

Economic Dependence on NTFPs and Livelihood Vulnerability among Tribal Households: A Comparative Study of Rayagada and Gajapati Districts, Odisha

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Abstract

This comparative study examines NTFP economic dependence and livelihood vulnerability among 1,000 tribal households, with 500 observations from Rayagada and 500 from Gajapati. The dataset contains 32 household-level variables. Mean NTFP income is ₹16,403, representing 15.97% of total annual income. Mean LVI is 24.15. Rayagada records an NTFP income share of 16.68% versus 15.26% in Gajapati. OLS results show that NTFP income share, debt, market distance, livelihood shocks and seasonal migration are positively associated with LVI, while assets and education are negatively associated. The model explains 58.5% of LVI variation. The results support a policy approach that combines NTFP value addition and fair marketing with livelihood diversification, financial resilience and sustainable forest management.

Keywords: NTFPs; tribal households; livelihood vulnerability; forest dependence; income diversification; Rayagada; Gajapati; Odisha.

1. Introduction

Non-timber forest products are an important part of forest-dependent livelihood systems. They provide food, cash income, seasonal employment and culturally significant resources. Rural households commonly combine NTFPs with agriculture, wage labour, livestock, migration and non-farm work.

NTFPs can reduce vulnerability by diversifying income, but strong dependence can expose households to seasonality, price fluctuations, ecological shocks and weak bargaining power. The sustainable-livelihoods perspective therefore requires NTFPs to be analysed together with assets, institutions, markets and shocks.

Rayagada and Gajapati provide an important southern-Odisha comparative setting. Their tribal and rural livelihood structures make forest-linked income relevant, while household-level information is needed to quantify NTFP dependence and vulnerability.

The central question is whether NTFP income dependence is associated with livelihood vulnerability and whether the relationship differs between the two districts.

2. Literature Review

Chambers and Conway (1992), Scoones (1998) and Ellis (2000) establish the sustainable-livelihoods framework, emphasizing assets, diversification and coping with shocks. Forest income studies by Vedeld et al. (2004), Sunderlin et al. (2005) and Angelsen et al. (2014) demonstrate that environmental income can be an important component of rural household economies.

NTFP commercialization produces heterogeneous outcomes. Neumann and Hirsch (2000), Belcher (2005) and Belcher et al. (2005) show that markets, institutions, product characteristics and bargaining power shape livelihood outcomes. Shackleton et al. (2011) similarly highlight the potential and limitations of NTFPs.

Hahn et al. (2009) provides the methodological basis for composite livelihood vulnerability

measurement. Odisha-focused research, including Samarath et al. (2021) and Tripathy (2019), provides evidence that NTFPs coexist with agriculture and other livelihood strategies among tribal communities.

The present study contributes by combining NTFP income share with household vulnerability indicators and comparing Rayagada and Gajapati within one dataset.

