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Unlocking the Economic Potential of Non-Timber Forest Products in Indonesia's Special Purpose Forest Zones

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ABSTRACT

This study explores the diversity of Non-Timber Forest Products (NTFPs) in the Forest Zone with Special Purpose (KHDTK) of Getas-Ngandong, East Java, Indonesia, with the aim of optimizing resource allocation, livelihood diversification, and biodiversity conservation in its planning and management. By conducting a six-month (May–October 2018) biophysical survey through direct observation, coupled with structured social surveys and interviews with key informants in adjacent community-managed forest area. We identified a wide range of NTFPs that are critical for sustainable forest management. Understanding the diversity and distribution of NTFPs is necessary to inform strategic interventions that enhance forest sustainability while supporting the economic resilience of surrounding communities. The findings reveal a rich variety of NTFPs within the region, with agricultural and food crops such as corn, sugarcane, rice, and cassava prevalent inside forest areas, while fruits like mangoes and bananas dominate the surrounding non-forest areas. These insights can serve as valuable inputs, such as integrating fruit tree cultivation into agroforestry zones to enhance income stability, for developing a KHDTK management plan that diversifies income sources, supports local livelihoods, and promotes sustainable forest management practices by balancing economic, ecological, and social benefits.

1. INTRODUCTION

The Special Purpose Forest Zone (KHDTK) Getas-Ngandong plays a pivotal role in bridging conservation and development objectives, reflecting a growing recognition that forest landscapes must support both ecological integrity and socio-economic needs. As pressures on natural resources intensify, KHDTK offers a strategic platform to harmonize research, education, community empowerment, and sustainable resource management within a single landscape (Hendra & Soendjoto, 2024). This dual mandate aligns with global trends emphasizing integrated landscape approaches, where conservation efforts are interwoven with livelihoods, food security, and climate resilience (Makkarennu *et al*., 2025). In this context, the development and optimization of KHDTK Getas-Ngandong are critical not only for advancing forestry science and education but also for demonstrating practical models of sustainable development that can be adapted elsewhere in Indonesia and beyond (Hendra & Soendjoto, 2024).

The utilization of KHDTK Getas-Ngandong, Indonesia, by Gadjah Mada University (UGM) as a site for education and training in forestry has a long and well-established history. In the 1990s, this area was managed by Perum

Perhutani, specifically by the Ngawi and Blora Forest Management Units (KPH). The Faculty of Forestry (FKT) UGM also utilized this area as a training ground for final-year undergraduate students (Yuwono *et al*., 2018). The KHDTK Getas-Ngandong area is not only characterized by its forest ecosystems but is also closely surrounded by rural communities whose livelihoods are historically linked to the forest landscape (Makkarennu *et al*., 2025). To facilitate field-based educational activities, FKT UGM optimized its field campus in Getas village, which serves as a base camp for students. Over time, the local community has become accustomed to interacting with students, and the presence of FKT UGM has been widely recognized, as evidenced by the establishment of community-assisted programs, such as agroforestry training and participatory forest monitoring, and by increased collaboration rates between local residents and university-led initiatives (Yuwono *et al*., 2018). The issuance of the Minister of Environment and Forestry Decree No. 632/Menlhk/Setjen/PLA.0/8/2016, dated August 9, 2016, formalized the management of the KHDTK, designating a forest area of 10,901 hectares for academic, research, training, and community service activities. This designation presents both opportunities and challenges for UGM, particularly FKT, to develop a comprehensive and integrated approach to advancing forestry-related science and technology while fostering community empowerment (Nuswantoro, 2017; Yuwono *et al*., 2018). To achieve these objectives, UGM must harness both the natural and socio-cultural potential of KHDTK Getas-Ngandong to actively contribute to regional development—both physical and non-physical.

