Plant Archives Vol. 24, Special Issue (GABELS), 2024 pp.359-366 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2024.v24.SP-GABELS.051

FOREST BASED LIVELIHOOD: OPPORTUNITIES AND CHALLENGES IN INDIA: A REVIEW

Priti Singh[1*], S. S. Dhuria[1], Neha Soan[1], Kuldeep Chauhan[2], Kamesh[1], and Shraddha Pandey[1]
[1]Department of Forestry, Wildlife & Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh, 495009, India
[2]ICFRE - ECO-Rehabilitation Centre, Prayagraj, Uttar Pradesh -211002, India
*Corresponding Author Email: spriti739@gmail.com

ABSTRACT

Forests play a vital role in sustaining the livelihoods of over 300 million forest-dependent people in India. This review examines the opportunities and challenges presented by forest-based livelihoods. A wide range of sources indicate that non-timber forest products (NTFPs) like tendu leaves, bamboo, and medicinal plants contribute substantially to rural incomes and employment generation. Forests also provide essential provisioning services like fuel wood, fodder, and grazing land that support livelihoods. However, communities face pressures from unsustainable extraction practices and lack of secure tenure that degrade forests and undermine long-term incomes. Other constraints include dependence on single NTFPs, elite capture of benefits, low wages, and vulnerability to climate change impacts and market risks. Strategies suggested to promote sustainable use include strengthening community rights, diversifying productive tree species and alternative opportunities, restoring degraded forests through joint management programs, reviving traditional knowledge systems, and building rural capacities. Studies evaluating India's joint forest management program and forest rights recognition show these aim to balance conservation with development objectives but have had mixed outcomes. An analysis of evidence around factors influencing forest access, dependency trends, and successful approaches provides insights for policymakers to safeguard forest-based rural livelihoods.

***Keywords*:** Livelihood, forest, Non-Timber Forest Products, Rural and Tribal People, NTFPs.

Introduction

Forests play an important role in supporting the livelihood of millions of people in India. As per the latest State of Forest Report released by Forest Survey of India (2019), India's forest and tree cover is around 24.56% of the total geographical area of the country. The report also estimated the dependency of over 300 million people on forestlands for their sustenance (FSI, 2019). Forest based products and activities such as collection of non-timber forest produce (NTFP), grazing, fuelwood collection etc. provide important sources of income and employment in large parts of rural India (Narain *et al.,* 2005).

However, forest dependent communities also face many challenges due to factors such as lack of secure access and user rights over forests, unsustainable extraction practices, environmental degradation etc. This affects their livelihood security and pushes them into a vicious cycle of poverty (Sunderlin *et al.,* 2008). There is a need to review the opportunities and challenges for promoting sustainable forest-based livelihoods. This is crucial for achieving the twin objectives of biodiversity conservation and rural poverty alleviation as envisaged under India's forest policy and programs (MoEF, 1988; Pandey, 2019).

This review work aims to provide a comprehensive review of the existing scientific literature around forest-based livelihood opportunities and challenges in India. It analyzes recent evidences around factors influencing access to forests and NTFPs, role of community forest rights and joint forest management programs, trends in forest-dependent employment and strategies for promoting sustainable forest management. The review identifies key gaps and

suggests ways for improving forest governance and developing alternative livelihood options to help secure forest-dependent communities in India.

