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Non-timber forest products and ecotourism: A bibliometric review of Scopus-indexed literature (1994–2025)



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Abstract: This bibliometric review examines how tourism links non-timber forest products (NTFPs) to livelihood and conservation outcomes in an emerging and dispersed research domain. Using a Scopus-indexed corpus of 58 English-language documents published between 1994 and 2025, the study applies Biblioshiny and VOSviewer to map publication patterns, keyword structures, and thematic linkages. The findings show that the literature is dispersed across multiple outlets and has grown more visibly since the mid-2010s. Keyword patterns centre on ecotourism, NTFPs, tourism, and ecosystem services. The synthesis identifies three mechanism-based pathways: portfolio shifts, product-market conversion, and valuation or bundling. Governance acts as a crosscutting filter through tenure clarity, enforcement legitimacy, and benefit-sharing rules. Practically, forest enterprises and NTFP cooperatives should strengthen product upgrading, quality control, traceability, and fair benefit-sharing. Policymakers and protected area managers should align tourism promotion with harvest rules, tenure clarity, and monitoring systems to avoid intensified resource pressure.

Keywords: non-timber forest products, ecotourism, governance, value chain, ecosystem services.

1. Introduction

Non-timber forest products (NTFPs) support income and daily needs in many forest settings. Ecotourism also shapes local livelihoods near protected areas and community forests. The interaction matters when households mix forest use and tourism work. Studies describe these links across protected areas and tourism parks (Zinda et al. 2014; Meilani et al. 2019).

This topic also matters for forest enterprises and policymakers because NTFPs are not only subsistence resources. When linked to tourism, NTFPs can

be transformed into visitor-facing products, local experiences, food items, crafts, and ecosystem-service narratives (Bachi and Carvalho-Ribeiro 2023; Cloutier et al. 2025; Lukman et al. 2025; Rovira et al. 2022). This creates opportunities for value addition, livelihood diversification, and rural enterprise development. However, tourism demand can also increase extraction pressure when harvest rules, quality control, traceability, and benefit-sharing arrangements are weak (Sierra-Huelsz and Kainer 2018; Zinda et al. 2014). For business and policy, the central issue is therefore not whether tourism and NTFPs are connected, but under what governance and market conditions this connection becomes viable, equitable, and sustainable.

Tourism can change what people harvest and how they sell it. Some studies frame NTFPs as visitor-facing products such as mushrooms and mangrove foods (Cloutier et al. 2025; Lukman et al. 2025). Other work shows that tourism demand can increase plant extraction through supply chains (Sierra-Huelsz and

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Kainer 2018). These mixed signals keep livelihoods and resource stocks in the same debate.

For business and policy, this creates a practical question: under what conditions does tourism improve local enterprise opportunities without intensifying unsustainable extraction? The existing literature remains difficult to use for decision-making because it is dispersed across forestry, tourism, conservation, ecosystem services, and rural development outlets. Some papers focus on community enterprises, product development, and marketing claims, while others examine rules, participation, benefit sharing, and conflict in protected area management (Archabald and Naughton-Treves 2001; Bachi and Carvalho-Ribeiro 2023; Etongo et al. 2023; Morgan et al. 2022; Rovira et al. 2022).

The field is also conceptually fragmented. Studies on NTFP value creation and tourism products often remain separate from studies on governance, sustainability outcomes, and benefit distribution, although forest enterprises and local communities must address market feasibility and governance constraints simultaneously. This fragmentation limits the ability of managers, enterprises, and policymakers to identify when tourism-linked NTFP systems become viable, equitable, and sustainable.

A common response is to add more case studies and planning tools. Some work maps market nodes and proposes where to expand community-based tourism-linked markets (Bachi and Carvalho-Ribeiro 2023; Bachi and Ribeiro 2022). Some work proposes institutional designs for benefit sharing around ecosystem services bundles (Morgan et al. 2022). These contributions help, but they do not settle mechanism questions.

Several studies suggest mechanisms but remain partial. Value chain work highlights costs, buyer dependence, and product chain fragility (Araujo-Santos et al. 2025). Tourism product studies discuss how microenterprises package experiences and position offerings (Cloutier et al. 2025). These studies still leave unclear when tourism substitutes extraction and when it stimulates extraction.

Governance studies point to candidate levers. Revenue sharing and protected area relations link rules with perceived fairness and local support (Archabald and Naughton-Treves 2001; Chapman et al. 2015). Community forestry work links tenure and

participation with incentives for long-term management (Nurrochmat et al. 2019). Valuation studies add accounting logic, but distribution outcomes can remain uneven (Dias et al. 2016; Difabachew et al. 2025).

A close reading shows three recurring lines of explanation. One line centers on livelihood portfolios and substitution or complementarity (Zinda et al. 2014; Li et al. 2021). One line centers on product market conversion and capability limits (Rovira et al. 2022; Sierra-Huelsz and Kainer 2018). One line centers on valuation, certification, and bundled benefits (Jaung et al. 2016; Morgan et al. 2022). The missing step is an integrated account that connects these lines.

This study aims to clarify how tourism links non-timber forest products to livelihood, enterprise, and conservation outcomes. It develops an integrated understanding of the mechanisms through which tourism may support livelihood diversification, convert forest products into visitor-facing value, or embed NTFPs within broader ecosystem-service and benefit-sharing arrangements. Rather than treating the NTFP-tourism relationship as a simple livelihood or conservation issue, the study positions it as a governance-sensitive forest-business system shaped by market capability, access rights, sustainability rules, and benefit distribution (Morgan et al. 2022; Sierra-Huelsz and Kainer 2018; Zinda et al. 2014).

The study contributes to the literature in three ways. First, it consolidates an emerging and dispersed research domain at the intersection of NTFPs, ecotourism, forest enterprise, and ecosystem-service governance. Second, it develops a mechanism-based framework that links three pathways: portfolio shifts, product-market conversion, and valuation or bundling, under a crosscutting governance filter. Third, it translates this framework into implications for forest enterprises, NTFP cooperatives, protected area managers, and policymakers by explaining when tourism-linked NTFP systems become viable, equitable, and sustainable, and when they risk increasing resource pressure or unequal benefit capture.

2. Methodology

2.1 Review design

This study adopts a bibliometric review design to examine the Scopus-indexed research stream connecting non-timber forest products and tourism (Marzi et al. 2025). The review combines bibliometric mapping

with document-level thematic interpretation. It is not positioned as a systematic literature review across multiple databases. Instead, systematic screening was used only to ensure that all records in the Scopus corpus met the predefined topic boundaries. This design fits an emerging and dispersed research domain because it supports profiling, mapping, and conceptual synthesis within a clearly bounded bibliographic corpus. To improve reproducibility, the review procedure was predefined and documented.

2.2 Search strategy and dataset construction

We built the keyword set on 3 January 2026 after an initial topic check (Marzi et al. 2025). We ran a broad

NTFP query and retrieved 4,333 records. We then added a tourism block and obtained 58 records. The final search used two blocks joined with AND. The NTFP block was (“non-timber forest product*” OR NTFP* OR NWFP* OR “non-wood forest product*”). The tourism block was (ecotourism OR “community-based tourism” OR CBT OR “nature-based tourism” OR “forest tourism”). We ran the combined query in Scopus on 29 January 2026. We limited results to English documents published from 1994 to 2025, and we summarized selection steps in Figure 1.

Scopus was used as the single bibliographic source for pragmatic and resource-based reasons. At the

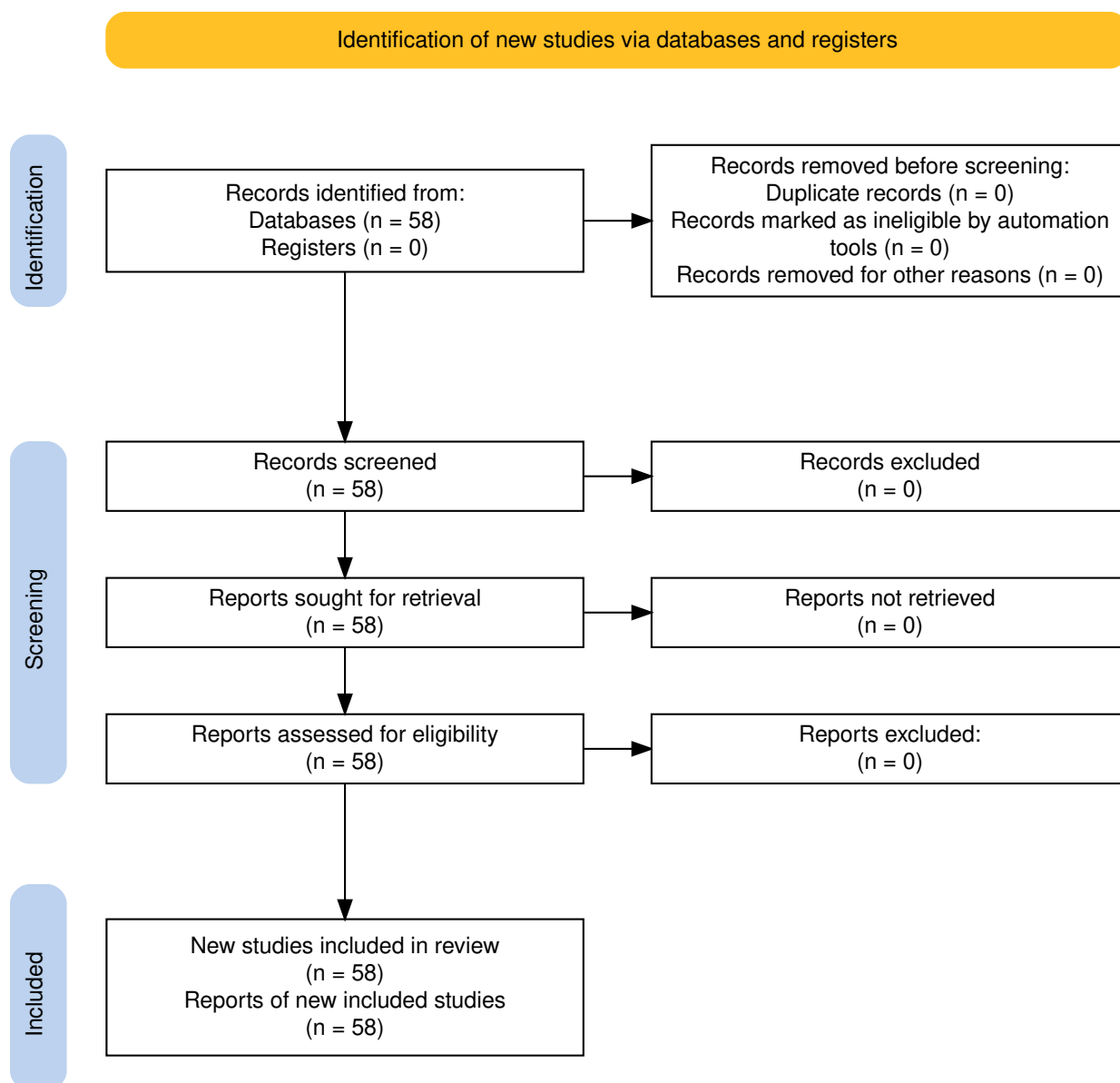


Figure 1. PRISMA flow diagram.

