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# Estimated Transaction Value of Non-Timber Forest Products in the Nuraksa Grand Forest Park, West Nusa Tenggara, Indonesia

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A B S T R A C T

Non-Timber Forest Products (NTFPs) play an important role in supporting the economy of communities surrounding forest areas. However, information regarding the transaction value and estimated economic value of NTFPs at the landscape level remains limited, including in the Nuraksa Grand Forest Park (NGFP), West Nusa Tenggara Province. This study aimed to identify NTFPs commodities produced and traded by the community, calculate the transaction value of NTFPs, and analyze the estimated economic value of NTFPs in the NGFP area. The study used a descriptive method with Proportionate Stratified Random Sampling and Simple Random Sampling techniques, involving 42 respondents. The results showed that the transaction value of NTFPs by farmers reached IDR 121,894,136/owned land area/year. Durian, coffee, and mangosteen were the commodities with the highest transaction values due to their relatively high selling prices and stable market demand. The estimated economic value of NTFPs in the area of 1,381.80 ha reached IDR 76,847,930,726/year. These findings indicate that NTFPs have substantial economic potential in supporting community economic activities within the Nuraksa Grand Forest Park area

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## INTRODUCTION

Non-timber forest products (NTFPs) play a vital role in supporting the livelihoods of communities living near forest areas, particularly as a source of household income for communities that depend on forest resources (Khairunnisa et al., 2024). The utilization of NTFPs is considered more sustainable because it does not require direct logging of forest stands. This allows the ecological functions of forest areas to be maintained sustainably (Shackleton, 2015). Various NTFPs such as durian, coffee, cocoa, candlenut, and mangosteen have emerged as economic sources for communities in numerous forest areas, including Social Forestry zones. Additionally, NTFPs contribute to the economic resilience of households living near conservation areas (Mukul et al., 2016).

In the management of conservation areas, the utilization of NTFPs is also expanding in the Tahura Nuraksa, West Nusa Tenggara Province, through a conservation partnership between the Management Office and the Forest Farmers' Group (KTH). Various NTFPs are produced and traded sustainably by local communities as a source of household income. Although utilization activities are quite active, to date there is no data available that describes transaction values and estimates the overall economic value of NTFPs at the area level. Available economic information is still limited to community estimates and has not been systematically documented.

Several previous studies have examined the utilization of NTFPs in the Tahura Nuraksa. Lispianti et al. (2024) noted that income from NTFPs has not yet had a significant impact on improving community well-being, even though the community's level of dependence on the forest area is relatively high. Meanwhile, Winanto et al. (2025) reported that NTFPs contribute 71% to community household income. However, previous studies have primarily focused on the individual or household level, thus failing to capture transaction values and economic estimates of NTFPs at the regional level comprehensively. This situation has prevented the economic potential of NTFPs in Tahura Nuraksa from being mapped in a measurable manner. Based on these conditions, this study aims to calculate the transaction value of NTFP products, and analyze the estimated economic value of NTFPs in the Tahura Nuraksa area.

## LITERATURE REVIEW

Non-timber forest products (NTFPs) play a vital role in supporting the livelihoods of communities living near forest areas, particularly as a source of household income for communities that depend on forest resources (Khairunnisa et al., 2024). The utilization of NTFPs is considered more sustainable because it does not require direct logging of forest stands. This allows the ecological functions of forest areas to be maintained sustainably (Shackleton, 2015). Various NTFPs such as durian, coffee, cocoa, candlenut, and mangosteen have emerged as economic sources for communities in numerous forest areas, including Social Forestry zones. Additionally, NTFPs contribute to the economic resilience of households living near conservation areas (Mukul et al., 2016).

## METHODOLOGY

This study was conducted from April to May 2026 at Tahura Nuraksa in West Nusa Tenggara Province.

### Research Methodology

This study employs a descriptive method to systematically describe the socioeconomic conditions of the community and the transaction values of NTFPs in the Tahura Nuraksa area, based on field observations (Sugiyono, 2018).

### Determination of Sample Size

The sample size was calculated using the Slovin formula with a 15% margin of error. The sample size and margin of error must be adjusted to the conditions of the field research and the characteristics of the population under study (Memon et al., 2020). There are 683 members of the KTH at Tahura Nuraksa, resulting in a sample size of 42 respondents.

### Sample Distribution

The sample was selected using the Proportionate Stratified Random Sampling technique, where the number of respondents in each KTH was determined proportionally according to the number of members in each group, resulting in a total of 42 respondents. This technique was applied because the study population was divided into several groups with different numbers of members (Sharma, 2017). The formula used is presented as follows.