Forest-based livelihood opportunities

Forests provide various products and services that communities rely on fortheir subsistence and cash income. NTFPs like Tendu leaves, Mahua flowers, Bamboo, Gums, Resins etc. generate significant revenue and employment (Khatun *et al.,* 2020). Estimates show NTFPs account for 15-33% of the average annual household income of communities living in and around forests (Nayak *et al.,* 2020). Fuelwood collection is another important activity supporting livelihoods, meeting over 70% of India's energy needs in rural areas (Purohit & Michaelowa, 2007). Livestock grazing within forests is critical for pastoral communities. Shah-Khan (2019) studied livelihood dependency on forest resources in Leh district of Ladakh. The author found that forests were utilized under 17 use categories. Medicines were most collected (65 species), followed by fodder, vegetables and fuel. Herbs formed most collected resources (61.67%), followed by shrubs, trees and climbers. Baloch *et al.* (2018a) studied livelihood and forest dependency of communities in forest fringe villages of Rajasthan's Pali District. The study found that around 83% of villagers met their fuel wood needs from local forests, with *Prosopis juliflora, Azadirachta indica* and *Acacia nilotica* being the main species. Additionally, fodder collection from forest included *Prosopis cineraria, Acacia senegal* and *Ziziphus mauritiana*. Baloch *et al.* (2018b) investigated forest resource use by communities near Pali District, Rajasthan. They found 83% obtained fuelwood from local forests, chiefly Prosopis juliflora, Azadirachta indica and Acacia nilotica. Fodder collection also depended on forest resources like *Prosopis cineraria, Acacia senegal* and *Ziziphus mauritiana*. Mishra (2020) studied the relationship between poverty, forests and livelihoods in Odisha. The study found that forest resources contributed 19.23% on average to household incomes but up to 35.35% for those residing near forests. In addition to fodder and grass, other forest materials like firewood, seasonal fruits, leaves, roots and construction materials were considered sources of forest income. Firewood constituted the highest proportion at 6.47% of total forest income, followed by leaves (sal and tendu leaves) at 5.15%. This highlights the importance of various forest resources for rural incomes and well-being in Odisha. Hussain *et al.* (2019) studied dependence on forest resources for rural livelihoods in Naltar Valley, Pakistan. They found forest resources contributed 39% to total household income, followed by agricultural products at 33% and livestock at 16%. Within forest income, firewood had the largest share at 52%, followed by timber at 46%. Firewood was the major source of energy for local community needs like cooking and heating. The study highlights the critical role of forest resources, particularly firewood, in sustaining rural livelihoods and livelihood diversification in the area. Kimengsi *et al.* (2019) studied livelihood diversification in rural Cameroon. They found forest-based activities formed a source for 63% households, with non-wood forest product domestication (31%) and medicinal plant collection (30%) being most preferred. Usually, households with better socio-economic status opted for non-forest over forest livelihoods. Kujur *et al.* (2019) studied non-wood forest products for rural livelihoods and sustainable forestry in Chhattisgarh, India. They revealed people in forested areas depended largely on different NTFPs for cash income and subsistence. Some NTFPs provided ingredients for pharmaceuticals and industries. These contributed to the socio-economy, culture and lives of forest dependent communities in Chhattisgarh. Chanie and Yirsaw (2018) examined the contribution of forest resources to sustainable rural livelihoods in Bench Maji Zone, Ethiopia. Forest income was found to be the second major source of livelihood diversification after agriculture. Rural households also engaged in other off-farm activities. Similarly, Kacani and Peri (2018) studied the role of forest resources in local livelihoods. They reported off-farm activities contributed around 53% of total income. Agriculture was the highest at 20%, followed by livestock at 18% and forestry at 9%. Firewood constituted the largest proportion of forest income, used mainly for domestic cooking and heating. On average, forest resources contributed 8.4% of household income. Main forest income sources were firewood, forest fruits, nuts and fodder. Income from firewood was the most important forest income. Khan *et al.* (2018) studied the livelihood dependence of two communities on Dachigam National Park in Kashmir, India. Per capita fuelwood consumption was 1.09-4.04kg/day. Annual household fuelwood extraction ranged from 0.21-7.32 metric tons. About 22% Kashmiri and 65% Gujjar communities extracted green fodder. Other forest products included medicinal plants, vegetables, timber, fish and honey. For the Gujjar community, lack of alternative fuels, harsh climate and poor roads drove high fuelwood consumption. Additionally, high illiteracy, unemployment led to greater subsistence dependency on forest resources. Lepcha *et al.* (2018) studied the contribution of non-timber forest products (NTFPs) to the livelihoods of forest communities near Jaldapara