time of the review, the research team had stable institutional access to Scopus and could export complete bibliographic metadata required for Biblioshiny and VOSviewer analysis. The use of Scopus should therefore be understood as a matter of institutional access, reproducibility, and corpus consistency, rather than as a methodological preference over Web of Science. Web of Science is also a well-established database for bibliometric research, and this study does not claim that Scopus is superior to Web of Science.

Following this boundary, the article is framed as a bibliometric review of Scopus-indexed literature. The findings therefore represent the structure, themes, and patterns of the Scopus-indexed research stream on non-timber forest products and tourism, rather than the complete universe of global evidence. This database boundary is acknowledged as a limitation, particularly because relevant studies indexed in Web of Science, regional databases, or non-English outlets may not be captured.

2.3 Screening and eligibility

We screened records using topic boundaries defined in advance (Marzi et al. 2025). We included studies that link NTFPs with tourism activities or tourism value creation. We excluded timber-focused studies and studies without a tourism link. We retained records with clear topic signals in the title, abstract, or keywords. For reproducibility, all records were screened using predefined inclusion and exclusion criteria. Records were included when the title, abstract, or author keywords explicitly linked NTFPs with tourism activities, tourism markets, ecotourism, community-based tourism, nature-based tourism, or forest tourism. Records were excluded when they focused only on timber products, general forest management, biodiversity conservation, or rural livelihoods without a clear tourism link. Ambiguous records were retained only when the title, abstract, and keywords showed a direct conceptual or empirical connection between NTFPs and tourism.

2.4 Bibliometric analysis using RStudio Biblioshiny

We processed the Scopus export in RStudio 4.5.2 using Biblioshiny 5.0. The final dataset includes 58 documents from 46 sources. Document types include 39 articles, 8 book chapters, 6 conference papers,

3 reviews, 1 book, and 1 note. We used Biblioshiny to report descriptive indicators and global citation rankings.

2.5 Science mapping using VOSviewer

We conducted science mapping in VOSviewer 1.6.20 (van Eck and Waltman 2010). For conceptual structure, we used keyword co-occurrence with Author Keywords and full counting. We set the main threshold at three occurrences.

For social structure, we used country level co-authorship with full counting. The option to ignore documents coauthored by a large number of countries was active. The maximum number of countries per document was set to 25. We reported network, overlay, and density views for country links.

Because bibliometric maps are sensitive to database coverage, keyword variation, and threshold settings, the VOSviewer outputs were treated as heuristic tools for identifying patterns rather than as stand-alone evidence of theoretical relationships. To reduce overinterpretation, the keyword clusters were checked against document-level coding of all 58 records, including NTFP type, tourism type, governance or value-chain logic, and dominant outcomes. Cluster labels and thematic interpretations were finalized only when they were consistent with both the bibliometric map and the coded content of the documents.

2.6 Systematic coding and synthesis

We reviewed and coded all 58 documents using a document level matrix. The matrix captured NTFP type, tourism type, governance or value chain logic, and dominant outcomes. We used VOSviewer maps to guide cluster naming, then aligned clusters with coded themes. the bibliometric review synthesis procedure (Marzi et al. 2025).

This study also acknowledges the main methodological limits of bibliometric analysis. First, using Scopus only may omit relevant records indexed elsewhere, including Web of Science or regional databases. Therefore, the findings should be interpreted as representing the Scopus-indexed structure of the NTFP-tourism research domain rather than the complete universe of global evidence. Second, the English-only filter may underrepresent locally grounded research in countries where NTFP and ecotourism studies are often published in other languages. Third,

bibliometric indicators reflect indexed publication patterns rather than the full underlying knowledge base. Fourth, keyword co-occurrence maps are influenced by author keyword choices, database indexing practices, and threshold settings. For this reason, the maps were not treated as definitive theoretical evidence, but were combined with document-level coding to support interpretation. These limits are important in a field that is geographically diverse and policy relevant.

3. Result

3.1 Dataset overview

The final corpus included 58 documents published between 1994 and 2025 across 46 sources. This indicates a small but multi-outlet literature base (Table 1). The stream showed a moderate to high citation profile for a niche topic, with 23.59 citations per document. It also drew on a broad reference base, with 540 cited references.

The field was keyword rich, containing 206 Author Keywords and 343 Keywords Plus. This pattern suggests terminology diversity and ongoing consolidation of concepts around NTFPs and tourism. The dataset contained no single-authored documents, and the average team size was 7.4 coauthors per paper.

This relatively large team size suggests that the field is shaped by governance-oriented and multi-stakeholder research settings, where studies often require collaboration across forestry, tourism, conservation, and community development expertise. Substantively, this indicates that the NTFP-tourism literature has evolved beyond individual case description toward research problems that require interdisciplinary and multi-actor interpretation. The high level of co-authorship is especially relevant for governance research because NTFP-tourism systems involve linked decisions on resource access, enterprise development, visitor management, conservation rules, and benefit distribution

International coauthorship was 39.66%. This points to multi-stakeholder research settings and frequent cross-country collaboration. It also indicates that the topic is often studied through partnerships that connect local forest contexts with international research networks, which is consistent with the

Table 1. Main information about the dataset.

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	1994:2025
Sources (journals, books, etc.)	46
Documents	58
Annual growth rate %	6.48
Document average age	9.19
Average citations per doc	23.59
References	540
DOCUMENT CONTENTS	
Index keywords (ID)	343
Author's keywords (DE)	206
AUTHORS	
Authors	280
Authors of single-authored docs	0
AUTHORS COLLABORATION	
Single-authored docs	0
Co-authors per doc	7.4
International co-authorships %	39.66
DOCUMENT TYPES	
Article	39
Book	1
Book chapter	8
Conference paper	6
Note	1
Review	3

cross-sector nature of NTFP value chains and ecotourism governance. For managers and policymakers, this suggests that practical solutions in this field are rarely sector-specific and often require coordination across enterprise, community, and regulatory actors. For forest enterprises and NTFP cooperatives, the implication is practical: business viability depends not only on product demand, but also on coordination with forest authorities, community institutions, tourism operators, buyers, and conservation agencies.

3.2 Annual scientific production

Scientific production was sporadic in the early years and became more active after the mid 2010s (Figure 2). Output rose around 2016, then stayed at a higher baseline through the 2020s. Peaks occurred in 2022 and 2025, with seven papers each. Annual output still fluctuated, including a visible dip in 2024.

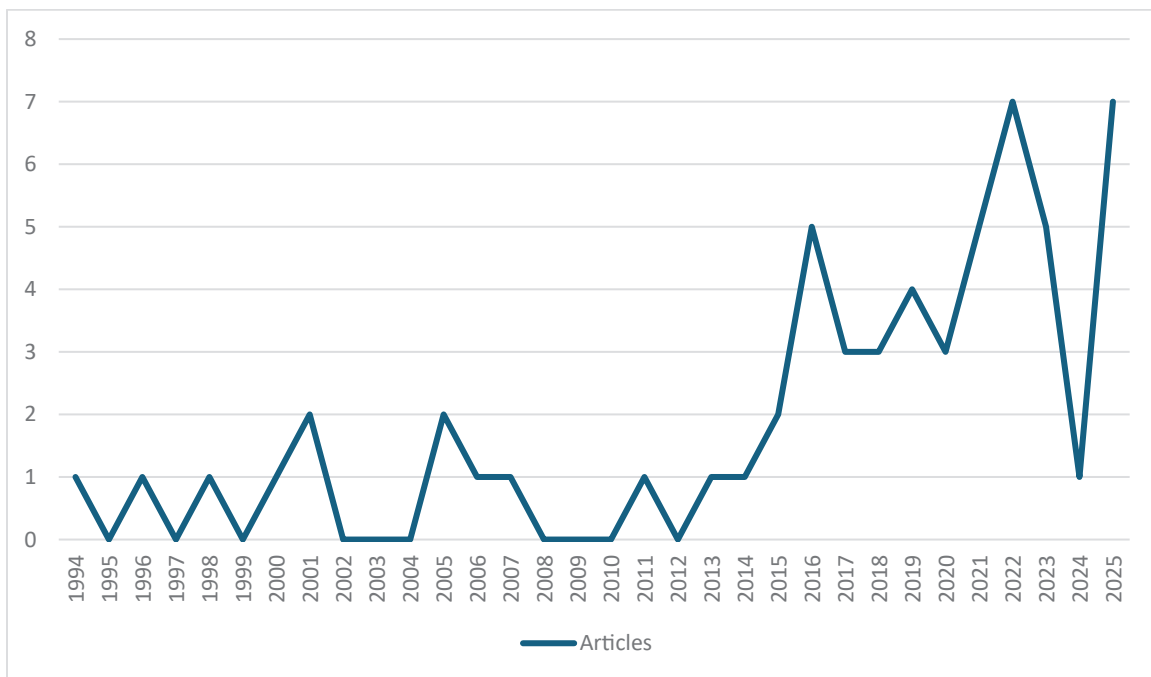


Figure 2. Annual scientific production, 1994–2025.