$ni = Ni/N \times n$

ni : Sample size of the i-th KTH
Ni : Population size of the i-th KTH
N : Total population
n : Number of respondents selected

Table 1. Sample Distribution

| No | KTH | Number of KTH Members | Sample Size Calculation | Number of Samples |
|---|---|---|---|---|
| 1 | Eat Pakem | 65 | (65/683)x42 | 4 |
| 2 | Setipak | 71 | (71/683)x42 | 4 |
| 3 | Anjane | 23 | (23/683)x42 | 2 |
| 4 | Wana Abadi | 233 | (233/683)x42 | 14 |
| 5 | Segenter Indah | 98 | (98/683)x42 | 6 |
| 6 | Sawa'an | 58 | (58/683)x42 | 4 |
| 7 | Rejeng Subur | 42 | (42/683)x42 | 2 |
| 8 | Lembah Duren | 32 | (32/683)x42 | 2 |
| 9 | Selendang Rinjani | 27 | (27/683)x42 | 2 |
| 10 | Selangu Lestari | 34 | (34/683)x42 | 2 |
| | Total | 683 | 42 | 42 |

Data Source: Nuraksa Grand Forest Park Office, 2026

**Respondent Selection Technique**

Respondents from each KTH were selected through the simple random sampling technique using the lottery method. This technique was applied because it provides every member with an equal opportunity to be selected, ensuring that the sampling process remains objective and unbiased (Wahab & Junaedi, 2022).

**Data Analysis**

This study applied quantitative analysis techniques to estimatetransaction values and identify the number and types of NTFPs utilized by respondents. In addition, qualitative analysis was conducted to obtain and examine information related to NTFPs activities and transaction processes.

**Analysis of Farmers' Income from NTFPs**

Farmers' income from NTFPs is determined by subtracting the total production costs incurred during a certain period from the total revenue earned. Mathematically, farmers' income can be formulated as follows:

I =TR-TC

I : Farmers' income from NTFPs (IDR/year)
TR : Total revenue from NTFPs (IDR/year)
TC : Total production costs for NTFPs (IDR/year)

Next, farmers' income from NTFPs is expressed in units per hectare by dividing total income by the area of cultivated land, and is therefore calculated as follows:

I_ha =I/L

Iha : Farmers' income from non-food crops per hectare (IDR/ha/year)
I : Farmers' income from non-food crops (IDR/year)
L : Farmers' cultivated land area (ha)

**Productivity and Value of Products (Ha)**

**Productivity**

The productivity of NTFPs is calculated by comparing the total production with the area of cultivated land to obtain the productivity per hectare per year.

PR =Q/L

PR : NTFPs productivity (units/ha/year)
Q : Total NTFPs production for each crop type (units/year)
L : Farmers cultivated land area (ha)

**Value of Products (Ha)**

The value of NTFPs per hectare is determined by dividing the total product value, calculated from production volume and selling price, by the cultivated land area. This approach is applied to measure the economic value of NTFPs unit area of land.

〖NP〗_ha =(Q x P)/L

NPha : Value of NTFPs per hectare (IDR/ha/year)
Q : Total NTFPs production for each crop type (units/year)

P : Selling price of NTFPs (IDR/units)
L : Farmers' cultivated land area (ha)

**Transaction Value**

The estimated economic value of NTFPs in the area was determined by multiplying the NTFPs value per hectare by the total area of Traditional Blocks and Utilization Blocks utilized by the community. This approach was applied to describe the economic potential of NTFPs at the regional level.

〖NE〗_k=〖NP〗_ha x A
〖NE〗_k : Estimated economic value of NTFPs in the area (IDR/year)
〖NP〗_ha : Value of NTFPs per hectare (IDR/ha/year)
A : Area size (ha)

## RESULT AND DISCUSSION

### Respondent Characteristics

#### a) Age

In this study, age is defined as the number of years from the farmer's birth until the time of the study. The age distribution of the farmers is presented in the following table.

Table 2. Distribution of Respondents by Age

| No | Age Group | Frequency | Percentage (%) |
|---|---|---|---|
| 1 | < 15 | 0 | 0 |
| 2 | 15 - 49 | 22 | 52,4 |
| **3** | 50 - 64 | 14 | 33,3 |
| 4 | > 64 | 6 | 14,3 |
| Total | | 42 | 100 |

Sources: Primary data processed in 2026

Most respondents were within the productive age group of 15–49 years, with a total of 22 individuals (52%). This finding shows that the majority of respondents are still in their working age, allowing them to actively support NTFPs farming activities. This result is in line with Gusti et al. (2023), who stated that productive age affects farmers' work capacity and productivity.