National Park. The study reported that the communities depended on NTFPs for daily needs, sociocultural and cash requirements, acting as a safety net during hard times. NTFPs contributed variably to monthly household income, from 1-70%. A total of 43 NTFP species were documented as being sold in processed or raw forms, including leaves, fruits, seeds, shoots, mushrooms and twigs. This highlights the important role of NTFPs in supporting local livelihoods near protected forest areas. Asfaw and Etefa (2017) studied the contribution of non-timber forest products to rural livelihoods in Western Ethiopia. They found people relied on multiple income sources. Non-timber forest products made the major contribution at 44.7% of total household income, followed by crop income at 34.32%. The largest percentage (74.9%) of total NTFP income came from forest coffee. NTFPs contributed over half the income for poor (55.5%) and medium (57.5%) households, but 35% for rich households. Rich households extracted NTFPs the most. This shows varying but significant dependency of different wealth groups on forests in the area. Suleiman *et al.* (2017) examined dependence on non-timber forest products around Falgore Game Reserve in Nigeria, finding that surrounding communities rely heavily on the reserve for firewood, fodder, medicinal plants and fruit nuts both for household use and sale. For 68% of households surveyed, income from NTFPs accounted for 20-60% of total income. Consumption of these forest goods was shaped by factors like age, household size, gender, occupation, distance to forest and market. Pandey *et al.* (2016) estimated 275 million poor rural Indians rely on forests for cash/subsistence, with resources also serving as a safety net. Forest depletion through unsystematic exploitation/ degradation threatens these livelihoods and economics, emphasizing the need for sustainable management strategies. Dominique *et al.* (2015) examined the relationship between forests, rural livelihoods and sustainable development in Central Africa. They found heavy reliance on forests, with timber and non-timber products contributing 48-63% of household income. This dependence varied between men/women, rich/poor communities and ethnic groups. Ofoegbu *et al.* (2015) investigated forest-based livelihoods as climate change alternatives in South Africa's Vhembe District. Results showed high household dependence on forest resources like firewood, wild fruits and thatch grass. Reliance on forest income was especially pronounced in Thulamela at 53%, followed by Mutale at 38.4% and Makhado at 26.6%. Additionally, between 82-95% of households across the municipalities did not meaningfully participate in local forest management.

India's Joint Forest Management (JFM) program launched in 1990 aims to promote community participation in forest management through protection committees. Studies found JFM improved forest conditions, increased availability of fuelwood and fodder, and generated new sources of income through wages for protection activities (Ravindranath & Sudha, 2004; Babu & Ganesh, 2016). Forest rights recognition under Forest Rights Act 2006 has strengthened community claims over forest resources restoring livelihood security (Ranjan *et al.* 2020). However, dependence on single NTFPs makes livelihoods vulnerable to market risks (Kango & Sudhakar, 2015).

Forest-based livelihood challenges

While forests offer livelihood opportunities, communities also face several challenges. Unsustainable extraction to meet growing demands threatens the resource base, degrading both forest ecosystem services and long-term incomes from the sector (Mahapatra & Tewari, 2005; Pattanayak & Sills, 2001). Lack of clear tenure often leads to open access exploitation undermining regeneration (Somanathan *et al.,* 2009). Poverty pushes communities towards short-term gains rather than conservation (Banerjee *et al.,* 2020). Further, problems of elite capture have been observed where benefits from programs accrue disproportionately to powerful communities marginalizing the vulnerable (Agarwal, 2001; Mallick & Pattanaik, 2019). Majority of forest-based jobs are seasonal with low wages (Ramachandran *et al.,* 2010). Climate change impacts like forest fires threaten both forests and livelihoods (Rawat & Kumar, 2015). Low bargaining power subjugates communities into exploitative market relations facing risks of indebtedness (Rastogi, 2005; Kango & Sudhakar, 2015). Hahn *et al.* (2009) reported that non-wood forest products directly reduce rural poverty by supporting livelihoods through subsistence needs, income generation, and small jobs/enterprises, with results showing harvesting and processing of forest resources had evolved from subsistence to include sales in developing nations. Forest resources thus present both opportunities and challenges for balancing conservation and development. Albertahenkan and Emanuelboon (2010) examined the NTFP supply chain in Ghana, finding it significantly contributed to food security, poverty reduction and livelihoods. However, marketing faced challenges like poor processing, labeling and organization. NTFP sales were informal and individual, lacking skills/information. Developing commercialization permanently could greatly boost sustainable employment, incomes, food security and livelihoods by overcoming these barriers. Luni *et al.*