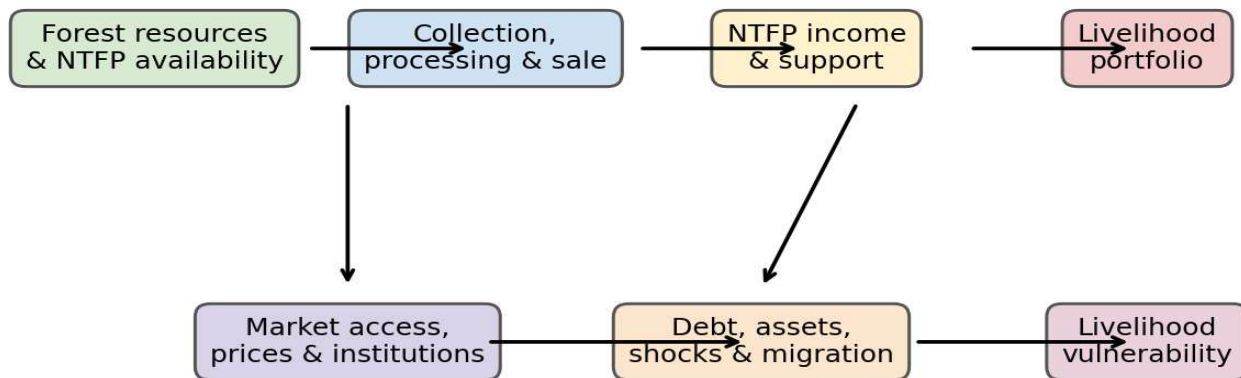


Figure 1. Conceptual framework

Table 1. Literature review

Study	Focus	Main contribution	Present study
Chambers & Conway (1992)	Sustainable livelihoods	Assets, activities and coping capacity.	Conceptual foundation
Scoones (1998)	Livelihood strategies	Diversification under uncertainty.	Portfolio approach
Ellis (2000)	Rural income diversity	Multiple income activities.	Income-share measure
Vedeld et al. (2004)	Forest income	Forest income can support rural welfare.	NTFP income importance
Belcher et al. (2005)	Commercial NTFPs	Market and household strategies matter.	Commercialization analysis
Sunderlin et al. (2005)	Forests & poverty	Forest-poverty links are complex.	Forest-livelihood context
Angelsen et al. (2014)	Environmental income	Environmental income is significant.	Comparative income design
Hahn et al. (2009)	LVI	Composite vulnerability measurement.	LVI approach
Samarath et al. (2021)	Rayagada	Tribal livelihood options include NTFPs.	District context
Tripathy (2019)	Odisha NTFPs	NTFPs and tribal livelihood promotion.	State context

Table 1. Selected literature informing the research design and analytical framework.

3. Objectives, Research Questions and Hypotheses

- Estimate NTFP contribution to household income.
- Compare NTFP dependence and vulnerability between Rayagada and Gajapati.

- Examine the association between NTFP income share and LVI.
- Assess debt, assets, education, market access, food security, shocks and migration.
- Develop policy implications for resilient NTFP-based livelihoods.

Hypotheses: H1: NTFP income share is positively associated with LVI. H2: Debt, market distance, shocks and migration are positively associated with LVI. H3: Assets and education are negatively associated with LVI. H4: Mean LVI differs between districts.

4. Study Area

Rayagada and Gajapati are southern-Odisha districts with substantial tribal and rural populations. Rayagada has extensive forest-linked livelihood activity and major tribal communities including Kondh and Soura. The comparative design is intended to identify household-level differences within a broadly similar regional context rather than to imply ecological or institutional equivalence.

5. Research Methodology

Figure 2. Research methodology framework

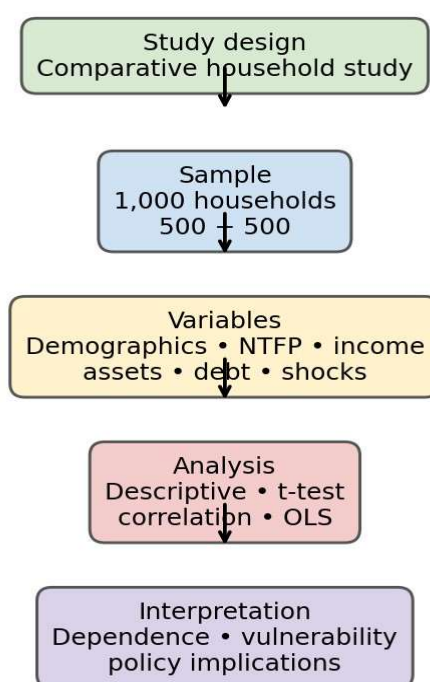


Figure 2. Research methodology framework.

5.1 Research design

The study uses a comparative cross-sectional household design. The supplied CSV contains 1,000 records, equally divided between the two districts.

5.2 Variables

The file contains 32 variables covering demographics, land, education, livelihood strategies, NTFPs, income, debt, assets, market access, food security, shocks, migration and LVI.

5.3 NTFP economic dependence

NTFP income share = $\text{NTFP income} / \text{total annual household income} \times 100$. This relative measure captures the economic importance of NTFPs.

5.4 Vulnerability

The LVI is analysed as a continuous outcome. Vulnerability classes are used descriptively; the supplied file contains no High category.

5.5 Statistical analysis

Descriptive statistics, Welch t-tests, Pearson correlations and OLS regression are used. The regression is associational, not causal.

5.6 Data integrity

The paper treats the supplied CSV as the study dataset but does not independently verify its field provenance. A genuine primary survey should document consent, sampling, enumerators and field dates.

