***Original Research Article***

**Marketing Channels of Agroforestry Produce: A case study of the Central Narmada Valley Zone of Madhya Pradesh, India**

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ABSTRACT

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| **Background:** Agroforestry enables both female and male farmers to diversify their income sources through the production of a wide array of products derived from trees, including forestry species and horticulture species, shrubs, crops, and often livestock within the agroforestry system, with improvement in Soil, water, Environment and biodiversity of the farm and the surrounding area.  **Aim:** Theaim of the study was to document the existing marketing channels for agroforestry produce in the Central Narmada Valley Zone of Madhya Pradesh, India.  **Methodology:** Amultistage random sampling was used to document information collected from respondents.The present study was conducted during the years 2021-2025 at the Central Narmada Valley Agroclimatic Zone of Madhya Pradesh, India. A total of 270 farmers of two districts, i.e. Narmadapuram and Narsinghpur of Madhya Pradesh, were selected through Multistage Random Sampling. The farmers were interviewed with a pre-tested questionnaire.  **Results:** Based on data analysis, farmers in selected zones are aware of agroforestry practices but lack marketing facilities to sell products at remunerative prices. The study documented 13 marketing channels affected by product nature, market distance, transportation, landholding, produce quantity and quality, and farmers' linkages with wholesalers and other factors. Few farmers process raw materials into products and through advanced tools/ technology like WhatsApp, Facebook, phone, and now they have adopted online transaction methods to sell their value-added products directly to consumers and get the direct benefit. Medium-sized farmers sell grains through C-2 (19.3%), C-3 (10.2%), and C-7 (5.4%). A small number of them benefit from buy-back schemes for sugarcane and mango via C-8 (1.8%). The majority of farmers, 15.1 % sold timber, fuel wood, and small timber by C-10. The maximum utilised marketing channel is C-1 (23.5%), followed by C-2 (20.6%) and C-10 (11.6%). Presently, very few farmers (16.3%, a total of C-10 to C-13) harvest trees.  **Conclusion:** The study concluded that marketing channels used by farmers of the study sites are diverse and evolving many channels to reach final consumers. By leveraging traditional markets, cooperatives, digital platforms and government initiatives, farmers can enhance their market access and achieve better economic returns. |

**Keywords***: Agroforestry system, Value-added Products,* marketing channels, agroforestry

1. INTRODUCTION

Agroforestry, the integration of trees and agriculture that is a sustainable approach of farming that offers various benefits like Environmental, economic and Socio-economic benefits of ways. According to Jamnadass *et al*. (2013), this practice, used by more than 1.2 billion people around the world. Agroforestry enables both female and male farmers to diversify their income sources through the production of a wide array of products derived from trees, including forestry species and horticulture species, shrubs, crops, and often livestock within the agroforestry system, with improvement in Soil, water, Environment and biodiversity of the farm and the surrounding area. Agricultural products and certain main and by-products of forests have market value, and can be cultivated and produced without destroying forest cover. In addition to their wood value, forests can also demonstrate multiple socioeconomic benefits, especially public welfare benefits such as soil and water conservation, carbon sequestration, air purification, and biodiversity conservation, as well as outdoor recreation, forest therapy, and other intangible functions (Liu, W. Y., & Chuang, 2023; Rosa et al., 2021).

The variety of products provided frequently by agroforestry farms includes 5 F i.e. fruits, fodder, fibre, fuelwood, and fertilisers. Besides this, it also provides timber, grains, cereals, vegetables, mulching material, honey and other value-added products through different components used in the various agroforestry systems, like agroforestry helps in aquaculture and vice versa. Agroforestry systems and farms positively contribute to improvement in rural communities and provide opportunities for agri-based and tree-based local businesses and industries (Gold *et al*., 2004 and Vrahnakis *et al*., 2016). According to FAO (1996), agroforestry farms supply raw materials for numerous global products, acting as a source of income as markets grow on national, regional, and international levels.

