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Optimization of Community Economic Empowerment through Kelulut Bee Cultivation in Tanjung Pasir Village with Innovation in Honey Processing and Propolis Utilization

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Abstract

Stingless bee cultivation in Tanjung Pasir Village, Pangkalan Susu District, Langkat Regency, North Sumatra, has become a local business with significant potential to enhance community economic development. In the 2024 community service program, beekeepers were successfully trained in colony-splitting techniques, resulting in increased honey production. However, two new problems emerged: low honey quality due to high water content, which easily alters its taste and color, and a short shelf life. Furthermore, the potential of propolis, which can be a valuable derivative product, has not been optimally utilized. This community service program aims to improve honey quality while diversifying the product line. The proposed solution includes the provision of a honey dewatering machine based on UiTM Terengganu technology, along with training on its operation, resulting in better-quality honey with a longer shelf life. Furthermore, the community has the skills to process propolis into value-added products, including propolis-based soap, which can serve as a superior village product. This initiative is expected to contribute to the achievement of Sustainable Development Goals (SDGs) point 8 concerning decent work and economic growth. Through this program, the Tanjung Pasir Village community is not only able to produce high-quality honey but also to optimize the utilization of propolis, thereby creating new business opportunities and increasing village economic welfare.

Keywords: Tanjung Pasir Village, Lebah Kelulut, Utilization of Propolis, Economic Growth

INTRODUCTION

Tanjung Pasir Village, located in Pangkalan Susu Subdistrict, Langkat Regency, North Sumatra, possesses considerable economic potential that can enhance community income. The village's resources span agriculture, palm sugar production, soft-shell crab cultivation, duck farming, palm frond stick production, and stingless bee (Trigona) beekeeping. Over the past two years, the village government has given particular attention to stingless bee farming, as the honey produced is considered to have high market value. This form of beekeeping is relatively simple to manage and can be practiced collectively. Moreover, it is safe to develop within residential areas since stingless bees

lack stingers. The beekeeping group, named **"Kelompok Tani Hutan Maju Bersama Trigona"** (Forest Farmers Group Advancing Together with Trigona), consists of 13 households who jointly manage their beekeeping activities at a single location, thereby facilitating collective monitoring. The harvested honey is sold to provide additional household income, while a portion of the proceeds is allocated for social contributions.

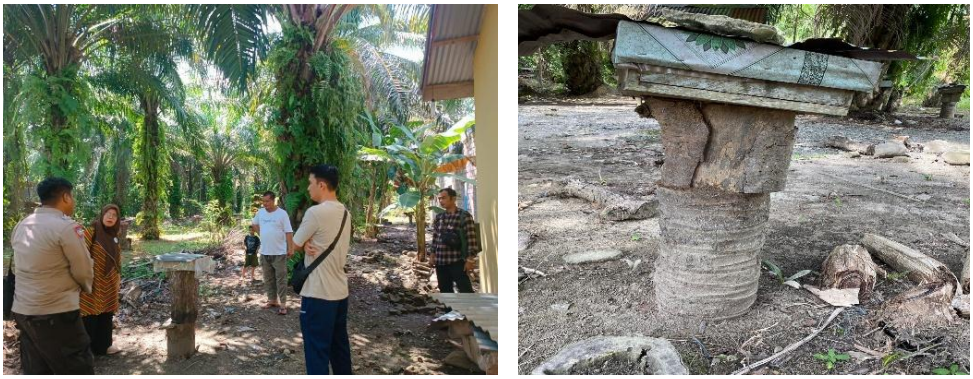

Figure 1. Stingless Bee Colony Belonging to the "Maju Bersama Trigona" Forest Farmers Group