6. Results

The sample contains 1000 households. Mean household size is 4.16, landholding 1.51 acres, education 4.69 years, and NTFP collector prevalence 90.5%. Mean total annual income is ₹103,674; mean NTFP income is ₹16,403; and mean NTFP income share is 15.97%.

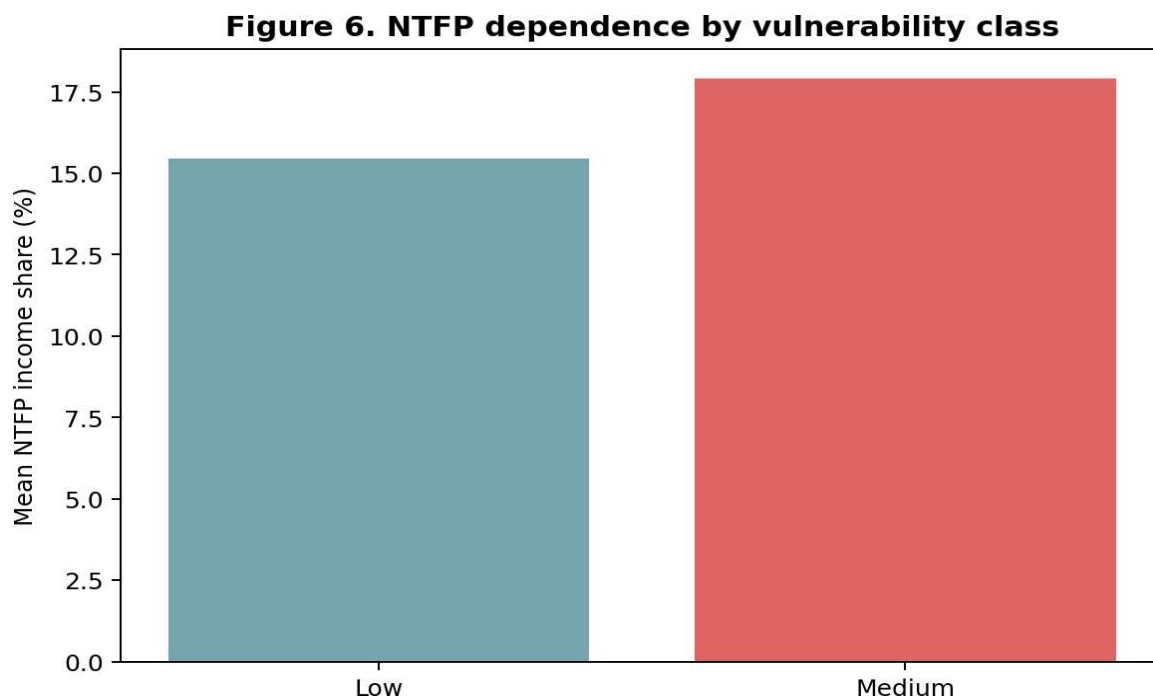


Figure 6. Household income portfolio / NTFP dependence pattern.

Indicator	Overall	Rayagada	Gajapati
Household size	4.16	4.18	4.14
Landholding (acres)	1.51	1.56	1.47
Education (years)	4.69	4.74	4.65
NTFP collectors (%)	90.5	91.2	89.8
NTFP income (₹)	₹16,403	₹17,292	₹15,515
NTFP share (%)	15.97	16.68	15.26
Total income (₹)	₹103,674	₹105,025	₹102,324
Debt (₹)	₹30,686	₹30,865	₹30,507
Assets (₹)	₹88,619	₹88,605	₹88,632
Food security	61.05	61.12	60.98
LVI	24.15	24.96	23.34

Table 2. Descriptive statistics and district comparison.

6.1 Vulnerability distribution

The dataset contains 788 Low and 212 Medium observations and no High observations. The continuous LVI is therefore the more informative outcome for regression analysis.