Market structure pertains to the organisational attributes of a market tailored for specific purposes. It encompasses the characteristics that shape the interactions and relationships between sellers and buyers within the market. (Traub and Jayne, 2008; Qamar, 1998). In India, a diverse array of marketing channels exists through which farmers sell their products to consumers within a specific timeframe. Each step of the marketing channel offers distinct advantages and challenges. Farmers in developing nations continue to face a variety of problems in the agricultural and agroforestry sector. Marketing facilities are one of them; they include revision of transportation costs (High prices), lack of cold storage facilities in rural areas, lack of well-established timber mandi/markets in interior villages, increased marketing costs and risks related to commercialisation. A study revealed that the attitude of farmers toward agroforestry is influenced by “good market prices of fruits” (Market) and by farmers seeing “others in the village get fruits to eat and to sell (Peer experiences) (Do et al., 2025; Olagunju et al., 2020).

The present study aims to document the existing market dynamics in the Central Narmada Valley Zone of Madhya Pradesh; this study will be helpful to develop more efficient and profitable marketing strategies for agroforestry farmers by identifying the major challenges in this area and simultaneously enhancing overall productivity and sustainability of agroforestry systems in the particular regions.

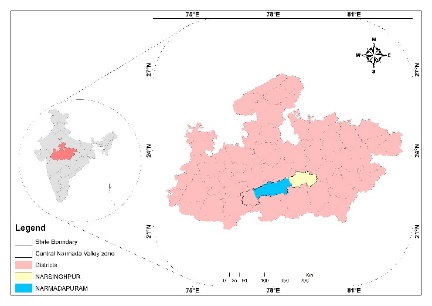
2. Materials and Methods

**Study Site**

Central Narmada Valley Agroclimatic Zone of Madhya Pradesh comprises three districts *viz* namely, Narmadapuram, Narsinghpur, and Harda, which are rich in culture and tradition and famous for their agriculture practices. The soil of this zone is black in colour and rich in nutrients, suitable for various crops like wheat, paddy, sugarcane, pulses, etc. Rainfall varied between 1200 to 1600 mm (http://jnkvv.org). This Zone is located near the Tropic of Cancer; this region experiences scorching summers and moderately cold winters.

**Collection of Data**

For this study total of 270 farmers from two districts, i.e. Narmadapuram and Narsinghpur, were selected through Multistage Random Sampling to document the existing marketing facilities used by farmers. Farmers were categorised into three land-holding levels during the field/ home visit, through a questionnaire that recorded the information on marketed products, status of market, where they sell their products and challenges faced during the marketing. Based on the response of farmers, further information was collected through the wholesalers, intermediaries, retailers, and consumers through the snowball sampling method up to the district level. Out of 270 farmers, those who utilised more than one channel to sell their products were recorded. For each marketing channel, the utilisation was compiled based on landholding categories, resulting in the total number of channels used by farmers in selected blocks.



**Figure 1. Study Site**

3. results and discussion

RESULT

During the study period, it was reported that farmers in this region have a high level of awareness and implementation of various agroforestry systems like Silvi-Agri System, Horti-Agri System, Silvi-Agri-Horti System, Aquaforestry, Silvi-Pasture System, and Horti-Pasture System as per their economic, ecological and dietary needs of farmers and their cattle. Resulting in diverse agricultural outputs like timber, fuelwood, grains, seeds, cereals, milk, vegetables, sugarcane, flowers, fertilisers, fruits, fodder, fencing material, fish, and pulses through different land use systems shown in figure-2.

