical training on the production of fish and seaweed meatballs
4	Assistance	Post-training assistance and mentoring for one month
5	Evaluation	Pre-test, post-test, and business analysis

The product preparation began with the raw material preparation stage. Fresh fish were thoroughly washed, after which the bones were removed and the fish flesh was cut into small pieces. The fish flesh was then ground using a food processor until a smooth texture was obtained. The ground fish flesh was subsequently mixed with tapioca flour, eggs, seaweed puree, seasonings, and ice cubes until all ingredients were thoroughly combined and a homogeneous dough was formed.

Following preparation of the dough, the forming stage is carried out by shaping the dough into round portions according to the desired size. The shaped dough is then boiled in boiling water until it floats to the surface, indicating that the product is fully cooked. The cooked products are subsequently removed from the boiling water and drained until excess surface moisture is reduced. The final stage is packaging, in which the drained products are placed in plastic packaging and tightly closed or sealed to maintain the product's hygiene, quality, and shelf life.

RESULTS AND DISCUSSION

Participant Characteristics

The training activity on the production of seaweed-based fish meatballs was intended for residents of Pudai Subdistrict, Kendari City, with a primary focus on the productive-age population, ranging from 18 to 55 years old. The majority of participants were women, particularly housewives, members of the Family Welfare Empowerment (PKK) organization, and young women residing in the coastal area of Pudai. In terms of educational background, the participants had attained basic to secondary levels of education (elementary school, junior high school, and senior high school/vocational high school). Therefore, the training materials and delivery methods needed to be designed in a practical, interactive, and easy-to-understand manner.

From a socio-economic perspective, the participants were predominantly from fishing households, household-scale micro and small enterprises (MSEs), and lower- to middle-income communities who relied on local fisheries and marine resources for their livelihoods. Most participants already possessed basic skills in preparing everyday meals; however, they had not yet mastered the techniques for formulating and processing marine products in a properly proportioned, hygienic manner that could generate higher market value. Limited knowledge of diversifying processed fish and seaweed products, as well as modern packaging and marketing techniques, represented the main challenges faced by the participants.

Education on the Benefits of Seaweed Fish Meatball Processing

The community service team stated that this activity aimed to increase the added value of local commodities while simultaneously promoting the diversification of healthy food products for coastal communities. “Eucheuma cottonii seaweed is abundant in the coastal areas of Kendari. When combined with fresh fish meat, it not only produces a delicious product but also provides a rich source of dietary fiber, protein, and essential minerals. The carrageenan compounds contained in seaweed also function as a natural gelling agent, enabling the production of healthy fish meatballs without the use of harmful chemical additives,” the team explained during the activity.

Figure 1. Educational Session on the Benefits of Processed Seaweed Fish Meatballs

The activity, which was enthusiastically attended by 30 participants, began with nutrition education and an introduction to the principles of hygiene and sanitation in food processing, followed by hands-on practice in preparing the meatball mixture and boiling the meatballs.

Preparation and Implementation of the Activit

The stage of preparing materials and equipment for the production of seaweed fish meatballs involved preparing all the ingredients required to produce seaweed-based fish meatballs. The seaweed selected for this process was *Eucheuma cottonii*. The seaweed was procured locally at the community service site, while other ingredients, such as breadcrumbs and tapioca flour, were obtained from Kendari City. Other supporting materials were also procured locally at the community service site. The selection of raw materials was adjusted to meet the target market and consumer preferences. The selection of seaweed as the primary raw material was carried out by choosing seaweed with low salt content and minimal impurities. Dried seaweed served as the basic raw material for all of the processed products introduced in this activity (Figure 2).

Figure 2. Seaweed Raw Materials That Have Been Soaked And Sun-Dried, And Skipjack Tuna Ready To Be Processed Into Seaweed Fish Meatballs.

The production process for seaweed fish meatballs was carried out by involving all women from the local community. The results showed that the seaweed fish meatballs had a pale white color. This color was influenced by the use of seaweed, which is naturally colorless and bland, as well as white-colored fish meat as the main raw material, resulting in a pale white appearance. The texture of the meatballs was chewy, which was attributed to the use of seaweed, tapioca flour, and STPP (sodium tripolyphosphate), all of which contribute to improving the elasticity and chewiness of the meatball mixture. The aroma of the meatballs was still slightly fishy, considering that the main ingredients used in their production were seaweed and fish meat, both of which may contribute a relatively strong fishy odor. In terms of taste, the meatballs were somewhat salty because the seaweed used already contained a relatively high amount of salt, and excessive salt was also added during the preparation process.