(2011) analyzed household factors influencing NTFP collection and marketing by Chepangs in Nepal, finding through regression analysis that relatively better-off households with more land, food, and income did not view NTFPs as attractive due to very low prices that did not cover labor costs. A cooperative struggled to improve prices due to capacity issues. Ahmed (2016) revealed that collecting and selling NTFPs was important for socioeconomic improvement in rural West Bengal. However, NTFP marketing faced many challenges like limited information, cooperation and coordination among stakeholders, despite providing income safety nets during lean agriculture seasons. The paper aims to identify marketing channels, problems and prospects to improve forest fringe people's income. Rawal *et al.* (2001) found the contribution of NTFPs to local economies was still limited, mainly due to underdeveloped reliable markets. The study recommends appropriate policies, regulations, and support for market information systems and associations/networks to help overcome current challenges in promoting and developing NTFP marketing. Vaidehi *et al.* (2005) reveals that NTFPs are critical for livelihoods, especially of women involved in their collection, processing and trade. Commercialization strategies are needed to increase economic value and raise awareness among policymakers of these products' importance to enable rural communities to better benefit from NTFP development by addressing challenges such as increasing productivity, group marketing support, and reducing transaction costs through improved infrastructure. Ahenkan and Boon (2010) reported that NTFP collection and marketing in Ghana is being promoted as a solution to rural health and poverty issues. However, little is known about their processing, packaging and labeling, which face critical challenges. Marketing is unorganized and disperse, with farmers lacking necessary skills and information. Survey results revealed agriculture as the main income source, with 61% cultivating cocoa and others cultivating crops. To supplement income, 62.2% also cultivated NTFPs, with beekeeping adopted most at 44.4%, followed by grass-cutter rearing and mushroom cultivation. About 32% earned over half their income from NTFPs.

Strategies for sustainable forest-based livelihoods

Various strategies have been suggested to mainstream sustainability while promoting forest-dependent livelihoods. Enhanced community rights through legal recognition and reduced dependence on single NTFPs could make resource use regimes more equitable and resilient (Nagendra *et al.* 2020). Increasing productivity of alternative tree species and improved processing helps meet both ecological and income needs sustainably (Chopra *et al.,* 2002; Manjula *et al.,* 2020). JFM strengthened with built-in equity safeguards along with restoration of degraded forest areas has shown potential for ecological regeneration, reduced carbon emissions and green jobs provisioning (Pandey *et al.,* 2019; Tripathi & Bhattarya, 2014). Revival of traditional knowledge systems has aided biodiversity conservation and adaptation (Posey, 1985; Padmanabhan & Priyadarshan, 2009). Diversification towards non-forest related opportunities reduces pressure on forest resources and income risks (Kango & Sudhakar, 2015; Dwivedi, 2018). Krishnamoorthy and Mani (2002) conducted a study through questionnaires in Tamil Nadu, India to identify factors influencing NTFP collection and disposal, contribution to tribal communities' income and employment, marketing channels and problems. The results can help inform government strategies and further research on improving the NTFP sector. Raufu *et al.* (2012) studied the economic impact of NTFPs on rural Nigerian women, revealing that non-availability due to deforestation was a major issue according to 58.9% of respondents. Problems with NTFP gathering and marketing included insufficient labor, storage issues, and theft. The study recommends government education programs and policies to aid rural welfare and control deforestation. Awono *et al.* (2010) observed that women primarily gather and trade NTFPs but have limited access to processing, marketing strategies, and market information. A CIFOR training program assessed showed 81% of traders' incomes increased on average 55% from gained NTFP revenue, demonstrating how capacity building can reduce constraints faced by traders. Mustafa *et al.* (2011) found that the vast majority of aonla growers wanted marketing guidance (91.66%), ensured transportation (78.33%), popularization of high-density orchards (75%), rejuvenation of old orchards (70.83%), proper pruning after harvesting (70%), and availability of quality planting material (68.33%) as major strategies to overcome constraints and improve aonla cultivation practices. Shackleton and Shackleton (2003) categorized the "safety net" role of NTFPs at two levels - assisting households to cope with adversities like droughts and crop failures, and everyday use resulting in cost savings that can be reinvested in livelihood strategies like agriculture, health and food (Paumgarten, 2005). Chanie and Yirsaw (2018) investigated the economic contribution of forest resources to sustainable rural livelihoods in the Bench Maji Zone of Ethiopia. They found that