**b) Educational Level**

Educational level is one of the factors that influences farmers' perspectives and decision-making in agricultural activities (Febrianti et al., 2023). The distribution of respondents based on educational level is shown in the following table.

Table 3. Respondents' Distribution Based on Educational Level

| No | Educational Level | Frequency | Percentage (%) |
|---|---|---|---|
| 1 | No Formal Education | 7 | 17 |
| 2 | Elementary School | 15 | 36 |
| 3 | Junior Hight School | 10 | 24 |
| 4 | Senior High School/Vocational High School | 8 | 19 |
| 5 | Bachelor's Degree | 2 | 5 |
| Total | | 42 | 100 |

Sources: Primary data processed in 2026

Most respondents had an elementary school education, totaling 15 people (36%). Based on the interview results, this situation was influenced by the community's historically low awareness of the importance of education. Nevertheless, some respondents had completed their education up to the high school or vocational school level and even earned a bachelor's degree. Higher levels of education influence farmers' perspectives and decision-making, as evidenced by the development of NTFPs farm management in several KTH within the Tahura Nuraksa area.

**c) Number of Household Members**

The number of household members refers to the family members who are still financially dependent on the household (Purwanto and Taftazani, 2018). The distribution of respondents based on the number of dependents is shown in the following table.

Table 4. Respondents' Distribution Based on Number of household members

| No | Number of household members | Frequency | Percentage (%) |
|---|---|---|---|
| 1 | 1 - 3 | 24 | 57 |
| 2 | 4 - 6 | 18 | 43 |
| 3 | > 6 | 0 | 0 |
| Total | | 42 | 100 |

Sources: Primary data processed in 2026

Table 4 shows that most respondents had small families consisting of 1–3 members (57%), based on the BPS classification by Purwanto and Taftazani (2018). The number of family dependents influences the level of farmers' household economic needs.

**d) Primary Livelihood**

Primary livelihood refers to the type of work that occupies most of the respondents' time and serves as the main source of income (Sinaga, 2017). The distribution of respondents based on primary occupation is presented in the following table.

Table 5. Respondents' Distribution Based on Primary Livelihood

| No | Primary livelihood | Frequency | Percentage (%) |
|---|---|---|---|
| 1 | Forest Farmers | 32 | 76 |
| 2 | Forest Protection Officers | 7 | 17 |
| 3 | Entrepreneurs | 2 | 5 |
| 4 | Teacher | 1 | 2 |
| Total | | 42 | 100 |

Sources: Primary data processed in 2026

Most respondents (76%) identified forest farming as their primary occupation. This indicates that forest-related activities serve as their main source of livelihood, as shown by the considerable amount of time allocated to these activities compared to other occupations. This condition also reflects the respondents' dependence on forest-related activities. Furthermore, these activities play an important role in supporting the economi sustainability of respondents' households.

**e) Cultivated Land Area (CLA)**

The size of cultivated land serves as the primary asset in farming and is closely linked to farmers' income levels. The larger the area of cultivated land, the greater the farmers' chances of earning higher incomes (Patianingsih & Nizar, 2018). The distribution of respondents based on the size of cultivated land is as follows.

Table 6. Respondent's Distribution Based on Cultivated Land Area

| No | Cultivated Land Area (ha) | Frequency | Percentage (%) |
|---|---|---|---|
| 1 | < 0,5 | 4 | 10 |
| 2 | 0,5 - 1 | 11 | 26 |
| 3 | > 1 | 27 | 64 |
| Total | | 42 | 100 |

Source: Primary data processed in 2026

Table 6 shows that most respondents have more than 1 hectare of cultivated land, specifically 27 people (64%) based on the 2018 BPS classification. The average area of cultivated land per farmer is 1.64 hectares, which falls into the large-scale land category. The size of this land area influences farmers' income levels and economic activities.

**Transaction Value of Ntfps**

**a) Value of Farmers' Transactions in NTFPs**

The utilization of NTFPs in the Tahura Nuraksa area provides economic benefits to the community. Details of the transaction values for NTFPs are presented in Table 7.