The forest area within KHDTK Getas-Ngandong is not entirely bounded by its borders, which means administratively boundaries of KHDTK are not physically demarcated, leading to overlapping land use claims. Its primary objective is to provide a site for forestry research and development, education and training, and activities related to culture and religion. Approximately half of the 10,901-hectare area is covered by young (age classes I-III) teak (Tectona grandis) stands, which are generally less productive at around 20 years of age. The remaining forest area is either vacant or used for agriculture, such as rice or corn cultivation. Historically, as a monoculture teak production forest, the area has faced several management challenges, including timber theft, grazing, and unauthorized cultivation by local communities. Timber theft affects approximately 5% of the forest area in Getas and up to 25% of the Ngandong area. Moreover, seasonal forest area cultivation negatively impacts KHDTK utilization, with 68% of the forest area in Getas and 11.6% in Ngandong used for agricultural activities (Nuswantoro, 2017; Yuwono *et al*., 2018). Addressing these challenges to restore the area and achieve the objectives of KHDTK is a critical goal (Hendra & Soendjoto, 2024).

KHDTK Getas-Ngandong also contributes to agrarian reform efforts aimed at accelerating food sovereignty, poverty alleviation, and greenhouse gas reduction (Baliekbis, 2018). Agricultural products such as soybeans, corn, and rice are potential commodities that can be further optimized. In addition to agricultural products, Non-Timber Forest Products (NTFPs) with high potential for development include secang (*Biancaea sappan*), known for its medicinal properties, and the cocoon (enthung) of the teak tree caterpillar (*Hyblaea puera*), widely consumed for its high protein content (Pramono *et al*., 2010). Other types of NTFPs that can provide significant income contributions include forest honey, rattan, bamboo, medicinal plants, fruits like durian and mangosteen, and wild mushrooms.

NTFPs can often provide greater and more stable income streams compared to timber or firewood, largely because they can be harvested more frequently without destroying the resource base, thus allowing continuous and diversified income throughout the year. For instance, the collection and sale of forest honey or medicinal plants involve sustainable harvesting practices that preserve the ecosystem while generating revenue. Examples from other contexts demonstrate this potential: in West Kalimantan, forest honey commercialization has significantly improved local incomes (Wibisono & Azham, 2017); in East Kalimantan, rattan harvesting supports household economies more sustainably than timber extraction (Karmilasanti & Maharani, 2016); and in Senaru, NTFS such as wild fruits and bamboo products offer stable supplementary earnings (Rizkillah, 2018). Evidence also suggests that the combined income from diverse NTFPs can exceed that obtained from timber or fuelwood sales alone (Kar & Jacobson, 2012).

Sustainable management of NTFPs—through practices such as controlled harvesting, domestication, value chain development, and capacity building—can dramatically enhance their contribution to local incomes. By improving post-harvest processing, marketing, and cooperative organization, communities can command higher market prices and access broader markets. This not only strengthens household economies but also reduces pressures on timber resources and improves forest conservation outcomes. Thus, NTFPs play a crucial role in improving the welfare of

communities adjacent to forests by providing diversified, sustainable income sources that reduce vulnerability to market or climate shocks. Beyond economic gains, they also foster stronger community engagement in forest stewardship, thereby aligning conservation objectives with local development aspirations.

While the potential for NTFP development in KHDTK is considerable, the challenges associated with resource management must also be addressed (Hendra & Soendjoto, 2024). This calls for continuous research efforts by the UGM academic community, including studies on regional management strategies and community empowerment (Palupi & Siswoko, 2019). However, research specifically focused on analyzing the potential of NTFPs in KHDTK Getas-Ngandong remains limited. Previous studies have primarily focused on timber production or land-use issues, this research uniquely addresses the socio-ecological value of NTFPs as a key component for integrated management of KHDTK. Thus, this study aims to generate comprehensive data on NTFP potential in KHDTK Getas-Ngandong and its surrounding areas. The findings are expected to help design strategic management of the KHDTK, contributing to sustainable economic development, community empowerment, and the conservation of forest resources.