forest income provides an important source of livelihood diversification after agriculture for rural households. Furthermore, households rely on other strategies like trade, asset rentals, and off-farm activities for livelihood per Kacani and Peri (2018), where off-farm activities contributed around 53% of total income. Agriculture accounted for the highest income at 20% followed by livestock at 18% and forestry at 9%. Firewood was found to be the largest forest-generated income source, utilized mainly for domestic needs like cooking and heating. On average, forest resources contributed 8.4% of household income for the two administrative units studied, with firewood, forest fruits, nuts, and fodder as the primary forest income sources, of which income from firewood comprised 37.4-65.3% of annual forest earnings. Pandey *et al.* estimated 275 million poor rural Indians rely on forests for income and subsistence, and as a safety net during hardships. However, overexploitation and degradation threaten forest depletion and livelihoods unless sustainable improvement and utilization strategies are implemented for dependent communities. Adam *et al.* (2013) researched the contribution of Non-Timber Forest Products livelihood strategies to rural development in dry lands of Sudan and the results revealed that a subsistence strategy for some sampled households and accumulative strategy for others represented by *Adansonia digitata* sales, while *Ziziphus spina-christi* and *Balanites aegyptiaca* fruits sale is a subsistence strategy for all the surveyed population. The study findings also revealed that the income from selling the fruits was positively and negatively influenced by various external and internal factors. Belcher *et al.* (2015) examined the influence of market access and forest proximity on forest-based livelihood strategies in villages located in Jharkhand, India. The researchers surveyed households to find that over 50% of total income was earned in cash, with forest products such as fuel wood making substantial contributions to overall income and maximum forest income being associated with closer proximity to forests as expected.

Conclusion

Forests play a vital role in sustaining rural livelihoods across India by provisioning diverse resources and ecosystem services. However, over-dependence on unsustainable extraction for subsistence and cash income generation threatens both forest health and long-term benefits for communities. There is an urgent need to mainstream sustainable use into forest governance approaches and promote alternative livelihood options.

Lessons from successful strategies highlight the importance of securing local tenure rights, enhancing productivity of multiple forest products, and integrating indigenous knowledge with scientific management. Community participation through initiatives like JFM strengthened by regulatory safeguards can balance conservation with development outcomes. Livelihood diversification towards non-forest activities alongside value addition of NTFPs supports resilient incomes while reducing exploitation pressures.

Addressing barriers limiting sustainable commercialization like underdeveloped markets, poor infrastructure, lack of skills and collective marketing is crucial. Capacity building and cooperative models aid in overcoming challenges faced by vulnerable groups. Equitable benefit-sharing through reduced intermediation helps incentivize conservation-oriented resource use regimes.

With over 300 million people dependent on forests, prioritizing sustainable forest-based livelihoods featured in poverty alleviation programs becomes urgent in the context of climate change impacts, developmental activities and depleted natural resources base. A rights-based governance framework, promotion of green jobs alongside diversified sustainable enterprises provide viable pathways to secure rural welfare sustainably in India's forest fringe areas.

Acknowledgements

The authors gratefully acknowledge the support provided by Guru Ghasidas University, Bilaspur, India for this study. We thank our colleagues in the Department of Forestry and Environmental Sciences for their valuable feedback that helped improve the manuscript. We also appreciate the numerous researchers whose published work formed the basis of our analysis.

Future Scope of the Study

- Undertake primary field surveys across different forest-dependent communities and ecological regions of India to obtain ground-level insights into livelihood dynamics. This will help validate and expand on findings of secondary studies.
- Conduct a quantitative assessment of the economic contributions of various forest products and services to rural incomes. This will provide more robust estimates of forest dependence for policy making.
- Analyze in depth the gender dimensions of forest dependency and implications for women's

empowerment and livelihood security. Identify interventions to promote equitable access and benefits for all sections.

