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Strategy and policy implementation for the transition to a green economy utilizing non-timber forest products in Papua province

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Abstract

The constraints of a sustainable green economy, which produces NTFPs, posed a risk to this study, notably the absence of appropriate procedures, legislation, and regulations to promote the sustainable use of NTFPs. Given these limitations, this research aims to develop a business plan for NTFPs that will enhance the economic value of local communities while expanding their marketing reach. The SWOT analysis and AHP techniques will be used during the strategy formulation process. The research findings show that the results of the SWOT Analysis matrix for the shift to green economic development using NTFPs are based on internal (S-W) values of +1.48 and external (O-T) values of +0.67. The developed techniques are classified as aggressive, which promotes the use of SO approaches. The key components of the SO approach are identified using the AHP analysis method. The AHP results indicate two factors from Strengths and three factors from Opportunities, resulting in a combination of six strategies, improving economic and social outcomes by raising public awareness of the importance of the green economy, market opportunities, and information related to NTFPs and the green economy, to enhance capacity and support for national and international markets. Strategic efforts are essential for FMU and FESB, grassroots institutions that manage.

Keywords: Green economy; NTFPs; SWOT; AHP analysis; Strategies

1. Introduction

Down streaming of non-timber forest products (NTFPs) is a significant priority in Papua Province's attempts to address environmental issues, particularly the substantial greenhouse gas emissions from the forestry and peatland sectors, which account for 95% [1]. Furthermore, the problem with Papua Province's poor Human Development Index, which ranks first at the national level, is related to inadequate welfare, education, and healthcare [2,3]. It is hoped that the downstream aspects of Non-Timber Forest Products (NTFPs) can address problems and that no one is left behind in the environmental, social, and economic fields, in the context of implementing the Sustainable Development Goals (SDGs) to build the resilience of Papua Province in the future [4,5,6].

Utilizing baseline data from seven (7) Forestry Management Units (FMU) and four (4) Forestry and Environmental Service Branches (FESB), the outstanding potential of Non-Timber Forest Products (NTFPs) is identified, specifically flour and snacks derived from sago, cocoa, coffee, honey, eucalyptus oil, ant nest tea, agarwood tea, betel nut coffee, charcoal briquettes, jeruju tea (mangrove leaves), tortilla chips, and ecoprint [7].

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Premium NTFP products are sold in sago-based beverages, which exhibit high sales performance, in addition to contributing to food security. The availability of raw materials in nature is also sufficient, especially in the southern region of Papua [8,9,10]. Nevertheless, there is an effort to cultivate sago on a larger scale for production. The most substantial potential for expansion is present in these products. The subsequent product category is coffee items, which are highly priced in Papua due to their unique aroma, characteristics, content, and flavor, particularly in the mountainous regions of Wamena and the Arfak Mountains [11,12,13]. Ecoprint products are the most exceptional premium NTFPs, with high pricing and sales, due to the attention of consumers who are interested in natural products. Ecoprint is also a popular product in numerous major cities in Indonesia, as it serves as a means of promoting the green economy [14, 15, 16, 17].

Numerous regional policies promoting the conservation of forest management and Non-Timber Tree Products (NTTPs) are incorporated into the documentation for the Long-Term and Short-Term Forest Management Plans at the FMU and FSEB in Papua Province [18]. At the local level, there exists Jayapura Regency Regent Regulation No. 5 of 2021 on the Advancement of a Communal-Based Green Economy in Jayapura Regency [19]. At the national level, there exists the Regulation of the Minister of Environment and Forestry Number 77 of 2019 regarding the Utilization of Non-Timber Forest Products in Production Forests and the Collection of Non-Timber Forest Products in State Forests, as well as the Regulation of the Minister of Forestry Number P35/Menhut-II/2007 of Non-Timber Forest Products.

The transition to a green economy, which has been incorporated into national development documents such as the National Medium-Term Development Plan (RPJMN) 2025-2029 and the National Long-Term Development Plan (RPJPN) 2025-2045, is being realized through the development of NTFPs products in Papua Province. Until 2045, the long-term projection is that the implementation of a green economy will stabilize average economic growth at 6.22%, reduce emissions by 86 million tons of CO2-equivalent, and generate up to 4.4 million jobs [20]. The implementation of this green economy is also appropriate for the conditions of Papua, where protected forests are still maintained at a level exceeding 80%. To achieve the Sustainable Development Goals in Papua, economic growth must be prioritized in conjunction with the empowerment of indigenous Papuans, as outlined in the 2018 Manokwari Declaration, while simultaneously enhancing social status and strengthening institutions [21].

The constraints of sustainable forest resource management that generate NTFPs pose a risk to this investigation. Environmental degradation, decreased resource quality, and hazards to specific species may result from the failure to implement sustainable management [22,23,24]. The market for NTFPs is frequently unstable and erratic due to market uncertainty. The livelihoods of local communities that rely on NFTPs can be impacted by price and demand variability. The economic value of NTFPs can be diminished by the absence of suitable processing and packaging facilities during processing and value addition. The financial advantages can be enhanced through the development of suitable downstream processing industries [25,26]. Empowering indigenous communities is a critical concern, as it improves the capacity and skills of these communities to manage NTFPs and increase their participation in the green economy [27,28]. Additionally, the strategies, policies, and regulations required to facilitate the sustainable use of NTFPs are equally critical [29, 30]. In light of these obstacles, the objective of this investigation is to create a business strategy for NTFPs that will enhance the economic value of local communities and broaden the scope of marketing coverage. SWOT analysis and AHP methodologies will be implemented during the strategy formulation process.

