**README: Data Extraction and Calculation for Ad Valorem Tariffs Rates and Forest Growing Stock and Forest Stock Growth for TiMBA**

Contents

[Calculation of Ad Valorem Tariffs Rates 1](#_Toc191022855)

[1. Overview 1](#_Toc191022856)

[2. Notes on Tariff Data Calculation and Updates 2](#_Toc191022857)

[I. HS Code Selection 2](#_Toc191022858)

[II. Base for Updates and Flag System for Data Sources 2](#_Toc191022859)

[III. Ad Valorem Rate Acquisition 2](#_Toc191022860)

[IV. List of Products 3](#_Toc191022861)

[Data Extraction and Calculation for Forest Growing Stock and Forest Stock Growth 4](#_Toc191022862)

[1. Overview 4](#_Toc191022863)

[2. Notes on Extraction and Calculation of Data 4](#_Toc191022864)

[3. Flag System for Data Sources 5](#_Toc191022865)

[References 5](#_Toc191022866)

# Calculation of Ad Valorem Tariffs Rates

## Overview

The Timber market Model for policy-Based Analysis **TIMBA** (TI-FSM 2024) is a partial economic equilibrium model for the global forest products market. It simulates production, consumption, and trade of wood-based products across 180 countries.

Trade in TiMBA depends, among others, on the transportation costs. Transportation costs entails commodity-specific freight costs and tariffs. Tariffs are calculated as a percentage of the value of the imported product using ad valorem rates. They are derived from the **World Trade Organization (WTO) Integrated Database (IDB)** (WTO 2024) notifications using **6-digit** (subheadings) or **4-digit** **codes** (headings) **HS (Harmonized System) codes**.

This Readme provides a detailed explanation of how the ad valorem rates were extracted and calculated for different wood-based products across different countries. The rates are based on the **Most-Favored-Nation (MFN)** applied tariff, and trade agreements were not considered in the calculations.

This research updates previous data as published with the Forest Sector Model GFPM (Buongiorno 2003; Buongiorno 2021). The base for the tariff update is the least available HS code version for each country, with updates based on data from **July 2024** sourced from the **World Trade Organization (WTO) Integrated Database (IDB)** (WTO 2024).

## 2. Notes on Tariff Data Calculation and Updates

### **HS Code Selection**

The extraction and / or calculation of ad valorem rates is based on the **HS codes** for each product. The HS codes provide standardized classifications of goods, used internationally for tariff purposes. The HS classifies products using 6-digit codes that are organized by chapters (2 digits), headings (4 digits), and subheading (6 digits). If applicable, we extract information stated on the **4-digit level**. However, in some cases, a product in the TiMBA model framework is represented by **6-digit HS codes**.

### B**ase for Updates and Flag System for Data Sources**

The calculation uses the **least available HS version** for a particular country. The rates were carefully checked for accuracy, and changes to earlier entries were marked using **flags** for transparency.

The different **flags** associated to the ad valorem rates in Table 2 carry additional information:

* **O:** indicates that the update are based on a very old HS version.
* **U:** indicates that the updated value differs from a earlier entries.
* **C: s**hows that the value has been checked in the with WTO IDB data from July 2024 and remains unchanged compared to the data provided by Buongiorno (2021).
* **X:** means that no information are available for the corresponding product and country. For these countries, we assume an ad valorem rate of zero.

Differences between provided data provided in Table 2 and the information delivered with the GFPM (Buongiorno 2021) should come from the updates of the values. However, especially when combined HS code combinations are used for product representation, the difference may also arise from the different use of product classifications and assignments in the current work and the GFPM (Buongiorno 2003) (Buongiorno 2015)

### **Ad Valorem Rate Acquisition**

In general, mean ad valorem rates for those specific products are extracted from the WTO IDB. Products represented by more than one HS-code are treated separately for calculating mean ad valorem rates for those specific products. Thus, depending on the number of HS codes digit levels involved, ad valorem rates were either extracted or calculated:

**Where possible, the ad valorem rate for a specific country and product are extracted** directly from the **WTO** **IDB** as (mean) ad valorem rates on the 4-digit or 6-digit code level. Prerequisite for the former case is, that the product representation in TiMBA is congruent with the 4-digit level in the HS system.

