

# Why is Nepal struggling to halt timber imports despite being rich in forest cover: A critical review from a theoretical lens?

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This paper unveils the historical background of timber production, trade, and revenue collection. It also delves into spatial dynamics and the countries' competitiveness to evaluate the comparative advantage of timber industry. Furthermore, it analyzes the effects of tax, non-tax, and export duties on timber to explain- why timber import substitution became elusive. The paper concludes by suggesting market-driven royalty fees for NF/NIPF-produced softwood and transferring benefits of international best practices to make domestic timber competitive and substitute imports.

**Key words:** Nepal; Stumpage value; Harvesting cost; Demand; Revenue; Economic rent.

Timber trade in Nepal dates back almost two centuries and gained momentum along with the railway expansion in northern and northeast India. Poor road facilities compelled using rivers in timber shipment. In the early nineteenth century, a 2.5 percent export duty was levied under the trade treaty signed in 1792, which provisioned reciprocal import duty between Nepal and British India (Whelpton, 1987). However, the actual measurement of raw logs was unclear, and export regulation was weak. Indian contractors monopolized timber extraction (Regmi, 1971), often paying export duties less than the logging cost paid to the labor (Hamilton, 1819).

The Sugauli treaty of 1816 allowed Indian merchants to exploit Nepal's Sal forests to export timber (Hodgson, quoted by Regmi, 1971). By 1882, a bilateral agreement between Nepal and the British India government facilitated the export of 17,000 pieces of round logs within three years (Mulmi, 2017). But measurement practice was primitive, relied on lump-sum duties for loaded boats and bull carts at exit points. Efforts to standardize volume measurement by practicing the Hoppus formula failed due to the resistance from merchants (Tiwari, 2000).

The Forbesganj-Jogbani railway extension in 1911 enabled the import of cheap Sal timber from eastern Terai, which boosted planned settlement for hill

migrants and timber export. As per the Nepal-Britain Treaty of Friendship in 1923, Nepal provided 200,000 broad-gauge sleepers to Britain for free, supervised by British forester J.V. Collier (Collier, 1928). During his tenure, Nepal experienced extensive deforestation in Terai virgin forests (Tiwari, 2000; Adhikari & Dhungana, 2010; Chaudhary et al., 2016; Ranjit, 2019).

Democratic reforms were initiated after the promulgation of Democracy in 1950. Public policies began to transform, which also influenced the forestry sector governing system. After the restoration of the multi-party system in the 1990s, new forest laws and bylaws were enforced to implement the Master Plan for the Forestry Sector (MPFS), which promoted community forestry to restore the degraded hills. However, political unrest and civil war disrupted forest management activities, and increased timber imports to meet urban demand. The 2000 Forest Policy banned green tree felling, further disturbed domestic timber production and supply chain.

To address those challenges, the government attempted to implement the Scientific Forest Management Procedure, 2014, the Forestry sector strategy for 2016-2025, and the Forest Policy, 2019 (DoF, 2014; MoFE, 2016; 2019). Despite these initiatives, timber production stagnated, and imports

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reached 0.3 million m<sup>3</sup> in 2022/23 (DoC, 2023), contributing one-fourth of the domestic market (Dangi, 2024). The Scientific Forest Management Program, though aimed to contribute to achieving policy goals, prematurely ended, with a marginal contribution to reduce timber imports.

## Materials and methods

This paper is based on desk research and uses qualitative and quantitative information from various sources, including the internet, government-published and unpublished documents, scholarly publications, online platforms, and textbooks. Where required and appropriate, insights from forestry professionals and practitioners were gathered through personnel interactions to support theoretical reasoning.

This paper uses the following four research questions to identify bottlenecks in timber production and develop a strategic roadmap to enhance timber production and reduce imports. First, what policy measures were adopted to increase domestic production and reduce imports? Second, why does the SFM practice extension process remain slow even in the production potential forests? Third, how competitive are the prevailing conditions to foster domestic timber industries? Fourth, what are the key determinants of timber economics, and how to achieve the policy targets?

## Results

### *Institutional arrangement*

The Constitution of Nepal, 2015 (GoN, 2015) divides state power into three levels -federal, provincial, and local– and elaborates power in schedules 6, 7, 8, and 9. It mandates governments to execute policies to conserve and promote natural resources, share benefits, and maintain forest cover for ecological balance.

The Ministry of Forests and Environment (MoFE) exists to administer federal forest agencies and draft national forestry sector policies and laws. Provincial Forest Ministries handle policy and legislation for managing national forests within their jurisdiction, consistent with federal law. The Provincial Ministry administers Divisional Forest Officers (DFO), which are responsible for executing timber production plans and collecting revenue as per national and provincial laws.

