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TRAINING IN CANDLENUT OIL PRODUCTION TO INCREASE ITS ECONOMIC VALUE FOR THE COMMUNITY

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Abstract. *Candlenut (Aleurites moluccana) is widely cultivated in Kede Bodu Village, East Ende District. Still, most residents have long sold raw candlenut seeds to collectors at low and highly fluctuating prices, mainly due to limited knowledge and skills in processing the seeds into higher-value candlenut oil. A team of students and lecturers carried out this community service activity to enhance local women's knowledge of the economic value of candlenut oil while equipping them with practical processing skills. The activity was implemented in four stages: preparation and socialization, material delivery, hands-on practice, and evaluation. Practical training covered roasting, pounding, pressing, and filtering the seeds to produce clear, aromatic oil. Results showed strong enthusiasm among participants, who successfully produced clear yellow candlenut oil and expressed interest in continuing production independently or developing it into a group-based home business. The program increased community awareness of local resource diversification as a strategy to raise household income. Follow-up support in packaging, business licensing, and marketing is recommended to help the community sustainably develop this small-scale enterprise.*

Keywords: *economic value, improving community economic welfare, production of candlenut oil*

Abstrak. Kemiri (*Aleurites moluccana*) tumbuh subur di Desa Kede Bodu, Kecamatan Ende Timur, namun selama ini sebagian besar masyarakat menjual biji kemiri mentah kepada pengepul dengan harga rendah dan fluktuatif, akibat minimnya pengetahuan dan keterampilan dalam mengolah biji kemiri menjadi minyak kemiri yang bernilai jual lebih tinggi. Kegiatan pengabdian masyarakat ini dilaksanakan oleh tim pengabdian kepada masyarakat (mahasiswa dan dosen)dengan tujuan meningkatkan pengetahuan ibu-ibu setempat tentang nilai ekonomi minyak kemiri sekaligus membekali mereka dengan keterampilan pengolahan secara praktis. Pelaksanaan dilakukan melalui empat tahap, yaitu persiapan dan sosialisasi, penyampaian materi, praktik langsung, dan evaluasi. Praktik pengolahan meliputi penyangraian, penumbukan, pengepresan, dan penyaringan biji kemiri hingga menghasilkan minyak yang jernih dan beraroma khas. Hasil kegiatan menunjukkan antusiasme tinggi dari peserta, yang berhasil memproduksi minyak kemiri berwarna kuning jernih secara mandiri dan menyatakan minat untuk melanjutkan produksi, bahkan mengembangkannya menjadi usaha kelompok. Kegiatan ini turut meningkatkan kesadaran masyarakat akan pentingnya diversifikasi hasil pertanian lokal sebagai strategi peningkatan pendapatan keluarga. Pendampingan lanjutan dalam hal pengemasan, perizinan usaha, dan pemasaran disarankan agar usaha ini dapat berkembang secara berkelanjutan.

Kata Kunci: nilai ekonomis, pembuatan minyak kemiri, peningkatan ekonomi masyarakat

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INTRODUCTION

Candlenut (Aleurites moluccana) is one of the non-timber forest products that grows abundantly in various regions of East Nusa Tenggara, including Ende Regency. Kede Bodu Village, administratively located in East Ende District, is one of the villages with a relatively large population of candlenut trees. Candlenut is an additional source of income for the local community, alongside other agricultural products such as cashew nuts and coconuts. Candlenut has considerable economic potential as a non-timber forest product that contributes to the livelihoods of rural communities, particularly those living around forest areas (Baharuddin et al.,

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2021; Abdullah et al., 2025). So far, most people in Kede Bodu Village have sold raw candlenut kernels to collectors at relatively low and fluctuating prices. This condition is particularly evident during the main harvest season, when an abundant supply causes the selling price of candlenut kernels to decline.

This situation is also highlighted by Parwati et al. (2023), who explain that the abundant production of candlenuts and their relatively low selling prices require creative solutions to optimize the utilization of candlenuts and generate added value. One creative solution that can be developed is the production of candlenut oil. Candlenut (Aleurites moluccana) is a plant that is widely utilized by communities. The part of the plant most commonly used is the seed, which serves as the raw material for producing candlenut oil. Candlenut oil is known to have various benefits, including promoting hair growth and addressing skin problems (Ni Made Widayanti et al., 2025). In fact, processing candlenut kernels into candlenut oil has the potential to increase product added value and selling prices because candlenut oil is widely used in hair and skin care products, as a raw material in the cosmetics industry, and as an ingredient in traditional health products (Darmawan, 2006; Cabral et al., 2016; Variyana et al., 2023). The utilization of candlenut seeds for oil production is also supported by their relatively high oil content and fatty acid composition, which make them a potential raw material for various industrial applications (Child, 1941; de Britto Rosa et al., 2022). The abundant availability of candlenut products produced by the community, combined with their relatively low selling prices, indicates the need for creative solutions to optimize the utilization of candlenuts and increase their added value (Parwati et al., 2023; Abdullah et al., 2025).