This growth pattern suggests that the NTFP-tourism intersection has moved from isolated case evidence toward a more established research stream, although it remains small and uneven. For practitioners, the recent increase in publications indicates growing attention to business, governance, and sustainability questions rather than only descriptive livelihood accounts. This shift is important because tourism-linked NTFP development is increasingly treated as a management and enterprise issue, not merely as a conservation or livelihood topic. In practical terms, the post-2016 growth suggests rising interest in how forest-based products can be organized, marketed, governed, and monitored within tourism destinations.

3.3 Most relevant sources / journals

The publication pattern was highly dispersed across outlets (Figure 3). Only two sources reached four papers each, *Forest Policy and Economics* and IOP Conference Series *Earth and Environmental Science*. A small second tier includes *Bosque*, *Ecosystem Services*, and *Forests* with two papers each. Most other outlets published one paper.

This dispersion suggests a multi-disciplinary stream that spans forestry policy and management, ecosystem services, conservation, and development. Tourism-specific outlets appeared, but remained

selective, such as *Journal of Ecotourism*. The field is not “journal centralized”—meaning that NTFP-tourism knowledge is not yet organized around a stable disciplinary home. As a result, forest managers and enterprise actors may need to combine insights from forest economics, conservation governance, tourism management, and value-chain studies when designing NTFP-based tourism initiatives.

This outlet pattern also showed that the topic is not owned by a single discipline. For forest-based enterprises and policymakers, this means that relevant knowledge is spread across business, conservation, and forest governance literatures. As a result, managerial decisions about NTFP tourism may need to draw on multiple evidence bases rather than on tourism research alone. For example, product development decisions require market and branding evidence, while harvest control requires forestry and conservation evidence. Benefit-sharing decisions require governance and institutional evidence. This explains why a narrow tourism-only perspective is insufficient for managing NTFP-linked enterprise development.

3.4 Countries and collaboration

Country production was reported as country appearances, so one paper can count for multiple countries. Indonesia led by a wide margin with 47 appearances.

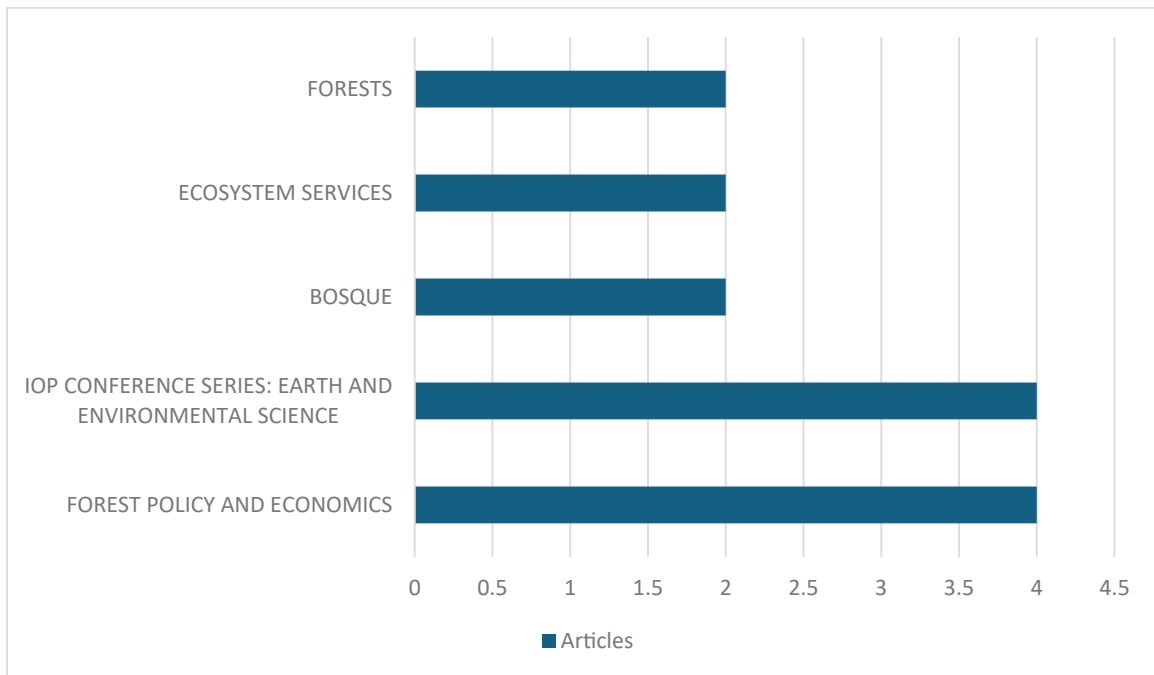


Figure 3. Most relevant sources/journals.

Brazil and the USA followed with 22 each. The next tier included Canada with 15, Australia with 13, and China with 13.

Additional contributions came from Kazakhstan with 8 and Ecuador with 7. Nepal and South Africa contributed 5 each. A long tail of countries contrib-

uted 1 to 4 papers each, including France, India, Spain, and the UK with 4. Japan, Peru, Seychelles, Singapore, and Thailand contributed 3 each. This distribution suggests that the stream is anchored in forest and biodiversity rich contexts, while also involving research intensive systems (Figure 4).

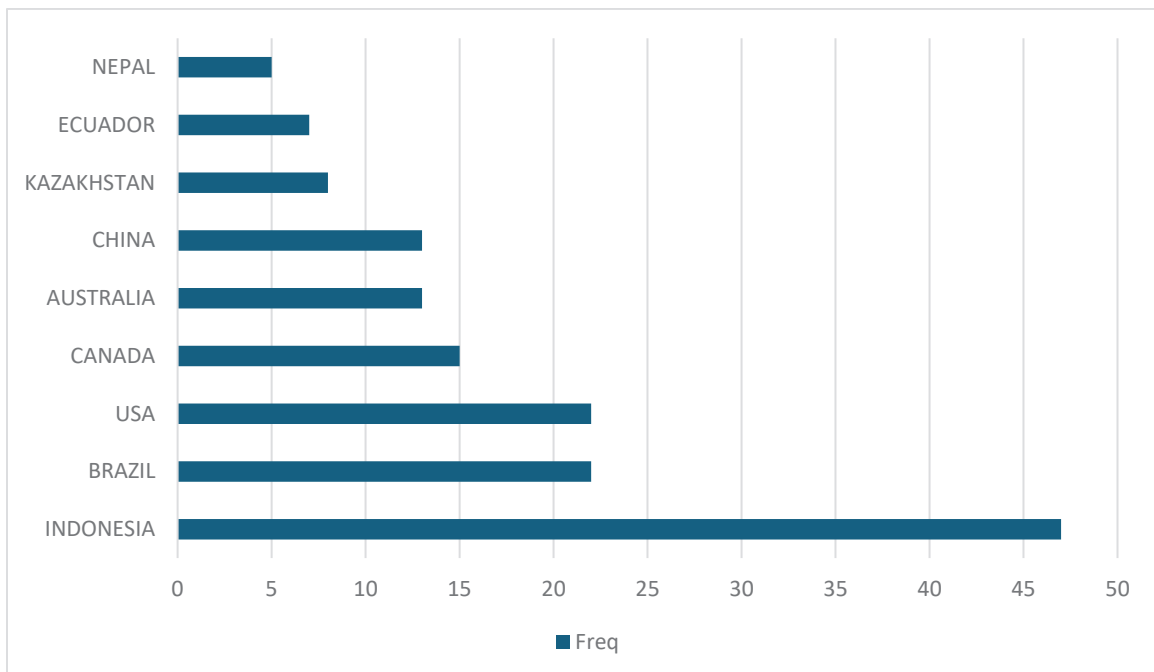


Figure 4. Country scientific production.

Figure 4 also suggests that the literature is concentrated in settings where forest use, conservation pressure, and tourism development interact directly, making these countries important empirical laboratories for governance and enterprise experimentation. The dominance of Indonesia, Brazil, and other biodiversity-rich countries is substantively meaningful because these settings face simultaneous pressures from forest-based livelihoods, conservation regulation, tourism expansion, and rural enterprise development. These countries therefore provide practical evidence on how NTFP-based tourism can generate income while also creating risks of overharvesting, unequal benefit capture, and governance conflict.

At the institutional level, contributions were also uneven. Universidade Federal de Minas Gerais led with 14 papers. IPB University followed with 6. Griffith University and Rhodes University each contributed 5. Several organizations contributed 4 papers each. These include CIFOR, University of British Columbia, Universitas Indonesia, and University of Southern Queensland. This pattern indicates multiple hubs rather than a single dominant center (Figure 5), and it fits the dispersed outlet structure. The presence of forestry, conservation, and development-oriented institutions reinforces the view that this research area

is shaped by applied governance problems rather than by tourism studies alone. For practitioners, this suggests that knowledge production is closely linked to field-based policy, community forestry, protected area management, and resource governance contexts.

Collaboration metrics showed a networked field. As noted above, there were no single-authored papers, the average team size was 7.4 coauthors per paper; and international coauthorship reached 39.66%. These metrics suggest that work at the NTFP tourism intersection is often multi-institutional and cross country. The pattern also matches the multi-actor nature of NTFP value chains and destination governance. Tourism and forest resource use often involve linked actors across policy, community, and market systems.