2. MATERIAL AND METHODS

2.1. Time and Location

This study was conducted between May and October 2018 in the KHDTK Getas-Ngandong area and its surrounding regions, specifically targeting 15 villages within the two districts (Figure 1). This period in Indonesia corresponds to the dry season transitioning into the rainy season, there is a risk of seasonal bias in the diversity of NTFPs detected. To address this limitation, future research is recommended to conduct year-round or multi-seasonal surveys to capture a more comprehensive picture of NTFP diversity. The study comprised three main phases: preparation, field data collection, and analysis. During the preparation phase, we developed a structured set of questionnaires and coordinated with local government authorities to ensure alignment with the research objectives and secure necessary permissions. Field data collection involved conducting interviews and direct observations across Ngawi and Blora Regencies, with research teams making daily trips from Gadjah Mada University (UGM) to the study area. The fieldwork targeted one district (Pitu) with seven villages in Ngawi (Cantel, Dumplengan, Kalang, Ngancar, Pitu, Selopuro, and Papungan) and three districts (Jati, Kradenan, and Randublatung) with eight villages in Blora (Gempol,

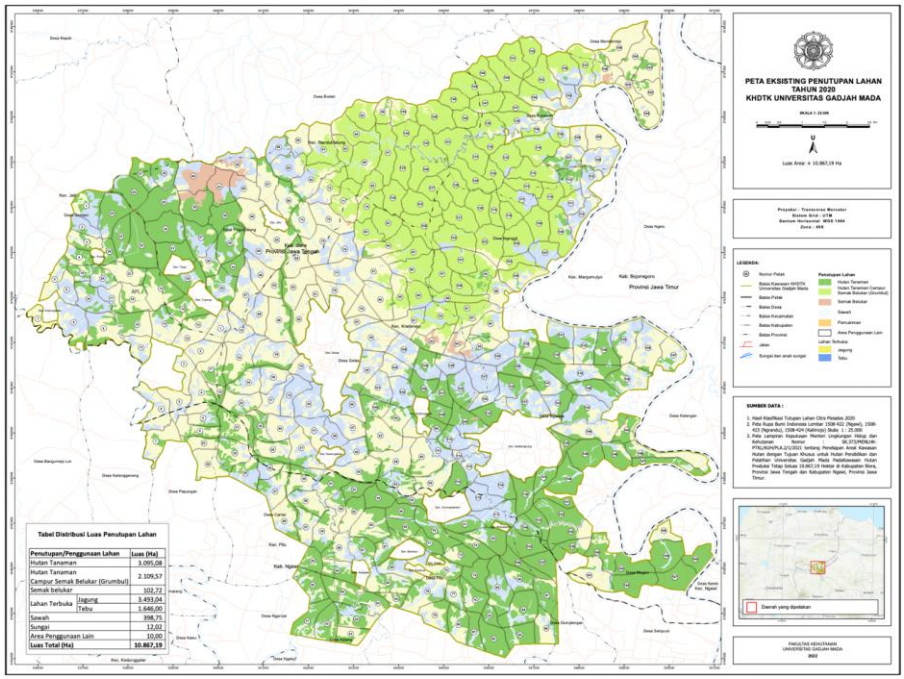

Figure 1. Villages located within the KHDTK Getas-Ngandong area

(Getas, Megeri, Nglebak, Nginggil, Ngrawoh, Bodeh, and Tlogotuwung). Based on preliminary findings, more detailed observations and in-depth surveys were subsequently conducted in nine villages, selected based on criteria such as species richness, community dependence on NTFPs, and accessibility. In the final phase, data analysis was carried out through extensive discussions among the research team to interpret findings and draw relevant conclusion.

2.2. Data Collection

Biophysical surveys were conducted to assess forest flora, while social surveys were employed to investigate the characteristics of the communities living around the forest and their potential for NTFPs development. Key questions in the social surveys included: (i) what types of agricultural or plantation crops are currently cultivated? (ii) what types of fruit-bearing plants are grown? (iii) what varieties of root crops are produced? and (iv) what are the supporting or inhibiting factors affecting the cultivation of these plants? Additionally, the surveys sought to evaluate the overall condition of the forest, as well as the communities' interest and willingness to engage in NTFP development.