Candlenut (Aleurites moluccana) is a perennial plant and is classified as a multipurpose tree. This plant has been widely cultivated in Indonesia for a long time and belongs to the Euphorbiaceae family (Krisnawati et al., 2011). Candlenut is used as a raw material for paint, varnish, ink, soap, wood preservatives, hair oil, and batik-making materials, while its kernels are commonly used as a cooking ingredient (Sahid & Ratnaningsih, 2021). As a non-timber forest product, candlenut has traditionally been used for generations as a natural hair-darkening agent. Candlenut oil can be obtained through laboratory extraction processes, including distillation and Soxhlet extraction, while industrial-scale production generally employs mechanical pressing. Previous studies have demonstrated that candlenut oil can be extracted using different techniques, including solvent-based extraction and mechanical pressing, with variations in extraction yield depending on the method and operating conditions (Variyana et al., 2023). Based on its chemical composition, candlenut oil contains various fatty acids, including linoleic acid, linolenic acid, oleic acid, palmitic acid, and stearic acid, which contribute to its potential applications in industrial and pharmaceutical fields (Child, 1941; Cabral et al., 2016; Sari et al., 2024). Recent research has also identified various fatty acid components in candlenut oil, demonstrating the influence of extraction solvents on its chemical composition (de Britto Rosa et al., 2022).

The main problem faced by the community in Kede Bodu Village is the limited knowledge and skills required to process candlenut kernels into high-quality oil. These skills include appropriate roasting, pressing, and filtration techniques to produce clear oil with good storage stability (Melya et al., 2022; Parwati & Suparno, 2017). Previous research has shown that pretreatment processes, particularly roasting and oven heating, can influence oil extraction yield and antioxidant activity (Novita et al., 2022; Variyana et al., 2023). In addition, extraction techniques and operating conditions, such as temperature, extraction time, and particle size, can affect the quantity and characteristics of the resulting oil. These findings indicate that appropriate processing techniques are important in producing candlenut oil with desirable characteristics. In addition, limited information regarding market potential, product packaging techniques, and marketing strategies remains an obstacle to developing independent candlenut-processing businesses. This situation highlights the importance of community-based training and the development of local resources to improve the economic value of non-timber forest products (Baharuddin et al., 2021; Abdullah et al., 2025). Therefore, community empowerment initiatives are needed through training programs that not only provide knowledge about the benefits and

economic value of candlenut oil but also equip community members with practical skills in the production process.

Based on these problems, the community service team, consisting of lecturers and students, considered it necessary to conduct candlenut oil production training for the community of Kede Bodu Village, particularly women's groups. This activity aims to improve community knowledge of the benefits and economic value of candlenut oil, provide practical skills in processing candlenut kernels into high-quality oil, and encourage the development of household businesses based on local resources as an effort to increase family income. The development of value-added products from non-timber forest resources can provide opportunities for improving household income and strengthening community-based economic activities (Baharuddin et al., 2021; Abdullah et al., 2025). Through this training, the community is expected to utilize the available candlenut resources in their surroundings more optimally, thereby reducing dependence on selling raw candlenut kernels and enabling them to produce processed products with higher added value and broader market opportunities.

Several community service activities with similar themes have been conducted in various regions and have demonstrated positive outcomes in improving community knowledge and skills. For example, candlenut oil production training for members of the Family Welfare Movement (PKK) in Bouweli Village, Alor Regency, successfully improved participants' skills in producing good-quality candlenut oil (Karbeka & Timung, 2020). Activities aimed at improving candlenut-processing businesses in Laguboti District were also reported to have increased the added value of local community-based candlenut enterprises (Aruan et al., 2021). Furthermore, a community empowerment program focusing on candlenut management as an entrepreneurial product in Silimalombu, Samosir Regency, demonstrated an improvement in community understanding and interest in independently developing candlenut-based businesses (Hasibuan et al., 2022). Candlenut oil production training using practical heating methods in Sumirah Village, North Aceh Regency, also demonstrated high participant enthusiasm and resulted in good-quality processed products (Sulhatun et al., 2024). These activities are consistent with research emphasizing the economic contribution of candlenut as a non-timber forest product and the importance of improving its utilization to strengthen rural livelihoods (Baharuddin et al., 2021; Abdullah et al., 2025). These various activities provide a supporting foundation for implementing candlenut oil production training in Kede Bodu Village through a hands-on practical approach. Through this activity, the community is expected to improve its candlenut-processing skills, develop local economic potential, and create sustainable household business opportunities.

