

DEVELOPMENT OF FACILITIES AND INFRASTRUCTURE TO SUPPORT LEMBUNG MANGROVE ECOTOURISM IN LEMBUNG VILLAGE, GALIS DISTRICT, PAMEKASAN REGENCY

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Abstract

Tourism development is an effort to create added value in all aspects of the tourism sector, starting from facilities and infrastructure, tourist objects and attractions, and other aspects. One of the tourism developments is the Lembung Mangrove Ecotourism in Lembung Village, Galis District, Pamekasan Regency. The problem with developing Lembung Mangrove Ecotourism in Lembung Village is that it has not properly accommodated visitor needs, such as the existence of good tourist facilities. Based on this, it is necessary to develop sustainable ecotourism. The aim of this community service (CS) is to develop Lembung Mangrove Ecotourism facilities in Lembung Village so that the local economy and community empowerment increase. The types of facilities and infrastructure developed by the CS Polinema team for the community partnership scheme at CS locations are in the form of science and technology diffusion of appropriate technological equipment, namely: deep fat frying machine. The PPM results are then awarded to Tourism Awareness Group (Pokdarwis) "Sabuk Hijau".

Keyword: Appropriate Technology, Community Partnership, Deep Fat Frying, Tourism Awareness Group

INTRODUCTION

Tourism is an activity that directly touches and involves the community so that it has a direct impact on local residents. Tourism activities can be an energy trigger (Yayuk, 2020) which causes society to experience metamorphosis in various aspects. In line with dynamics, tourism is developing towards sustainable tourism, namely tourism development that seeks to ensure that tourism can be carried out in environmentally friendly destination areas. One of them is the application of mangrove ecotourism for sustainable development in the tourism sector.

Tourism development can also maintain ecological processes and help preserve natural and man-made heritage and biodiversity (Kagungan and Yulianti, 2019). Tourism must be managed seriously involving various relevant stakeholders because tourism development and development is the result of long-term sustainability with planning and support from all parties.

The tourism sector is one of the sectors that has the largest multiplier effect in the economy. The tourism sector is supported by various subsectors ranging from transportation, accommodation, to the micro, small and medium enterprise (MSME) industry.

The development of Lembung Mangrove Ecotourism (Fig. 1) as an alternative tourism product can be a motor for sustainable development of coastal areas in the tourism sector in Lembung Village, Galis District, Pamekasan Regency. Sustainable tourism basically aims to optimize the use of environmental services. The four important components that are the focus of sustainable tourism development are local communities and/or managers, ecotourists, natural resources, and infrastructure and accessibility (Kissiger et al, 2021).



Figure 1. Lembung Mangrove Ecotourism

Sustainable tourism is based more on empowerment efforts at social, economic and cultural levels. Sustainable tourism makes the community the main actor in the tourism business by driving regional tourism and enjoying greater benefits (Hadiwijono, 2012). The presence of ecotourist to these unspoiled places provides opportunities for local residents to earn alternative income. For example, becoming a tour guide, opening an eco-lodge, food stall and other businesses related to tourism. This business opportunity can improve their welfare or quality of life, both materially, spiritually, culturally and intellectually.

The ecotourism development strategy is oriented towards community empowerment by prioritizing the role and participation of local communities as development subjects (Community Based Tourism Development, CBTD). The development of Lembung Mangrove Ecotourism is a community-based activity, in this case with the Tourism Awareness Group (Pokdarwis) "Sabuk Hijau", with the mainstreaming of regional resources and uniqueness in the form of physical and non-physical elements attached to the coastal area. is the main driving element of tourism activities themselves. Economic, ecological and social aspects are important considerations in developing Lembung Mangrove Ecotourism in the context of sustainable tourism.

Pamekasan Regency has the potential for various types of fishery products (catching, cultivation and aquaculture). The total production of the marine fisheries sector in Pamekasan regency in 2018 reached 19,554.1 tons; contributing 21% of the total volume of fisheries production in the Madura region. Total fisheries production in Galis district is 591.5 tons (Agus

et al, 2019). The potential in this fisheries sector is mostly sold in the form of fresh fish (Fig. 2.b). Fisheries sector actors in Lembung Village, Galis district, Pamekasan regency partly produces processed fish products, for example fried fish which is sold in stalls, but the processing techniques use traditional methods (Fig. 2.c).