Federal Forest Law/Bylaw elucidates the legal and functional role of three governments, while provincial

law further details management functions. The Local Government Operation Act, 2017 (GoN, 2017a) grants limited authority to municipal governments. The Federal Forest Law has recognized two separate productive assets in NF- land (Owned by the federal government) and biomass (usufruct rights granted to forest users). As legitimate land owners, the federal government regulates all forest regimes under NF to ensure sustainable use for societal benefits.

The National Forest Policy, 2019 (MoFE, 2019) and the Forestry Sector Strategy for 2016-2025 (MoFE, 2016) aim to maintain at least 40% of land mass under forest cover and expand SFM practices in 50% of Terai forests and 25% of inner Terai and mid-hill forests to produce 10 million m<sup>3</sup> round timber annually.

Based on the above discussion, following takeaways can be drawn.

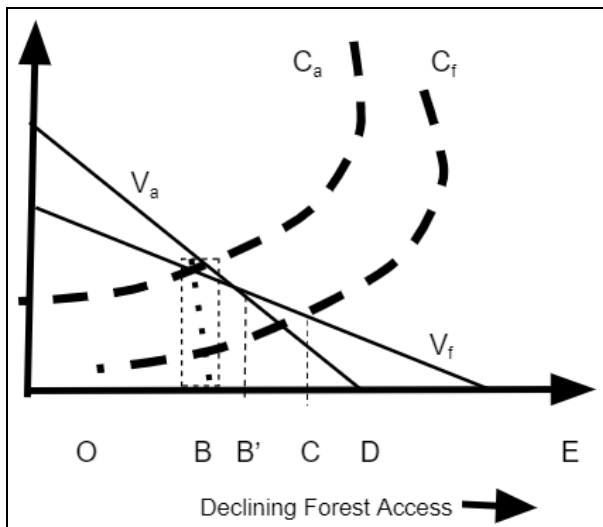
1. Ambitious target: timber production potential is calculated by multiplying the forest area by annual growth (MAI). However, such predictions overlook spatial and regulatory constraints, such as slope restrictions under the Chure Master Plan, which lead to estimation error.
2. Implementation Gaps: Disparities between predicted and actual harvests highlight the need for improved governance, technical capacity, and financial support to extend SFM practices effectively.

### *Forests suitable for timber production*

Recalling the ambitious policy targets, the issue was investigated by adapting a modified framework model, initially developed in the 19<sup>th</sup> century by a German economist, Johann Heinrich Von Thünen, for agricultural land use planning. Like other theoretical models, it also offers the opportunity to start with a simple assumption and expand later as required and appropriate. This framework is simple but effective in interpreting the interaction of production cost, transportation cost, and market access in timber production decisions, and elaborated in land use planning and forestry (Hyde et al., 1991; Hyde et al., 1996; Dangi, 2000; Dangi & William, 2001; Hyde, 2003; Angelsen, 2007 & 2010; Hyde, 2012; Han et al., 2022; Dangi, 2024).

The value of a timber tree is a function of the expected revenue received upon delivering raw timber at sawmill. That means harvested raw logs get reasonable prices if the mill is nearby and delivery

cost is minimal. Therefore, timber harvesting is often high in forests near roads or seaports due to lower transportation costs and proximity to markets and processing facilities (Kaimowitz & Angelsen, 1998; Angelsen, 2010). Similar logic holds in the framework below, where  $V_a$  and  $V_f$  represent the value function of the land under agriculture and forestry, respectively. Both land uses require investment by the owner to secure property rights on those assets, as described by cost function  $C_a$  and  $C_f$  for Agriculture and Forestry, respectively.



**Figure 1: Impact of spatial dynamics in timber production appraisal**

The land owner has an incentive to manage agriculture up to (B), and forest up to (C), where cost equals return, respectively. Therefore, land B to B' is underutilized farmland, where natural trees grow or plant trees as non-industrial private forest (NIPF). The return obtained from land (B to B') merely covers the cost of intensive farming practices and is set aside for specific uses that require low labor inputs. Beyond B', the  $V_f$  is above the  $V_a$ , so land from B' to C would be left as natural forests and managed by local communities as community forests (CF, includes collaborative and community forests), and forests beyond C remains as unmanaged public forests. This is elaborated elsewhere at a greater length.

Under high-migration scenarios, the cost curve shifts to the left, making management costly, and CF tends to remain passive (left to point C). Though such forests do have the potential to produce positive returns, the labor shortages need to allow users to manage them by following technical standards. The DFO has the financial and technical capacity to manage part of the forests near point C as Government managed forest (GMF), but significant costs may not allow them to

go far away (close to D). Such remote forests remain as unmanaged old-growth natural forests.