In addition to interviewing local community members, relevant stakeholders were consulted to validate and enrich the data. These stakeholders included representatives from local government bodies in Blora and Ngawi districts, the Central Statistics Agency, Perhutani KPH Ngawi and Blora KPH, and representatives from the Forest Village Community Institutions (LMDH) in both districts. These interviews were crucial for cross-verifying information obtained from the communities and understanding the broader context for forest management and NTFP development in the region.

2.3. Questionnaire

To gather data on the potential and opportunities for NTFP development, an initial survey was conducted by administering structured questionnaires to the communities surrounding the KHDTK. The sampling method employed was purposive sampling, with 5–10 respondents selected per village, yielding a total of 100 respondents across 15 villages. Based on the initial survey findings, villages with the highest potential for NTFP development were identified, taking into consideration both the diversity of NTFPs present and the potential for further development. In Ngawi Regency, the selected villages were Selopuro, Pitu, and Cantel. In Blora Regency, the selected villages were Tlogotuwung, Getas, Gempol, Bodeh, Nglebak, and Megeri.

The types of NTFPs identified with the most potential for development in these villages include bamboo, secang (*Biancaea sappan*), empon-empon (medicinal roots, spices, herbs), forest honey, and wild fruits such as mangoes and bananas. The high diversity of NTFPs within these villages enhances development potential by offering multiple product streams that can be marketed throughout the year, reducing dependency on a single commodity and increasing resilience to market fluctuations.

Several factors influence the potential for NTFP development, including proximity to markets, community knowledge and traditional practices related to NTFPs, availability of natural resources, and existing community organizational structures such as farmer groups or cooperatives. To optimize villages with the highest potential, interventions such as capacity building for sustainable harvesting techniques, post-harvest processing training, product diversification, and improved market linkages should be implemented.

Sustainable development of NTFPs in these villages can be achieved through strategies such as community-based forest management, the establishment of value chains that emphasize fair trade principles, certification schemes for sustainably harvested products, and continuous participatory monitoring to ensure that resource extraction remains within ecological limits.

2.4. Interview

Interviews were conducted with key stakeholders in the selected villages—three in Ngawi Regency and six in Blora Regency. These stakeholders included the chairpersons of Forest Village Community Institutions (LMDH), leaders of farmer groups, village officials, “pesanggem” (local forest cultivators), and staffs from Perhutani, the state forestry enterprise. Each village was represented by 3–6 respondents, resulting in a total of 40 respondents across all villages.

These key informants were strategically chosen to provide insights into local NTFP management, community engagement, and the socioeconomic dynamics within the region.

2.5. Field Observation

This phase of the research was conducted following the collection of preliminary information from the questionnaires. Field observations were carried out simultaneously with the interviews to validate and corroborate the data obtained through the structured questionnaires. These observations were critical for verifying the accuracy of the responses and confirming the presence of NTFPs in the region. Additionally, field assessments provided an opportunity to identify other potential NTFPs that had not been recognized in the initial survey. The fieldwork also fostered more in-depth communication and interaction with key village stakeholders, allowing for a deeper understanding of the local context and dynamics surrounding NTFP utilization and management.

2.6. Data Analysis

Data collected from the field were analyzed through descriptive, quantitative, and qualitative methods, supported by tables and figures. The first step involved analyzing the initial survey results from all villages, focusing on the diversity of NTFPs in each village. Villages from both districts that exhibited a minimum of four types of NTFPs were selected for more in-depth field surveys (Table 1). This selection process was designed to optimize the study within the constraints of limited time and resources, while still ensuring adequate representation of the villages within the KHDTK Getas-Ngandong area. In subsequent stages, field surveys and in-depth interviews were conducted in the selected villages to reconfirm the potential NTFP diversity identified in the preliminary survey. Key informants directly involved in NTFP management, both inside and outside the forest areas, were consulted for detailed information on yield per hectare, harvest cycles, and unit prices. The outcomes of this analysis provide a comprehensive assessment of the potential economic value associated with each identified commodity.