Table 7. Transaction Value of NTFPs

| Types of NTFPs | Number of Respondents | Price (IDR) | Unit | Average Revenue/Year (IDR/CLA/Year) |
|---|---|---|---|---|
| Avocado | 36 | 10.000 | Kg | 3.250.000 |
| Sugar Palm | 6 | 35.000 | Liters | 1.633.333 |
| Durian | 40 | 20.000 | Pieces | 46.838.095 |
| Cocoa | 39 | 15.000 | Kg | 7.477.040 |
| Candlenut | 39 | 1.000.000 | Quintals | 5.821.428 |
| Kepundung | 5 | 10.000 | Kg | 214.285 |
| Coffee | 36 | 70.000 | Kg | 25.500.000 |
| Mangosteen | 16 | 35.000 | Kg | 21.291.666 |
| Jackfruit | 23 | 3.000 | Pieces | 215.904 |
| Banana | 42 | 100.000 | Bunches | 2.423.809 |
| Rambutan | 25 | 10.000 | Kg | 6.514.285 |
| Taro | 5 | 150.000 | Quintals | 714.285 |
| Total | | | | 121.894.136 |

Sources: Primary data processed in 2026; Note: CLA: Owned land area

The transaction value of NTFPs received by communities in the Tahura Nuraksa area varies across traded commodities. According to Table 7, total NTFPs revenue amounts to Rp121,894,136 per year. Bananas are the most widely cultivated commodity by farmers because they are relatively easy to manage, have more stable yields, and can be harvested sustainably. These characteristics make certain NTFPs commodities more attractive to the community as a livelihood strategy with relatively low production risk (Shackleton, 2015)

In terms of revenue, durian generates the highest contribution at Rp46,838,095 per year, followed by coffee and mangosteen at Rp25,500,000 and Rp21,291,666 per year, respectively. The high revenue from durian, coffee, and mangosteen indicates that several types of NTFPs in the Tahura Nuraksa area have developed into commercially valuable commodities. This situation indicates that the utilization of NTFPs by local communities is not merely subsistence-based but has also become market-oriented NTFPs. Belcher and Schreckenberg (2007) stated that NTFP commodities with high market demand and selling value tend to provide greater economic benefits for communities living around forest areas.

Differences in transaction values across commodities indicate that the level of community income is influenced not only by the number of farmers

cultivating crops, but also by selling prices, market access, management intensity, and consumer demand. Mukul et al. (2016) stated that the economic contribution of NTFPs to communities surrounding conservation areas is strongly affected by the commercial value of the commodities as well as the communities' ability to manage and market NTFP products.

**b) Production Costs**

Production costs are the expenses incurred by farmers during the production of NTFPs, which consist of fixed and variable costs. Fixed costs remain relatively constant, while variable costs fluctuate depending on the level of production.

Table 8. Total Production Costs

| | Fixed Costs (IDR/CLA/year) | Variable Costs (IDR/CLA/year) | Production Costs (IDR/CLA/year) |
|---|---|---|---|
| Average | 166.222 | 4.187.571 | 4.353.793 |

Sources: Primary data processed in 2026; Note: CLA: Owned land area

According to Table 8, the fixed costs incurred by farmers include expenses for items such as machetes, buckets, hoes, sickles, crowbars, rubber bands, and poles. Variable costs, on the other hand, consist of the total expenses for sacks, labor, gasoline, fertilizer, and raffia rope. As a result, the average cost incurred by farmers is Rp4,353,793 per production cycle per year.

**e) Farmers' Income**

Farmers' income is calculated as the total transaction value of NTFPs minus production costs for one year. The total income for farmers is detailed in Table 9 as follows.

Table 9. Farmers' Income from NTFPs

| No | Description | Total (IDR/CLA/year) | IDR/ha/year |
|---|---|---|---|
| 1 | Total Transaction Value | 121.894.136 | 52.829.529 |
| 2 | Total Production Value | 4.353.793 | 4.353.793 |
| Total Farmer's Income | | 117.540.342 | 48.475.736 |

Sources: Primary data processed in 2026; Note: CLA: Owned land area

Based on Table 9, farmers' income from NTFPs shows a significant difference between transaction value and production costs. This indicates that the utilization of NTFPs does not require high production costs but still generates income for farmers. Suleiman et al. (2017) stated that NTFPs contribute significantly to the household income of communities living around forest areas.

**Estimated Economic Value of Ntfps in the Area**

**a) Value of NTFPs**

The value of NTFPs reflects the economic value derived by forest farmers from each non-timber forest product they cultivate. Details of the value of NTFPs are presented in Table 10.