Figure 3. Vulnerability classification

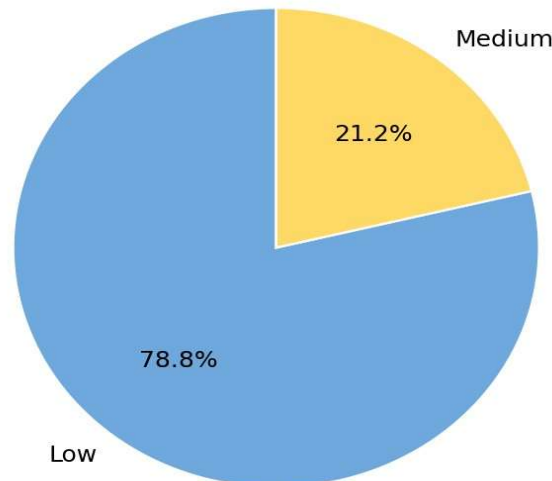


Figure 3. Vulnerability classification.

6.2 District comparison

Mean NTFP income share is 16.68% in Rayagada and 15.26% in Gajapati (Welch $t=2.52$, $p=0.0119$). Mean LVI is 24.96 and 23.34, respectively ($t=2.33$, $p=0.0200$).

Figure 4. District comparison

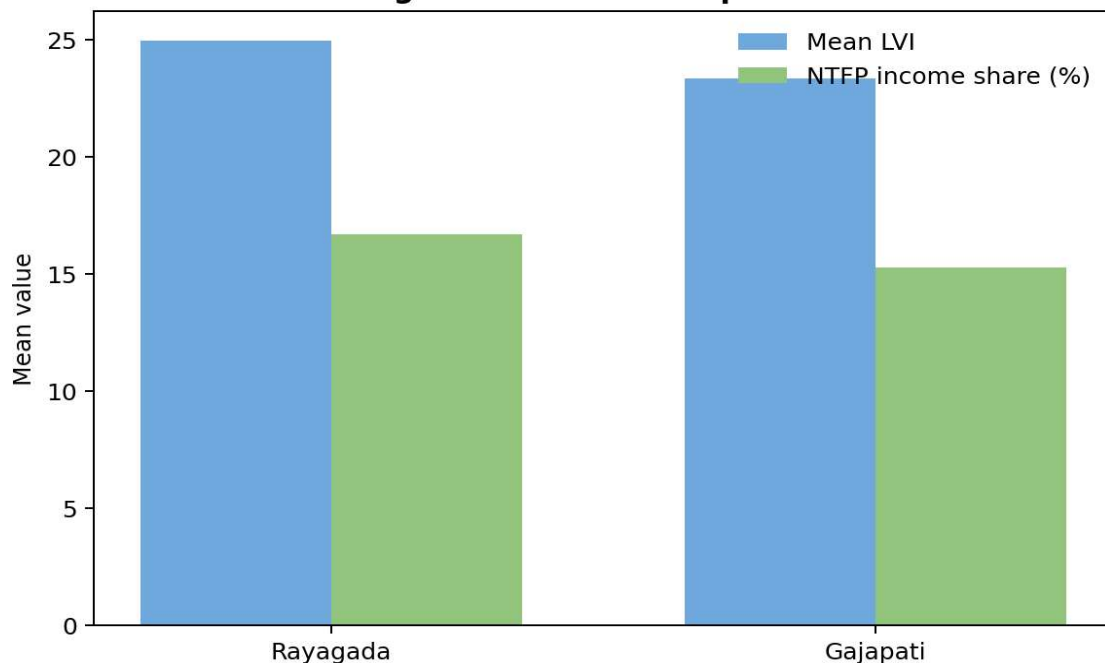


Figure 4. District comparison of NTFP dependence and vulnerability.

6.3 NTFP dependence and vulnerability

The Pearson correlation between NTFP income share and LVI is 0.191. The positive direction is consistent with H1, but the cross-sectional design cannot establish causality or determine whether vulnerability causes greater NTFP dependence.