Stingless bees (*Trigona* spp.), commonly referred to as *kelulut*, are honey-producing insects distinct from honey bees (*Apis* spp.). These small-sized bees belong to the tribe *Meliponini* and are closely related to stinging honey bees (*Apis* spp.) within the family *Apidae* (Harjanto et al., 2020). Unlike honey bees, stingless bees do not possess stingers, and the honey they produce has been reported to contain higher levels of antioxidants compared to that of honey bees. *Kelulut* honey is rich in minerals and organic acids, such as malic, tartaric, lactic, and oxalic acids, which contribute to metabolic processes and overall health. Furthermore, *kelulut* honey contains essential vitamins, including B2, B1, C, B6, and B3. The bioactive composition and benefits depend largely on the quality of nectar and pollen collected. Notably, *kelulut* honey has been suggested to aid individuals with diabetes by stabilizing blood glucose levels, enhancing glucose utilization in the body, and mimicking insulin function. Owing to its unique characteristics and health benefits, *kelulut* honey generally commands a higher market price than conventional honey. It is also distinguished by its characteristic flavor profile, which tends to be sour, depending on the floral sources, thereby making it highly favored by consumers (Lukman, Hardiansyah, & Siahaan, 2020). Stingless bees typically prefer flowers such as *Antigonon leptopus* (commonly known as coral vine), fruit tree blossoms, and a wide variety of ornamental flowers found in home gardens. Importantly, stingless bee farming can be carried out in limited spaces, such as household yards or small-scale plantations (Alfarisi & Susilowati, 2024).

Figure 2. Stingless Bee and Propolis

In addition to honey, stingless bees also produce propolis, a brown substance that acts like glue to coat honey sacs and bee pollen. This propolis aims to protect the hive from environmental disturbances and other organisms. The composition of propolis is influenced by the type and age of the plant that feeds it, as well as its origin. Propolis is beneficial for health and is rich in properties and is safe for use as a herbal medicine. Stingless bee propolis has antiviral, antifungal, anti-inflammatory, and antioxidant properties, and is richer in flavonoids that are useful for reducing inflammation, improving glucose metabolism, and inhibiting the activity of α-glucosidase, which plays a role in managing blood glucose levels. Propolis has also been shown to have a wound-healing effect, accelerating the process of skin cell regeneration and supporting the repair of damaged or inflamed skin. Key phenolic compounds, such as gallic acid, caffeic acid, and rutin, are the main bioactive components underlying these various benefits (Sarah & Kustiawan, 2025). Due to its multifunctional properties, propolis has great potential for formulation in various modern skincare products, from creams and serums to ointments, providing a natural and effective solution for skin health and beauty (Segueni et al., 2022). One use of propolis as a derivative product is organic soap, which offers benefits for treating skin irritation, acne, and premature aging. Propolis-based soap is more environmentally friendly and safe for sensitive skin (Sari et al., 2023).

Stingless bee (*Trigona* spp.) farming has been successfully developed in Terengganu, Malaysia, including by Universiti Teknologi Mara (UiTM), Terengganu branch. The cultivation is carried out on the university campus by placing bee hives in designated areas. The harvested honey is marketed under the brand name “UiTM Honey” and undergoes quality testing in UiTM’s campus laboratory. In addition to producing raw honey—packaged directly after harvesting—UiTM also processes honey to reduce its water content, thereby improving its quality and extending its shelf life. Honey quality plays a crucial role in building consumer trust, ensuring product sustainability, and encouraging consumers to consistently choose local honey products. This, in turn, motivates producers to maintain and enhance honey quality, which becomes a key determinant in sustaining competitiveness in the honey market (Chandra & Irwansyah, 2023).

Based on the results of the survey, two main challenges were identified among the community partners. First, the honey currently marketed is raw honey, which is only filtered and directly packaged without any further processing. This practice results in honey that is relatively dilute, as raw honey still contains a high level of water. Consequently, the elevated moisture content shortens the shelf life and causes changes in both color and taste. Second, the propolis naturally produced by the stingless bees has not yet been utilized, despite its well-documented health benefits. Due to limited knowledge, the community lacks an understanding of how to process propolis and remains unfamiliar with the potential value-added products that can be derived from it. If properly utilized, propolis-based products could become high-value commodities and serve as flagship products from Tanjung Pasir Village.

To address these challenges, a community service team from Universitas Sumatera Utara (USU) and UiTM Terengganu introduced targeted solutions. The team provided basic training on honey harvesting followed by post-harvest processing to reduce water content, adopting practices already implemented at the UiTM Honey Laboratory in Terengganu. In addition, propolis utilization was introduced through the production of propolis-based soap, a simple product that can be produced domestically while diversifying the range of stingless bee products. These interventions are expected to improve honey quality and create new economic opportunities by transforming previously underutilized propolis into marketable derivative products.