(a) Waiting for the fish catch from the fishing boat

(b) Fresh fish sent outside the area



(c) Traditional method of frying fish at CS locations

Figure 2. Potential of the fisheries sector at CS locations

Frying in an oil bath (deep fat frying) is a process for drying, cooking and formulating food products (Varela 1998; Gertz 2000): various roots and tubers (Gamble and Rice 1987; Baumann and Escher 1995; Vitrac et al , 2000–2004), fruit (Diaz et al. 1999) and meat (Lisse and Raoult-Wack 1998). The success of the deep fat frying method is due to its versatility and flexibility on both industrial and household scales. In addition, deep fat frying provides several advantages compared to alternative technologies: highly efficient heat transfer, crispy texture for fast-drying and delicious fried products (Raoult-Wack et al. 2000; Moyano and Pedreschi 2006).

However, the application of deep fat frying in sea fish frying has several limitations: (a) the difficulty to orient independently of heat and oil-mediated phenomena that occur simultaneously during the frying process; and (b) increasing consumer demand for low fat products. Reducing oil absorption is the concern of the CS Polinema team for the community partnership scheme in Lembung Village to meet the health demands of ecotourism visitors as consumers. Coating with hydrocolloids and/or modified starch is an alternative used to reduce

oil absorption during frying. Incorporation of cellulose powder or cellulose derivatives into batters or mixtures of marine fish products can reduce oil uptake due to their thermal gelation and film-forming properties.

A meeting by the Polinema CS team for the community partnership scheme was held with the "Sabuk Hijau" Pokdarwis partners in Lembung Village. As a result of the meeting (Fig. 3), the following partner problems were obtained.



Figure 3. Meeting and FGD with Pokdarwis “Sabuk Hijau”

a) The role of the tourism sector in improving the local economy is not yet optimal.

The existence of “Lembung Mangrove Ecotourism” in Lembung village has not made a real contribution to improving the local economy. The existing problems are: (1) the potential of the fisheries sector and MSMEs as business actors has not been optimally synergized with tourism development, (2) the tourism sector as a mediator between local communities as producers and ecotourism visitors as consumers, for example through the establishment of tourist restaurants, has not been implemented, and (3) three actors in the tourism industry, namely: tourist destinations, ecotourists and local communities have not been optimally integrated into the tourism industry.

b) Infrastructure capacity and accessibility are still felt to be lacking.

To support the development of the leading regional tourism sector, several problems faced are (1) the infrastructure aspect is still lacking, (2) increasing the distribution of goods and services is still not optimal, and (3) offline marketing has not been utilized which is powerful in increasing the spirit of independence and entrepreneurship public.

IMPLEMENTATION METHOD

Strengthening the tourism sector aims to develop unique tourism products and bring out the uniqueness of the Madura coastal region. The CS locus is at the “Lembung Mangrove Ecotourism” location, namely a tourist destination in Lembung Village, Galis District., Pamekasan Regency. It is hoped that this CS activity can strengthen tourist attractions in the Pamekasan Regency becomes more diverse while still providing flexibility for the development of other potentials so that it continues to accommodate natural and socio-cultural riches and complement each other and increase tourist attractions in the District. Pamekasan as a whole.

The CS Polinema activities of the community partnership scheme are (1) Introduction of fish processing using deep fat frying machine technology and (2) Offline marketing through the establishment of tourist restaurants for processed fish products, which is shown in Fig. 4.