Above discussion leads us to the following takeaways:

1. Due to socio-economic and ecological constraints, not all forests in fragile hills and remote areas are suitable for producing timber.
2. The increased migration has a counterproductive impact in expanding SFM practice. Timber-producing potential forests were estimated and were represented by point B to B', point B' to C and nearby point C under NIPF, CF, and GMF respectively.

### *The competitive advantage of the timber industry*

The Government has reduced timber export duty to earn foreign currency and balance the trade deficit. We adopt Michael E. Porter's five forces, an industry-level analysis tool, to understand the external competitive environment. This tool offers a strategic guide for input product suppliers to position themselves within the timber industry. This framework is adapted in competitive strategy development using five driving forces (Jelicic, 2019), though it is less common in the timber industry. We attempt to scan the competitive advantage of the domestic timber industry in Nepal by adapting the five forces analysis tool.

1. Factor conditions: From earlier discussion, not all forests in Nepal are suitable for producing timber due to demographic and ecological constraints. One study estimates 2.02 million hectares of NF ideal for timber production, capable of producing 2.9 million  $m^3$  (Dangi, 2024). Raw timber export restrictions in the past had favored establishing timber sawmills, but poor public infrastructure - electrification, rural road networks, led to concentrate in the lowland urban centers.
2. Demand conditions: Recalling timber demand for 2020 of 3.7 million  $m^3$  (Kanel et.al., 2012); It was assumed that rural demand is satisfied by the local community forests and trees nurtured in the private lands. One study estimates that the current timber supply in the formal market is 2.7 million  $m^3$  contributing three-fourth of the domestic market (Dangi, 2024). The remaining one-fourth is contributed by imported timber, which is recorded at 0.3 million  $m^3$  in FY 2022/23 (DoC, 2023). The lowland forests have greater commercial value, but the Chure Master Plan adopts a limited-use approach in forests for above 19 degrees slope and strict protection

for above 31 degrees gradient (GoN, 2017b). Such environmental standards impact timber production and supply.

3. **Related and Supporting Industries:** Timber processing industries are concentrated where electrification and road facilities are reasonably better. Softwood processing industries (sawmill, veneer, and plywood) are operating where public infrastructure is better and softwood logs are available at reasonable price and quantities. The hardwood processing units are concentrated in the lowlands where hardwood is produced by NF. Sawmills in big cities use both domestic and imported timber (hardwood/softwood) for construction and furniture-making. Thus, urban area consume large share of processed timber in the construction and furniture-making industries.
4. **Firm strategy, Structure, and Rivalry:** Reduced export duty is likely to increase demand for raw timber export and make it expensive for existing industries. Existing industries will face tight competition for input products. Firms with diversified operation such as sawmills supplementing furniture making, may face exit barriers, forcing them to operate at a price merely covering variable costs. It risks increasing competition and reducing employment for skilled labor.

The reduced export duty increases export opportunities, but risks raw timber leaving the country, and making it expensive for domestic industries. However, fragmented forests, lack of economies of scale, and legal compliance pose challenges. Timber supply barriers due to poor internal governance risk distortion in the supply chain, new entrants would face cost disadvantages in switching delivery channels. Above-stated entry barriers discourage new entrants.

5. **Government Influence:** The availability of imported timber risks the domestic industry's switch to imports making the input product market volatile. The market for softwoods is much price-sensitive and low-priced imported timber risks making domestic softwood less attractive. Saw-mill, veneer industry, construction industry, and furniture-making industry are the principal raw softwood buyers. The NIPF contributes about two-thirds of raw softwood, and export opportunities increase the bargaining power of suppliers in the veneer industries. The veneer is the input product for plywood industries, and

plywood is the input product for the furniture industry. The furniture industry may exercise the power to substitute plywood based on price and preference.

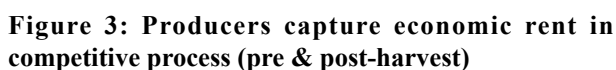
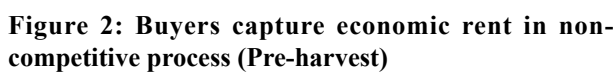
Since NIPF producers have weaker bargaining power, NF producers can influence the market. In that context, the government can ensure consistent timber supply at competitive prices by implementing SFM practices in all timber-producing potential forests to reduce competition among existing industries. The fiscal incentive to invest in advanced technologies would help to reduce costs, improve quality, and diversify output for the broader market. The institutional support to eliminate regulatory hurdles in NIPF will further enhance the competitive position of domestic timber.