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| --- | --- | --- | --- |
| Timber | D:\Jai shri Ram\Jai Hanuman lets rock\Papers for submission\Marketing of products\8f6b6245-eae8-4088-af91-6049a64ab19c.jpg  Raw material  for Industries | D:\Jai shri Ram\Jai Hanuman lets rock\Papers for submission\Marketing of products\WhatsApp Image 2024-05-30 at 8.35.56 PM (1).jpeg  Value added  products | D:\Jai shri Ram\Jai Hanuman lets rock\Objective 5\AngleCam\202110\20211029_113549.jpg  Flower |
| D:\Jai shri Ram\Jai Hanuman lets rock\Objective 5\AngleCam\202110\20211009_173416.jpg  Fruits |  | | D:\Jai shri Ram\Jai Hanuman lets rock\Objective 5\normal camra photo of matkuli sarvey\PXL_20240306_101223441.MP.jpg  Meat/ fishes |
| Non-Timber Forest Products | D:\Jai shri Ram\Jai Hanuman lets rock\Objective 5\normal camra photo of matkuli sarvey\PXL_20240306_101236467.MP.jpg  Vegetables |
| D:\Jai shri Ram\Jai Hanuman lets rock\Papers for submission\Marketing of products\0f9ab75e-4e34-4695-940e-14f399537d5a.jpg  Medicinal Plants | D:\Jai shri Ram\Jai Hanuman lets rock\Objective 5\AngleCam\202110\20211009_163458.jpg  Hay | D:\Jai shri Ram\Jai Hanuman lets rock\Papers for submission\Marketing of products\c96347d3-e060-4667-a61b-a7748eaeb121.jpg  Fodder | Grains |

**Figure 2. Products obtained from various Agroforestry** **systems**

In both districts, only a small number of farmers engaged in adding value to their existing produce, such as converting sugarcane into jiggery (Figure 3), transforming pigeon pea (Arhar) into pulse/grain (Figure 4), and cultivating organic moong. These farmers effectively promoted their products through multimedia, Kisan Mela, exhibitions/fairs, and some have successfully established direct marketing channels for their products.

Several farmers engaged in the cultivation, harvesting, and processing of medicinal plants, as well as enhancing the value of certain non-wood forest products that come from their fields and are collected from nearby forests. They also produced other forest-derived items such as *Phyllanthus emblica* (Amla), *Madhuca longifolia* (Mahua), *Aegle marmelos* (Bael), and *Moringa oleifera* (Moringa) leaf powder, from their own farms (Figure 5), among others. Some of these farmers realised that by adding value to their products and altering their marketing strategies, they could significantly increase their profits. A few farmers opted to sell their enhanced products directly to consumers. This process of value addition not only boosts farmers' earnings but also extends the shelf life of crops and plays a crucial role in ensuring food security.

Following the pandemic, the medicinal plant industry experienced growth as it embraced various agroforestry systems centred on medicinal plants. Meanwhile, small farmers residing near forest edges gathered medicinal plants such as (*P. emblica*) Amla, (*Ma. longifolia*) (Mahua), and *Buchanania cochinchinensis* (Chironji) to sell at the nearest local markets. Additionally, they sold grains and cereals at these markets to quickly earn money and meet their daily needs.

**Figure 3. Jaggery production at Narsinghpur District**

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| Sugarcane under Agroforestry system | Processing of sugarcane to jaggery | Brick and Candy of Sugarcane | Organic jaggery | Organic products are sold at Exhibitions |

**Organic Pulses at Narsinghpur and Narmdapuram District**

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| Mango+ Arhar-Based Agroforestry System | Processing and cleaning of Arhar | Processed dal | Value-added product |
| **Figure 4. Cultivation, processing and value addition of Arhar** | | | |

Moringa leaf is processed into Moringa leaf powder at Narmadapuram District

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| Munga-based Horti-Oleri System | Processed Munga leaves powder |
| **Figure 5. Moringa leaf to its leaf powder** | |

Marketing channels significantly influence farmers' income, depending upon the product’s nature (Perishable/ semi-perishable/non-perishable). To achieve better financial returns, it is crucial to have adequate market facilities in these areas, and the markets should be conveniently located near villages so that farmers can easily access them to sell their goods. Field and market surveys revealed that farmers at the block and district levels face fewer market challenges compared to those in remote villages. The study also found that farmers utilise 13 different marketing channels for 7 different types of produce, as shown in Table 1. Additionally, it was noted that farmers utilised more than one marketing channel to sell products derived from various agroforestry systems at different levels.

