

The Innovation of Seaweed Processing Process into Chips as a Local Food Superior Product

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ABSTRACT

This community service aims to introduce innovations in the process of processing seaweed into chips as a superior local food product in Wanci Coastal Village. This village has a great potential in seaweed production, but its utilisation is still limited to raw products, so the added value for the local community is not optimal. Through this activity, technology transfer was conducted to process seaweed into chips using simple yet efficient drying and frying methods. The training involved farmer groups and housewives as the main actors. The results showed that this innovation not only improved the technical skills of the community, but also opened up new business opportunities with products that are highly competitive in the local market. The response from the community was very positive, as seen from the increase in production and market demand. Thus, this programme is expected to become a model for other coastal areas in developing the potential of local natural resources in a sustainable manner.

Keywords: Community Service, Innovation, Seaweed Chips

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INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) has a significant impact on the industrial and economic sectors of a country. According to Law No. 20/2008, small businesses are owned and managed by a single individual or a small group of individuals with a certain level of wealth and income. Despite their small business, they have demonstrated the ability to drive the country's economic success. Seaweed is one of the marine commodities that has high economic value and great potential to be developed, especially in coastal areas of Indonesia that are rich in this natural resource (Syarif, 2024). As a maritime country, Indonesia has a diversity of seaweed species that can be utilized, both for domestic consumption and export. However, seaweed utilization in Indonesia is still dominated by raw or semi-finished products, such as agar and carrageenan, so the added value obtained by coastal communities is relatively low (Romahorbo, 2024). The service activities included socialization and technical training on seaweed processing, which focused on small and medium enterprise (SME) groups and local communities involved in the food industry. The training covered not only

basic seaweed processing techniques, but also aspects of product design and marketing strategies (Sululing S., 2024)

This service was selected because it acknowledges the coast's enormous potential, which is limited by economic diversity and wealth inequality. The activity's methodology comprised determining local requirements, holding training sessions and workshops, as well as panel discussions and mentoring sessions. Participants, who came from a variety of backgrounds, were equipped to create sustainable company strategies and learn more about coastal entrepreneurship. Outcomes include improved entrepreneurial skills, successful local product showcases, and support from government and stakeholders. The program, proved that with a holistic approach, coastal communities can optimize their economic potential. Figure 1 shows the community sorting and cleaning seaweed in Liya Onemelangka Village, Southeast Sulawesi.



Figure 1. Cleaning and Sorting Seaweed in Liya Onemelangka Village, Southeast Sulawesi

Innovation in seaweed processing into value-added food products, such as seaweed chips, is one effective strategy to increase community income while introducing a variety of local food products to consumers (Fahrudin et al., 2024). The flavor, texture, and high nutritional value of seaweed chips provide a promising product for commercial development. Liya Onemelangka Village's native goods are competitive with those of other coastal communities in terms of both quantity and quality. The majority of this region's customer demand is for seaweed products. Transporting goods from Wawonii Island is more challenging than mobilizing goods from this region to other locations. Product sales should rise as a result of upgrading or updating packaging and obtaining business permissions for MSMEs. The second focus is on developing the quality of human resources. Activities carried out in the form of community education on the positive values of entrepreneurship as an effort to improve the mentality and morality of good entrepreneurs. Empowerment and Development of Coastal Community SMEs has an impact on increasing knowledge about processing coastal resources, increasing product differentiation, branding, utilizing technology and internet access in marketing the products produced and expanding product marketing areas so that they can be used by consumers through training and empowerment activities based on community participation.

To overcome these problems, researchers with various parties, including local governments and community organizations, took the initiative to carry out a community service program (Rahayu et al., 2024). This program aims to increase community awareness and skills in utilizing seaweed into economically valuable products. The involvement of various parties is important to ensure that the community service program is effective and sustainable, and can provide long-term benefits to the local community (Fachri et al., 2024). Through case studies and primary data obtained from aspiring business owners in the coastal tourism industry through in-depth interviews, observations, and content analysis, a qualitative approach highlights the value of establishing robust communication networks through stakeholder collaboration in order to assist entrepreneurs in overcoming early obstacles and seizing opportunities. A key component of successful entrepreneurship is the development of communication networks, with support from family and the community serving as a crucial basis for the expansion and advancement of a business. Government and pertinent agency-developed communication strategies should incorporate components that facilitate the development of these networks, guarantee successful socialization, and give new business owners comprehensive and reliable information to help them navigate the process of starting their own venture (Subekti & Sjachro, 2024).