### *Strategic insights for timber production*

Timber producers consider market price (marginal revenue, MR) and production cost (marginal cost, MC) to determine timber quantities to produce and supply. They aim to maximize return when MR exceeds MC, which emphasizes the importance of accurate pricing and cost estimation in sustainable timber economics. Discussion was simplified by assuming price represents the average weighted market value of one unit of raw timber, and MC represents the weighted average cost to produce one unit of raw timber (measured in  $\text{ft}^3$  or  $\text{m}^3$ ) in below Figure 2 and Figure 3.

In the non-competitive process in Figure 2, the buyers face cost function ( $C_h$ ) that include Royalty fee (R), and production cost. Suppose, saw-mill gate price of timber is (P), then producer collects upfront revenue equivalent to area RFOh. The revenue for the producer depends on the volume, inaccurate volume measurement leads to low economic rent to the producer. If buyers adopt selective logging at (h), leave low-quality trees uncut, and earn equivalent PAER and capture economic rent equivalent CGE.

In the competitive process in Figure 3, producers determine stumpage fee ( $p''$ ), which is above royalty fee (R). It allows buyers to estimate sawmill price and subtract production costs (includes stumpage fee, harvesting cost, and average profit) to quote offer price (stumpage value) to producers. Generally, the quoted price exceeds the stumpage fee, and the owner captures the difference between the stumpage value and the royalty fee as an *economic rent*. Recall from Figure 2, it was captured by the buyer. While related, the royalty fee and stumpage value serve different



Post-harvest auction is common among producers in NF and NIPF practice pre-harvest price negotiation. However, the post-harvest model follows the same theoretical argument which has been elaborated earlier for Figure 3. Producers intend to make earnings by determining the  $p''$  above the  $R$ . Whoever offers  $P'$  more than  $p''$  that gets approval after depositing upfront revenue ( $P' \times q$ ), where  $q$  represents the timber volume ( $m^3$ ). Thus, accurate estimation pushes buyers to go beyond (h) to recover upfront payment; if extended up to (D), then the producer earns equivalent to  $P'COD$  and  $PP'AB$  by the buyer.

Based on above discussion, following strategic insights were presented to enhance domestic timber production:

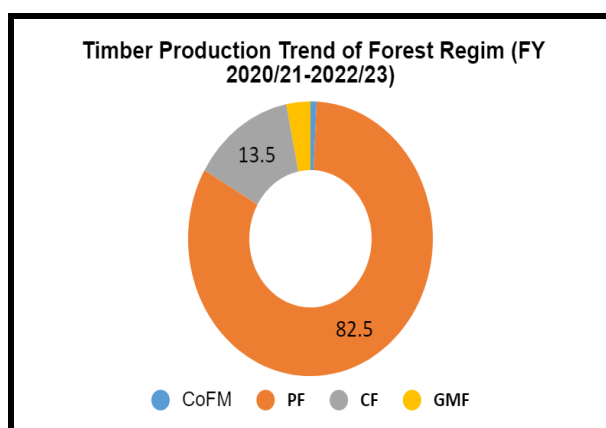
1. Competitive mechanisms increase revenue for producers, decrease incentive for buyers to decide selective logging, and encourage the use of timber resources.
2. Elevated fee structure risks reducing timber demand. Producers need to consider the elasticity of demand to respond to such risk while maintaining competitiveness.
3. Flexible fee customized to timber location and quality, and fiscal incentives to expand SFM practice, and investment in advanced technology enhances the competitiveness of the domestic timber industry.

Majorities of timber production predictions for Nepal have relied on estimated gross forest area and average annual growth (MAI). However, timber logging in ecologically sensitive areas such as fragile mountains, sensitive watersheds, and biodiversity hotspots risks threatening local and downstream communities, where society expects strict regulation. Authorities respond by enforcing standards, which increase production costs and narrows the viable forests available for timber production. Therefore, such predictions based solely on forest area and growth rate may be overly optimistic.