**Table-1. Marketing channels prevailing in Central Narmda Valley Zone (M.P.)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Marketing Channel | Products | Links | | | | | | | |
| C-1 | Perishable items like milk, vegetables, fruits, fodder, Sugarcane Juice | Farmers |  | | Nearest Weekly Market |  |  |  |  | |
| C-2  C-3 | Grain an Cereals | Farmers |  | | Krishi Upaj Mandi  Govt. Society |  |  |  |  | |
| C-7 |  |  |  | | Middleman | Mandi | Retailers |  | Consumers | |
|  |  |  |  | |  |  |  |  |  | |
| C-4 | Vegetables  And  Fruits | Farmers |  | | Direct Consumers |  |  |  |  | |
| C-5 | Farmers |  | | Wholesaler |  | Retailer |  | Consumers | |
| C-6 | Farmers |  | | Local/ regional Market- |  | Retailers |  | Consumers | |
| C-8 | Sugarcane, Fruits (Mango), Fodder, Pulses | Farmers |  | | Industries  (Buyback Scheme) |  |  |  |  | |
| C-9 | Jaggery, Processed Pulses, Processed leaves, Medicinal plants etc. | Farmers |  | | Local Market |  | Regional market |  | Consumer | |
| C-4 |  | Farmers |  | Direct Consumers | |  |  |  |  | |
| C-10 | Fuelwood, Small timber | Farmers |  | | Local timber shop |  | Consumers |  |  | |
| C-11 | Timber  and  pulpwood | Farmers |  | | Regional Wood market |  | Consumer |  |  | |
| C-12 | Farmers |  | | Middle man |  | Industries |  |  | |
| C-13 | Farmers |  | | Forest Department |  | Consumers |  |  | |  |
|  | |  |

In the course of the study, small farmers are utilising 12 different marketing channels. It was also observed that the largest proportion (34.2%) of small farmers sold their products, such as milk, vegetables, fruits, fodder, grain, and cereals, at the nearest weekly market (C-1) followed by 22.1% (C-2) who sell their grains directly to the Krishi Upaj Mandi, as grains are harvested within 3-6 months depending on the crop. Additionally, 9.4% (C-7) of farmers follow the chain of selling through middlemen (intermediaries) to mandis, then to retailers, and finally to consumers. Meanwhile, agroforestry products like timber, fuelwood, poles, and small timber are sold directly to local timber shops by 8.1% (C-10).

Medium and large category farmers are utilising all 13 channels to market their products. Medium-sized farmers, for instance, sell grains through C-2 (19.3%), C-3 (10.2%), and C-7 (5.4%). A small number of them benefit from buy-back schemes for sugarcane and mango via C-8 (1.8%). The majority of farmers, 15.1 % sold timber, fuel wood, and small timber by C-10.

On the other hand, large category farmers directly sell their produce (grain) to Krishi Upaj Mandi (C-1) (19.3%) and Government Society (C-3) (9.3%). However, some farmers have shifted towards adding value to their crops and fruits, selling these enhanced products directly to local and regional markets (C-9) (4.3%) without involving intermediaries. Farmers who have adopted forest species are selling their harvested products through C-11 (Farmer to Regional Wood market to Consumer) with 1.9%. While some farmers utilise marketing channel C-12 (2.5%) (Farmers to Middleman à Industries) and C-13 (1.2%) (Farmers to Forest Dept.), shown in figure-6.