3. RESULTS AND DISCUSSION

3.1. Non-Timber Forest Products

The findings from the initial survey provide detailed insights into the species composition, abundance, and community utilization patterns of potential NTFPs in each village, as presented in Table 1. The NTFPs identified are predominantly composed of semi-wild or agroforestry-based staple crops, such as tubers and vegetables, which play a crucial role in meeting the daily subsistence needs of local communities. Additionally, pure wild NTFPs, including forest honey and rattan, were also identified. While agricultural crops such as maize, sugar cane, and rice are significant for food security, they are typically not classified as NTFPs. However, their inclusion here reflects their role within forest-based agroecosystem systems and their importance to rural livelihoods (Makkarennu *et al*., 2025). The second most prevalent category of NTFPs consists of fruit-bearing trees, which contribute significantly to both local food security and potential marketable produce. These results highlight the reliance of rural livelihoods on a combination of semi-wild, agroforestry-based products and pure NTFPs, underscoring their economic and social importance within the surveyed areas.

3.2. Potential of NTFPs in Ngawi Regency

The study focused on areas both inside and outside the KHDTK Getas-Ngandong, covering villages in Blora and Ngawi Regencies. Questionnaires were distributed to each village in these regions to collect community insights regarding local NTFP potential. Based on the questionnaire results, several villages with the highest number of NTFP commodities were identified, including Pitu, Cantel, and Selopuro in Ngawi Regency. The identified commodities were categorized into those found within the forest areas and those cultivated outside the forest boundaries. As shown in Table 2, corn and sugarcane emerged as dominant crops in all three sample villages, with substantial annual production volumes. These findings contrast with previous research, which highlighted the potential of soybean cultivation in the districts of Pitu and Kradenan in Ngawi Regency (Kuswantoro *et al*., 2015). Soybeans, particularly the Pangrango variety, can be successfully cultivated as an understory crop in teak stands, optimizing forest area use

Table 1. Initial survey results on the potential of NTFPs in 15 villages within the KHDTK Getas-Ngandong

Village	Potential NTFPs	# NTFP species
Cantel*	Corn, Cassava, Cane, Turmeric, Temulawak (*Curcuma xanthorrhiza* Roxb.), Galangal	6
Dumplengan	Corn, Cassava	2
Kalang	Tamarind	1
Ngancar	Chili leaves, Grass jelly, Empon-empon (spices, herbs), Vegetable foreskin	4
Pitu*	Corn, Peanuts, Cassava, Wild yam "Gadung" (*Dioscorea hispida*), Banana, Bamboo, Sengon (*Paraserianthes falcataria* (L.) Nielsen) seed, Sugar Cane, Ginger, Turmeric	10
Selopuro*	Corn, Cassava, Empon-empon, Gadung, Fruits, Sugarcane	6
Papungan	Sugarcane	1
Gempol*	Bitter ginger "Puyang" (*Zingiber zerumbet* (L.) Roscoe ex Sm.), Cardamom, Honey	4
Getas*	Cane, Corn, Papaya, Cassava, Soybeans, Ginger, Banana, Gadung	8
Megeri*	Corn, Sugarcane, Cassava, "Gadung", Garut, Banana, Soybean, Peanuts, Mango	9
Nglebak*	Fruit, medicinal herbs	2
Nginggil	Honey, Corn, Cashew	3
Ngrawoh	Corn, Rice, Banana, "Gadung", Eggplant, Sugarcane, Cassava	7
Bodeh*	Corn, Cassava, "Gadung", "Empon-empon", Bulbs, Charcoal	6
Tlogotuwung*	Corn, Paddy, Cassava	3