2. Material and methods

2.1. Study area

This research was carried out in seven (7) Forest Management Units (FMU): Jayapura City, Sarmi, Keerom, Memberamo Raya, Biak Numfor, Yapen, and Waropen, in conjunction with four (4) Forestry and Environmental Service Branches (FESB): Jayapura Regency, Sarmi, Keerom, and Memberamo Raya. The specified places are located in coordinates 0°38'04.91" S and 135°20'08.91" E, as well as 2°50'37.85" S and 140°40'42.45" E, with high places varying from 0 to 488 meters above sea level (Figure 1).

Papua's Gross Domestic Product (GDP) grew by 0.76 percent between Semester I-2023 and Semester I-2022. In terms of production, the Financial Services and Insurance business sector (Category K) saw the most significant increase of 12.16% [31]. As a result, non-green economy industries continue to dominate economic growth. Papua Province has a high number of impoverished and underprivileged individuals, as well as the lowest Human Development Index (HDI) value among all provinces at the national level [32]. Additionally, there is a lack of a growing downstream NTFPs industry to support income and community welfare. Some communities in Papua may face limited access to regional and global markets. This could be due to inadequate infrastructure, complex trade bureaucracy, or other barriers to NTFPs trade. Community education and the capacity for sustainable management and development of NTFPs companies

have gotten little attention. Better training and education can boost community capacity in this area. Non-supportive laws and regulations may hinder the sustainable use and downstream of NTFPs or impose limitations that conflict with local traditions.

Papua Province's FMU and FESB produce high-quality flour, sago snacks, cocoa powder, coffee powder, honey, eucalyptus oil, ant nest tea, agarwood tea, and ecoprint, among other things. The strengths, weaknesses, opportunities, and threats that lead the development efforts of NTFPs to still be inadequate are the focus of the strategic and policy activities that were produced as a result of this study.
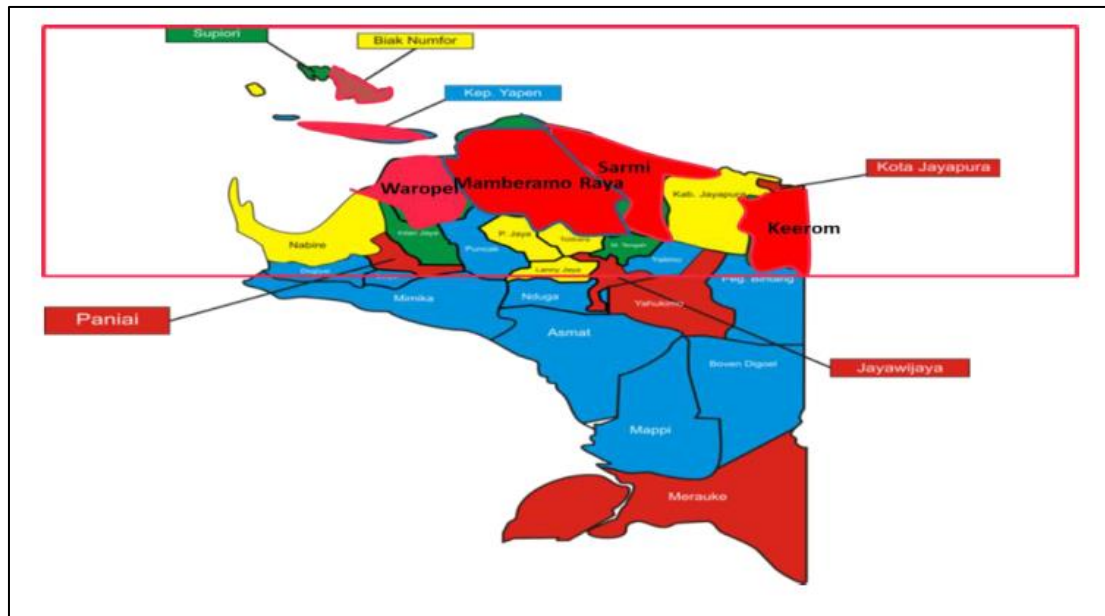

Note: (yellow represents FESB and red represents FMU)

Figure 1 Research site in FMU and FESB of Papua Province

2.2. Method of data analysis

2.2.1. Respondent

This study used a mixed-method approach, utilizing questionnaires and focus group discussions (FGDs) with 30 persons randomly selected local community respondents, plus 10 persons comprising village authorities (4 persons), community leaders (3 persons), and representatives from FMUs/FESBs (3 persons) across each of the 7 FMUs and 4 FESBs [33,34]. The total number of responses amounted to 440 persons engaged in the management of NTFPs in Papua Province.