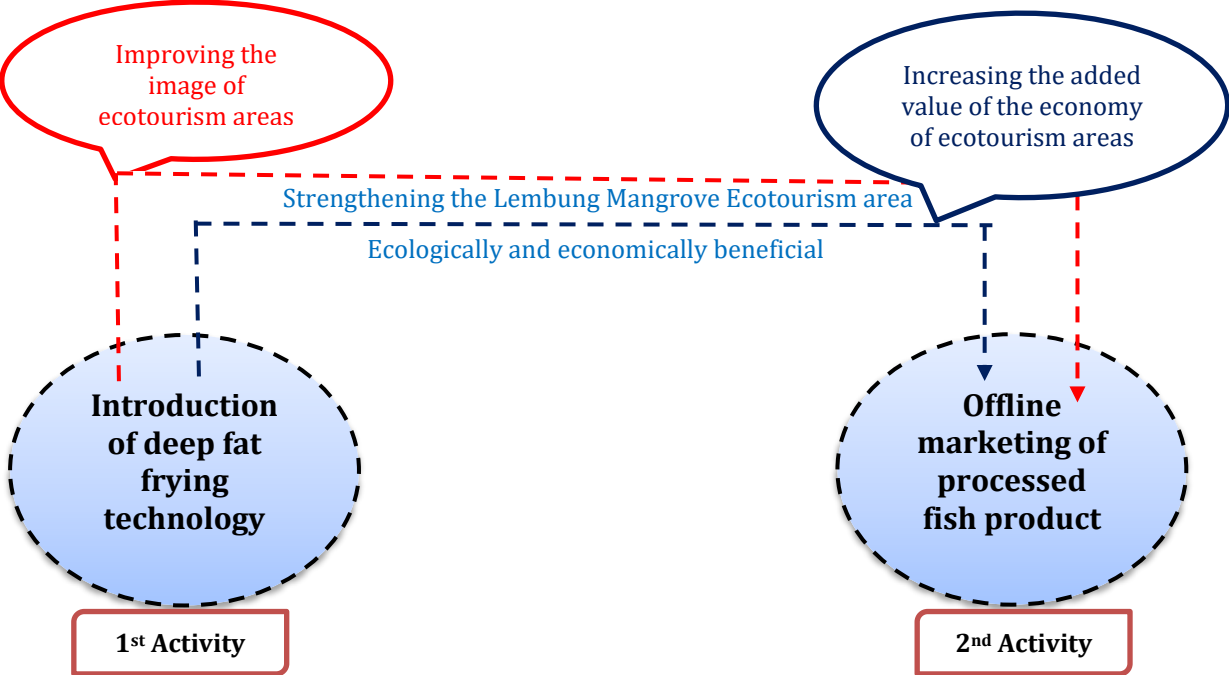


Figure 4. Community Partnership scheme PPM activities in Lembung village

Method of activities by the CS Polinema team for the community partnership scheme in Lembung Village, Galis, Pamekasan was implemented as a result of an agreement between the PPM implementation team and the Pokdarwis “Sabuk Hijau”. This also refers to the conditions, potential of the area and local wisdom as a mangrove conservation area as shown in Table 1.

Table 1. Community service activity methods for the community partnership scheme

| Activities carried out | Activity approach |
|---|--|
| 1. Introduction to fish processing technology | <ul style="list-style-type: none"> • Introduction of deep fat frying machine technology to user partners; • Application of deep fat frying machine technology for frying pelagic and demersal fish; and • Application of deep fat frying machine technology to manufacture processed fish products. |
| 2. Marketing processed fish products | <ul style="list-style-type: none"> • Implementation of offline sales of processed fish products through the construction of tourist restaurants. |

The CS Polinema community partnership scheme activity is an effort to improve the function and performance of the Pokdarwis “Sabuk Hijau” as the operator of “Lembung Mangrove Ecotourism”. To support its function and performance, educational steps are needed through efforts to increase knowledge capacity about post-harvest fish processing and marketing through training and action activities. The Community Partnership Scheme PPM program in Lembung Village includes: (1) Introduction of fish processing technology and (2) Offline marketing of processed fish products through the establishment of tourist restaurants. Evaluation of the implementation of the PPM program to target partners and the sustainability of the program after completion of the activities is shown in Table 2.