Empowerment activities with increased family economic resilience are carried out by involving neighbourhood residents and housewives. This is important to maintain economic stability in the family. This activity is carried out for entrepreneurial activities independently at home so that later the home industry can be developed in the area by utilizing seaweed as the main raw material. The utilization of seaweed is because seaweed plants are easy to use. In terms of benefits as food, seaweed is also a source of antioxidants. Seaweed parts can be utilized for food raw materials by making cakes and other food preparations (Rokhmah & Novita Sari, 2024).

The development of seaweed chips as an eco-friendly substitute product has great potential for lowering the amount of marine trash that pollutes the environment and minimizing adverse effects. High-quality seaweed chips may now be produced because to the utilization of seaweed as a plentiful and renewable raw material and the creation of creative processing methods. Seaweed chip production can be a successful way to produce nutrient-dense, healthful snacks if the public supports and is aware of ecologically friendly products.



Figure 2. Drying and Soaking Seaweed Raw Materials in Liya Onemelangka Village, Southeast Sulawesi

The service activities included socialization and technical training on seaweed processing focused on small and medium enterprise (SME) groups and local communities involved in the food industry (Fachri et al., 2024). The training covered not only basic seaweed processing techniques, but also aspects of product design and marketing strategies. This holistic approach is expected to help local communities develop relevant new skills and increase the added value of the products produced (Suci & Fridayati, 2024). Using nutrient-rich seaweed, we evaluated the production process, analyzed the product composition, and tested its potential advantages in practical applications. The manufacturing process of Seaweed Chips is carried out using tutorial and hands-on methods involving seaweed collection, seaweed fibre processing, and forming into stick form. Innovative processing techniques have been developed to ensure adequate quality and strength of the seaweed sticks. The results show that seaweed sticks have attractive characteristics, with the potential to become a sustainable alternative in the consumer industry. This service's primary goal is to investigate the entire seaweed chip-making process, from raw material selection and processing processes to appropriate packaging methods. The prospects and difficulties in the development of seaweed chip products for both domestic and foreign markets will also be covered in this article. It is envisioned that seaweed chips will develop into a superior product that not only enhances the well-being of coastal communities but also solidifies Indonesia's position as the world's top seaweed producer by utilizing suitable and cutting-edge processing methods.

The following areas are typically the focus of seaweed chip-related community service research. Increasing seaweed's added value is the first factor. The processing of seaweed into products with additional value, like chips, is the main emphasis of this study. Increasing the revenue of communities engaged in seaweed cultivation is the goal. The development of novel products is the second factor. The goal of this project is to develop novel seaweed chip flavors, textures, and packaging. This also includes creating recipes or using more productive production methods.

Then, the third aspect is local community empowerment. The focus is on training and empowering local communities, especially in coastal areas rich in seaweed. Through training, communities are taught how to produce seaweed chips, small business management, and product marketing. The fourth aspect is economic feasibility analysis. The research involved economic analyses to ensure that the production of seaweed chips could provide a viable profit for the community. This includes a study of production costs, selling prices, and market potential. The fifth aspect is environmental sustainability. This focuses on environmentally friendly means of production, including the utilization of seaweed waste and farming methods that do not harm the marine ecosystem. The sixth aspect is marketing and distribution. The research also covered marketing and distribution strategies for seaweed chips, both for local and international markets. The overall goal of this research focus is to improve community welfare

through the development of sustainable and high-economic value seaweed products.