From a managerial perspective, this reinforces the view that forest-based enterprises do not operate in isolation. Their performance depends on coordination with communities, regulators, buyers, and tourism actors. From a policy perspective, it supports the view that effective NTFP-tourism strategies require cross-agency and cross-scale collaboration rather than stand-alone sector programs. Thus, the collaboration structure of the literature mirrors the

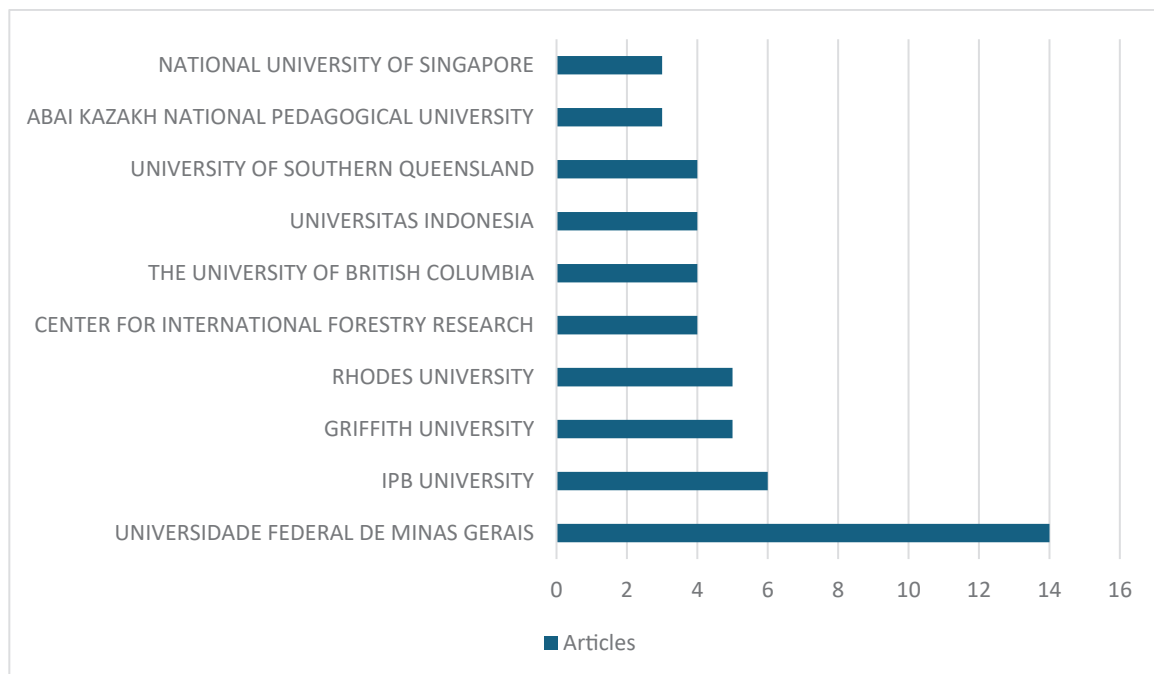


Figure 5. Most relevant affiliation.

operational reality of the sector: successful NTFP-tourism initiatives require joint action across producers, cooperatives, destination managers, protected area authorities, local governments, and market intermediaries.

4. Mapping results (VOSviewer)

4.1 Keyword co-occurrence structure

The three-occurrence network is compact and organized around a small set of bridging concepts. Four nodes act as anchors, ecotourism, non-timber forest products, tourism, and ecosystem services (Figure 6). The map is connected rather than split into isolated components. This connected structure suggests that the literature does not treat NTFPs, tourism, and ecosystem services as separate issues. Instead, it increasingly frames them as linked components of forest-based livelihood, enterprise, and sustainability systems.

For managerial interpretation, tourism appears as the key bridging concept because it connects NTFP use with visitor markets, forest landscapes,

and ecosystem-service governance. This means that forest enterprises should not treat NTFP-based tourism simply as a product diversification strategy. It must also be managed as a governance-sensitive activity involving harvest limits, quality standards, visitor experience, traceability, and benefit-sharing arrangements. The structure resembles a chain, where NTFPs and ecotourism sit on a use and value side and ecosystem services and sustainable forest management sit on a management and outcomes side. Tourism, together with forests, bridges these sides; thus, tourism functions as the linking mechanism.

In VOSviewer, link strength reflects repeated co-occurrence of keyword pairs across documents (van Eck and Waltman 2010). The visible links showed consistent pairings, such as ecotourism with NTFPs, NTFPs with tourism, and tourism with forests. The chain extended toward sustainable forest management and ecosystem services. Conceptually, discussion often moves from products and practices toward landscape framing and then toward governance and performance logic.

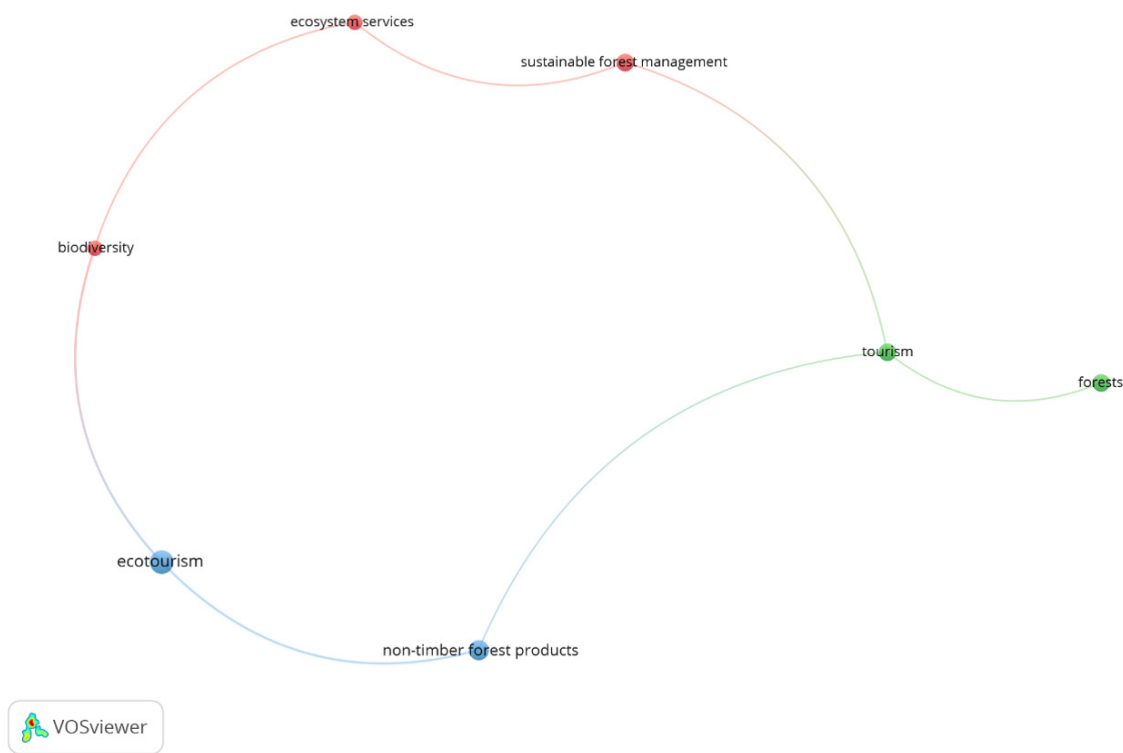


Figure 6. Keyword network visualization of the NTFP-tourism literature, showing tourism as the central bridge between ecotourism, non-timber forest products, forest landscapes, and ecosystem-service governance. The strongest connections indicate that the field links product use and livelihood activity with broader concerns about forest management, sustainability outcomes, and governance.

For forest-based enterprises, this structure suggests that NTFP-related tourism should not be managed only as a product opportunity. Enterprise decisions also depend on forest governance, ecosystem-service concerns, and destination-level management conditions. For policymakers, the map indicates that tourism, forestry, and conservation policies are interdependent rather than separate domains.

4.2 Cluster descriptions

Three cluster-level storylines appear in the three-occurrence map (Table 2). Each cluster is small because of the threshold. Each remains coherent in meaning.

The map shows two dominant linkage chains: one chain runs from ecotourism to NTFPs to tourism and then to forests; a second chain links tourism to sustainable forest management and then to ecosystem services. This structure supports the idea that tourism connects product-level activity with system-level sustainability framing. For forest-based enterprises, this means that NTFP-tourism development cannot be managed only as a sales or destination-promotion issue. It also requires attention to sourcing rules, harvest limits, quality standards, visitor management, and local benefit distribution.

Cluster A centers on NTFPs and ecotourism. It covers tourism-facing market logic and small enterprise practices. Examples include territorial marketing and place branding for non-wood products (Rovira et al. 2022). It also includes mycotourism initiatives and microenterprise strategies (Cloutier et al. 2025), as well as NTFP commercialization in tourism park settings (Affandi et al. 2017).

The managerial implication of Cluster A is that forest-based enterprises need capabilities in product development, branding, packaging, and visitor-oriented service design. In practical terms, enterprises

and cooperatives should move beyond selling raw forest products and develop higher-value offerings such as curated tasting, guided harvesting experiences, processed products, craft demonstrations, local storytelling, and destination-linked branding. The policy implication is that support should focus on market readiness, cooperative upgrading, and small-enterprise capability building rather than tourism promotion alone. This includes training in quality control, hygiene, labeling, traceability, pricing, and digital promotion so that tourism demand can be converted into durable local value.

Cluster B centers on tourism and forests. It reflects studies where the focal unit is a managed forest destination or protected landscape. Outcomes emphasize access, rules, participation, and trade-offs more than product design. This includes protected area revenue relations and compliance dynamics (Archabald and Naughton-Treves 2001; Chapman et al. 2015). It also includes tenure and participation logic in community forestry settings (Nurrochmat et al. 2019).