This initiative supports Sustainable Development Goal (SDG) 8: Decent Work and Economic Growth, by fostering economic productivity and encouraging sustainable business practices. The outcomes of this program are expected to enhance local knowledge and skills in honey processing, open new economic opportunities, and ultimately improve the well-being of the Tanjung Pasir Village community.

MATERIALS AND METHOD

This activity collaborated with UiTM (Universiti Teknologi Mara) Terengganu to solve the problems faced by a beekeeping group located in Tanjung Pasir Village. The implementation of this community service activity began with a survey at the partner's location. The survey was conducted to determine important aspects in broadcasting the problem and understanding the needs of the partners. In this case, the village head and members of the Forest Farmers Group Maju Bersama Trigona provided information on the problems faced, so that the information collected truly reflected the community's needs and became the basis for designing targeted solutions. Then the stage continued with collecting literature studies, and direct discussions with the community service partners at UiTM Terengganu. During this visit, the USU team also studied in depth how to make machines and utilize propolis into soap so that it could be adopted and produced at USU. The strengthening and community service activities were carried out for six months, starting from April to September.

RESULTS AND DISCUSSION

A community service team from USU visited Dungun, Terengganu, Malaysia, to learn how the machine is built. They also studied the machine's mechanics and operation in detail. Before the honey is fed into the machine, it must be allowed to rest for at least four hours and then filtered. Afterward, it can be fed into the machine. The machine, owned by the UiTM Honey Laboratory, has a large capacity, capable of processing three kilograms of honey in one cycle. The honey is then cycled and allowed to evaporate for eight hours until the honey thickens. Once the honey thickens, the water reduction process is complete, and the honey is ready to be bottled for sale.

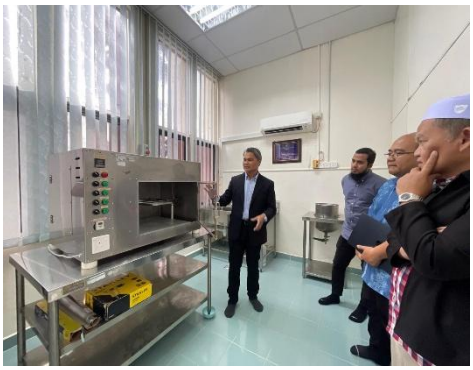

Figure 3. Demonstration of the Honey Moisture Reduction Machine at UiTM Terengganu

In addition to studying the operation of the machine, the team from the University of North Sumatra (USU) also received training on the utilization of propolis, which had previously been underexploited. The UiTM Terengganu team conducted a demonstration on processing propolis into soap. The key step in soap production is the preparation of propolis extract. Propolis extraction can be performed using two methods: immersion in ethanol or immersion in glycerin. Extraction with ethanol allows the propolis to dissolve more quickly, enabling the extract to be directly incorporated into the soap base. The liquefied propolis is then filtered using filter paper before being mixed with the soap base in appropriate proportions. In contrast, extraction using glycerin requires a longer duration, typically 1–2 weeks. During this period, the storage container must be inverted daily to maximize the release of bioactive compounds from the propolis. Once the extraction is complete, the glycerin-based extract is filtered in the same way as the ethanol extract, after which it can be incorporated into the soap base.