Note: *Nine villages were selected based on the high diversity of NTFPs observed and from in-depth interviews with key personnel

Table 2. Potential of NTFPs in forest areas of Ngawi Regency

Village	Commodity	Harvest (kg/ha)	Harvest period (month)	Price (IDR/kg)
Pitu	Corn	3660	4	3200 dry/2000 wet
	Soy	1200	3	8000–8500
	Cane	72,000*	12	320
	Peanuts	150	4	5000
	Paddy rice	240	3	4000
	Chili	6600	4	12,000–30,000
	Cassava	850	8	500
	Long beans	3000	4	2500
Cantel	Corn	7600	4	3200
	Cane	77,000*	12	320
Selopuro	Cane	28,000*	12	320
	Paddy rice	1400	3	8000
	Corn	800	4	3200

Note: * The NTFP species with the greatest yield per village.

through an agroforestry system. Furthermore, the development of corn agribusiness holds promise, particularly through potential partnerships with companies interested in investment. Notably, in March 2018, the first successful harvest of 'Gogo' rice (upland rice) was achieved in an area with limited water availability, underscoring the adaptability of these agricultural practices in diverse conditions. Although corn and sugarcane are not traditionally classified as NTFPs, in this context, they represent key agricultural commodities integrated within forested landscapes.

In contrast, the NTFPs found outside the forest areas, specifically in home yards within Ngawi Regency, exhibit different commodity types compared to those within the forest boundaries (Table 3). According to the data collected, the dominant commodities identified in the villages of Pitu, Cantel, and Selopuro are bananas and mangoes, both of which are commonly cultivated in residential yards. These commodities fall under the fruit category of NTFPs. The production volumes of these two commodities vary significantly across the different villages, reflecting the diverse cultivation practices and environmental conditions present in each location.

The potential of NTFPs can be identified both within and outside the KHDTK area, with notable distinctions in the types and volumes of commodities produced. Within the KHDTK area, the majority of NTFPs in the three sample villages consist of corn and sugarcane, although some other commodities were found in smaller quantities or in isolated

Table 3. Potential NTFPs outside the forest areas in Ngawi District.

Village	Commodity	Harvest (tree/yard)	Price (IDR)
Pitu	Banana	16*	40,000/bunches
	Mango	3	150,000–200,000/tree
Cantel	Banana	6*	40,000/bunches
	Mango	1	150,000–200,000/tree
Selopuro	Banana	16*	40,000–75,000/bunches
	Mango	1	150,000–200,000/tree

Note: *the most common NTFP species per area.

locations. These NTFPs fall under the category of food crops. Among the villages, Cantel exhibits the highest corn production at 7,600 kg/ha, while Selopuro has the lowest at 800 kg/ha (Table 2). Similarly, Cantel leads in sugarcane production, with Selopuro producing the least. The superior yield in Cantel can be attributed to its relatively smaller rice field area compared to Selopuro and Pitu (BPS, 2017c), which allows farmers to concentrate more effectively on managing their arable forest area within the forest area. Additionally, the LMDH in Cantel (LMDH Sumber Sejahtera) is highly active in securing resources such as fertilizers to support agricultural activities. According to data from Pitu district (BPS, 2017c), maize yields in Cantel surpass those of Pitu and Selopuro, averaging 724 kg/ha, 720 kg/ha, and 706 kg/ha, respectively. In terms of annual income potential, corn in Cantel, Pitu, and Selopuro could generate approximately IDR 72 million, IDR 35 million, and IDR 8 million, respectively, while sugarcane could yield IDR 24 million, IDR 23 million, and IDR 9 million, respectively. This demonstrates that corn holds greater economic potential than sugarcane, as evidenced by the extensive corn cultivation observed in the forest area. Pitu village, in particular, exhibits greater crop diversity, producing soybeans, peanuts, rice, chili, cassava, and long beans. This diversification is encouraged by the leadership of LMDH Karya Tani in Pitu, which motivates its members to experiment with planting additional crops.

