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Sustainable Stingless Beekeeping for Rural Socioeconomic Transformation An Asset-Based Community Approach

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Abstract. *Abstract, Rural poverty in agricultural regions is often exacerbated by limited livelihood diversification and the underutilization of abundant local natural resources. This program addresses the urgent need for sustainable economic alternatives by enhancing community capacity through stingless bee (kelulut) cultivation using the Asset-Based Community Development (ABCD) approach. The methodology followed a structured four-stage process: asset mapping, technical training in beekeeping, continuous mentoring, and the institutionalization of community business groups. Results indicate a significant improvement in technical proficiency among participants, particularly in colony management and hygienic harvesting techniques. The program successfully established independent business groups and achieved measurable income diversification, with honey and its derivatives providing a new, stable value-added revenue stream for households. Beyond economic gains, the initiative resulted in a 45.7% increase in environmental awareness regarding pollination services. Ultimately, this program provides a replicable model for green economic development and sustainable rural transformation through the strategic mobilization of local biodiversity and social capital.*

Katakunci:
Asset-Based Community Development (ABCD); Budidaya Lebah Kelulut; Diversifikasi Pendapatan; Ekonomi Hijau.

Abstrak. Kemiskinan perdesaan di wilayah agraris sering kali diperburuk oleh terbatasnya diversifikasi mata pencaharian dan rendahnya pemanfaatan sumber daya alam lokal yang melimpah. Program ini menjawab urgensi kebutuhan alternatif ekonomi berkelanjutan dengan meningkatkan kapasitas masyarakat melalui budidaya lebah tanpa sengat (kelulut) menggunakan pendekatan *Asset-Based Community Development* (ABCD). Metodologi pengabdian dilakukan melalui empat tahapan terstruktur: pemetaan aset, pelatihan teknis budidaya, pendampingan berkelanjutan, dan institusionalisasi kelompok usaha masyarakat. Hasil pengabdian menunjukkan peningkatan signifikan dalam kemahiran teknis peserta, terutama dalam manajemen koloni dan teknik pemanenan yang higienis. Program ini berhasil membentuk kelompok usaha mandiri dan mencapai diversifikasi pendapatan yang terukur, di mana madu serta produk turunannya memberikan

aliran pendapatan baru yang bernilai tambah bagi rumah tangga. Selain keuntungan ekonomi, inisiatif ini menghasilkan peningkatan kesadaran lingkungan sebesar 45,7% terkait jasa penyerbukan. Pada akhirnya, program ini menyediakan model yang dapat direplikasi untuk pengembangan ekonomi hijau dan transformasi perdesaan yang berkelanjutan melalui mobilisasi strategis keanekaragaman hayati lokal dan modal sosial.

1 Introduction

Tandikek Village is situated within Kinali Subdistrict, West Pasaman Regency, in the province of West Sumatra. From an administrative perspective, Nagari Tandikek occupies the southern part of West Pasaman Regency and spans an area of around 900 hectares, with land elevations varying between 2 and 425 meters above sea level (Profil Nagari Tandikek, 2023). Such physical conditions provide favorable opportunities for economic activities, particularly in agriculture and plantation-based production. The local community engages in the cultivation of diverse crops, including bananas, pineapples, salak, citrus fruits, mangoes, durians, papayas, oil palm, coconuts, and coffee, which collectively contribute to household livelihoods. Nevertheless, the presence of abundant natural resources has not translated into broad-based economic welfare. Access to and utilization of these resources remain uneven, leaving a substantial segment of the population unable to benefit fully from existing agricultural potential. Consequently, poverty continues to affect a significant share of households, with approximately 45.7 percent of families still classified as living below the poverty line.

Poverty alleviation has become a major and shared focus because, according to the United Nations (2020), poverty has a negative impact on human welfare and development, including productivity (Waarts et al., 2021). The main weaknesses in reducing poverty in agriculture-based communities are fundamental factors such as land fragmentation, price volatility, purchase costs that do not cover production costs, community capacity to invest, and difficulties in diversifying sources of income (Waarts et al., 2021; Wang et al., 2023). Therefore, income-generating strategies can focus on opening up non-agricultural employment

opportunities to support income diversification and household economic stability (Komikouma et al., 2021). In response to these constraints, income improvement strategies should not rely solely on agricultural activities but instead promote the expansion of non-agricultural employment opportunities to support income diversification and enhance household economic stability (Lupia et al., 2024).

Based on the natural resource potential of Nagari Tandikek, Kinali District, concrete efforts are required to strengthen the economy of poor households through empowerment programs relevant to local conditions. While the community has traditionally relied on land-based sectors such as agriculture and plantations, this potential has not yet been fully reflected in the local livelihood structure (Dinas PPKBPP2A, 2022). Interviews conducted on 25 March 2023 with local stakeholder Mrs. Farida reveal a significant opportunity to initiate *galo-galo* (stingless bee) cultivation through community service programs involving lecturers and students. This gap between existing natural resources and household income underscores the need for a targeted intervention that focuses on community empowerment and economic strengthening.