Table 2. Evaluation of program implementation and sustainability

| No | Activities | Implementation Evaluation | Sustainability Evaluation |
|----|--|---|---|
| 1. | Education to the community about post-harvest fish processing. | The community enthusiastically took part in the activities. | The community helps protect mangrove forests to preserve natural resources |
| 2. | Introduksi teknologi peng-gorengan ikan pelagis dan demersal. | Anggota Pokdarwis “Sabuk Hijau” terlibat secara aktif dan langsung dalam kegiatan. | Pokdarwis “Sabuk Hijau” mampu melakukan duplikasi kegiatan bersama tim PPM di lokasi kawasan ekowisata. |
| 3. | Introduction to pelagic and demersal fish frying technology. | Members of the Pokdarwis “Sabuk Hijau” enthusiastically took part in operational and maintenance training for deep fat frying machines. | Members of the Pokdarwis “Sabuk Hijau” are able to operate and carry out maintenance on deep fat frying machines. |
| 4. | Construction of tourist restaurants for silvofishery products. | Members of the Pokdarwis “Sabuk Hijau” helped build a tourist restaurant. | Members of the Pokdarwis “Sabuk Hijau” feel the benefits. |
| 5. | Offline marketing of processed fish products at tourist restaurants. | Members of the Pokdarwis “Sabuk Hijau” become offline sales operators of processed fish products. | Members of the Pokdarwis “Sabuk Hijau” feel the economic benefits of having a tourist restaurant. |

RESULTS AND DISCUSSION

A tourist attraction has several important elements, namely: attractions, tourist infrastructure, tourist facilities, infrastructure, community, environment and culture. Tourist facilities are the completeness of an ecotourism destination area that is needed to serve the needs of ecotourist visitors in enjoying their ecotourism trip. The development of ecotourism facilities in ecotourism destination areas has been adapted to regional characteristics and ecotourism needs, both quantitatively and qualitatively. Several tourist facilities that have been repaired at the PPM location include (1) Painting name boards; (2) Repairing jogging tracks to ecotourism locations, and (3) Building tourist restaurants to serve the needs of ecotourists (Fig. 5).



(a) Painting of the nameboard “Lambung Mangrove Ecotourism”



(b) Construction of tourist restaurants



(c) Gazebo construction



(d) Repairing jogging tracks at “Lembung Mangrove Ecotourism”

Figure 5. Improvement of tourist facilities at the “Lembung Mangrove Ecotourism”

The results of improvements to tourism facilities at the location “Lembung Mangrove Ecotourism” CS Polinema with the community partnership scheme show an increase in the number of ecotourist visitors attending compared to before the improvements (Fig. 6a). The results of this community services have been uploaded to YouTube (<https://youtu.be/pwlZkXMqO0c?t=14>), causing an increase in the arrival of ecotourists from outside the Madura region. In fact, the efforts made have attracted the interest of an international NGO based in Japan, the Organization for Industrial, Spiritual and Cultural Advancement (OISCA), led by the head of the group, Mr. Yutaka Nakagaki (Fig. 6b).