- Evaluate impact of recent policies like Forest Rights Act on forest governance, resource use patterns, conflicts and livelihood outcomes. Suggest improvements based on learning.
- Explore opportunities for developing value chains of commercially important NTFPs through rural entrepreneurship models and cooperative mechanisms.
- Research indigenous and innovative approaches for sustainably enhancing forest productivity, especially of marginalized communities inhabiting fragile forest ecosystems.
- Undertake pilot projects on diversification of forest-based activities such as ecotourism and build evidence on their socio-economic and ecological viability.
- Study traditional ecological knowledge systems and scope for integrating them with formal forest management approaches for synergistic conservation-livelihood outcomes.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Ahmed, M.U., Jana, S.K. and Roy, S.D. (2016). Marketing of non-timber forest products – a study in Paschim Medinipur district in West Bengal, India. *Intercontinental Journal of Marketing Research*, 4(3), 330-337.

Mishra, A. (2020). Poverty, forests and livelihoods: a study of three villages in Odisha, India. SSRN Electronic Journal, 1-17.

Adam, Y.O., Pretzsch, J. and Pettenella, D. (2013). Contribution of Non-Timber Forest Products livelihood strategies to rural development in drylands of Sudan: Potentials and failures. Agricultural Systems, 117, 90-97.

Agarwal, B. (2001). Participatory exclusions, community forestry, and gender: An analysis for South Asia and a conceptual framework. *World development*, 29(10), 1623-1648.

Ahenkan, A. and Boon, E. (2010). Commercialization of Non-Timber Forest Products in Ghana: Processing, Packaging and Marketing. *Journal of Food, Agriculture and Environment*, 8(2), 962-969.

Asfaw, A. and Etefa, L. (2017). The contribution of Non-Timber Forest Products to the rural livelihood: The case of yayo district, illu ababora zone, Oromia regional state, western Ethiopia. *International Journal of Applied Agricultural Research*, 12(2), 157-169.

Awono, A., Ndoye, O. and Preece, L. (2010). Empowering Women's Capacity for Improved Livelihoods in Non-Timber Forest Products Trade in Cameroon. *International Journal of Social Forestry*, 3(2), 151-163.

Babru, B. and Ganesh, T. (2016). Impact of joint forest management on forest conditions, income sources and income levels in Kolli Hills, Eastern Ghats, India. *Small-scale Forestry*, 15(2), 177-194.

Baloch, S.R., Limba, N.K., Bala, N. and Khan, A.A. (2018). Livelihood of local communities forest resources dependency in forest fringe villages of Pali district, Rajasthan, India. *Acme Intellects International Journal of Research in Management, Social Sciences and Technology*, 22(22), 1-14.

Banerjee, A., Datta, A. and Chattopadhyay, S. (2020). Bridging the gap between forest dependent communities and policy: insights from sustainable livelihood framework. Environment, Development and Sustainability, 22(3), 2483-2506.

Belcher, B., Achdiawan, R. and Dewi, S. (2015). Forest-based livelihoods strategies conditioned by market remoteness and forest proximity in Jharkhand, India. *World Development*, 66, 269-279.

Chanie, M. and Yirsaw, T. (2018). Economic contribution of forest resources to sustainable rural livelihoods in Bench Maji Zone, South West Ethiopia. *International Journal of Advanced Research*, 6(6), 1-10.

Chopra, K., Leemans, R., Kumar, P. and Simons, H. (2002). Ecosystem services and human well-being: a case study from India. *Environment, Development and Sustainability*, 4(2), 119-131.

Dominique, E., George, A.N., Kenneth, A.A. and Gill, S. (2015). The linkage between forest resources, the livelihoods of rural households and possible contributions to sustainable development goals in the developing countries of the Central African region. XIV World Forestry Congress, Durban, South Africa, 7-11 September 2015.

Dwivedi, R. (2018). Joint forest management in India: understanding the dynamics of institutional change. Small-scale Forestry, 17(1), 59-74.