2.2.2. Internal and External Factor Analysis

SWOT analysis refers to the systematic identification, evaluation, and appraisal of potentially beneficial internal and external factors, represented by the acronym for "strengths" (S), "weaknesses" (W), "opportunities" (O), and "threats" (T). The following actions are required to create the matrix of strengths, weaknesses, opportunities, and threats [35,36]:
- Identification of internal factors, encompassing notable strengths and weaknesses, together with the development of the internal factor assessment matrix (IFE). Internal factors, encompassing substantial opportunities and threats, are recognized, and an external factor evaluation matrix (EFE) is developed.
- Develop an internal-external matrix. The respondents' answers determine the weighting and are subsequently multiplied by the rating (1-4, significant weakness to significant strength) to provide a score for each internal and external factor.
- Development of strategic suggestions utilizing the SWOT (strengths, weaknesses, threats, opportunities) matrix.
- To identify the five optimal strategies and policies through weighted, ranking, and scoring methodologies through the AHP analysis

2.2.3. Analytical Hierarchy Process (AHP)

AHP employs pairwise comparisons to account for assessment factors and weight factors in multi-factor scenarios [37]. The AHP approach divides the consistency value into two sections: the consistency index (CI) and the consistency ratio (CR). The CI value is calculated by dividing the result by the reduced number of criteria and subtracting the number of criteria from the highest lambda. The formula for calculating the confidence interval (CI) is as follows:

$$CI = \frac{\lambda_{max} - 1}{n - 1} \dots\dots\dots\dots\dots\dots 1$$

The inconsistency limit defined is the Consistency Ratio (CR), determined by comparing the values of the Random Index (RI) and the Consistency Index (CI), as shown in Table 1 [38]. The order of the matrix n influences this number. Consequently, CR can be articulated as follows:

$$CR = \frac{CI}{RI} \dots\dots\dots\dots\dots\dots\dots 2$$

Table 1 RI values

N	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

3. Results and discussion

3.1. Internal Factor Analysis of NTFPs

The initial stage in creating the internal factor evaluation matrix involves prioritizing the strengths and weaknesses of the Transition Green Economy, utilizing NTFPs in Papua Province. A survey was administered to respondents and forestry planners to get their input. Internal elements were identified through a study and consultation with specialists to establish the influence or relevance. To ensure that each strength and weakness coefficient adds up to one, each attribute was assigned a numerical value between 0 and 1 [39,40]. This allows us to assess the magnitude of the influence of the internal components. Each identified internal factor is assigned a numerical value between 1 and 4, where 1 indicates a significant weakness, 2 indicates a moderate weakness, 3 indicates a mild strength, and 4 indicates a considerable strength [41]. The final result was multiplied by the allotted weights by their matching ratings. The outcome was determined by multiplying the designated weights by the corresponding ratings. The weights, ratings, and scores of the specified internal components are displayed in Table 2.

The 15 variables that comprise the internal elements of strengths are listed, and then 7 of those variables are selected based on the responses of both general and essential respondents. Similarly, the remaining seven factors are used for further study, while the remaining fifteen variables are used to identify weaknesses.

Tabel 2 Internal factors for the development stage of NTFPs

No	Strengths	Weight	Ranking	Score
1	Potential of NTFPs as a green economy	0.09	4	0.36
2	NTFPs products from several FMUs and FESBs in the Gallery Shop	0.13	4	0.52
3	Sustainable forests and prosperous local communities	0.06	3	0.18
4	Green economic growth	0.08	4	0.32
5	Conservation of forests and ecosystems	0.10	3	0.30
6	Improving economic and social performance	0.07	3	0.21
7	FMUs and FESBs as grassroots-level institutions that manage the green economy	0.07	4	0.28
	Sub Total	0.60		2.17
No	Weaknesses	Weight	Ranking	Score

1	Regional and geographical variations (regional disparities)	0.07	2	0.14
2	Not included in Low Carbon Development Planning	0.05	1	0.05
3	National and international markets are still limited	0.06	2	0.12
4	Supporting materials are still obtained from Java	0.05	2	0.10
5	There is no advertising & promotion yet	0.06	1	0.06
6	Weak coordination between parties	0.05	2	0.10
7	Lack NTFPs industry in Papua Province	0.06	2	0.12
	Sub Total	0.40		0.69
	Total	1.00		2.86

Source: Primary data (2023

3.2. External Factor Analysis of NTFPs

The second phase of the SWOT analysis involves identifying opportunities and threats. Table 3 indicates that Papua Province is advancing green economy infrastructure through the aggregation of expert opinions. Upon discovery, both external and internal components undergo an identical evaluation process to determine their relevance and establish their relative ranking. Within the Sustainable Green Economy Framework domain, scores of 1, 2, 3, and 4 signify fundamental and conventional levels of comprehension [42]. Table 3 presents the weights, rankings, and final ratings for the most critical opportunities and hazards.

Of 15 variables, 8 were identified as external determinants for opportunities that are significant to respondents. While 10 variables have been selected to address the impact of forest and environmental devastation on climate change and disasters, out of 15 variables, they represent a threat.