This policy direction aligns with the evolving concept of the bioeconomy, particularly in the management of Non-Timber Forest Products (NTFPs/HHBK). Honey is a primary NTFP commodity with high social and economic value, involving multiple stakeholders in its production process (Harianja et al., 2023). The development of *galo-galo* bee farming is uniquely relevant as it utilizes an integrated social, economic, and ecological approach (Setiadi et al., 2024). By leveraging the region's high biodiversity, *kelulut* cultivation offers a promising alternative income source for poor households living near agricultural areas (Muhammad et al., 2022). Ultimately, this initiative provides a dual benefit: improving household economies while preserving the environmental integrity of the local ecosystem through sustainable resource management.

Similarly, to support the development of galo-galo bees, which will have economic value, based on our observations through a telephone interview with Mr Armi on 6 April 2023, who is a galo-galo honey entrepreneur in Tanah Datar Regency, he stated that technically, galo-

galo bees require the availability of plants to produce pollen (pollen) as their staple food, propolis (plant resin) as raw material for their hives, and nectar (sweet plant liquid) which will be produced into honey. These three types of materials are essential for the survival of galo-galo bees.

Technically, gal-galo bee farming can increase the income of entrepreneurs (Sahlan et al., 2019) and also help provide pollination support to the agricultural and plantation sectors (Narjes & Lippert, 2019). The success of galo-galo bee farming for economic development and strengthening has been highlighted in several studies, which indicate that galo-galo bee farming (kelulut) has a positive impact on improving the economy of farming communities. According Lukman et al (2021) based on the results of their research in Galang Village, Sungai Piyuh District, Mempawah Regency, the potential of kelulut honey bees can increase the income of the village community. However, he specifically explained that the amount of increase in economic income varies depending on the type of galo-galao (kelulut) bee being cultivated. Therefore, it is recommended that the development of galo-galo farming should consider the type of kelulut that can adapt to new environments and is easy to breed. Specifically, the comparison of community income before and after galo-galo bee farming based on the study Lukman et al (2021).

2 Method

This community service program utilizes the Asset-Based Community Development (ABCD) approach, which is a strategy that focuses on leveraging the assets, strengths, and inherent potential within the community. Maulana (2019) describes the ABCD concept as an alternative for community empowerment that uses the community's own potential as a stimulus for developmental programs. Similarly, Jauhari et al. (2025) state that this approach emphasizes empowerment by exploring local issues and potentials to improve the quality of work for both individuals and groups. By centering on existing assets rather than deficits, the method ensures a more sustainable and dignified path toward local development.

The choice of the ABCD method is driven by its ability to utilize past energy, future appeal, and present persuasion. Technically, the implementation follows a five-cycle model known as the 5D Cycle: Discovery (assessment of strengths), Dream (visioning), Design (procedural planning), Define (goal setting), and Destiny (self-determination). This structured descriptive flow ensures that the community remains the primary driver of the empowerment process, moving from identifying what works well to establishing a self-sustaining future.

The practical application of this strategy begins with the identification of 20 participants from the local poor community based on data from Nagari Tandikek. The first operational step involves mapping individual assets, including knowledge, skills, social capital, and physical or natural resources, with the assistance of local leaders like the Wali Nagari to ensure program eligibility. Following this mapping, "Low Hanging Fruit" activities are initiated to provide participants with early and easily achievable successes that help maintain their motivation and confidence in the program's long-term expectations.

The operational flow of this service is systematically illustrated in the following process chart:

Figure 1. Flowchart of Community Service

As shown in Figure 1, the descriptive stages begin with the Identification of Field Problems, specifically addressing poverty, limited land availability for traditional agriculture, and a lack of information regarding sustainable livelihoods in Nagari Tandikek. This is followed by Field Observations and Relevant Studies, which aim to find appropriate solutions by considering the local social and economic environment. This analysis confirms that the region has the necessary carrying capacity for *galo-galo* (stingless bee) cultivation, supported by abundant natural food sources and local stakeholder backing.

The next stage focuses on Mitigation Efforts, where stingless bee farming was selected as the primary solution because it is environmentally friendly, requires minimal land, and can be implemented with affordable capital. During the assistance phase, planning is conducted to set priorities and organize the specific activities to be implemented. This phase is critical as it bridges the gap between the theoretical identification of assets and the practical execution of the business model, ensuring that the community is prepared to manage the new venture effectively.

The final stage of the methodology is the Creation of New Sources of Income and Enhancement of Biodiversity, resulting in high-value honey production and improved plant pollination. The entire program concludes with a robust monitoring and evaluation phase using an activity monitoring matrix involving local officials (*jorong*), participants, and resource persons. This collaborative oversight ensures that the economic benefits and ecological improvements are sustained, fulfilling the Destiny phase of the ABCD cycle where the community takes full ownership of their development.

3 Results

The community service program successfully mobilized the productive age population of Nagari Tandikek to utilize their territory effectively for sustainable economic growth. By focusing on 900 hectares of fertile land, where 77.77% is currently dedicated to plantations, the program successfully transitioned residents toward a high-value and sustainable economy. A joint team consisting of village leaders and

business operators established a concrete action plan to ensure the precise distribution of breeding assistance and technical support to the target participants.