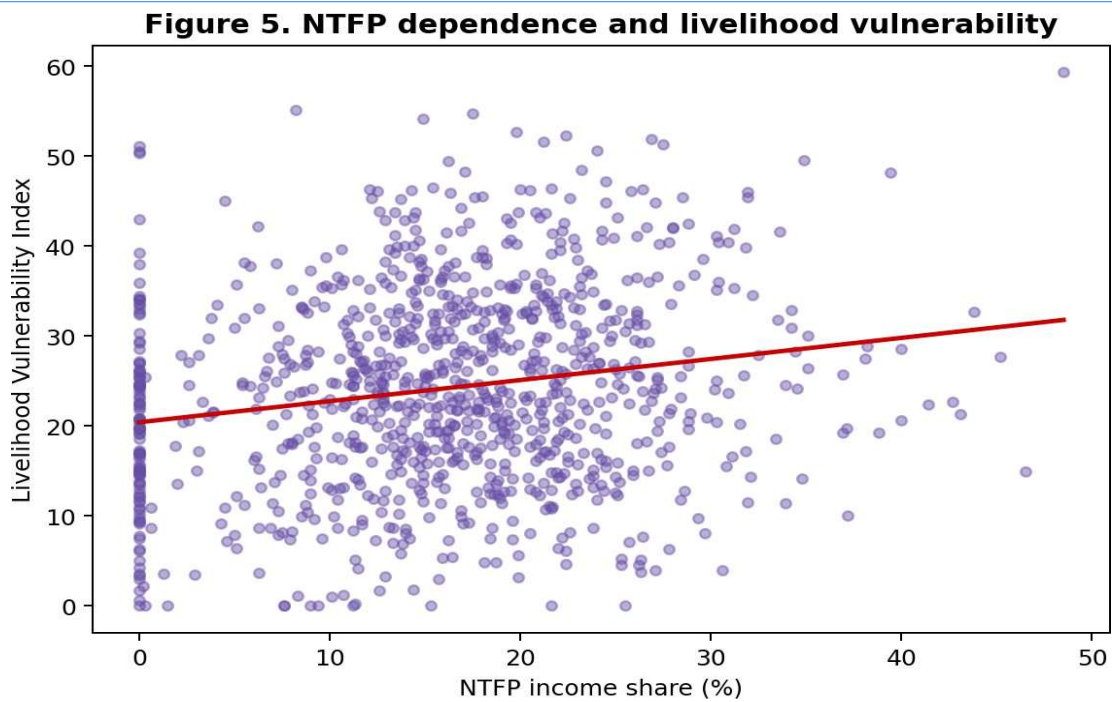


Figure 5. NTFP dependence and livelihood vulnerability.

6.4 Multivariate regression

The OLS model has $R^2=0.585$ and adjusted $R^2=0.582$. NTFP income share, debt, market distance, shocks and migration have positive coefficients; assets and education have negative coefficients.

Predictor	B	SE	p
NTFP share (%)	0.2418	0.0253	0.0000
Debt	0.0002	0.0000	0.0000
Assets	-0.0001	0.0000	0.0000
Education	-0.5330	0.0729	0.0000
Market distance	0.6013	0.0558	0.0000
Food security	-0.0154	0.0215	0.4732
Shocks	3.2311	0.2023	0.0000
Migration	9.8289	0.4947	0.0000

Table 3. OLS regression estimates for LVI.