Table 3 External factors for the development stage of NTFPs

No	Opportunities	Weight	Ranking	Score
1	Climate resilience and a hospitable environment for communities	0.06	4	0.24
2	NTFP preliminary costs	0.06	3	0.18
3	Increasing community awareness of the significance of the green economy	0.05	4	0.20
4	Opportunities in the market	0.06	3	0.18
5	Information concerning the green economy and NTFPs	0.05	3	0.15
6	Paradigm of the green economy	0.06	4	0.24
7	Optimization of NTFP products	0.05	4	0.20
8	Increasing community involvement	0.06	3	0.18
	Sub Total	0.45		1.57
No	Threats	Weight	Ranking	Score
1	Catastrophic hydrometeorological events	0.06	2	0.12
2	The Disaster Risk Index experiences a substantial increase.	0.06	2	0.12
3	Sectoral ego	0.06	2	0.12
4	Challenges associated with climate change	0.05	1	0.05
5	We are still concentrating on timber forest products.	0.06	1	0.06
6	Provinces and districts are experiencing an increase in economic growth.	0.04	1	0.04
7	Enhancing the accessibility of community infrastructure and facilities	0.05	1	0.05

8	Community involvement is exclusively restricted to the planning phase.	0.05	2	0.10
9	The financing for the green economy is not well-organized.	0.06	2	0.12
10	Institutions associated with the green economy are presently unavailable.	0.06	2	0.12
	Sub Total	0.55		0.90
	Total	1.00		2.47

Source: Primary data (2023)

The outcomes of the SWOT Analysis matrix concerning the transition to green economic development utilizing NTFPs, based on internal (S-W) and external (O-T) factors, are illustrated in Figure 2. The derived strategies are categorized in Quadrant 1, which endorses the integration of SO (Strengths and Opportunities) methods. Influential variables are identified for the SO strategy through the AHP analysis method.
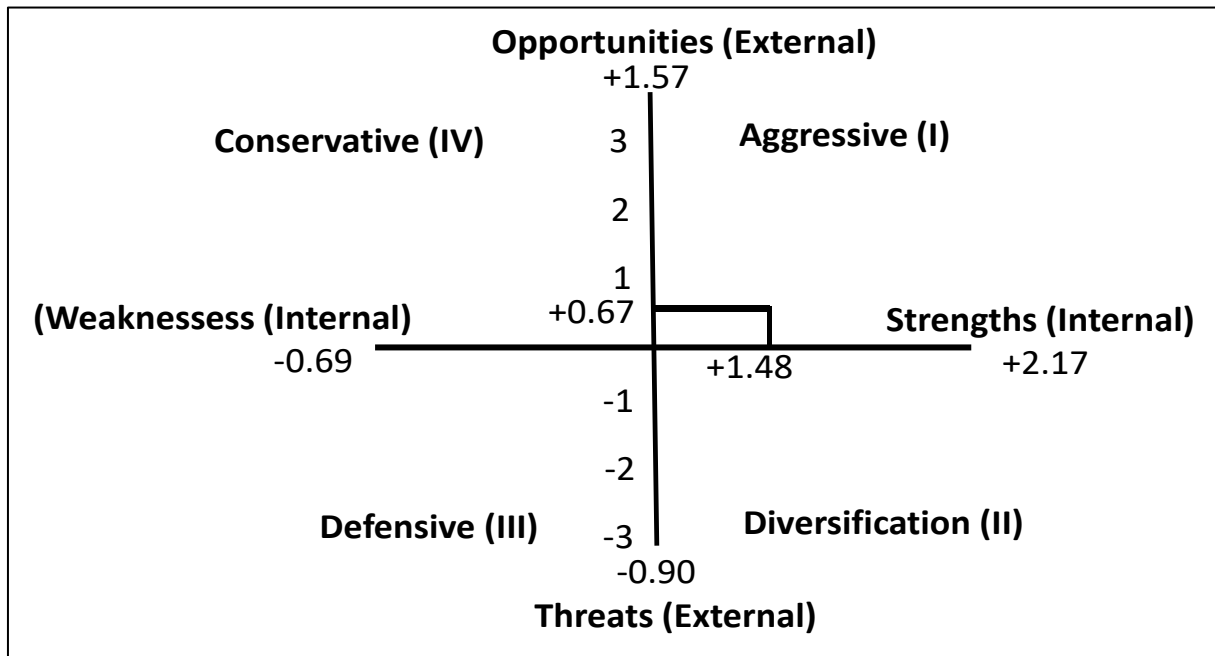

Figure 2 Matrix of SWOT analysis

3.3. AHP Analysis of NTFPs

The SWOT matrix utilizes the Analytical Hierarchy Process (AHP). Initially, pairwise evaluations of the SWOT categories were conducted using a 1-9 comparison scale [43]. The comparison findings are presented in Table 4. The elements of the SWOT matrices are contrasted within each respective SWOT category. A team of forestry specialists conducts all pairwise comparisons within the application. An expert team was formed from the 7 FMUs and 4 FESBs of the Forestry and Environmental Agency in Papua Province. The comparison of the SWOT analysis matrix indicates that Strengths and Opportunities are prioritized for further examination using AHP, as shown in Tables 5 and 6.