The managerial implication of Cluster B is that enterprise viability depends on rule clarity, access rights, and stable relations with protected area or community forest authorities. For forest-based enterprises, unclear access rules can create business uncertainty, while weak enforcement can encourage overharvesting and reduce trust among community actors. The policy implication is that zoning, tenure clarity, participation, and benefit-sharing design are not background issues; they directly shape whether forest-based business models can operate sustainably. Protected area managers and local governments should therefore connect tourism permits, harvesting rights, visitor flows, and community benefit-sharing into one operational governance system.

Table 2. Cluster descriptions of keyword co-occurrence network.

Cluster label	Core keywords	Typical unit of analysis & setting	Common outcomes (dominant)
Cluster A: Livelihood & product-market pathways	Ecotourism; non-timber forest products (NTFPs)	Community-based ecotourism; NTFP-linked tourism products/services in forest-adjacent communities	Livelihood diversification; local income/value creation; early-stage conservation co-benefits
Cluster B: Forest tourism as a connecting domain	Tourism; forests	Forest landscapes as tourism assets; destination/landscape planning and management context	Tourism-conservation trade-offs; governance arrangements; land-use planning implications
Cluster C: Ecosystem-services & sustainability governance framing	Ecosystem services; sustainable forest management; biodiversity	Landscape/ecosystem assessment; policy/management interventions for forest sustainability	Conservation performance; ecosystem service valuation/metrics; biodiversity protection; management effectiveness

Cluster C centers on ecosystem services and sustainable forest management, plus biodiversity. It contains valuation and measurement frames and multi-benefit governance logic. Examples include ecosystem service valuation tied to planning or intervention design (Rijal et al. 2021; Gómez et al. 2023). It also includes cost benefit or ROI frames for protected areas that include tourism and NTFPs (Dias et al. 2016). It includes bundled benefit approaches linked to benefit sharing (Morgan et al. 2022; Jaung et al. 2016).

The managerial implication of Cluster C is that forest-based enterprises may need to position NTFP-tourism activities within broader sustainability and certification frameworks, especially where conservation performance affects market access or legitimacy. This means that enterprises should be prepared to document sourcing practices, conservation contributions, community benefits, and compliance with sustainability standards. The policy implication is that valuation, certification, and ecosystem-service programs should be designed with attention to transaction costs, inclusion, and benefit distribution, so that smaller actors are not excluded. For policymak-

ers, the key challenge is to ensure that sustainability requirements improve forest governance without creating compliance burdens that only larger or better-funded actors can meet.

The three clusters show that forest-based enterprises operate across three connected domains: product and market creation, governance and access management, and ecosystem-service legitimacy. This means that enterprise success depends not only on demand, but also on institutional stability and the ability to align commercial activity with sustainability rules. Thus, the clusters translate into a practical management sequence: develop marketable NTFP-based tourism products, secure legitimate access and benefit-sharing arrangements, and demonstrate sustainability performance through monitoring or valuation systems.

4.3 Temporal signal

The overlay view suggests a topic shift over time (Figure 7). Earlier contributions, approximately 2014–2016, align more with use-oriented and tourism product terms, especially ecotourism and NTFPs (van Eck and Waltman 2010). Mid-period work, ap-



Figure 7. Keyword overlay visualization.

proximately 2016–2018, concentrates around tourism and NTFPs. Later contributions, approximately 2018–2020, increasingly foreground system level sustainability framing, especially sustainable forest management and ecosystem services.

This pattern matches how the corpus evolves in emphasis. Earlier and mid period studies often frame the link through livelihood substitution or complementarity and practical use (Zinda et al. 2014; Affandi et al. 2017; Li et al. 2021). Later work more often articulates valuation or bundling and governance performance logic. It also uses ecosystem service methods and benefit-sharing frameworks in which tourism is one benefit channel among others (Dias et al. 2016; Rijal et al. 2021; Morgan et al. 2022; Gómez et al. 2023).

Tourism remains a persistent connector across periods. It links resource-based discussions to governance and ecosystem outcomes. It does not become a standalone tourism subfield in this dataset. These clusters are conceptual groupings of keywords, not causal pathways. This distinction is important for interpretation: the overlay map shows how the vocabulary of the field has evolved, while the subsequent synthesis explains the mechanisms through which tourism may affect livelihood and conservation outcomes.

The subsequent synthesis reorganizes evidence into three mechanism-based pathways. Governance is treated as a crosscutting moderator or filter rather than a separate pathway. This step moves from map structure to explanatory structure.

Keyword overlay visualization shows the temporal evolution of the NTFP-tourism literature from earlier livelihood-use and product-oriented discussions toward later governance, ecosystem-service, and sustainable forest management themes (Figure 7). The overlay indicates that tourism remains the main bridging concept across periods, connecting NTFP use, forest landscapes, and sustainability-oriented governance.

This temporal shift also has practical relevance. For forest-based enterprises, it suggests that market-oriented NTFP tourism is no longer sufficient on its own; firms increasingly operate in environments shaped by sustainability metrics, certification pressures, and governance expectations. Enterprises therefore need to combine product development

with traceability, harvest monitoring, and evidence of community or conservation benefits. For policymakers, the shift indicates that future support should move beyond simple livelihood promotion toward integrated frameworks that combine enterprise development, conservation performance, and benefit-sharing rules. This includes designing policies that link tourism development with forest management plans, local enterprise upgrading, monitoring systems, and fair distribution of benefits.

5. Discussion

5.1 From clusters to mechanisms: three pathways under a governance filter

Guided by document level coding, we reorganize cross-cluster evidence into three mechanism-based pathways. These pathways explain how tourism links NTFPs to livelihood and conservation outcomes. The pathways are P1 portfolio shifts, P2 product-market conversion, and P3 valuation or bundling. The causal direction of these pathways is not uniform. Depending on governance conditions and market context, tourism can either reduce extraction pressure, maintain mixed extraction-tourism strategies, or stimulate new extraction through visitor demand and commercial scaling.

In this review, causal direction refers to the dominant direction of change suggested by the coded studies: from tourism participation or tourism demand toward changes in NTFP harvesting, enterprise activity, conservation incentives, and benefit distribution. The direction is conditional rather than automatic because the same tourism intervention may produce different outcomes under different governance, market, and household conditions. Across all three pathways, governance functions as a crosscutting filter and moderator, shaping access, compliance costs, and distributional outcomes through tenure clarity, enforcement legitimacy, and benefit-sharing rules (Archabald and Naughton-Treves 2001; Chapman et al. 2015; Etongo et al. 2023; Nurrochmat et al. 2019).

Pathway P1, portfolio shifts, explains how tourism changes household labor allocation and NTFP harvest choices. Its core logic is substitution or complementarity: tourism may reduce extraction by shifting labor into tourism work, or it may coexist with continued harvesting in mixed livelihood port-

folios. Studies show that the direction of the effect depends on household assets, access to tourism jobs, and tourism seasonality (Zinda et al. 2014; Li et al. 2021). For example, tourism participation may reduce pressure on forest resources when households obtain stable employment or service income from tourism. However, when tourism income is seasonal, low, or limited to a small group, households may continue NTFP harvesting as a complementary livelihood strategy rather than replacing it.

Pathway P2, product-market conversion, explains how NTFPs are turned into visitor-facing products or inputs to tourism services. Its core logic is that tourism demand can create income opportunities, but it can also increase extraction when demand grows faster than quality control and governance capacity. The effect depends on boundary conditions such as perishability, storage, transport, branding, and buyer dependence (Sierra-Huelsz and Kainer 2018; Cloutier et al. 2025; Lukman et al. 2025). For example, mycotourism initiatives and mangrove food products show how NTFPs can be converted into visitor-oriented experiences or products, while tourism demand for forest-based materials can also increase pressure on raw materials when sourcing rules and traceability are weak.

Pathway P3, valuation or bundling, explains how NTFPs and tourism are linked through valuation, certification, payments for ecosystem services (PES), or other multi-benefit governance arrangements. This pathway can support conservation and diversify income when benefits are legitimate and fairly shared, but it can also exclude smaller actors when compliance and monitoring costs are high. Its main boundary conditions are governance capacity, transaction costs, monitoring systems, and inclusion rules (Dias et al. 2016; Jaung et al. 2016; Morgan et al. 2022). For example, ecosystem-service bundling can integrate tourism, biodiversity, and NTFP values into one benefit-sharing framework, but the outcome depends on whether local users can meet monitoring requirements and whether benefits are distributed fairly.

Governance remains outside the pathway list because it does not operate as a separate pathway. Instead, it filters all three pathways by shaping who can harvest, who can participate in tourism, who captures value, and how conflicts are resolved.

Where tenure is unclear, enforcement is weak, or benefit sharing lacks legitimacy, tourism is less likely to reduce extraction pressure and more likely to intensify disputes or unsustainable use (Archabald and Naughton-Treves 2001; Etongo et al. 2023). Conversely, where tenure is clear, enforcement is legitimate, and benefit sharing is transparent, tourism-linked NTFP activities are more likely to support livelihood diversification, enterprise stability, and conservation compliance.

Figure 8 visualizes this mechanism. Tourism enters the system through three pathways: household portfolio shifts, product-market conversion, and valuation or bundling. Governance filters each pathway by regulating access, enforcement, participation, and benefit distribution. Boundary conditions such as seasonality, market access, processing capacity, monitoring systems, and transaction costs then shape whether the outcome becomes livelihood improvement, continued mixed extraction, conservation support, or intensified resource pressure.