METHOD

The candlenut oil production training was conducted in Kede Bodu Village, East Ende District, Ende Regency, involving women from the local community. The activity was implemented through several stages, as follows. The first stage was preparation and socialization. At this stage, KKN students coordinated with the Kede Bodu Village government to obtain permission to conduct the activity, while also identifying community needs and initial conditions related to candlenut processing. Socialization was conducted to explain the objectives, benefits, and sequence of the training activities to prospective participants.

The second stage was material presentation. The materials covered an introduction to candlenut plants and kernels, the benefits and economic potential of candlenut oil, the basic principles of the processing procedures (roasting, crushing, and pressing), as well as the fundamental principles of safety and hygiene in household food and cosmetic product preparation. The materials were delivered through lectures, discussions, and question-and-answer sessions to ensure that participants understood the concepts comprehensively before beginning the production process. The presentation also introduced basic information about candlenut oil extraction and the influence of pretreatment and extraction methods on oil yield and characteristics (Novita et al., 2022; Variyana et al., 2023).

The third stage was hands-on practice in candlenut oil production. At this stage, the women were directly assisted by KKN students in carrying out the candlenut-processing procedures step by step, starting with cleaning and roasting the candlenut kernels, crushing or pounding the roasted kernels, pressing or heating the candlenut paste to extract the oil, and filtering the oil to obtain a clear product. The process referred to traditional roasting and pressing methods that have been demonstrated to be effective in previous studies (Melya et al., 2022; Parwati & Suparno, 2017). The selection of roasting as a pretreatment technique was also supported by research indicating that heating pretreatment can influence the yield and antioxidant activity of candlenut oil (Novita et al., 2022; Variyana et al., 2023). The tools and materials used included candlenut kernels, a frying pan, a stove or traditional furnace, a mortar and pestle or blender, filter cloth, collection containers, and packaging bottles.

The fourth stage was oil packaging. The processed oil was then poured into bottles for packaging. The final stage of the activity was evaluation. Evaluation was conducted through direct observation of the women's practical skills and reflective discussions at the end of the activity to assess their level of understanding and plans for follow-up activities. The evaluation was also carried out descriptively by comparing participants' initial knowledge before the training with their understanding after the training, based on the results of question-and-answer sessions and observations of the candlenut oil production process.

RESULTS AND DISCUSSION

The candlenut oil production training in Kede Bodu Village was conducted over one full day and attended by women from the village. The activity proceeded smoothly and received a positive response from the community, as reflected in their enthusiasm throughout the training. The activity began with the presentation of materials related to the utilization of candlenut kernels to support the community's economic well-being.



Figure 1. *Opening session and presentation of training materials*

During the material presentation stage, the women demonstrated a high level of enthusiasm and actively asked questions about the benefits of candlenut oil, particularly its use in hair care and its potential as a marketable product. Candlenut oil can be used as an ingredient in hair care and cosmetic products, and its applications have been widely discussed in previous studies (Darmawan, 2006; Estrada et al., 2007; Cabral et al., 2016). Research by Shoviantari et al. (2019) demonstrated that candlenut oil formulated as a nanoemulsion hair tonic could improve hair growth activity in experimental animals. Similarly, Almas et al. (2022) reported that nanoemulsion preparations containing candlenut oil demonstrated hair growth-promoting activity in mice. More recent research has also demonstrated the potential of candlenut oil combined with celery extract in hair growth spray formulations (Wahyuni et al., 2025). These findings support the potential development of candlenut oil as a value-added ingredient for cosmetic products. Through this explanation, most participants acknowledged that they had only

recently learned that candlenut kernels, which they had previously sold in their raw form, could be processed into products with considerably higher market value when converted into oil.

Following the presentation, the next stage involved processing candlenuts into oil. At this stage, the women were divided into several small groups to ensure that each participant had the opportunity to practice every processing step directly. The process began with selecting good-quality candlenut kernels, which were then blended until finely ground. After the kernels had been ground, the mixture was filtered and cooked. Appropriate raw material preparation and processing techniques are important factors in determining the quality and characteristics of vegetable oils obtained from plant seeds.