**Figure-6. Marketing Channels adopted by the farmers in Central Narmada Valley Zone of M.P. (A sample of 270 farmers, utilising more than one marketing channel, accounted for a total of n=476 usages across the 13 marketing channels)**

The maximum utilised marketing channel is C-1 (23.5%), followed by C-2 (20.6%) and C-10 (11.6%) because agriculture marketing is well established in these zones. Farmers are not facing any challenges in selling *Acacia* spp., *Leucaena leucocephala*, and *Bamboo* spp. in both districts, but farmers encounter challenges in supplying timber to industries due to the absence of established timber markets and industries in these regions. Consequently, they sometimes receive only the price of fuelwood. Farmers in both districts are planting fast-growing species for commercial benefit from *Eucalyptus* and *Gmelina arborea*, but they are struggling to sell their produce due to high transportation costs and a lack of wood-based mandi at the Village/ district level. As a result, suppliers (middlemen) are taking advantage of selling their products to industries, and giving less profit to farmers. Presently, very few farmers (16.3%, a total of C-10 to C-13) harvest trees, as shown in figure-6. Farmers who planted Teak (*Tectona grandis*) in Silvi-Agri system, Silvi-Agri-Horti system, Silvi-medicinal system, etc. unable to harvest teak due to legal and rigid felling rules.

The data revealed that land ownership significantly influences agricultural output, as larger farms tend to produce more than smaller ones. Additionally, medium and large-scale farmers often have better access to infrastructure and facilities for processing, storage, transportation, and marketing of their products. The increased quantity and quality of produce from these larger farms tend to attract major traders in the area.

The Narsinghpur district, also known as the sugar bowl of Madhya Pradesh, which is having five sugar cane industries. These sugar mills give buy-back facilities and provide high-yielding sugarcane variety planting material, but during the height of the sugar industry, farmers encountered difficulties such as inadequate transportation facilities. They are still using traditional Bullock carts for the transportation of sugarcane from the farm to the industry.

They continued to rely on animal-based transport systems, which, along with the available transportation, led to issues like increased carbon emissions and traffic congestion on main roads. However, this also offered an opportunity for income generation, particularly during the harvest and transportation time.

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| Modes of transportation used for sugarcane | | A view of the Sugar Industry | A view of Local Haat |

**Figure 7- Processing, transporting and marketing of sugarcane**

The results of this study are anticipated to offer significant insights into the marketing strategies of agroforestry products and pinpoint areas that could benefit from enhancement. The regions studied are abundant in food-processing industries such as sugar mills, dal mills, and rice mills. Moreover, the success of agroforestry is heavily reliant on the implementation of effective marketing strategies and the availability of strong marketing channels. In India, farmers employ a variety of marketing channels to distribute their agroforestry products, each presenting unique benefits and challenges. Gaining an understanding of these channels is essential for improving market access, enhancing livelihoods, and fostering sustainable agricultural practices.

Local and regional markets, which are traditional marketplaces, hold a crucial position in the distribution of agroforestry products. These venues offer a direct connection between producers and buyers, allowing farmers to sell their goods without the need for intermediaries. Nonetheless, these markets often encounter challenges such as insufficient infrastructure, fluctuating prices, and a limited customer base.