Outside the forest area, NTFPs in the three villages are predominantly banana and mango plants. The average number of banana plants per household ranges from 6 to 16, with a market price of approximately 40,000 – 75,000 IDR per bunch. This aligns with data from the Pitu District, which recorded banana production at 850 tons in 2016 (BPS, 2017c). Mango trees are typically planted in home yards, with each household cultivating 1–3 trees. The fruit is often sold in bulk at prices ranging from 150,000 to 200,000 IDR per tree. These commodities, in addition to being consumed domestically, provide supplementary income for households (Agustina *et al*., 2024). Despite their relatively modest income contributions, commodities like bananas and mangoes provide essential supplemental revenue, reducing economic vulnerability and enhancing the resilience of rural households in the face of seasonal variations and external shocks. These results highlight the reliance of rural livelihoods on a combination of semi-wild, agroforestry-based products and pure NTFPs, underscoring their economic and social importance within the surveyed areas (Agustina *et al*, 2024; Makkarennu *et al*., 2025).

3.3. Potential of NTFPs in Blora Regency

The potential of NTFPs in Blora Regency is categorized into those found within the KHDTK Getas-Ngandong forest area and those located outside the forest boundaries. The selected villages in Blora Regency for sampling included Gempol village in Jati District, Getas, Nglebak, and Megeri villages in Kradenan District, and Tlogotuwung and Bodeh villages in Randublatung District. Table 4 outlines the potential NTFPs within the forest area, with maize and rice emerging as the predominant crops across all sampled villages. This finding aligns with 2015 data, which reported that Blora Regency harvested corn on 500 ha of forest within the 54 BKPH Ngandong, KPH Ngawi area (Infoblora, 2015).

Outside the forest area, bananas and mangoes were the most common NTFPs, except in Nglebak village. Table 5 illustrates the annual production volumes of these commodities and the associated economic benefits derived from their harvests. In total, six villages across three districts were sampled to assess NTFP potential in the Blora Regency portion of KHDTK Getas-Ngandong. Within the forest area, maize and rice dominated as the primary agricultural commodities. Gempol Village, located in Jati District, reported the highest maize production at 6,500 kg/ha, with two harvests annually, whereas Tlogotuwung Village in Randublatung District recorded the lowest yield at 1,133 kg/ha

Table 4. Potential NTFP yields in forest areas of Blora Regency.

District	Village	Commodity	Harvest (kg/ha)	Harvest period, month	Price (IDR/kg)
Jati	Gempol	Corn	6500*	6	2800
		Paddy rice	1467	6	8000
		Cassava	1667	8	1000
Kradenan	Getas	Corn	2758*	6	2800
		Paddy rice	1175	6	8000
		Cassava	2333	8	1000
	Nglebak	Corn	4000*	6	3000
		Paddy rice	2667	6	8000
	Megeri	Corn	5000	6	3000
		Paddy rice	1600	6	8000
		Cane	24,000*	12	400
Randublatung	Tlogotuwung	Corn	1133	6	2900
		Paddy rice	2933*	6	8000
		Cassava	1900	8	1000
	Bodeh	Corn	3639*	6	2800
		Paddy rice	500	6	8000
		Cassava	2500	8	1000

Note: * the NTFP species with the greatest yield per village.

Table 5. Potential NTFP yields outside forest areas in Blora Regency

District	Village	Commodity	Harvest (tree/yard)	Price (IDR)
Jati	Gempol	Mango	4	250,000–500,000/tree
		Banana	43	30,000–60,000/bunches
		Jack Fruit	1	150,000/tree
		Bamboo	84*	10,000/trunk
Kradenan	Getas	Mango	1	150,000–200,000/tree
		Banana	24	30,000–40,000/bunches
		Bamboo	250*	10,000/trunk
	Nglebak	Banana	20*	30,000–50,000/bunches
	Megeri	Mango	30*	250,000/tree
		Cane	1	417/kg
		Banana	10	25,000–40,000/bunches
Randublatung	Tlogotuwung	Mango	2	250,000–300,000/tree
		Orange	1	500,000/tree
		Banana	5*	20,000–50,000/bunches
	Bodeh	Mango	1	250,000/tree
		Banana	20	30,000–60,000/bunches
		Bamboo	37*	10,000/trunk