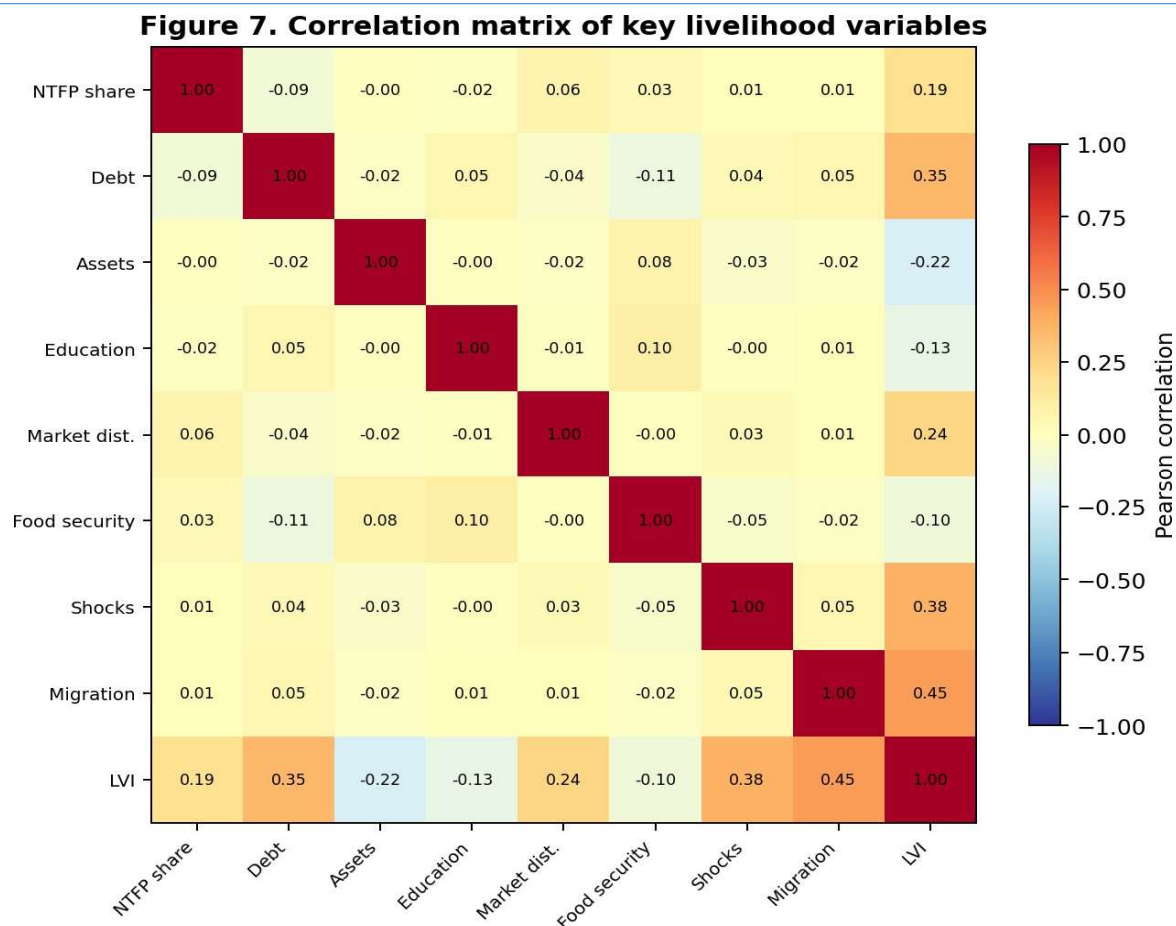


Figure 7. Correlation matrix of key livelihood variables.

7. Discussion

The results show that NTFPs are a meaningful component of household income portfolios. The average income share indicates contribution without complete dependence, consistent with diversified rural livelihood strategies.

The positive association between NTFP share and LVI should not be interpreted as proof that NTFPs cause vulnerability. Households with fewer alternatives may simultaneously have higher vulnerability and greater forest dependence.

Debt is positively associated with vulnerability, while assets and education show protective associations. These patterns support policies that build productive assets, human capital and financial resilience.

Market distance is positively associated with vulnerability, highlighting the importance of transport, storage, buyer competition and collective marketing in NTFP value chains.

Migration is positively associated with LVI, but migration may be a coping response. Future fieldwork should measure migration duration, earnings and remittances.

8. Policy Implications

- Value addition through village-level grading, processing, drying and storage.
- Fair marketing through producer groups, cooperatives and transparent price information.
- Livelihood diversification through agriculture, livestock, skills, enterprise and non-farm employment.
- Financial resilience through savings, responsible credit and formal financial inclusion.
- Market connectivity through roads, transport, storage and digital market information.
- Sustainable harvesting linked with regeneration and community resource governance.

- Social protection and local employment to reduce distress migration.
- Community institutions for stronger participation and benefit sharing.

9. Conclusion

Using the supplied 1,000-household dataset, the study finds meaningful NTFP contributions to household income and a positive association between NTFP income dependence and livelihood vulnerability. Rayagada records higher NTFP dependence than Gajapati, while assets and education are associated with lower vulnerability. The appropriate policy response is not simply to reduce dependence, but to increase returns, improve market access, strengthen sustainable harvesting and expand alternative livelihood opportunities.

10. Limitations and Future Research

- Cross-sectional data do not establish causality.
- Equal district sample sizes are not population weights.
- Village identifiers, sampling weights and fieldwork metadata are unavailable.
- LVI weights and thresholds are not independently documented in the CSV.
- No household is classified as High vulnerability.
- Recall error may affect income and NTFP estimates.
- Future surveys should document sampling, consent, product quantities, prices, buyer type, gendered collection, migration and remittances.

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