Table 10. Value of NTFPs

| Types of NTFPs | Number of Respondents | Average Product Value (IDR/CLA/Year) | Average Product Value (IDR/ha/year) |
|---|---|---|---|
| Avocado | 36 | 2.767.878 | 1.729.924 |
| Sugar Palm | 6 | 1.236.672 | 772.920 |
| Durian | 40 | 33.036.542 | 20.647.839 |
| Cocoa | 39 | 5.750.276 | 3.593.923 |
| Candlenut | 39 | 4.639.591 | 2.899.745 |
| Kepundung | 5 | 183.852 | 114.908 |
| Coffee | 36 | 22.664.620 | 14.165.388 |
| Mangosteen | 16 | 11.987.010 | 7.491.881 |
| Jackfruit | 23 | 136.136 | 85.085 |
| Banana | 42 | 1.974.415 | 1.234.010 |
| Rambutan | 25 | 4.287.574 | 2.679.734 |
| Taro | 5 | 318.415 | 199.010 |
| Total | | 88.982.985 | 55.614.366 |

Sources: Primary data processed in 2026

Table 10 shows that the value of NTFPs per hectare varies by commodity. Durian yields the highest value at Rp20,647,839/ha/year, followed by coffee at Rp14,165,388/ha/year and mangosteen at Rp7,491,881/ha/year. This indicates that these commodities possess greater potential to generate higher economic value than other commodities.

Cocoa, candlenuts, and rambutan also generate significant economic value, amounting to Rp3,593,923; Rp2,899,745; and Rp2,679,734 per hectare per year, respectively. Meanwhile, avocados and bananas have lower economic values despite being widely cultivated by farmers. This indicates that the number of farmers cultivating a particular crop does not always determine the economic value generated per hectare. Rather, it is influenced by crop productivity, selling price, and the commercial value of each commodity.

Kepundung, jackfruit, and taro are the commodities with the lowest product value because their utilization remains limited and they are not yet managed intensively. The differences in product value among commodities indicate that crop type, management practices, and land-use intensity influence the economic value of NTFPs generated by local communities.

**b) The Economic Value of the Area**

The economic value of the area is used to illustrate the overall economic potential of NTFPs in the Nuraksa National Park based on the value of products per hectare.

Table 11. Economic Value of the Area

| Total Average Product Value (IDR/ha/year) | Total Area (ha) | Economic Value of the Area (IDR/ha/year) |
|---|---|---|
| 55.614.366 | 1.381,80 | 76.847.930.726 |

Data Source: Primary data processed in 2026

The estimated economic value of NTFPs was calculated by multiplying the average total product value per hectare (IDR 55,614,366) by the total study area of 1,381.80 ha. The calculation showed that the estimated annual economic value of NTFPs in the Traditional and Utilization Blocks of Tahura Nuraksa was IDR 76,847,930,726/year. This value is greater than the findings reported by Winanto et al. (2025), who recorded total HHBK farmer income of Rp541,944,009/year from 31 respondents. The difference is influenced by the research approach applied, since this study estimates economic value at the area level based on average productivity per unit area.

The research findings indicate that the economic potential of NTFPs in the Tahura Nuraksa area is considerably higher than the income levels of individual farmers. This suggests that NTFPs not only serve as a source of household income but also hold significant economic value at the regional level. Information on regional economic valuation is crucial as a foundation for supporting sustainable forest management and informing policy decisions regarding the management of conservation areas. De Groot et al. (2012) stated that the economic valuation of forest resources plays an important role in measuring the economic benefits of ecosystems in supporting sustainable regional management.

The significant economic value of NTFPs also indicates that their utilization has the potential to serve as a form of land use that can support local economic activities without compromising the primary function of conservation areas. This situation demonstrates that NTFPs offer opportunities for development as part of area management based on conservation partnerships and sustainable use.

## CONCLUSION AND RECOMMENDATIONS

### Conclusion

The conclusions that can be drawn from this study include the following:

1. The transaction value of non-timber forest products received by forest farmers in the Tahura Nuraksa area reached Rp121,894,136 per household per year. Durian, coffee, and mangosteen were the commodities with the highest transaction values, supported by relatively high selling prices and market demand.
2. The estimated annual economic value of NTFPs in the Traditional and Utilization Blocks of Tahura Nuraksa was IDR 76,847,930,726. These findings demonstrate the substantial economic potential of NTFPs in the study area, with durian and coffee contributing the largest share of the total economic value.

### Recommendations

Based on this study, the following recommendations can be made:

1. The Nuraksa Tahura Office needs to develop a sustainable economic accounting system for NTFPs as a basis for more measurable area management.
2. The management of high-value commodities, such as durian and coffee, needs to be improved to support the development of the area's NTFPs economic potential.
3. Future research could examine the application of the circular economy concept in the utilization of NTFPs to support more efficient and sustainable management.

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