FSI. (2019). State of Forest Report 2019. Forest survey of India, Ministry of Environment, Forest and Climate Change, Government of India. Retrieved from http://fsi.nic.in/

Hahn, M.B., Riederer, A.M. and Foster, S.O. (2009). The Livelihood Vulnerability Index: A pragmatic approach to assessing risks from climate variability and change—a case study in Mozambique. *Global Environmental Change*, 19(1), 74-88.

Hussain, J., Zhou, K., Akbar, M., Khan, M. Z., Raza, G., Ali, S., ... & Ghulam, A. (2019). Dependence of rural livelihoods on forest resources in Naltar Valley, a dry temperate mountainous region, Pakistan. Global Ecology and Conservation, 17, e00553.

Kacani, A. and Peri, L. (2018). Role and significance of forest resources in livelihoods of local communities-A case of Melan and Zerqan administrative units. *Albanian Journal of Agricultural Science*, 836-842.

Kango, J. and Sudhakar Reddy, C. (2015). Livelihood vulnerability and dietary deficiency among forest-fringe communities in India: insights to design community-based adaptation programs. *Climate and Development*, 7(3), 243-256.

Khan, K.A., Musavi, A., Khan, J.A. and Ahmad, K. (2018). Livelihood of two local communities and their dependence on forest resources: A case study from Western Himalaya, Dachigam National Park, Jammu & Kashmir, India. Journal of Human Resource and Sustainability Studies, 6, 294-305.

Khatun, K., Barik, S.K. and Tripathi, R.S. (2020). Importance of non-timber forest products and their implications for the livelihood food and nutritional security in India. Plants, 9(1), 44.

Kimengsi, J.N., Pretzsch, J., Kechia, M.A. and Ongolo, S. (2019). Measuring livelihood diversification and forest conservation choices: insights from rural Cameroon. Forests, 1-16.

Krishnamoorthy, L. and Mani, G. (2002). Collection and marketing of non-timber forest products in Tamil Nadu. My Forest, 38(3), 247-255.

Kujur, D., Dutta, J. and Ranga, M.M. (2019). Non wood forest products for rural livelihood and sustainable forestry with special reference to Chhattisgarh, India. *Journal of Environment and Sociobiology*, 16(2), 231-237.

Lepcha, L.D., Shukla, G., Pala, N.A., Vineeta, Pal, P.K. and Chakravarty, S. (2018). Contribution of NTFPs on livelihood of forest-fringe communities in Jaldapara National Park, India. *Journal of Sustainable Forestry,* 1-17.

Luni, P., Maharjan, K.L., Joshi, N.P. and Dangol, D.R. (2011). Collection and marketing of Non-Timber Forest Products by Chepang community in Nepal. *The Journal of Agriculture and Environment*, 12, 10-21.

Mahapatra, A.K. and Tewari, R.K. (2005). Regulating access and harvesting of non-timber forest products in central Himalaya, India. *Forest Policy and Economics*, 7(4), 599-611.

Mallick, S. and Pattanaik, C. (2019). Elite capture of local institutions and forest governance: evidence from community forestry in India. *Forest Policy and Economics*, 104, 58-67.

Manjula, B.G., Krishnadas, M. and Pushpangadan, P. (2020). Nurturing potential medicinal plants for the livelihood and conservation of forest fringe communities. *Biodiversity and Conservation*, 29(5), 1631-1647.

MoEF. (1988). National Forest Policy. Ministry of Environment and Forests, Government of India. Retrieved from https://moef.gov.in/wp-content/uploads/2018/08/national-forest-policy-1988.pdf

Mustafa, M., Pandey, S.K. and Katare, S. (2011). Socio-economic profile constraints faced by aonla growers in Ratlam district of Madhya Pradesh. *Agriculture Update*, 6(1), 151-153.

Nagendra, H., Sone, L., Xu, J. and Ranja, D. (2020). Community forest rights and forest conditions: Evidence from community-based forest management areas in Odisha, India. World Development, 127, 104745.

Narain, U., Gupta, S. & Van't Veld, K. (2005). Poverty and the environment: Exploring the relationship between household incomes, private assets, and natural assets. *Land Economics*, 81(1), 48-67.