METHODS

The main focus here is to develop the most effective method for processing seaweed into quality chips. This includes various stages in the production process, such as drying, fermentation, and serving techniques. The aim is to ensure that the final product has optimal nutritional value, flavour and quality, making it suitable for marketing and consumption (Moreno-Miranda & Dries, 2022). Here, attention is paid to how seaweed chips production can affect the local economy (Bekele Sime et al., 2024). This includes market analysis to understand the demand, the prospects of selling the seaweed products, as well as how the community's income can be increased through this venture. The purpose is to demonstrate that seaweed chips production can be a sustainable source of income for the community (Quoc & Van, 2023)

This section highlights the importance of education and campaigns to increase community knowledge about the health benefits offered by seaweed chips. Effective strategies need to be developed to disseminate this information, so that people are more interested in trying and consuming the seaweed as part of a healthy lifestyle. The last section focuses on how the seaweed chips making business can continue to grow and be sustainable in the long term (Voge et al., 2023). This includes sustainable natural resource management, effective marketing strategies, and product innovation to ensure the business remains relevant and can withstand market challenges. Overall, this problem statement aims to identify the steps needed to build a seaweed chips industry that not only produces quality products, but also has a positive impact on society and the environment in a sustainable manner (De Keyser et al., 2023).

Research design is the initial stage where the researcher plans and designs the entire study. The research design includes the selection of research methods, development of hypotheses or research questions, sample selection, and planning of data collection procedures. The aim is to ensure the research is conducted in a systematic and structured manner, so that the results are reliable (Petrescu-Mag et al., 2024). The next stage is collection of data. At this stage, the researcher starts collecting the data needed for the research. In this context, data collection is most likely to be done through interviews with the selected respondents.

Interviews are conducted to obtain in-depth information and perspectives from participants related to the research topic. The next stage is to analyze the data (Allasiw et al., 2023). Data analysis usually involves identifying themes, patterns, or categories in the answers given by participants. The researcher looks for meaning behind the answers to answer the research questions or test the hypotheses that have been formulated. Overall, this flow illustrates a structured qualitative research process, starting from research planning, data collection through interviews, to data analysis that aims to draw in-depth conclusions from the data collected (Gyal, 2024). The approach used in this service is participatory, namely by actively involving the local community in every stage of the activity (Gaitán-Cremaschi et al., 2020). This direct involvement is important to ensure that

the knowledge and skills acquired are aligned with local needs and potential (Putri & Susilo Kusdiwanggo, 2024). The program began with a socialization session to raise awareness of the importance of seaweed management and its economic potential (Figure 3). This socialization was followed by technical training that focused on processing seaweed into various products such as chips, cakes, and seaweed-based foods.

The training activities were divided into several sessions, each focusing on a different aspect of the production process. The initial session included an introduction to tools and materials, as well as basic seaweed processing techniques. The next session covered product design, where participants were taught how to design attractive and functional products (Fahrudin et al., 2024). The last stage is marketing strategy, where participants are given insights on how to market their products, both through local and online channels. All training sessions are guided by instructors who are experienced in their fields, and participants are given the opportunity for hands-on practice.

Evaluation of the activities was conducted on an ongoing basis to assess the effectiveness and impact of this service. The evaluation is conducted through surveys and interviews with participants, as well as direct observation of the products produced. The evaluation criteria include improvement in technical skills, quality of products produced, and changes in participants' income (Fahrudin et al., 2024). The evaluation aims to identify areas for improvement and ensure that the program is meeting its objectives. This operational approach was chosen because it allows for adjustments and improvements to be made to the program based on feedback received, thus ensuring sustainability and long-term success.

FINDINGS AND DISCUSSION

Community service on seaweed management in Liya Onemelangka Village, Southeast Sulawesi, involved a series of activities designed to increase the awareness and skills of local communities. The mentoring process began with a socialisation session aimed at educating the community about the impact of underutilisation of seaweed on the environment and its economic potential. Figure 3 shows researchers and a number of agencies working together to socialize and educate the community about the environmental impacts of seaweed underutilisation and its economic potential.

Seminars and Training are basic concepts in human resource development and motivation in entrepreneurship must be emphasised in order to be enthusiastic in achieving entrepreneurial goals. The results of the activities showed that the participants were enthusiastic and felt the benefits of the activities carried out. Limited skills in production and digital marketing are the main obstacles. The majority of MSMEs need training in production, digital marketing, and finance (Fitriani et al., 2024).