5.2 Mechanisms and boundary conditions

Table 3 summarizes the three mechanism-based pathways, their causal logic, key boundary conditions, and dominant outcome directions. Each pathway has a distinct causal logic and a specific set of boundary conditions that shape whether the effect is substitutive, complementary, or extraction-stimulating. Portfolio shifts reflect changes in household work and harvest choices (Affandi et al. 2017; Zinda et al. 2014; Li et al. 2021). Product to market conversion depends on demand, quality control, and value chain access (Cloutier et al. 2025; Sierra-Huelsz and Kainer 2018; Rovira et al. 2022). Valuation or bundling links NTFPs and tourism to ecosystem service accounting and program rules (Dias et al. 2016; Jaung et al. 2016; Morgan et al. 2022). The causal direction is therefore best understood as conditional: tourism may reduce extraction, coexist with extraction, or increase extraction, depending on how these boundary conditions operate.

For P1, the causal direction depends on whether tourism replaces labor in NTFP extraction or simply adds income to an existing mixed portfolio. Tourism is more likely to reduce harvesting where households have access to jobs, skills, and a long enough visitor season. Where tourism is seasonal, low paid,

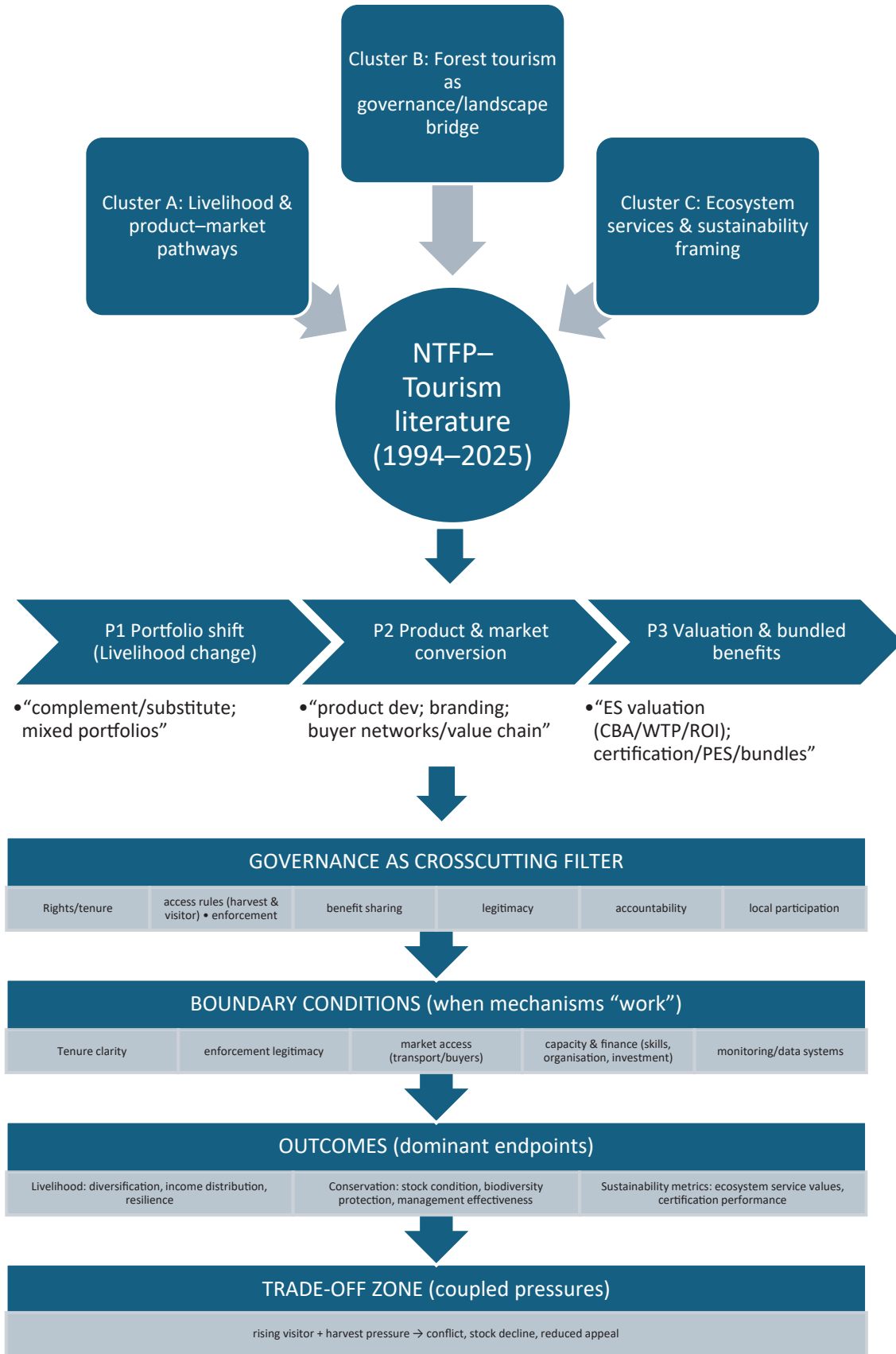


Figure 8. Conceptual framework: Mechanism-based pathways linking NTFPs and tourism under governance filters and boundary conditions.

Table 3. Mechanism pathways and governance filter.

Mechanism pathway	What the pathway covers in the coded studies	Core mechanisms	Governance filter / moderators (crosscutting)	Boundary conditions	Common trade-offs under rising harvest & visitor pressure	Examples from the coded set
P1 Portfolio shifts (livelihood change)	Income and labor reallocation between NTFP use, tourism work, and mixed portfolios; substitution vs. complementarity patterns.	Income substitution; portfolio adjustment; diversification into tourism-linked microenterprise.	Tenure clarity/ security; enforcement legitimacy; benefit-sharing transparency (shape incentives to reduce vs. intensify extraction).	Access to tourism jobs/markets; baseline asset endowment; seasonality of tourism; household skills.	Tourism income may reduce extraction for some households, yet tourism demand can increase use of NTFP-linked inputs/ services.	Affandi et al. (2017); Zinda et al. (2014); Li et al. (2021)
P2 Product-market conversion (product & value chain pathway)	NTFPs as visitor-facing products or inputs for tourism services (fibers, mushrooms, mangrove foods, crafts); viability depends on value-chain feasibility.	Product development; quality control; market access; buyer-network linkage; visitor-demand coupling.	Harvest rules & quotas; sourcing ethics/traceability requirements; enforcement capacity; benefit-sharing arrangements that affect who participate and who captures value.	Transport/logistics; storage/processing capacity; perishability/ seasonality; buyer dependence; branding capability.	Successful product scaling can raise harvest pressure; can also fund local management if rules hold and benefits are seen as fair.	Cloutier et al. (2025); Lukman et al. (2025); Sierra-Huelsz and Kainer (2018); Rovira et al. (2022)
P3 Valuation/ bundling (ecosystem services & program logic)	NTFPs embedded within multi-benefit bundles (carbon, biodiversity, tourism as cultural service); linked to valuation, certification, PES/ program logic.	Valuation methods (TEV/WTP/ ROI); bundling schemes; certification/PES; multi-service accounting.	Institutional design of benefit sharing; compliance rules & monitoring; legitimacy of implementing agencies; dispute-resolution mechanisms.	Governance capacity; monitoring/ data availability; transaction/ compliance costs; inclusion/exclusion rules (scale, gender, poverty).	Bundling can diversify income and support conservation but may add compliance costs that exclude smaller actors and shift benefits upward.	Dias et al. (2016); Rijal et al. (2021); Morgan et al. (2022); Jaung et al. (2016)

or inaccessible, mixed extraction-tourism portfolios are more likely to persist (Zinda et al. 2014; Li et al. 2021). The key boundary conditions are household assets, labor availability, access to tourism employment, skill levels, and the stability of visitor flows. In practical terms, tourism does not automatically substitute forest extraction; it does so only when it offers reliable and accessible income.

For P2, the causal direction depends on whether tourism demand can be converted into stable value rather than short-term sales. Where quality control, storage, transport, and branding are adequate, tourism-linked NTFPs can generate income without necessarily increasing unsustainable extraction. Where these conditions are weak, rising demand can intensify pressure on raw materials (Cloutier et al. 2025; Lukman et al. 2025; Sierra-Huelsz and Kainer 2018). The key boundary conditions are product perishability, processing capacity, storage, logistics, branding capability, buyer dependence, harvest rules, and traceability. For example, mushrooms, mangrove foods, crafts, and thatching materials may become viable tourism products, but their sustainability de-

pends on whether sourcing and product scaling remain within ecological and governance limits.

For P3, the causal direction depends on whether valuation and bundling arrangements broaden incentives or concentrate benefits among better-resourced actors. Where monitoring, legitimacy, and benefit-sharing are strong, these schemes can support both conservation and local income. Where transaction costs are high or inclusion rules are narrow, they can exclude smaller actors and weaken distributive fairness (Morgan et al. 2022; Jaung et al. 2016; Dias et al. 2016). The key boundary conditions are monitoring capacity, institutional legitimacy, transaction costs, certification requirements, inclusion rules, and the design of benefit-sharing mechanisms. This means that valuation or certification can strengthen conservation incentives, but only when local actors can participate without being excluded by administrative or financial burdens.

Rules and enforcement shape outcomes by defining harvest access and visitor access. Protected area studies show that weak legitimacy or weak enforcement can shift extraction patterns and change

attitudes toward tourism benefits. Unclear benefit sharing can weaken support and raise disputes. These dynamics recur across protected area governance and community relations cases (Archabald and Naughton-Treves 2001; Chapman et al. 2015; Etongo et al. 2023). This provides the clearest explanation of governance as a filter: the same tourism-linked opportunity can support conservation where rules are legitimate, but can produce conflict where access, enforcement, or benefit distribution is contested.

Tenure clarity and participation shape local enterprise choices and long-term incentives. Community forestry and joint management studies link clearer rights with stronger incentives for long-term management. Participation helps align harvesting rules with tourism plans. These conditions explain why similar forest settings produce different livelihood outcomes (Nurrochmat et al. 2019; Baloch 2025). For forest enterprises, tenure clarity reduces uncertainty over resource access and investment. For policymakers, participation helps ensure that harvest rules and tourism plans are locally legitimate rather than imposed as external restrictions.