Table 4 Comparisons matrix of SWOT groups

SWOT Groups	S	W	O	T	Importance Degrees of SWOT groups
S	1	3	1	3	0.35
W	0.33	1	0.50	2	0.16
O	1	4	1	2	0.35
T	0.33	0.70	0.80	1	0.14
CR = 0.23					

Table 5 Comparison matrix of strengths groups

Strengths	S1	S2	S3	S4	S5	S6	S7	Importance Degrees
Potential of NTFPs as a green economy (S1)	1	0.33	0.20	0.50	0.50	0.20	0.14	0.03
NTFPs products from several FMUs and FESBs in the Gallery Shop (S2)	3	1	0.17	0.20	0.25	0.60	0.43	0.06
Sustainable forests and prosperous local communities (S3)	5	6	1	3	1.50	0.80	0.71	0.17
Green economic growth (S4)	2	5	0.40	1	1.25	0.40	0.29	0.09
Conservation of forests and ecosystems (S5)	2	4	0.67	4	1	0.40	0.29	0.11
Improving economic and social performance (S6)	5	6	0.80	5	4	1	0.71	0.21
FMUs and FESBs as grassroots-level institutions that manage the green economy (S7)	7	6	0.80	7	5	4	1	0.32
CR= 0.30								

Table 6 Comparison matrix of opportunities groups

Opportunities	O1	O2	O3	O4	O5	O6	O7	O8	O9	O10	Importance Degrees
Climate resilience and a hospitable environment for communities (O1)	1	3	0.2	0.14	0.5	0.25	0.11	0.2	0.2	0.25	0.02
NTFP preliminary costs (O2)	0.33	1	0.04	0.05	0.17	0.08	0.04	0.07	0.67	0.08	0.01
Increasing community awareness of the significance of the green economy (O3)	5	6	1	5	4	4	7	6	4	5	0.18
Opportunities in the market (O4)	7	8	5	1	7	5	4	4	5	3	0.18
Information concerning the green economy and NTFPs (O5)	2	4	4	3	1	7	5	6	6	5	0.17
Paradigm of the green economy (O6)	4	4	4	3	2	1	3	5	6	6	0.15
Optimization of NTFP products (O7)	9	8	1.8	1.29	4.5	2.25	1	3	3	4	0.12
Increasing community involvement (O8)	5	6	1.2	0.71	2.5	1.25	0.56	1	1.2	1.25	0.06
Climate resilience and a hospitable environment for communities (O9)	5	6	1.2	0.71	2.5	1.25	0.56	0.8	1	1.25	0.06
NTFP preliminary costs (O10)	4	4	0.8	0.57	2	0.8	0.44	0.8	0.8	1	0.05
CR= 0.15											

3.4. Priority Strategy NTFPs Business Development

The SO technique provides a proactive approach to advancing the Sustainable Green Economy Framework system in Papua Province by utilizing the NTFPs. Consequently, the primary goal of this aggressive strategy is to capitalize on existing strengths and opportunities to fortify the capacity of the green economy, markets, and infrastructure. An aggressive approach is established in Figure 2. It is further developed in Table 7 through the AHP analysis, which is derived from the convergence of the strengths and threats of the green economy system in Papua Province.

Six SO tactics are generated by combining two strength variables with three opportunity variables, as identified by economic, environmental, and social administrators and planners. Numerous studies conducted in Indonesia and internationally, including those in India and Brazil, have demonstrated that this SO tactic is widely employed in industry-based local community development, particularly in agroforestry and social forestry contexts [44,45,46,47].

Enhancing economic and social performance by increasing public awareness of the significance of the green economy, market opportunities, and information related to NTFPs and the green economy, particularly funding for the development of small and medium-scale industries in local communities and international funding, to increase the capacity and support for national and international markets [48,49,50,51]. Strategic initiatives are also required for FMU and FESB, grassroots institutions that oversee the NTFPs-based green economy, to advance and develop. This is achieved through the support of parties for their products [52, 53, 54].

Tabel 7 Priority scores of SO strategies

SWOT Groups	Group Priority	SWOT Factors	Factor Priority	Overall Priority
Strength	0.35	Potential of NTFPs as a green economy (S1)	0.03	0.01
		NTFPs products from several FMUs and FESBs in the Gallery Shop (S2)	0.06	0.02
		Sustainable forests and prosperous local communities (S3)	0.17	0.06
		Green economic growth (S4)	0.09	0.03
		Conservation of forests and ecosystems (S5)	0.11	0.04
		Improving economic and social performance (S6)	**0.21**	**0.07**
		FMUs and FESBs as grassroots-level institutions that manage the green economy (S7)	**0.32**	**0.11**
Opprtunities	0.35	Climate resilience and a hospitable environment for communities (O1)	0.02	0.007
		NTFP preliminary costs (O2)	0.01	0.004
		Increasing community awareness of the significance of the green economy (O3)	**0.18**	**0.06**
		Opportunities in the market (O4)	**0.18**	**0.06**
		Information concerning the green economy and NTFPs (O5)	**0.17**	**0.06**
		Paradigm of the green economy (O6)	0.15	0.05
		Optimization of NTFP products (O7)	0.12	0.04
		Increasing community involvement (O8)	0.06	0.02
		Climate resilience and a hospitable environment for communities (O9)	0.06	0.02
		NTFP preliminary costs (O10)	0.05	0.02