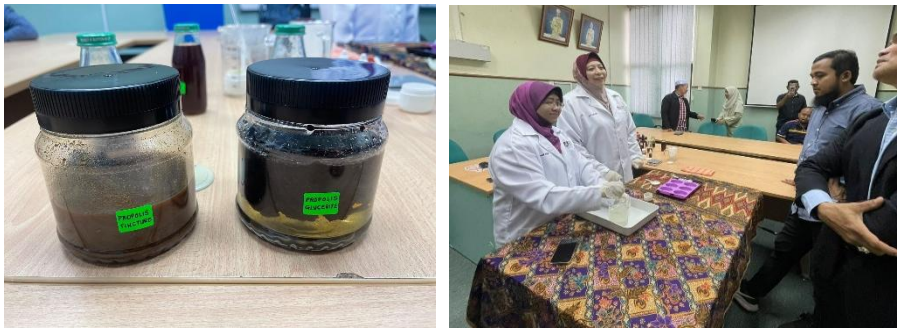

Figure 4. Demonstration of Soap Production at UiTM Terengganu

With the knowledge acquired in Terengganu, the community service team from Universitas Sumatera Utara (USU) developed a honey moisture reduction machine and independently conducted training on the production of organic soap using propolis. The machine was fabricated in the laboratory of the Faculty of Vocational Studies, USU, and subsequently tested in the same facility. The machine developed at USU was designed with a smaller capacity, accommodating up to 1 kg of honey. This adjustment was made because honey production in Tanjung Pasir Village remains relatively limited compared to that in Terengganu. In operation, the machine requires approximately 8 hours—the same duration as the machine in Terengganu—to effectively reduce the moisture content and thicken the honey. Trial results indicated a reduction in honey weight of about 6% after the moisture content was lowered. Testing was conducted using five bottles of honey with an initial total weight of 931.5 g. Following the moisture reduction process, the honey weighed 864.8 g, yielding only slightly more than four bottles. As illustrated in Figure 3.3, this outcome demonstrates that the machine functioned effectively.

Figure 5. Honer Trial Process

After the trial phase, the community service team from Universitas Sumatera Utara (USU) visited Tanjung Pasir Village to deliver the honey moisture reduction machine, introduce its use, and conduct training on propolis utilization. The activities included a demonstration of machine operation and a workshop on the production of propolis-based soap, involving both the "Maju Bersama Trigona" stingless bee farmers group and members of the village women's association (PKK). The program was enthusiastically received by the community as it opened new economic opportunities through product diversification, which had not previously been explored. Whereas the community had previously focused solely on selling raw honey, beekeepers are now able to market honey at a higher price due to improved quality, in addition to producing value-added products such as propolis soap. These products can also serve as unique village souvenirs, further enhancing their market potential. This initiative not only broadens income sources for the community but also strengthens the competitiveness of Tanjung Pasir Village in leveraging its local resources.

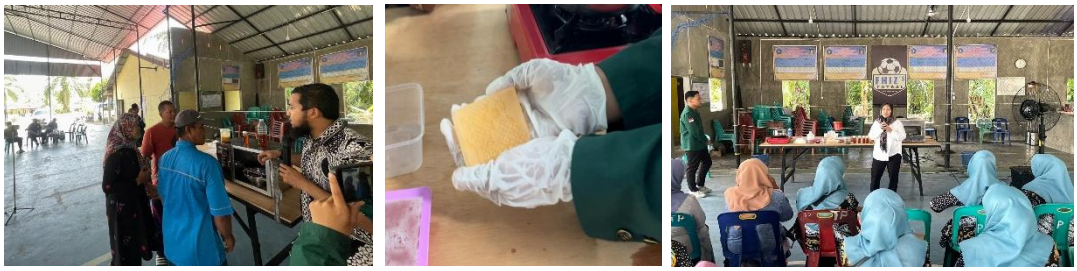

Figure 6. Demonstration of Machine Utilization and Propolis Processing into Soap

CLOSING

This community engagement program successfully improved the quality of stingless bee honey production in Tanjung Pasir Village. The application of the honey moisture reduction machine produced honey with a thicker consistency and longer shelf life, enabling it to meet market quality standards. This had a positive impact on beekeepers, as the selling price of honey increased, thereby enhancing their household income. At the same time, product diversification through the utilization of propolis—previously underutilized—into soap created new entrepreneurial opportunities for the community. The involvement of the village women's association (PKK) further broadened the economic benefits, ensuring wider community participation. Thus, this program not only generated short-term impacts, such as increased income, but also provided a foundation for sustainable enterprises based on local resources. This aligns with Sustainable Development Goal (SDG) 8: Decent Work and Economic Growth, and reinforces the principle that proper management of natural resources can serve as a foundation for long-term community self-reliance and prosperity.

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