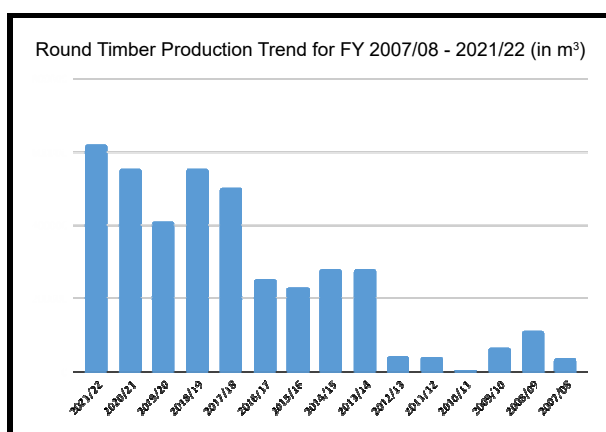
The data accessed from seven provincial Forest Directorates for fiscal year 2020/21 to 2022/23 shows that NIPF producers dominate the formal market, contributing 82% while natural forests under the NF account for 18% (Dangi, 2024). The timber production trend in NF has not been very impressive for the last fifteen years (Figure 5); downturns in 2010

and 2020 indicate disturbances in timber production due to administrative hurdles, reflecting general criticism of public forest management in a weak governance context.

In mid-hills, NIPF producers nurture trees to produce non-wood products (e.g., fodder, fuel-wood). They tend to produce timber in small quantities and individual producers cannot influence the market and accept the prices buyers offer. As price takers, individual firms face an elastic demand curve that appears horizontal, as explained in Klemperer (1996). In low-land, NIPF producers plant fast-growing commercial timber species benefiting from a competitive local market. They reflect perfectly inelastic behavior, as explained by Newman and Wear (1993). Relaxing export duties could escalate buyer competition raising timber prices in low-lands. Whereas, mid-hill producers get marginal benefits as price takers.



**Figure 4: Timber production trend (by Regime)**  
(Source: Dangi, 2024)



**Figure 5: Timber production trend (Aggregate)**  
(Source: MoF, 2022)

The NF producers, managing old-growth forests, face stricter regulation as per the societal expectation. Timber production and sales involves paying

stumpage price, and have to comply with the standards. Consequently, hardwood prices remain relatively high, reflecting the limited supply. NF producers influence the market as price setters and face an inelastic demand curve.

There are two primary revenue sources: tax and non-tax revenues. Stumpage fees are the principal sources, if buyers express willingness to pay a high price then there is no reason to lower it. Overpricing risks reducing domestic demand and stockpiling. Stockpiling further diminishes value due to reduced usability. These economic implications are further elaborated elsewhere (Amacher et al., 2003). Since underpricing risks over-exploitation for exporting, it harms the domestic industries. To mitigate such pricing issues, adoption of a market-responsive stumpage fee has been suggested that take account of the relative prices of similar products in domestic and international markets.

With reference to the debate, high stumpage fees determined by the government have made domestic timber less competitive than imports. It has been argued in response that this is partially true, given that producers in the lowlands are understood to face an inelastic demand curve. The buyer's willingness to pay high prices for preferred timber species may negate competitiveness concerns. Historical insights (e.g., Weintraub, 1958) emphasize that properly adjusted stumpage fees help sustain timber production without negotiating demand.

## Conclusion

Nepal's timber trade history spans over two centuries, manifested by the massive deforestation in Terai to export timber for railway expansion in adjoining northeast India. The planned settlement for hill migrants in Terai further elevated deforestation to expand farmland. Decentralized forestry governance practiced in 1990 contributed to improving forest quality and expanding forest cover. National policy and programs emphasized extending SFM practice to enhance timber production. Despite all such efforts, timber production did not improve, and imports continued.

The timber supply potential of Nepal is estimated at 2.7 million m³ annually in the formal market from NIPF and NF producers. NIPF producers dominate the softwood market, and NF producers dominate hardwoods. The NF producers' contribution to the formal domestic market is less than that of NIPF due to the regulatory obligations. Due to the high demand for domestic hardwoods, NF producers act as price

setters, whereas the NIPF producers vary in demand elasticity depending on their locations.

Nepal has recently enforced a policy shift by relaxing previously practiced high export duty for raw timber to boost exports. However, a landlocked nation with a limited capacity risks elevating competition for existing domestic industries, threatening job opportunities for skilled labor. There is a need to align domestic timber prices with imported prices and revise royalty fees to maintain competition. Practicing a transparent mechanism was recommended by the concerned authorities to review royalty fees by involving experts to prevent potential conflicts.

In summary, Nepal needs to learn from timber-exporting countries, such as Malaysia, Indonesia, and Vietnam, to execute strategic reform. Hence, conclusion was made by suggesting the concerned authorities focus on expanding SFM practices, practicing accurate volume measurement methods for harvested round logs, adapting market-driven royalty fees for NF/NIPF-produced softwoods, and taking advantage of international best practices to strengthen the domestic timber industry while safeguarding environmental and economic goals.

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## Conflict of interest

The author reports no conflicts of interest and takes full responsibility for the analysis and conclusions. The findings of this paper do not necessarily reflect the organization's views, where the author had prior professional engagements.

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