Figure 2. The Joint Team of Nagari Heads Compiling an Action Plan and Supporting Requirements

The socialization phase significantly increased community capacity regarding the safe cultivation of stingless bees (galo-galo). Participants achieved a comprehensive understanding of biological characteristics, allowing them to distinguish stingless bees from ordinary honey bees and identify optimal maintenance environments. This knowledge is essential for the 45.7% of the community living in poverty, as it introduces new opportunities for sustainable business that complement their existing roles as farmers. Residents are now capable of managing colony propagation and constructing hives or nest boxes, ensuring the long-term viability of their small-scale apiaries.

Figure 3. Socialization activities for the cultivation of Galo-Galo bees in Nagari Tandikek

Practical demonstrations and interactive simulations resulted in the community's mastery of hygienic and sustainable harvesting techniques. Participants were equipped to identify honeycombs and maintain product quality for derivative products like propolis and beeswax. This technical proficiency directly impacts family welfare by introducing high-value products to local and online markets. Furthermore, the program successfully highlighted the added value of these products from both health and economic perspectives, fostering strong motivation among participants to view bee cultivation as a primary value-added economic activity.

The program also fostered a deep ecological awareness regarding the role of stingless bees in maintaining ecosystem balance. Drawing on findings that stingless bees significantly increase the productivity of horticultural and plantation crops through pollination, participants recognized that this cultivation provides broad ecological benefits while simultaneously increasing agricultural yields. The most significant result was the formation of community business groups. These groups now serve as a collective forum for sustainable development, ensuring that the community moves from passive participation to active ownership of their economic progress.

4 Discussion

The success of the empowerment program in Nagari Tandikek demonstrates that the synergy between physical assets and social capital is the primary key to overcoming structural barriers in rural communities. The dominance of plantation land, accounting for 77.77% of the area, is an ecological foundation that provides abundant vegetation as a natural food source for bees. This alignment between land use and stingless bee cultivation is consistent with the findings of Harianja et al. (2023), who emphasize the vast potential of beekeeping to support Indonesia's environment and economy. By utilizing these existing assets, the program applies the Asset-Based Community Development (ABCD) strategy, which (Maulana (2019) describes as an effective approach to community development by focusing on internal strengths rather than deficits.

Stingless bee cultivation emerged as a highly appropriate technological solution for Nagari Tandikek, where the poverty rate reaches 45.7%. As noted by Lukman et al. (2021), Trigona spp. cultivation has significant potential to improve the economy of village communities due to its relatively easy maintenance and affordable capital requirements. This approach addresses the limitations faced by residents with lower formal education, providing them with access to innovation and alternative business opportunities (Selasi et al., 2021). The systematic transfer of knowledge, ranging from hive construction to colony management, ensures that technical complexities are distilled into practical skills, empowering the productive-age population to diversify their livelihoods (Harjanto et al., 2020).

The organizational aspect of this program, involving village heads and local entrepreneurs, played a crucial role in establishing legitimacy and ensuring sustainability. According to Febriani & Saputra (2018), social capital is a vital element in developing kelulut honey as both an economic and tourism commodity. The partnership with local entrepreneurs provides participants with tangible role models, which is essential for maintaining motivation in poverty alleviation efforts (Wang et al., 2023). This collaborative framework ensures that the community is not merely a passive recipient of aid but an active participant in a structured action plan, bridging the gap between smallholder farmers and modern commodity markets (Waarts et al., 2021).

Ultimately, the impact of these activities creates a symbiotic green economy loop that supports sustainable development. Economically, products such as honey, propolis, and beeswax offer high selling value and can be further processed to increase household income (Nirma & Yunani, 2022). Ecologically, managed bees provide essential crop pollination services, which (Narjes & Lippert, 2019) identify as an optimal intersection between socio-economic gain and ecological balance. By forming community business groups, Nagari Tandikek has established a collective strength that aligns with global efforts for poverty alleviation and biodiversity conservation(Sodhi et al., 2010). This model proves that when economic empowerment is built upon local asset potential, it

creates a resilient system capable of sustaining both family welfare and environmental integrity.

5 Conclusion

The community service activities in Nagari Tandikek demonstrate that the Asset-Based Community Development (ABCD) approach is highly effective in driving socio-economic transformation through the sustainable development of galo-galo bee farming. By leveraging local natural and social assets, the program successfully converted non-timber forest products into a viable economic engine, a success attributed to the active participation of the community, support from the nagari government, and strategic mentorship from local business actors. The initiative has significantly enhanced technical skills and ecological awareness among participants, leading to increased household income and reduced economic vulnerability through environmentally friendly diversification. To ensure long-term sustainability, it is recommended that the community receive continued assistance in product management and marketing, alongside technical capacity building and the development of partnership networks with research institutions and the private sector. Furthermore, securing product innovations and quality certifications such as halal and organic labeling will be essential for national market competitiveness. Integrating this program into the long-term nagari development plan will solidify stingless bee cultivation as a cornerstone of poverty alleviation and green economic development in West Pasaman, serving as a replicable model for regional socio-economic transformation.

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