(a) Domestic ecotourist visitors



(b) NGO visit from OISCA Japan

Figure 6. Ecotourist visitors after developing facilities

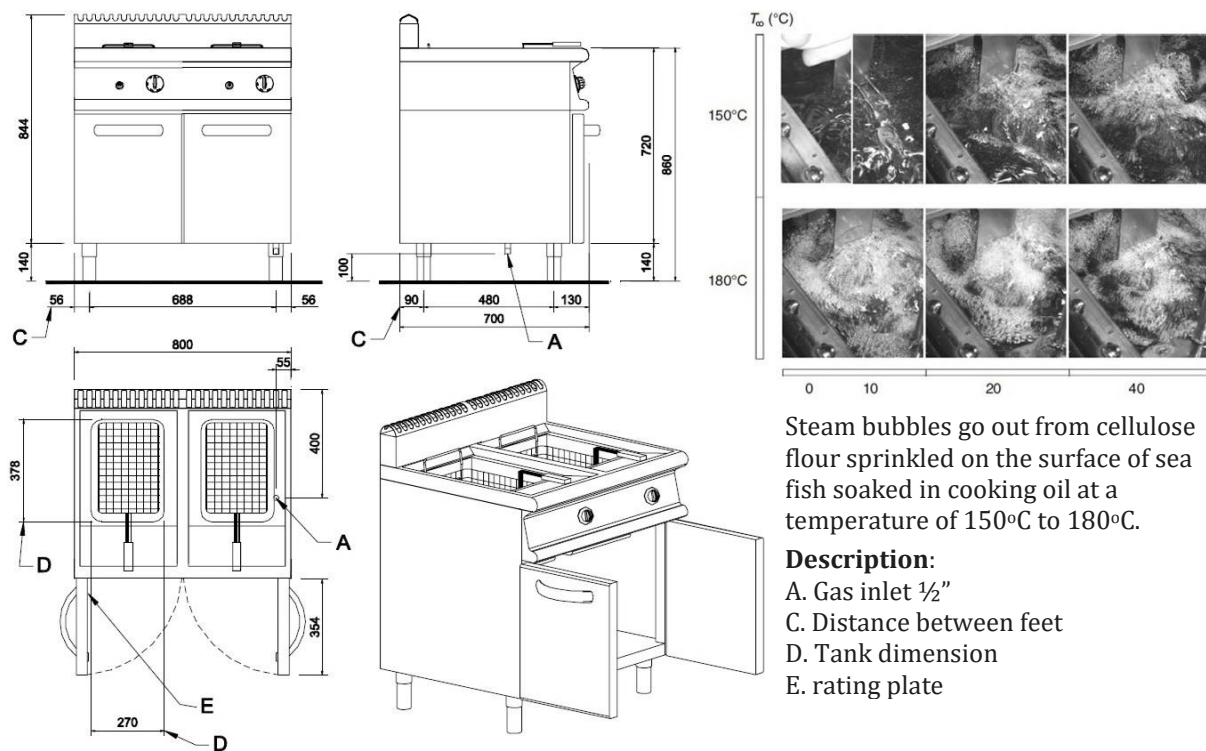


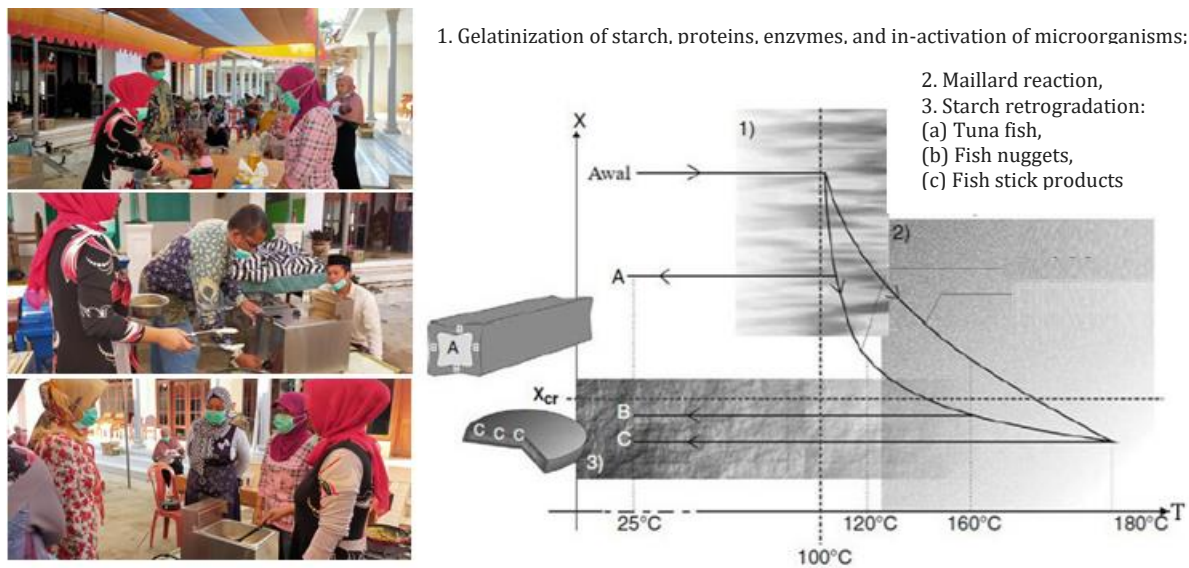
Figure 7. Introduction of deep fat frying machine technology