Market access and tourism demand shape whether NTFP products convert into income. Transport constraints, pricing, and buyer networks recur as binding limits. Value chain studies also flag risks in quality control and dependence on narrow buyer sets. These limits matter, even when destination demand exists (Araujo-Santos et al. 2025; Laudari et al. 2021). Thus, demand alone is not a sufficient condition for enterprise success. NTFP-tourism initiatives also require processing capacity, market information, buyer diversification, and mechanisms to prevent value capture by a small number of intermediaries.

Capacity and finance affect scaling and durability of NTFP tourism links. Studies point to skills, organization, and investment as separators between short-lived pilots and stable enterprises. Certification and enterprise design work shows how compliance costs can change who participates. This matters when programs connect NTFPs, tourism, and conservation funding streams (Jaung et al. 2016; Boshoven et al. 2022; Silalahi et al. 2017).

Across the three pathways, the main trade-offs arise when visitor pressure and harvest pressure increase at the same time. Tourism may reduce extraction through livelihood substitution, but it may

also create new demand for forest-based foods, crafts, and materials. The net effect therefore depends on the interaction between demand growth, governance quality, and local capability, which is why governance is treated here as a crosscutting filter rather than a background condition (Zinda et al. 2014; Sierra-Huelsz and Kainer 2018; Gómez et al. 2023). The practical implication is that managers should monitor visitor growth and harvest intensity together. If visitor numbers increase without harvest limits, traceability, local participation, and benefit-sharing rules, tourism-linked NTFP development may shift from livelihood support to resource pressure.

6. Theoretical contribution

6.1 Conceptual framework: NTFP–tourism outcome pathways under governance and sustainability logics

This framework advances prior work by integrating three explanations that are usually treated separately: tourism-driven changes in household resource use (Zinda et al. 2014), tourism-induced demand for forest products through supply chains (Sierra-Huelsz and Kainer 2018), and the bundling of multiple forest benefits through governance arrangements (Morgan et al. 2022). The theoretical missing link in these studies is that each explains only one part of the NTFP-tourism relationship. Zinda et al. (2014) help explain how tourism participation can change household resource-use behavior, but they do not fully explain how NTFPs are transformed into tourism-linked products and value chains. Sierra-Huelsz and Kainer (2018) show how tourism demand can stimulate forest-product consumption through supply chains, but they do not fully connect this demand effect to household livelihood portfolios or governance-based benefit distribution. Morgan et al. (2022) explain how multiple forest ecosystem services can be bundled for just benefit sharing, but they do not specify how tourism-linked NTFP markets operate as enterprise pathways within such governance arrangements.

The coding revealed four crosscutting themes in the corpus. These themes are livelihood change, governance, product and market dynamics, and ecosystem service framing. The framework does not treat the themes as pathways. It formalizes three pathways and treats governance as a crosscutting filter that moderates all pathways.

Across the dataset, tourism is not treated as a standalone sectoral outcome. Tourism functions as a connector that converts forest-based resources into income portfolios, marketable products or experiences, and valued ecosystem service bundles. The effectiveness of this conversion is filtered by governance, including rights, rules, enforcement, and benefit sharing. It is also conditioned by market access and capability, including value chain feasibility, finance, skills, and infrastructure.

Pathway 1 covers livelihood change through mixed portfolios. Tourism income can complement NTFP extraction or partially substitute it. Effects vary with household assets and access to tourism work. This helps explain why similar destinations produce different livelihood outcomes. Households shift between NTFP use, tourism employment, and mixed strategies, rather than fully exiting extraction (Affandi et al. 2017; Zinda et al. 2014; Li et al. 2021).

Pathway 2 covers product and market conversion. NTFPs are treated as visitor-facing products or as inputs to tourism services. Outcomes depend on market design variables such as product development, quality control, buyer networks, seasonality, processing, and logistics. Tourism can raise product visibility and create enterprise opportunities. It can also raise harvest pressure when demand scales faster than governance capacity (Cloutier et al. 2025; Lukman et al. 2025; Sierra-Huelsz and Kainer 2018; Rovira et al. 2022).

Pathway 3 covers ecosystem service and bundled benefit framing. NTFPs are embedded within multi-benefit sets that include carbon, biodiversity, and tourism. The pathway operates through valuation, certification, PES, or program logic. These logics can legitimize conservation and guide benefit sharing. This helps explain why later work increasingly discusses performance metrics, ecosystem service accounting, and institutional design (Dias et al. 2016; Rijal et al. 2021; Morgan et al. 2022; Jaung et al. 2016).

Governance is the recurring selection mechanism across pathways. It shapes access to harvest, access to visitors, compliance costs, and benefit distribution. Where rules are unclear or enforcement lacks legitimacy, studies report conflict, rule breaking, and weaker support for tourism benefits. Clearer tenure and participation support longer term management and more stable enterprise decisions (Archabald and

Naughton-Treves 2001; Chapman et al. 2015; Etongo et al. 2023; Nurrochmat et al. 2019).

Trade-offs intensify when harvest pressure and visitor pressure rise together. Tourism may reduce extraction for some households, yet it can create new demand for NTFP-linked materials and services. Rising numbers of visitors also strain institutions that manage access and benefit sharing. Rising harvesting levels can weaken resource stocks and reduce tourism appeal and ecosystem service values used in valuation work (Zinda et al. 2014; Sierra-Huelsz and Kainer 2018; Swaminathan and Purushothaman 2000; Gómez et al. 2023).

The framework contributes in three ways. First, it shifts the discussion from a simple tourism-livelihood association to a mechanism-based explanation of outcome variation. Second, it connects household-level behavior, value-chain dynamics, and ecosystem-service governance within one integrated framework. Third, it explains why similar tourism-linked NTFP initiatives may produce different outcomes across settings: the effect depends on boundary conditions such as tenure clarity, market access, processing capacity, monitoring systems, transaction costs, and benefit-sharing legitimacy.

The framework also strengthens this study's relevance for forest economics and value-chain governance. From a forest economics perspective, it shows that NTFP-tourism outcomes are shaped not only by income diversification, but also by value creation, transaction costs, capability thresholds, and trade-offs between returns and resource sustainability (Chang et al. 2019; Dias et al. 2016). This extends forest economics by treating NTFP-tourism systems as resource-based enterprise arrangements in which economic returns must be evaluated alongside harvest pressure, institutional costs, and conservation performance. From a value-chain governance perspective, it shows that outcomes depend on sourcing rules, quality control, traceability, buyer dependence, and benefit distribution, not on tourism demand alone (Rovira et al. 2022; Araujo-Santos et al. 2025). This extends value-chain governance thinking by showing that forest-product value chains linked to tourism are not only market coordination problems, but also governance problems involving access rights, ecological limits, and distributive fairness. The contribution, therefore, is to clarify when tourism-linked

forest products become viable, governable, and sustainable forest-business opportunities.

The evidence base is small, multi outlet, and conceptually split between livelihood and product work on one side and governance and valuation work on the other side. Mapping shows tourism as the connector term between NTFP use and value terms and ecosystem service and sustainable management

framing. The synthesis indicates three mechanism pathways—portfolio shifts, product to market conversion, and valuation or bundling—operating under a crosscutting governance filter. This structure supports a focused research agenda that prioritizes identification, moderation, feasibility, justice, and thresholds rather than more descriptive case studies. The resulting research agenda is summarized in Table 4.

Table 4. Research agenda.

RA	Research gap (why it matters)	Priority research questions	Suggested designs & data	Key variables / indicators	Likely settings	Expected contribution
RA1	Causality is weak: Causality remains weak because most studies are descriptive and do not clearly distinguish whether tourism substitutes for or stimulates NTFP extraction.	When does tourism participation reduce NTFP extraction vs increase it via demand? How do household assets and tourism job access mediate the effect?	Quasi-experiments around shocks (rule change, COVID recovery); panel/recall household surveys; mixed-method livelihood portfolio analysis.	Livelihood portfolio; tourism participation intensity; NTFP harvest volume/frequency; asset endowment; job access; local price/demand proxies; shock exposure.	PA, CBT villages, tourism parks.	From association → mechanism-based causal inference on portfolio shift (P1).
RA2	Governance Governance is often treated as contextual background rather than modeled as a moderator of sustainability outcomes.	Which governance features (tenure clarity, benefit-sharing transparency, participation) best predict compliance, perceived fairness, and conflict?	Comparative case studies (PA vs CF); governance indices linked to behavioral outcomes; survey + administrative incident records.	Tenure clarity; benefit-sharing transparency; participation quality; enforcement legitimacy; compliance; conflict incidence; trust/ attitudes.	PA co-management, CF, joint forest management.	Governance as crosscutting filter (G) + boundary conditions (BC) explaining heterogeneity.
RA3	Market feasibility under-specified: because claims about “NTFPs for tourism” are rarely tested against value-chain viability and capability thresholds.	Which NTFP categories are viable for tourism-linked markets under seasonality/perishability? What minimum capabilities (processing, storage, branding, buyer networks) are required?	Value chain mapping + enterprise metrics; visitor demand studies; branding/ place-marketing experiments; cost/ margin breakdown per node.	Product category; perishability/ seasonality; processing/storage; QC; branding; buyer networks; margins; market lens (0/1); value chain (0/1).	CBT market nodes, micro/SME initiatives, destination supply chains.	Builds testable evidence for product–market conversion (P2) + VC feasibility.
RA4	Valuation/certification but many studies overlook distributional justice and compliance costs, which may create exclusionary effects.	When valuation/ certification is introduced, who captures benefits and who is excluded? How do bundling schemes change incentives for harvest intensity and tourism growth?	Institutional analysis of PES/certification; distributional impact assessment; participatory valuation + governance diagnostics; equity audits.	Compliance cost burden; benefit-sharing rules; inclusion/ exclusion (gender/ scale/poverty); WTP/ valuation (0/1); TEV/ WTP/ROI; incentive shifts.	PES/ certification, restoration concessions, multi-benefit schemes.	Integrates valuation/ bundling (P3) with inclusion & distributive justice mechanisms.
RA5	Trade-offs, but thresholds are rarely measured, especially the point at which combined visitor pressure and harvest pressure shift toward degradation.	What ecological/ governance thresholds shift tourism-linked demand from conservation support to degradation? How do monitoring capacity and enforcement interact with thresholds?	Coupled social– ecological models; stock assessment + visitation data; scenario modelling for planning; enforcement sensitivity tests.	Visitation intensity; harvest intensity; resource stock indicators; monitoring capacity; enforcement effort; rule-breaking proxies; destination performance; threshold metrics.	High-visitation PAs, ecotourism parks, forest tourism landscapes.	Provides quantitative pressure– threshold logic to operationalize trade-off zone.