Figure 3. Socialization of Trainees

The event attracted many participants, including small and medium-sized enterprises and local community members. The session continued with technical training in the form of introduction to tools and materials, basic processing techniques, and product design. The active participation of the participants showed the high spirit of learning and contributing to the efforts of seaweed-based food management. The community service event was a comprehensive effort to explore the latest knowledge on digital marketing for local products. The event included a series of diverse activities, from the official opening to in-depth learning sessions on market segmentation and digital marketing. Prominent speakers provided insights on the importance of proper market segmentation and effective digital marketing strategies in promoting seaweed chips in the online era (Yosepha et al., 2024).

Preliminary data shows that participants' knowledge and skills in entrepreneurship improved significantly, as measured through pre-test and post-test. Furthermore, the initiative also contributed to an increase in participants' income and promotion of local products, which in turn supported the sustainability of product empowerment. These results suggest that local product-based entrepreneurship training can be an effective strategy for village economic development and community empowerment (Nur et al., 2024).

This assistance is carried out through several stages, namely identification of local product potential, technical training on product processing and packaging, and development of branding and marketing strategies. In addition, this program also provides education on business legality to increase consumer confidence and expand market reach. With this assistance, it is expected that community service in Ngemplakrejo Village will be able to improve product quality, strengthen competitiveness, and optimize existing local economic potential. The results of this program are expected to have a positive impact on community service actors, both in increasing business capacity and in expanding the market for coastal products, so that the contribution of community service to the local economy is increasingly significant (Azarah et al., 2024).



Figure 4. Participants Designing the Product

In the production session, participants were given the opportunity to practice their newly learnt skills, with direct guidance from the instructor (figure 4). The resulting product, seaweed chips, showed an improvement in the quality and creativity of the participants (figure 5).



Figure 5. Various Seaweed Product Processing into Economical Food Sources

Marketing strategy was the focus of the final stage, where participants were equipped with knowledge on various distribution channels and marketing techniques, both locally and online (Figure 6).



Figure 6. Packaging for Online Order Delivery

This activity not only increased their understanding of the importance of marketing, but also introduced them to digital platforms that can expand their market reach. The mentoring provided practical insights on business management, from production to marketing, which is important for the sustainability of their business. The ministry has also brought about significant social change (AR et al., 2020). There is an increased awareness among communities of the importance of seaweed management and the economic opportunities it can generate. This is in line with recent literature findings that community-based empowerment program

can drive behaviour change and increase participation in environmental conservation efforts (Prayetno et al., 2024).

The goal of this service is to find and evaluate digital marketing tactics that work well for boosting local product sales in the online marketplace. Literature reviews, polls of nearby business owners, and data analysis from online sources are some of the service techniques employed. The findings demonstrate the significance of social media, SEO, and content marketing in broadening market penetration and drawing in new clients. In addition, the integration of e-commerce with digital marketing strategies such as paid advertising (PPC), email marketing, and influencer marketing also proved effective in increasing sales. This study comes to the conclusion that a thorough grasp of the target market, flexibility in responding to emerging digital trends, and consistency in campaign execution are all necessary for the success of digital marketing strategies. In order for local businesses to effectively compete in the online marketplace, the service's practical implications offer recommendations on how to maximize their digital marketing strategies. (Silaen et al., 2024).

In developing a company, marketing strategy is an important factor that must be applied. However, the key to a company's success is not only in the marketing strategy implemented, but also in the ability to conduct appropriate analyses and observations of the factors that affect marketing strategy. The purpose of the research is to provide information on how to implement marketing strategies in the global or international market in Indonesia (Safa'atin & Luky Denata, 2024).

In addition, the formation of a new working group in the form of a local co-operative that focuses on the production and marketing of processed seaweed products, demonstrates the emergence of new institutions that provide a forum for collaboration and innovation. Behavioural changes were also seen in the form of increased community participation in seaweed management and food production activities. Participants showed greater interest in learning and innovation, and were more open to new ideas about sustainability and the circular economy (Suwarno, 2024). These changes reflect an increased understanding of the importance of environmental sustainability and the economic potential of seaweed, which can provide a foundation for broader social transformation.