The next tourism facility that was implemented that are the introduction of deep fat frying machine technology considering that the community services location produces a lot of fish caught by fishermen. Deep fat frying machine technology (Fig. 7) uses liquid cooking oil, in large quantities with a high boiling point, whose initial temperature is set well above the boiling point of water. This process is carried out in batches using an immersion bucket. Because oil and fat are fluids that are very easily expanded due to heat (thermo expandable fluids), a buoyancy force occurs which is very efficient to homogenize the temperature along the vertical direction.

The physical process in deep fat frying machine is similar to the frying process in households and industry, only the way the temperature is controlled is different. As shown in Fig. 6 in an experimental frying process, heat is primarily used to evaporate water. Steam bubbling outward from the outer surface of the product is observed immediately or a few seconds after immersion in hot cooking oil. Since steam is the only gas phase in the product, water evaporation occurs at the saturation temperature of the water, namely T_{sat} , and the evaporation rate is proportional to the temperature difference between the cooking oil and T_{sat} . Experimentally, increasing the internal pressure so that the boiling point of water is higher than the oil temperature suppresses evaporation. At external air pressure (atmospheric pressure), an increase in cooking oil temperature causes a minimum residual water content of fish products, which corresponds to the saturation temperature of water in equilibrium with solutes and macromolecules.

An introduction to deep fat frying machine technology was carried out (Fig. 8a) in front of the participants at the CS Polinema community partnership scheme location facilitated by the Pokdarwis “Sabuk Hijau”. The introduction of deep fat frying machines is important for MSMEs/SMEs in the fisheries sector in Lembung Village, Galis District, Pamekasan Regency.

Deep fat frying is a process where food products are heated and fried by immersing them in frying oil as a heat conductor for a certain period of time. In the deep fat frying system frying process, the frying temperature is between 150°C to 180°C with varying lengths of time (Fig. 8b).



(a)

(b)

Figure 8. Deep fat frying machine demo with community service partners

(a) Diffusion of science and technology to CM partners; (b) State diagram of hydrothermal changes and product transformations regarding different product geometries and compositions.

The curve that describes the change in water content with temperature at a certain pressure is called the boiling curve or desorption isobar. Typical isobars at 100 kPa for starchy and non-starchy products and as a result of thermal propagation in processed fish products are illustrated in fig. 8.b. Since moisture content is related to solids content and not fat, isobars can be determined at thermal equilibrium during a demonstration of frying in superheated steam. It should also be noted that the oil content or thermo-mechanical changes of the product do not significantly modify the isobars because they characterize certain physico-chemical interactions between water and the solid matrix. The interaction energy is expressed as the boiling temperature, which corresponds to the kinetic energy required to terminate this interaction. It is assumed that the effect of pressure on the boiling point of water is higher in free water and capillary water compared to dispersed water in strong interaction with the solid matrix. This method can reduce oil absorption in fish products using deep fat frying technology due to electrostatic interactions and mixing with the polymer phase.

CONCLUSION

The fisheries and marine sector in Lembung Village with the presence of mangrove forests has economic and tourism prospects. Located directly opposite the Madura Strait, it has the potential for various types of fish with high economic value, both pelagic and demersal fish. The development of the Lembung Mangrove Ecotourism area needs to be carried out through community service activities through (1) Improvement of tourist facilities in the Lembung Mangrove Ecotourism, and (2) Introduction of deep fat frying technology as a form of economic empowerment for coastal communities.

Fishery products are perishable food. Post-harvest handling, processing and marketing of fishery products requires the support of many stakeholders. Synergism of cross-sectoral activities between the government of Pamekasan Regency as a stakeholder and universities through community services (CS), needs to be continued. CS activities need to be carried out again at the Lembung Mangrove Ecotourism location, according to the necessary stages, adapted to the physical conditions of the location, socio-economic conditions and the level of community capabilities.

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