Strategy:
Enhancing economic and social outcomes by elevating community understanding regarding the importance of the green economy (SO1)
Economic and social performance enhancement through market opportunities (SO2)
Improving economic and social performance with knowledge on the green economy and NTFPs (SO3)
FMUs and FESBs are grassroots institutions that administer the green economy and raise community understanding of its relevance (SO4)
Community-based green economy and market opportunity providers include FMUs and FESBs (SO5)
Green economy information concerning NTFPs is gathered by FMUs and FESBs, which are grassroots-level institutions that oversee the green economy (SO6)

4. Conclusion

The internal elements of strengths consist of 15 variables, and 7 of these variables are selected based on the responses of both general and essential respondents. Similarly, the remaining 7 factors are used for further investigation, while the remaining 15 variables are used to identify weaknesses. 8 variables were identified as external determinants for opportunities that were significant to respondents, out of a total of 15 variables. Although 10 variables have been chosen to investigate the influence of forests and environmental degradation on climate change and disasters, they pose a threat out of 15 variables.

The SWOT analysis matrix comparison indicates that Strengths and Opportunities are highlighted for further research with AHP. The comparative analysis using AHAP provided important degree values for each SWOT component as follows: 0.35, 0.16, 0.35, and 0.14. Additionally, in collaboration with a team of forestry professionals from 7 FMUs and 4 FESBs of the Forestry and Environment Service in Papua Province, comprehensive pairwise comparisons were conducted about parameters associated with SO.

The SWOT and AHP analyses generated six prioritized strategies derived from an aggressive (SO) strategic development approach. Improving economic and social outcomes by raising public awareness of the importance of the green economy, market opportunities, and information related to NTFPs and the green economy, especially funding for the development of small and medium-sized enterprises in local communities and international financing, to enhance capacity and support for national and global markets. Strategic efforts are essential for FMUs and FESBs, grassroots institutions managing the NTFPs-based green economy, to progress and improve. This is accomplished by the endorsement of parties for their products.

Compliance with ethical standards

Disclosure of conflict of interest

There is no conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1]   Regional Development Planning Agency of Papua Province. (2023). Low Carbon Development Plan of Papua Province. Jayapura, 240 pp..

[2]   Dalimunthe, A. A., Fitrianto, A., Sartono, B., & Oktarina, S. D. (2022). Regency Clusterization Based on Village Characteristics to Increase the Human Development Index (IPM) in Papua Province. Jurnal Ekonomi Pembangunan, 20(02), 153-168.

[3]   Afalia, W., Hamda, I., Adriana, S. A., Alamsyah, A. F., & Wafiroh, N. L. (2023). Determinants Of Human Development Index In Papua Province 2012-2021. Wiga: Jurnal Penelitian Ilmu Ekonomi, 13(2), 246-256.

[4]   Lawlor, K., Sills, E., Atmadja, S., Lin, L., & Songwathana, K. (2019). SDG 1: No poverty–impacts of social protection, tenure security and building resilience on forests. Sustainable development goals: their impacts on forests and people, 17-47.

[5]   Pullanikkatil, D., & Shackleton, C. M. (2019). Poverty reduction through non-timber forest products. Sustainable Development Goals Series. Berlin: Springer Nature.

[6]   Gregersen, H., El-Lakany, H., & Frechette, A. (2020). Forests, Forest People, and Un 2030 Agenda's Ethical Mandate:"leave No One behind. Washington, DC: Rights and Resources Initiative, 10.

[7]   Forestry and Environmental Agency of Papua Province. (2023). Study of Potential of Non-Timber Forest Products in Papua Province. Jayapura, 225 pp.

[8]   Rasyid, T. H., Kusumawaty, Y., & Hadi, S. (2020). The utilization of sago waste: prospect and challenges. In IOP conference series: earth and environmental science (Vol. 415, No. 1, p. 012023). IOP Publishing.

[9]   Sundari, S., Ibo, L. K., Rahajoe, J. S., Alhamd, L., Gunawan, H., & Priyono, N. C. (2020, September). Biodiversity study of several peatland types in Papua. In IOP Conference Series: Earth and Environmental Science (Vol. 572, No. 1, p. 012002). IOP Publishing.

[10]   Abdulgani, F., Zulfikar, M., & Nurdin, B. V. (2021, December). Food Insecurity and Agribusiness Expansion in Papua, Indonesia. In 2nd International Indonesia Conference on Interdisciplinary Studies (IICIS 2021) (pp. 213-219). Atlantis Press.

[11]   Adi, T. B., & Meriana, R. (2019). Analysis of Factors that Affect the Purchase Decision of Wamena Arabica Coffee. Honai, 2(1), 59-70.

[12]   Suparno, S., Nugroho, R. A., & Damanik, R. (2023). Market value and sensory attributes of Papua highland coffee: A comparative study. Indonesian Journal of Agricultural Economics, 28(1), 33–48.

[13]   Adnan, A., Nuraini, L., Trisnawati, W., & Rubiyo, R. (2024, February). Exploration of characteristics and cup quality of Arabica coffee in Papua. In AIP Conference Proceedings (Vol. 2957, No. 1). AIP Publishing.