Note: * The most common NTFP species per village

(Table 4). The maize yield in Gempol closely mirrors the figure reported in the Jati District statistical book at 5,652 kg/ha (BPS 2017a), while the production in Tlogotuwung significantly underperforms relative to Randublatung District of average maize yield of 5,061 kg/ha (BPS, 2017d).

The potential income generated from maize cultivation in each sampled village is as follows: Gempol (IDR 36 million), Megeri (IDR 30 million), Nglebak (IDR 24 million), Bodeh (IDR 20 million), Getas (IDR 15 million), and Tlogotuwung (IDR 6 million) per year. These figures demonstrate the varying economic impact of NTFP cultivation across different localities, with Gempol standing out as the most productive and economically viable village for maize cultivation.

In terms of rice production potential, Tlogotuwung village demonstrates the highest yield among the surveyed villages, producing 2,933 kg/ha with two cropping cycles per year. Conversely, Bodeh village records the lowest rice yield at 500 kg/ha. These figures are notably lower compared to the official data from Randublatung, which reports an average rice yield of 5,200 kg/ha per year. The potential income generated from rice cultivation in the villages of Tlogotuwung, Nglebak, Megeri, Gempol, Getas, and Bodeh amounts to IDR 46 million, IDR 42 million, IDR 25 million, IDR 23 million, IDR 19 million, and IDR 8 million per year, respectively. Additionally, cassava is another significant NTFP commodity in Blora Regency. The highest cassava production is recorded in Bodeh village at 2,500 kg/ha, followed by Getas (2,333 kg/ha), Tlogotuwung (1,900 kg/ha), and Gempol (1,667 kg/ha), while the remaining two villages reported no cassava production.

Outside the forest area, the NTFP potential is predominantly represented by mango and banana plants. Megeri village exhibits the largest number of mango plants, while Gempol village leads in banana cultivation (Table 5). According to BPS data from 2016, banana plants represented the highest yielding horticultural crop in Jati, Kradenan, and Randublatung Districts, with yields of 2,396 t, 891 t, and 1,909 t, respectively (BPS 2017a, b, d). Mango plants, the second most significant horticultural commodity, yielded 1,221 t in Jati, 346 t in Kradenan, and 223 t in Randublatung (BPS 2017a, b, d). Other notable NTFPs identified in these areas include bamboo, jackfruit, sugarcane, and grapefruit. These findings underscore the diversity and economic potential of NTFPs, both within and outside forested areas, contributing significantly to local livelihoods (Agustina *et al*., 2024).

4. CONCLUSION

The preliminary findings from the first year of this study indicate that the NTFPs within the KHDTK Getas-Ngandong region possess promising development potential, with average yields of 8,942 kg/ha and market prices ranging from IDR 320–30,000/kg. These NTFPs contribute to forest conservation efforts through economic, ecological, and social dimensions. The NTFPs identified in both Ngawi and Blora Regencies—specifically, corn, sugar cane, and rice in forested areas, and mango, banana, empon-empon (spices, herbs), and bamboo in non-forested areas—are deemed viable for development based on their annual productivity and market value. However, the majority of these NTFPs are currently utilized as raw materials, with limited post-harvest processing or value-added management to enhance their economic potential. Consequently, future research should prioritize feasibility studies, value chain analysis, and the formulation of sustainable business models for key NTFPs, with an emphasis on developing business plans, establishing market linkages, and providing capacity building for local stakeholders. These efforts will help maximize the economic impact of NTFPs while simultaneously supporting forest conservation initiative s

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