Figure 7. Product Exhibition Attended by Various Agencies

The emergence of local leaders who are proactive in organizing and leading this initiative is one of the significant outcomes of this service (Fatimah, 2023). These local leaders are not only instrumental in encouraging community participation

but also in ensuring the sustainability of the program. Their presence is in line with recent research findings that emphasize the importance of local leadership in the success of community empowerment program (SUDARMI et al., 2024). With strong institutional support and local leaders, the community of Liya Onemelangka Village in Southeast Sulawesi is now in a better position to continue to develop and expand this initiative in the future. Evaluation of Service Activities

Evaluation of Service Activities

Two primary techniques were employed for assessing this program: participant surveys and interviews, as well as in-person product observation. According to the interviews, the participants understood the production process from start to finish, including the marketing phase, better. They were able to identify the critical processes that turn raw materials into economically valuable final goods. By effectively turning garbage into marketable commodities, participants demonstrated originality in the final products, indicating a rise in technical proficiency and inventiveness.

Table 1. Evaluation of Service Activities

Evaluation Aspects	Description
Evaluation Methods	◦ Surveys and interviews with participants: Understanding production process from inception to marketing. ◦ Direct observation of the product: Seeing its innovation from an undervalued material to an economic good.
Evaluation Criteria	Technical Skills Enhancement: ◦ Definition of production process: From raw material selection to the final stage. ◦ Product design: Products that match the market trends. Product quality: ◦ Assessment of marketable products: Analyze which products are attractive to consumers. Change in income ◦ Assessment of marketable products

Purpose of evaluation

- Identify areas that need improvement.
- Ensure the program is running as intended.

An Operational Approach for Evaluation

- Adjust and improve the program based on feedback.
 - Support the sustainability and long-term success of the of the program.
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The evaluation criteria covered several important aspects, including the improvement of participants' technical skills. After attending the program, participants have a better understanding of the production process, from the selection of raw materials, product design that suits market trends, to effective and efficient sales strategies. Product quality is also a major focus in the evaluation, where the products produced are assessed based on their level of acceptance in the market. This includes analyzing which products are successful in attracting consumer interest and gaining good sales. In addition, the evaluation also assessed the impact of the program on participants' income. Although the recorded increase in income is still small, it shows a positive trend that can be further enhanced. The main objective of the evaluation was to identify areas for improvement, as well as to ensure that the program is working in line with its stated objectives. This comprehensive evaluation approach allows for continuous adjustment and improvement, which not only supports the sustainability of the program but also its long-term success. It therefore serves as an important tool to ensure that the program provides maximum benefit to participants (Bekele Sime et al., 2024).

CONCLUSION

The Liya Onemelangka Village community in Southeast Sulawesi demonstrated a notable improvement in their knowledge and abilities in seaweed management as a result of this service project. In addition to turning seaweed into items with added value, the community was able to boost revenue by selling the processed goods. As a result, a successful circular economy model is produced, in which food items that were formerly worthless are now turned into goods that the market wants. Waste management can be used as a solution in other places with comparable circumstances because of its success, which shows the potential of a community-based approach to tackling local environmental and economic issues.

However, despite the positive results, there are some limitations that need to be considered. First, the scale of the programme is still limited to a specific area in Liya Onemelangka Village, Southeast Sulawesi, so the impact has not been widely felt. Secondly, limited resources and technological support limit further innovation and the development of more diverse products. In addition, the income changes achieved by participants are still relatively small, suggesting there is still room for improvement in terms of production scale and market access. This service

is uncommon in that it emphasizes the direct participation of communities in all phases of the process, from marketing to production. In addition to enhancing the community's technical proficiency, this helps people comprehend the circular economy and the significance of managing seaweed. It strongly suggests that this initiative be extended to other regions and that associated agencies and future researchers provide further assistance in the form of advanced training and access to more modern technologies. In order for processed seaweed goods to reach a larger market and offer more economic advantages to the community, it is also critical to expand the marketing network.

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