[14]   Rahayu, M., Kuncari, E. S., Rustiami, H., & Susan, D. (2020). Utilization of plants as dyes and natural color binder in traditional pringgasela woven fabric, East Lombok, West Nusa Tenggara, Indonesia. Biodiversitas Journal of Biological Diversity, 21(2).

[15]   Tresnawati, R., Dewi, A. R., & Lestari, N. D. (2020). Market perception and sustainability values in Indonesian ecoprint textile production. Indonesian Journal of Creative Industries, 12(2), 102–115.

[16]   Pringgenies, D., Ridlo, A., Dewi, L. F., & Djunaedi, A. (2021). The commercial value of mangrove-based pigments as natural dye for batik textiles.

[17]   Fatubun, A., Susanti, C. M. E., Sinaga, N. I., Wanma, J. F., & Lea, M. M. (2023, June). Natural dyes used by the byak tribe and its prospects as raw materials for the natural dyes industry. In IOP Conference Series: Earth and Environmental Science (Vol. 1192, No. 1, p. 012023). IOP Publishing.

[18]   Forestry and Environmental Agency of Papua Province. (2024). Long Term and Short Term Forest Management Plan in Forest Management Unit. Jayapura.

[19]   Government of Jayapura Regency. (2021). Regent Regulation Of Jayapura Regency Number 5 Of 2021 Regarding The Development Of A Communal-Based Green Economy In Jayapura Regency. Jayapura, 10 pp.

[20]   Government of Republic Indonesia. (2024). Government Encourages Implementation of Green Economy to Stabilize Long-Term Economic Growth. Jakarta, Press Release.

[21]   Government of Papua and West Papua Province. (2018). Manokwari Declaration: Sustainable Development Based On Customary Territories In Papua Land. Manokwari, 4 pp.

[22] Schmidt, L., Widianingsih, N. N., Kaad, A. P., & Theilade, I. (2020). The impact of deforestation on collection and domestication of Jernang (Daemonorops spp.) and other NTFPs in southern Sumatra, Indonesia. NJAS-Wageningen Journal of Life Sciences, 92, 100325.

[23] Pasaribu, G., Winarni, I., Gusti, R. E. P., Maharani, R., Fernandes, A., Harianja, A. H., Saragih, G.S., Turjaman, M., Tampubolon, A.P., Kuspradini, H., Lukmandaru, G. & Kholibrina, C. R. (2021). Current challenges and prospects of Indonesian non-timber forest products (NTFPs): A review. Forests, 12(12), 1743.

[24] Delgado, T. S., McCall, M. K., & López-Binnqüist, C. (2023). Non-timber forest products: small matters, big significance, and the complexity of reaching a workable definition for sustainability. Small-scale Forestry, 22(1), 37-68.

[25] Makkarennu, Mahbub, A. S., & Ridwan. (2021). An Integration of Business Model Canvas on Prioritizing Strategy: Case Study of Small Scale Nontimber Forest Product (NTFP) Enterprises in Indonesia. Small-scale Forestry, 20, 161-174.

[26] Shrivastava, N. (2024). Problems and Possibilities of Non-Timber Forest Products in Tribal's.

[27] Harbi, J., Cao, Y., Milantara, N., & Mustafa, A. B. (2023). Assessing the Sustainability of NTFP-Based Community Enterprises: A Viable Business Model for Indonesian Rural Forested Areas. Forests, 14(6), 1251.

[28] Setiawan, M. R., Nurrochmat, D. R., & Purwawangsa, H. (2024). Strengthening village forest management strategies in East Kolaka, Southeast Sulawesi, Indonesia. Biodiversitas Journal of Biological Diversity, 25(7).

[29] Sabastian, G. E., Yumn, A., Roshetko, J. M., Manalu, P., Martini, E., & Perdana, A. (2019). Adoption of silvicultural practices in smallholder timber and NTFPs production systems in Indonesia. Agroforestry systems, 93, 607-620.

[30] Safitri, Y., & Sundawati, L. (2024). Development Strategy of Non-Timber Forest Product Multi-Business Forestry In Social Forestry Partnership. Journal of Natural Resources & Environment Management/Jurnal Pengelolaan Sumberdaya Alam dan Lingkungan, 14(2)..

[31] Statistic Agency of Papua Province. (2023).Papua's Gross Domestic Product (GDP). Jayapura, 62 pp.

[32] Afalia, W., Hamda, I., Adriana, S. A., Alamsyah, A. F., & Wafiroh, N. L. (2023). Determinants Of Human Development Index In Papua Province 2012-2021. Wiga: Jurnal Penelitian Ilmu Ekonomi, 13(2), 246-256.

[33] Mele, V., & Belardinelli, P. (2019). Mixed methods in public administration research: Selecting, sequencing, and connecting. Journal of Public Administration Research and Theory, 29(2), 334-347.

[34] Ferreira, R. M., Martins, P. N., Pimenta, N., & Gonçalves, R. S. (2022). Measuring evidence-based practice in physical therapy: a mix-methods study. *PeerJ*, *10*, e12666.