Figure 3. Training on the Preparation of Seaweed Fish Meatballs

Evaluation of the Activity

The results achieved through the implementation of the community service program demonstrate that all activities planned by the implementation team were successfully carried out. These activities had been jointly discussed and agreed upon with the women's community members in Pudai Village, Abeli District. In general, the tangible outcome of the community service activities was the

establishment of effective communication and a positive relationship between the fishing community in Pudai Village, Abeli District, and the academic community from Universitas Halu Oleo, Kendari. The community service programs implemented in Pudai Village and the outcomes achieved are presented in Table 2.

Table 2. Community Service Programs and Activities in Pudai Urban Village, Kendari City

No	Program	Activities	Achievements
1	Entrepreneurial Capacity Building	Entrepreneurship training covering business planning, financial management, production management, marketing and product distribution systems, as well as strategies for becoming a successful entrepreneur.	• Increased interest and motivation among fishing communities to engage in entrepreneurship and create new employment opportunities, particularly in seaweed-based products. • Enhanced understanding and knowledge among existing entrepreneurs.
2	Increasing the Economic Value of Processed Seaweed Products	a. Training on processing seaweed into seaweed fish meatballs. b. Training on the diversification of fishery products, particularly seaweed-based products. c. Dissemination of information on the safety of processed seaweed products.	• Increased knowledge and skills among fishermen's wives and female household members in processing seaweed into seaweed fish meatballs. • Production of processed fishery products that are suitable for sale, both as ready-to-eat products and as products ready for cooking. • Increased knowledge and understanding of how to process food and natural ingredients safely while maintaining quality, hygiene, and high competitiveness

Figure 4. Group Photo of the Community Service Implementation Team with the Activity Participants

Although the participants have a high level of openness to learning and strong motivation to improve their families' economic well-being through entrepreneurial activities, they demonstrated a strong commitment to participating in all stages of the training, beginning with the delivery of theoretical materials, followed by practical meatball-making sessions, and concluding with the packaging process. By utilizing the abundant availability of local raw materials in Pudai Subdistrict, the participants are expected not only to acquire new technical skills but also to be encouraged to establish Joint Business Groups or initiate independent and sustainable business ventures after the training. This is consistent with the findings of Nur et al. (2022), which indicate that direct technical assistance can accelerate the community's mastery of food-processing technologies in coastal areas.

CONCLUSION

The community service activity through training on the production of seaweed-based fish balls in Pudai Subdistrict, Kendari City, successfully enhanced participants' knowledge and skills in processing local resources into economically valuable food products. The use of seaweed as an ingredient in fish ball production was shown to improve the physical quality of the product, particularly in terms of texture and elasticity, while also contributing to its nutritional value without reducing consumer acceptance of the resulting product. In addition to improving food-processing skills, the activity provided participants with insights into opportunities for developing businesses based on local resources. Therefore, the training program has the potential to create new entrepreneurial opportunities for housewives in the coastal area of Pudai Subdistrict, while encouraging more productive utilization of seaweed resources to increase added value and household income.

Based on the results of the activities that have been implemented, continuous assistance is needed for the group in the process of obtaining product distribution permits, particularly the P-IRT (Home Industry Food Production License) and Halal Certification, so that the products produced have proper legal status and can be marketed more widely. In addition, further assistance should be directed toward strengthening the group's marketing capacity through the utilization of digital technology and the implementation of effective digital marketing strategies. To support increased production capacity, support from relevant institutions is also expected in the form of appropriate technology, such as meatball-making machines, vacuum sealers, and other production equipment tailored to the group's needs. Such assistance is expected to improve production efficiency, maintain product quality and shelf life, and increase production volume, thereby expanding market reach and increasing the group's income.

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The highest appreciation is also extended to all training participants, particularly the housewives and micro, small, and medium-sized enterprise (MSME) actors in Pudai Urban Village, for their enthusiasm, active participation, and exceptional commitment throughout all stages of the activity, from beginning to end. Appreciation is also extended to all members of the community service team and students who actively contributed and worked diligently throughout every stage of the program, including preparation, implementation, mentoring, and documentation. It is hoped that the outcomes of this community service activity will provide sustainable benefits and contribute to enhancing the knowledge, awareness, and capabilities of the community, particularly in supporting improvements in nutritional well-being and the local economy in Pudai Urban Village.

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