In addition to traditional markets, farmers increasingly leverage modern marketing channels. Cooperatives and farmers' associations have become vital in aggregating produce, negotiating better prices, and reducing transaction costs. These organisations often facilitate access to larger markets and provide support services such as storage, transportation, and marketing information. Various Farmers Producer Organisations (FPOs) are also registered in Narsinghpur and Narmadapuram districts, and they evolve in One District One Product, production and selling. Government initiatives and policies are pivotal in influencing the marketing environment for agroforestry products. Programs designed to enhance rural infrastructure, strengthen market connections, and offer financial assistance are crucial for aiding farmers in their marketing endeavours. Initiatives such as the National Agriculture Market (eNAM) strive to establish a cohesive national market for agricultural goods, including agroforestry products, by linking physical wholesale markets through an online trading platform. Additionally, the Ministry of Food Processing Industries (MoFPI) administers the One District One Product (ODOP) scheme for the food processing industry. This initiative seeks to promote and elevate traditional crafts, industries, and unique district-specific products. By focusing on products unique to each district, ODOP aids in the economic development of rural regions and boosts farmers' incomes at the grassroots level. Farmers Producer Organisations (FPOs) can also boost insurance options by arranging group policies for tree crops and creating risk-sharing strategies among members. Regarding marketing, FPOs can set up collective marketing avenues, establish direct connections with buyers and processors, and secure better prices through bulk sales. They can strengthen stakeholder relationships by linking with government bodies, research institutions, and industry partners, promoting knowledge exchange and technology transfer. Despite these advancements, challenges persist in the marketing of agroforestry products. Problems such as insufficient market information, limited access to credit, and inadequate post-harvest infrastructure continue to impede farmers' ability to fully exploit market opportunities. Tackling these issues necessitates a comprehensive approach involving various stakeholders throughout the agricultural value chain.

The emergence of digital platforms and e-commerce has created new opportunities for farmers to connect with a broader audience. Through online marketplaces and mobile apps, farmers can sell their goods directly to consumers, bypassing traditional supply chains and minimising the role of intermediaries. These platforms also offer valuable market insights and help farmers achieve better pricing, but transportation cost is a major challenge.

**Discussion**

Agroforestry demands an initial investment of both time and money, and the returns on this investment take longer to materialise compared to those from annual crops (Sharma *et al*., 2016). Tree growers encounter significant challenges, such as the lack of access to loans for both the establishment and maintenance phases, as well as insurance options to cover crop failures caused by biotic and abiotic factors and unpredictable climate conditions. Additionally, the absence of a marketing infrastructure and connections with other stakeholders presents further obstacles. Addressing these issues is crucial for increasing the adoption of tree farming and enhancing the economic returns for farmers. The complexities involved in felling, harvesting, obtaining transit passes, and marketing, along with uncertain regulations regarding the rights to cut and sell wood, deter them from engaging in tree cultivation (Pandey *et al*., 1999 and Saravanan and Berry, 2021).

Russell and Franzel (2004) also identified that in agroforestry systems, it typically takes between three and six years for the benefits to be fully realised. Similar market information and problems reported by other studies in developing countries, impoverished (poor) farmers are often isolated from markets, primarily growing crops for their own use and selling only a small fraction of their produce (Minot and Hill, 2007). Dorward *et al*. (2003) and Stiglitz (2002) also reported that small farmers have limited access to markets due to the unavailability of transportation facilities that indirectly affect market accessibility. When farmers decide to sell portions of their harvest, they usually do so by trading with local buyers who purchase their produce directly at the farm, often facing little competition from other buyers (Ferris, 2004), and traders resell them in the urban market centres. Conversely, large-scale farmers are able to produce substantial quantities with consistent quality, which enables them to attract buyers who are prepared to pay true market prices for their goods. Transaction cost economics suggests that information asymmetry is the main factor contributing to inefficient market performance and elevated transaction costs (Gyau *et al*., 2014). As the marketing chain becomes longer, the portion of the consumer's rupee that goes to the producer decreases (Bangarw and Sirohi, 2017). The market chains for these and numerous other agroforestry and NTFPs face underdevelopment due to obstacles like inadequate product development, insufficient packaging, lack of standardisation, and a scarcity of market information (Facheux *et al*., 2007; Foundjem-Tita, 2009). For timber marketing, Negi *et al*. (1996) reported the same problems contributing to the poor returns from eucalyptus plantations.

**4. Conclusion**

In conclusion, the marketing channels used by farmers in India for selling agroforestry products are diverse and evolving. By leveraging traditional markets, cooperatives, digital platforms, and government initiatives, farmers can enhance their market access and achieve better economic outcomes. Continued efforts to improve infrastructure, provide market information, and support farmers' associations are essential for the sustainable growth of the agroforestry sector.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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