Nayak, D.K., Naik, D.K. and Behera, M.D. (2020). Role of Non-Timber Forest Products in Livelihood and Economy of Tribal People of Niyamgiri, India. Small-Scale Forestry, 19(3), 367-384.

Ofoegbu, C., Chirwa, P.W., Francis, J. and Babalola, F.D. (2015). Understanding forest based livelihood practices as a climate change mitigation and adaptation option in Vhembe districts of South Africa. XIV World Forestry Congress, Durban, South Africa, 7-11 September 2015.

Padmanabhan, M.A. and Priyadarshan, P.M. (2009). Prioritizing medicinal plant species of conservation concern from tropical evergreen forests of southern Western Ghats, India. *Plant Genetic Resources: Characterization and Utilization*, 7(3), 233-237.

Pandey, A.K. (2019). Joint forest management and forest dwellers' rights in India: Reflections and directions. International Forestry Review, 21(4), 480-494.

Pandey, C.B., Tripathi, P. and Tripathi, N.K. (2019). Joint forest management as an approach for sustainable forest management and rural livelihoods in India. *Journal of Sustainable Forestry*, 38(3), 221–242.

Pattanayak, S.K. and Sills, E.O. (2001). Do tropical forests provide natural insurance? The microeconomics of non-timber forest product collection in the Brazilian Amazon. *Land Economics*, 77(4), 595-612.

Paumgarten, F. (2005). The Role of non-timber forest products as safety-nets: A review of evidence with a focus on South Africa. *Geo Journal*, 64(3), 189-197.

Posey, D.A. (1985). Indigenous management of tropical forest ecosystems: the case of the Kayapo Indians of the Brazilian Amazon. *Agroforestry systems*, 3(2), 139-158.

Purohit, P. and Michaelowa, A. (2007). CDM potential of agro-forestry forestation projects in India. *Climate and Development*, 2(3-4), 167-184.

Ranjan, P., Bhengra, A.K. and Pattnaik, A.K. (2020). Forest rights act and forest dependence: impacts on livelihoods and forest conditions in India. *Land Use Policy*, 99, 104895.

Raufu, M.O., Akinniran, T.N., Olawuyi, S.O. and Akinpelu, M.O. (2012). Economic analysis of rural women income from Non-Timber Forest products in Ife South local Government Area of Osun State, Nigeria. *Global J. of Scin. Frontier Res. Agri. & Bio*., 12(1), 23-32.

Rawal, R.B., Acharya, B. and Subedi, B.P. (2001). Jaributi Marketing and Policy Issues in Nepal, National Workshop on Non-Timber Forest Products: Jaributi, Kathmandu.

Rawat, J.S. and Kumar, M. (2015). Vulnerability of mountain communities to climate change in the Indian Himalayan Region. *International Journal of Climate Change Strategies and Management*, 7(1), 2-15.

Shackleton, C. and Shackleton, S. (2003). Value of non-timber forest products and rural safety nets in South Africa. The International Conference on Rural Livelihoods, Forests and Biodiversity. Center for International Forestry Research (CIFOR), Bonn, Germany.

Shah-Khan, F.A. (2019). Livelihood Dependency on Forestry Resources in Leh District of Ladakh. Ph.D. Forestry Thesis (Unpublished), Faculty of Forestry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Kashmir, India.

Somanathan, E., Prabhakar, R. and Mehta, B.S. (2009). Decentralization for cost-effective conservation. *Proceedings of the National Academy of Sciences*, 106(11), 4143-4147.

Suleiman, M.S., Wasonga, V.O., Mbau, J.S., Suleiman, A. and Elhadi, Y.A. (2017). Non-timber forest products and their contribution to households income around Falgore Game Reserve in Kano, Nigeria. *Ecological Processes*, 1-14.

Tripathi, N. and Bhattarya, S. (2014). Joint forest management and equity evidences from community-based ecosystem management programs in India. *Land Use Policy*, 41, 333-344.

Vaidehi, S., Rao, K.R.M. and Masha, T. (2006). Commercialization of Non-Timber Forest products (NTFPs) in India under the IPR regime. In R. M. Rao (Ed.), Role of Universities in Promotion of Intellectual Property. New Delhi: Serials Publications.