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Efforts To Increase Production Through Training On Liquid Organic Fertilizer (Lof) Preparation For Caulerpa Seaweed Farmers Group In Takalar Regency

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Abstract:

Liquid Organic Fertilizer (LOF) is a fertilizer produced from natural ingredients. LOF is highly beneficial for enhancing seaweed cultivation productivity due to its complex nutritional content. It is favored by the community as it is relatively inexpensive and environmentally friendly. However, seaweed farmers currently lack the knowledge and skills to produce liquid organic fertilizer. This activity aimed to equip seaweed farmers with the knowledge and skills needed to produce environmentally friendly liquid organic fertilizer (LOF) using locally available materials, thereby improving the production and quality of cultivated seaweed. The methods employed to address this issue included educational sessions on environmentally sustainable farming practices and practical training on producing LOF from banana stalks. Results from these activities indicated that Caulerpa farmers were generally unaware of the potential use of banana stalks as raw material for LOF production. Through these educational sessions, members of the "Bahagia Bersama" Caulerpa farmers group gained an understanding of environmentally friendly cultivation techniques utilizing affordable and readily available banana stalk-based liquid organic fertilizer. Recommendations for future activities include intensive mentoring to ensure consistent implementation of cost-effective, environmentally sustainable seaweed farming methods, particularly through the use of locally sourced liquid organic fertilizer (LOF).

Keywords: Banana stalk; *Caulerpa*; Liquid organic fertilizer

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Introduction

Caulerpa sp. seaweed is one of the fisheries commodities with significant potential for cultivation development. This seaweed species contains essential nutrients such as proteins, carbohydrates, minerals, vitamins, (Nomleni et al., 2022); (Astriani & Nurjanah, 2023); (Darmawati et al., 2024) and antioxidants (Antara et al., 2022); (Putra et al., 2023). Efforts to increase seaweed production can be achieved through fertilization practices. Currently, seaweed farmers primarily rely on inorganic fertilizers to enhance production, posing significant risks to consumers if consumed over a prolonged period. These fertilizers have been indicated to contain

toxic substances that negatively impact both consumers and the environment. Jaelani et al. (2021) stated that the continuous use of inorganic fertilizers leads to soil hardening. Soil hardening occurs due to the accumulation of chemical residues, making it challenging for the soil to decompose. Chemical materials tend to be more resistant to decomposition compared to organic materials.

Based on these considerations, the provision of organic fertilizer is essential to balance the use of inorganic fertilizers. Organic fertilizers are safe for human health, environmentally friendly, affordable, and easily accessible (Hartatik et al., 2023); (Marasabessy & Tanasale, 2021). The use of organic fertilizers has become increasingly popular due to the growing public awareness of consuming organic food products, which are perceived as healthier because they are free from chemicals and synthetic fertilizers. According to (Safitri et al., 2023); (Hapsari et al., 2023); (Kospa, 2023), organic fertilizers significantly enhance production both in terms of quality and quantity, reduce environmental pollution, and sustainably improve soil quality.

There are two types of organic fertilizers commonly used by the community: solid organic fertilizers and liquid organic fertilizers. Liquid organic fertilizer is a solution derived from the decomposition (fermentation) of natural organic materials containing nutrients essential for plant growth (Ermawati & Masruroh, 2020); (Agustina & Rukmana, 2022). The advantage of liquid organic fertilizer is its ability to quickly provide nutrients, thereby rapidly addressing nutrient deficiencies (Hadi et al., 2021); (Setyowati & Widyaningrum, 2021); (Darmawati, et al., 2022).. The addition of organic materials in seaweed cultivation serves as an alternative nutrient supply, significantly improving seaweed production (Safitri et al., 2023); (Darmawati, et al., 2022). One locally available material suitable for producing liquid organic fertilizer is banana stalks, which are typically discarded after harvesting bananas due to their lack of economic value.

The target of this activity is the group of lawi-lawi seaweed (*Caulerpa* sp.) farmers located in Puntondo Hamlet, Laikang Village, Takalar Regency, South Sulawesi Province. This group comprises seaweed farmers organized under the business group "Bahagia Bersama," with cultivation ponds covering approximately one hectare, producing fresh Caulerpa sp. seaweed for export. The region possesses significant potential as a business opportunity for the members of this farmer group. The "Bahagia Bersama" group consists of 10 members with educational backgrounds ranging from elementary to high school levels, influencing their competency levels. High competencies among farmers are associated with their mastery of technical aspects of seaweed cultivation and their managerial capabilities (Prasedya et al., 2022).

The objective of this community service activity is to provide knowledge and skills to the "Bahagia Bersama" seaweed farmers group regarding locally sourced liquid organic fertilizer, including its production and application techniques for *Caulerpa* sp. seaweed cultivation. The expected benefit from this activity is that seaweed farmers will gain a thorough understanding of locally-based liquid organic fertilizers and will independently produce and apply these fertilizers in their Caulerpa sp. seaweed farming practices.

Method

The community service activity was conducted with the “Bahagia Bersama” seaweed farmers group located in Punaga Hamlet, Laikang Village, Mangarabombang District, Takalar Regency. This activity focused on training the farmers in techniques for utilizing banana stalks and other materials to produce liquid organic fertilizer (LOF). The group comprises ten members who currently produce fresh Caulerpa seaweed.

The activity was carried out by a team consisting of six lecturers, two students, and one instructor. The lecturers provided counseling aimed at improving the quality of Caulerpa cultivation and techniques for producing banana stalk-based liquid organic fertilizer. The educational materials were designed to enhance the farmers' competencies by employing participatory extension methods and intensifying the training through group-based approaches (Ramadhana & Subekti, 2021); (Sukiman et al., 2021); (Pashar et al., 2024). The students prepared training materials and assisted the instructor during the practical sessions on LOF production. The instructor was responsible for conducting the hands-on training sessions, guiding participants to produce liquid organic fertilizer ready for application.