[35] Bento, D. F., Gomes, E. S., Guedes, V. M., & Coelho, E. (2020). SWOT Matrix (Strengths, Weaknesses, Opportunities and Threats) of a cooperative focused on logging and non-timber management in the Amazon. Revista Brasileira de Ciências da Amazônia/Brazilian Journal of Science of the Amazon, 9(2), 11-18.

[36] Sribudiani, E., Daulay, M. H., Andriani, Y., Suhada, N., Pebriandi, P., & Fahrorrozi, M. I. (2024). Potential development of non-timber forest products in the Sapat Village Forest Indragiri Hilir Regency. In BIO Web of Conferences (Vol. 99, p. 03001). EDP Sciences.

[37] Dos Santos, M., de Araújo Costa, I. P., & Gomes, C. F. S. (2021). Multicriteria decision-making in the selection of warships: a new approach to the AHP method. *International Journal of the Analytic Hierarchy Process*, *13*(1).

[38] Siekelova, A., Podhorska, I., & Imppola, J. J. (2021). Analytic hierarchy process in multiple–criteria decision–making: a model example. In SHS web of conferences (Vol. 90, p. 01019). EDP Sciences.

[39] Nabi Bidhendi, G., Daryabeigi Zand, A., Vaezi Heir, A., & Nabi Bidhendi, A. (2020). Prioritizing of strategies for the ecological design of urban waste transfer stations using SWOT analysis. Journal of Environmental Science Studies, 5(2), 2665-2672.

[40] Mareta, Z., Kudziyah, K., & Wartini, S. (2024). Vannamei Shrimp Cultivation Business Development Strategy at CV. Karya Milenial Lautan Indonesia. Mandalika Journal of Business and Management Studies, 2(1), 37-41.

[41] Amirshenava, S., & Osanloo, M. (2022). Strategic planning of post-mining land uses: A semi-quantitative approach based on the SWOT analysis and IE matrix. Resources Policy, 76, 102585.

[42] Phadermrod, B., Crowder, R. M., & Wills, G. B. (2019). Importance-performance analysis based SWOT analysis. International journal of information management, 44, 194-203.

[43] Saaty, T .L. (1980), The Analytic Hierarchy Process, McGraw-Hill, New York.

[44] Adhikary, P. P., Shit, P. K., & Bhunia, G. S. (2021). NTFPs for socioeconomic security of rural households along the forest ecotone of Paschim Medinipur forest division, India. In Forest resources resilience and conflicts (pp. 239-246). Elsevier.

[45] de Mello, F. A. A., Souza, H. N., & Rodrigues, A. (2023). Social forestry and livelihood security: Insights from Amazonian community enterprises. *Forest Policy and Economics, 149*, 102961. https://doi.org/10.1016/j.forpol.2023.102961.

[46] Lestari, S., & Winarno, B. (2023). Understanding indigenous knowledge in sustainable management of NTFPs agroforestry in Indonesia: a case of Southern Sumatra. In IOP Conference Series: Earth and Environmental Science (Vol. 1133, No. 1, p. 012063). IOP Publishing.

[47] Safitri, Y., & Sundawati, L. (2024). Development Strategy of Non-Timber Forest Product Multi-Business Forestry In Social Forestry Partnership. Journal of Natural Resources & Environment Management/Jurnal Pengelolaan Sumberdaya Alam dan Lingkungan, 14(2).

[48] Meinhold, K., & Darr, D. (2019). The processing of non-timber forest products through small and medium enterprises—a review of enabling and constraining factors. Forests, 10(11), 1026.

[49] Singh, S., Chaudhary, N., & Bhatia, A. K. (2020). Role of non-timber forest products in rural economy of farmers. International Journal of Economic Plants, 7(Nov, 4), 165-169.

[50] Talukdar, N. R., Choudhury, P., Barbhuiya, R. A., & Singh, B. (2021). Importance of non-timber forest products (NTFPs) in rural livelihood: A study in Patharia Hills Reserve Forest, northeast India. Trees, Forests and People, 3, 100042.

[51] Frey, G. E., Chamberlain, J. L., & Jacobson, M. G. (2023). Producers, production, marketing, and sales of non-timber forest products in the United States: a review and synthesis. Agroforestry Systems, 97(3), 355-368.

[52] Ilham, Q. P., Purnomo, H., & Nugroho, T. (2019, May). Model of multi-stakeholder forest management: A system study of Protected Forest Management Unit in Solok, Indonesia. In IOP Conference Series: Earth and Environmental Science (Vol. 285, No. 1, p. 012009). IOP Publishing.

[53] Wulandari, C., Syahiib, A. N., Astuti, P. T., Bakri, S., & Kaskoyo, H. (2023). Similarity paper berjudul The importance of development planning for the utilization of non-timber forest products in supporting the sustainability of protected forest area: A case study of pesawaran Forest Management Units (FMU), Lampung province, Indonesia.

[54] AjebeNnoko, H., Juscar, N., & Brown, S. T. (2024). Scaling-up Community Participatory Mapping and Land Use Planning to reinforce customary land governance for multi-stakeholder engagement on sustainable investments and trade on land in Southwest Cameroon. Communities and integrated natural resource management. African Journal of Land Policy and Geospatial Sciences, 7(1), 125-147.