Figure 2. *Candlenut oil cooking process*

The next stage was filtration, which was carried out using traditional processing techniques, referring to previously examined traditional methods (Parwati & Suparno, 2017). The extracted oil was subsequently filtered using a filter cloth to separate the residue from the oil. The practical results showed that the candlenut oil produced had a clear yellow colour and a distinctive aroma, indicating that the processing had been carried out satisfactorily. These characteristics are consistent with the organoleptic properties of candlenut oil reported in previous research (Child, 1941; Leny et al., 2020). The physical characteristics of candlenut oil can also be influenced by its processing and extraction conditions (Novita et al., 2022). Further demonstrated that extraction conditions, including temperature, solvent type, and extraction duration, influence the quantity of oil obtained. Therefore, appropriate processing and filtration techniques are important for producing candlenut oil with desirable physical characteristics.



Figure 3. *Filtration process of cooked candlenut kernels*

The final stage of candlenut processing involved obtaining clear candlenut oil, which was then poured into packaging containers (bottles). Packaging is an important aspect of product development because it helps protect the product, facilitates storage, and supports its presentation for potential marketing. Previous research has demonstrated that candlenut oil can be formulated into various cosmetic preparations, including gel and nanoemulsion products, indicating opportunities for further product diversification (Leny et al., 2020; Chasanah et al., 2022). The development of candlenut oil into commercially attractive products may therefore provide opportunities for expanding household-based businesses.



Figure 4. *Bottled candlenut oil product*

Based on the reflective discussions conducted at the end of the activity, most participants stated that the training had been very beneficial. Following the activity, the women's groups expressed their intention to continue production independently in their respective homes. Some participants also expressed their interest in developing the product into a group-based business, with the expectation that it could be marketed both within the village and beyond the Ende Regency area. This initiative is consistent with the concept of community-based economic development, in which the processing of local agricultural resources can create additional income opportunities and strengthen household economic activities (Baharuddin et al., 2021; Abdullah et al., 2025). The development of small-scale processing businesses can also be strengthened through technical assistance and business planning to improve production capacity and market opportunities (Asyari et al., 2023; Heryadi et al., 2017).

The activity in Kede Bodu Village demonstrated positive outcomes. This is also consistent with the candlenut-processing business development program in Laguboti District, which succeeded in increasing the added value of candlenut products through direct practical assistance (Aruan et al., 2021), as well as candlenut oil production training using practical heating methods in Nisam Antar Village, Seumirah District, North Aceh Regency, which demonstrated high participant enthusiasm and produced good-quality processed oil (Hasfita et al., 2024). Similar patterns of success across these activities indicate that a hands-on training approach is an effective strategy for rural communities with relatively similar social and economic backgrounds. This approach enables participants to acquire practical skills through direct involvement in the production process rather than relying solely on theoretical explanations.

This activity also generated non-technical impacts by increasing community awareness of the importance of diversifying locally processed agricultural products as a strategy for improving household income (Hasibuan et al., 2022), while simultaneously strengthening cooperation among local community members in sustainably managing the village's candlenut resources. Community empowerment through candlenut processing has also been shown to encourage entrepreneurial interest and provide opportunities for developing independent community-based businesses (Hasibuan et al., 2022). Furthermore, research on the formulation of candlenut oil-based hair tonics, shampoos, and other cosmetic preparations demonstrates the potential for expanding the utilization of candlenut oil beyond traditional household applications (Almas et al.,

2022; Chasanah et al., 2022; Leny et al., 2020; Putri et al., 2026). Shoviantari et al. (2019) also demonstrated that candlenut oil nanoemulsion could improve hair growth activity in experimental animals. More recent research has further demonstrated the potential of combining candlenut oil with celery extract in hair growth spray formulations (Wahyuni et al., 2025). These findings reinforce the importance of developing local agricultural products into value-added commodities that can support sustainable household enterprises.

CONCLUSION

The candlenut oil production training conducted in Kede Bodu Village, East Ende District, successfully improved the knowledge and practical skills of the local community, particularly the women, in processing candlenut kernels into good-quality candlenut oil. Throughout the training, participants demonstrated a good understanding of the entire production process, starting from the selection and preparation of candlenut kernels to roasting, grinding, cooking, filtering, and packaging the resulting oil. The participants were also able to carry out the processing stages independently and successfully produce clear, yellow-colored candlenut oil with a distinctive aroma. In addition to improving technical skills, this activity increased community awareness of the economic potential of locally available candlenuts, which had previously been underutilized and primarily sold in their raw form.

As a follow-up initiative, the village government and relevant agencies are encouraged to provide continuous assistance to the community, particularly in product packaging, business licensing, product quality standards, and appropriate marketing strategies. Further support is also needed to strengthen the organizational capacity of women's groups, improve production consistency, and develop attractive product branding to increase consumer interest. Through sustained mentoring, access to broader marketing networks, and collaboration with relevant stakeholders, the community groups in Kede Bodu Village are expected to develop candlenut oil production into a sustainable household-based business.

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