The training and mentoring materials were systematically structured in stages to ensure effective understanding among the partners. The training began with techniques for cultivating Caulerpa seaweed and culminated in producing liquid organic fertilizer (LOF). The materials were formulated based on the needs of the partners. The training and mentoring materials provided to the "Bahagia Bersama" group can be seen in Table 1.

Table 1. Training and Mentoring Material Concepts

Material	Benefit
Education on environmentally friendly Caulerpa seaweed cultivation techniques	To help partners understand the benefits of environmentally sustainable Caulerpa cultivation systems for the continuity and sustainability of their business and environment.
Introduction to environmentally friendly fertilizer materials	To enable partners to utilize inexpensive, readily available natural materials as fertilizers in Caulerpa cultivation.
Production of liquid organic fertilizer from banana stalks	To guide partners in the production of liquid organic fertilizer and its application in cultivation pond

Results and discussions

The development of Caulerpa seaweed cultivation with export-quality standards is crucial for penetrating international markets. Therefore, this community service activity focused primarily on enhancing the knowledge and skills of partners regarding the production of affordable and environmentally friendly liquid organic fertilizer (LOF), aiming to improve the production quality of Caulerpa seaweed. As stated by (Ariska et al. 2021) and (Haryuni et al. 2021), LOF contains complex nutrients and growth-promoting substances that can function effectively as plant growth regulators.

Figure 1. Educational Session on Environmentally Friendly Caulerpa Seaweed Cultivation

This community service activity commenced with the identification of partner needs, highlighting a key requirement: understanding how to utilize natural materials to produce environmentally friendly organic fertilizers. Consequently, training was provided on the production of affordable and easily accessible organic fertilizer, which offers sufficient availability and provides dual benefits for farmers and environmental sustainability in pond cultivation. As reported (Jaelani et al. (2021); (Setiawan et al. 2021), liquid organic fertilizer is an effective alternative, serving to enrich organic matter, supply essential nutrients, enhance soil physical properties, and replenish nutrients removed during harvesting. Liquid organic fertilizers should comply with the minimum technical requirements stipulated by Permentan No.70/Permentan/SR.140/2011. Compared to inorganic fertilizers, LOF is safer for health and environmentally friendly (Rahayu & Sugiarti, 2021); (Sukandar & Dewi, 2023).

Figure 2. Training on Production of Banana Stalk-Based Liquid Organic Fertilizer (LOF)

Figure 2. Training on Production of Banana Stalk-Based Liquid Organic Fertilizer (LOF) The participants exhibited high enthusiasm during the training, as evidenced by active engagement through numerous questions and interactive discussions between trainers and participants (Figures 1 and 2). To evaluate the success level of this community service activity for the target audience, a matrix of activity achievement indicators is presented. The indicators for the success of the community partnership program are clearly outlined in Table 2.

Table 2. Activity Achievement Indicators Matrix

Activity	Indicator	Achievement
Education on environmentally friendly Caulerpa seaweed cultivation techniques	Improved understanding of environmentally friendly Caulerpa cultivation techniques	Partners understand environmentally friendly Caulerpa cultivation techniques
Introduction to environmentally friendly fertilizer materials	Enhanced understanding of affordable and environmentally friendly organic fertilizer materials	Partners are capable of utilizing affordable and readily available natural materials as fertilizers for Caulerpa cultivation
Production of liquid organic fertilizer from banana stalks	Improved skills and techniques in producing banana stalk-based liquid organic fertilizer	Partners understand the production process of liquid organic fertilizer and are capable of producing and skillfully applying it in cultivation ponds

There was a significant improvement and development in partners' understanding and skills related to environmentally friendly Caulerpa cultivation techniques and the production of banana stalk-based liquid organic fertilizer, achieving the activity's primary target of enhancing

partners' comprehension and practical abilities in producing liquid organic fertilizer (Figures 2 and 3).

Figure 3. Application of Liquid Organic Fertilizer (LOF) in Partners' Cultivation Ponds

In addition to the training sessions, the implementation team collected feedback from the participants through questionnaires containing several statements evaluated before and after the educational outreach.

Table 3. Comparison of Average Scores for Each Questionnaire Statement Before and After Educational Outreach

No	Statement	Before Outreach	After Outreach
1	Knowledge of environmentally friendly Caulerpa cultivation techniques	2.50	3.00
2	Knowledge of various natural materials as basic ingredients for organic fertilizer	2.00	2.85
3	Knowledge of techniques for producing liquid organic fertilizer (LOF)	1.00	3.00

The questionnaire was administered to seaweed farmers before and after the educational outreach. Scores were rated on a scale from 1 (not knowledgeable), 2 (moderately knowledgeable), to 3 (knowledgeable). Based on the questionnaire results, the farmers' average knowledge level before the outreach was rated at scale 2. However, following the outreach activity, their knowledge significantly improved, especially regarding statement 3, reaching a score categorized as knowledgeable.

Conclusion

Following the implementation of the community service activity, it can be concluded that the partners demonstrated high enthusiasm and motivation toward developing organic Caulerpa seaweed cultivation with export quality. However, they initially lacked the necessary skills and knowledge for environmentally friendly cultivation and the use of organic fertilizers, despite these being abundant and easily accessible natural resources. The training method used for producing organic fertilizer proved effective in improving the partners' abilities and skills. There was a noticeable enhancement in partners' proficiency in environmentally sustainable cultivation techniques and in the production of banana stalk-based liquid organic fertilizer (LOF). Such community service activities, involving training and mentoring, significantly benefit from continuous support from higher education institutions through ongoing farmer development programs.

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