RA1 targets a basic causal gap in livelihood change. Many papers link tourism participation with NTFP use, but rarely test direction and size. Some settings suggest that tourism participation is associated with lower household dependence on NTFP extraction, whereas others suggest that tourism may increase demand for NTFP-linked products and thereby raise harvesting pressure (Zinda et al. 2014). Future studies could use shock-based research designs, such as policy changes, new access rules, destination closures or reopenings, and COVID-19 recovery periods, to compare NTFP extraction before and after these events or between affected and less-affected communities (Laudari et al. 2021; Maraseni et al. 2022; Marzi et al. 2025).

RA2 treats governance as an explanatory factor rather than background description. Revenue sharing and protected area relations show how rules shape perceived fairness and local support (Archabald and Naughton-Treves 2001; Etongo et al. 2023). Community forestry studies add tenure and participation as core levers (Nurrochmat et al. 2019). Comparative designs can link governance indices to compliance and conflict outcomes (Chapman et al. 2015).

RA3 focuses on product categories and value chain feasibility. Several studies describe market facing claims, yet capability thresholds remain unclear. Value chain risks appear in works on chain sustainability and buyer dependence (Sierra-Huelsz and Kainer 2018; Araujo-Santos et al. 2025). Market studies can build on mycotourism and territorial marketing discussions (Cloutier et al. 2025; Rovira et al. 2022; Lukman et al. 2025).

RA4 extends valuation and bundling into distribution and inclusion. The coded set includes TEV logic, participatory valuation, and ROI frames that combine tourism and NTFPs within benefit bundles (Dias et al. 2016; Rijal et al. 2021; Gómez et al. 2023; Morgan et al. 2022). These designs can track who pays compliance costs and who captures gains. Equity audits fit PES and certification settings (Morgan et al. 2022; Difabachew et al. 2025).

RA5 quantifies coupled visitor and harvest pressures and their thresholds. Economic framing compares tourism returns and extraction values, but few studies estimate tipping points (Swaminathan and Purushothaman 2000). Policy option work also

shows trade-offs among incentives, monitoring, and acceptance (Thompson and Friess 2019). Coupled models can join visitation metrics with stock indicators, then test enforcement sensitivity.

7. Practical and policy implications

The findings have clear implications for forest enterprises, NTFP cooperatives, protected area managers, local governments, and policymakers. Because tourism-NTFP linkages operate through portfolio shifts, product-market conversion, and valuation or bundling, stakeholder responses should focus on harvest control, market readiness, and fair benefit distribution. This reshapes the current understanding of forest business by showing that NTFP-based tourism should not be treated merely as product diversification or destination promotion. It should be managed as a resource-based enterprise system that requires market capability, governance safeguards, and sustainability monitoring at the same time.

For forest enterprises, the main priority is to scale NTFP-based tourism products only with clear sourcing rules, quality control, and harvest monitoring. Tourism can increase product visibility and enterprise opportunities, but it can also increase extraction pressure when demand grows faster than governance capacity (Sierra-Huelsz and Kainer 2018; Cloutier et al. 2025). Enterprises should therefore document sourcing, apply basic quality standards, and align product expansion with seasonal harvest rules. In practical terms, enterprises should prepare a simple sourcing register, identify which NTFPs can be harvested seasonally, set minimum product quality standards, and avoid scaling products whose raw materials cannot be monitored. This changes forest-business practice from volume-based selling toward traceable and sustainability-sensitive value creation.

For NTFP cooperatives and community producer groups, tourism should be used to increase value, not only sales volume. Cooperatives can strengthen outcomes through collective grading, shared branding, transparent benefit-sharing rules, and simple rotation systems for harvesting. They can also combine products with visitor experiences, such as tasting, craft demonstrations, or guided collection, so that income is not dependent only on raw-product extraction (Rovira et al. 2022; Lukman et al. 2025). A

practical implication is that cooperatives should develop product standards, shared packaging, rotating harvest schedules, and transparent revenue-sharing records. These tools can help prevent internal conflict and reduce the risk that tourism demand benefits only a few actors.

For protected area managers and forestry agencies, governance should be treated as a practical management tool rather than a background condition. The review shows that rule clarity, legitimacy, and benefit sharing shape compliance and local support (Archabald and Naughton-Treves 2001; Etongo et al. 2023). Managers should use zoning, seasonal permits, joint monitoring of harvesting and visitation, and simple grievance mechanisms to reduce conflict and overuse. This implies that protected area and forest managers should link tourism permits with harvest rules. For example, visitor routes, harvesting zones, collection periods, and community access rights should be planned together, rather than managed by separate units.

For local governments, the priority is to address the capability gaps that limit product-market conversion. Support should focus on processing, storage, transport, branding, and enterprise training, because tourism demand alone does not guarantee stable income (Araujo-Santos et al. 2025; Rovira et al. 2022). Short-term promotion is less useful than improving these basic enabling conditions. Local governments can operationalize this by supporting small processing facilities, product-labeling assistance, cooperative training, digital marketing support, buyer matching, and destination-level quality standards. This moves sectoral policy from promotional tourism campaigns toward enterprise upgrading and resource governance.

For policymakers, NTFP-ecotourism should be integrated into forest governance and rural development policy. This means aligning tourism promotion with tenure clarity, harvesting rights, and benefit-sharing rules, while ensuring that smaller actors are not excluded by certification or compliance costs (Jaung et al. 2016; Morgan et al. 2022). At the sectoral policy level, this implies that NTFP-based tourism should be positioned across forestry, tourism, cooperative, and rural development programs. Policies should not only ask whether NTFP tourism increases income, but also whether it clarifies access

rights, protects resource stocks, improves local bargaining power, and distributes benefits fairly. At the sectoral policy level, this implies that NTFP-based tourism should be positioned across forestry, tourism, cooperative, and rural development programs.

A central policy lesson is that tourism should not automatically be assumed to reduce extraction. In some settings, it supports livelihood diversification, but in others it stimulates new demand for forest products (Zinda et al. 2014; Sierra-Huelsz and Kainer 2018). Stakeholders should therefore monitor visitor growth and harvest pressure together, not separately. A practical monitoring checklist should include visitor numbers, NTFP harvest volume, product sales, household participation, benefit distribution, rule violations, and resource-stock condition. These indicators can help managers detect when tourism-linked NTFP development is shifting from livelihood support to resource pressure.

8. Limitations

This review is limited to Scopus-indexed and English-language records. This boundary reflects the institutional access and resource conditions of the research team, not a methodological claim that Scopus is superior to Web of Science or other databases. As a result, relevant studies indexed only in Web of Science, regional databases, or non-English outlets may not be captured. The findings should therefore be interpreted as representing the Scopus-indexed structure of the NTFP-tourism research domain rather than the complete global evidence base.

The dataset is small by construction. The combined query yields 58 records across the timeframe from 1994 to 2025. This size matches a niche intersection between NTFPs and tourism. The small corpus limits fine grained subgroup tests across NTFP types and tourism formats.

Mapping results depend on occurrence thresholds. VOSviewer clusters can shift when rare keywords enter the map (van Eck and Waltman 2010). The synthesis stabilizes interpretation through document level coding (Marzi et al. 2025).

9. Conclusions

This field centers on four anchor terms in the keyword map. They are ecotourism, NTFPs, tourism,

and ecosystem services. Studies connect livelihood portfolios with managed forest settings. Many papers also frame outcomes through governance and conservation metrics.

Causal testing is still limited. Papers describe substitution or complementarity but rarely isolate demand effects and rule effects. Product viability often appears as a claim without capability thresholds or cost breakdowns. Valuation and bundling work also needs to include distribution checks tied to compliance costs.

The conceptual framework links three pathways and one governance filter. The pathways are portfolio shifts, product to market conversion, and valuation or bundling. The governance filter focuses on tenure, enforcement legitimacy, and benefit sharing. The research agenda sets five priorities that match these mechanisms and their boundary conditions.

The practical conclusion is that NTFP-tourism development should be managed as an integrated forest-business and governance system. Forest enterprises should not scale products before confirming raw-material availability, quality control, sourcing rules, and market access. NTFP cooperatives should use tourism to increase value through processing, branding, visitor experiences, and transparent benefit sharing, rather than relying only on higher extraction volume. Protected area managers should connect tourism permits, harvesting zones, seasonal rules, and joint monitoring into one operational system. Local governments should prioritize processing capacity, packaging, storage, transport, digital promotion, and cooperative upgrading. Policymakers should align tourism development with forest tenure, harvest rights, certification requirements, and benefit-sharing safeguards.

Overall, the main recommendation is straightforward: tourism can support NTFP-based enterprise development only when market growth is matched by governance capacity. Without clear rules, monitoring, traceability, and fair distribution, tourism may convert forest products into short-term income while increasing extraction pressure. With these safeguards, NTFP-tourism systems can become viable forest-business opportunities that support livelihood diversification, conservation compliance, and more inclusive rural development.

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