Some products are represented by more than one 4-digit and / or 6-digit HS code. When this occurs, the tariffs for these codes are treated separately for the calculation, and the final ad valorem rate reflects the aggregate or a representative value based on the available data. In case that a product in TiMBA is composed of **multiple HS codes (see Table x), the ad valorem rate is calculated** based on the available tariff data for the product and country as the average of ad valorem duties of the respective reporter country and product.

### **List of Products**

Table 1: Products and assignment of HS codes used for the ad valorem rate calculations.

|  |  |
| --- | --- |
| Product | HS codes |
| Fuelwood | 4401 |
| Industrial Roundwood | 4403 |
| Sawnwood Non-coniferous | 440721, 440722, 440723, 440724, 440725, 440726, 440727, 440728, 440729, 440791, 440792, 440793, 440794, 440795, 440796, 440797, 440799 |
| Sawnwood Coniferous | 440710, 440711, 440712, 440713, 440714, 440719 |
| Veneer and Plywood | 4412 |
| Particleboard | 4410 |
| Fibreboard | 4411 |
| Mechanical Pulp | 4701 |
| Chemical and Semi-chemical pulp | 4703, 4704, 4705 |
| Other Fibre Pulp | 4706 |
| Waste Paper | 4707 |
| Newsprint | 480100 |
| PWP | 4802 |
| Paper and Paperboard | 4804, 4805, 480620, 480630, 480640, 4807, 4808, 4810, 4811, 481500, 4819, 4821, 4823 |

# Data Extraction and Calculation for Forest Growing Stock and Forest Stock Growth

## Overview

This dataset contains information on forest growing stock and forest stock growth for 180 countries, as considered in the TiMBA model. While data on forest area and forest area growth for the reporting year 2020 is adequately provided by the FAO **Forest Resources Assessment (FRA) 2020** (FAO 2022), data on forest growing stock and forest stock growth is fragmented and not fully reported for all countries. This README explains the methodology used to extract data as well as fill in the data gaps and provide consistent values for forest growing stock and stock growth across all countries. The methodology ensures that the data used in the TiMBA model is as consistent and reliable as possible, despite the fragmented nature of global forest stock data.

## 2. Notes on Extraction and Calculation of Data

Whenever available, data for the country-specific **growing stock for the total forest area** was taken from the **FRA 2020** (FAO 2022) for the reporting year 2020. This data provides the most up-to-date estimates for forest stock at a global level.

In cases where data for 2020 was not reported but older data for forest growing stock data for the total forest area (e.g., from 2010) was available, we used them to fill in gaps where more recent data are unavailable. If no data on forest growing stock on total forest area were reported at all, we searched the FRA 2020 database for data specific to naturally regenerated and/or planted forest areas.

In some instances, total forest growing stock was calculated from the FRA biomass stock (measured in t/ha). This approach provides an alternative estimation based on biomass density when forest growing stock reports for any forest type were non-available.

For those countries not covered by the **FRA 2020** reports, the total forest growing stock was calculated using data from the **GlobalForestWatch** (GFW 2024) on living woody biomass density. If the reported forest area was greater than 1 while the growing forest stock was reported and/or calculated to be smaller than 1, a correction was applied where the stock value was set to 1. This correction was necessary to standardize data across the dataset and ensure that unrealistic or inconsistent values were adjusted.

The calculation of annual growth rates for forest stock, excluding harvest, is based on the average growth rate of the forest stock. If this data is unavailable, the average growth rate of biomass is used as a substitute. In cases where data on forest growing stock development was insufficient or outdated, stock growth was set to zero.

The values for forest growing stock and annual forest stock growth are provided in the accompanying table.

## 3. Flag System for Data Sources

The table entails the following flag system to denote the source and reliability of the data:

* **A**: Taken from FRA growing stock for the total forest area (million m3), using data for the reporting year 2020.
* **B**: Taken from FRA growing stock for the total forest area (million m3), but the reporting year is not 2020; it may be older (e.g., 2010).
* **C**: Taken from FRA growing stock for naturally regenerated and/or planted forest area (million m3).
* **D**: Calculated from the FRA biomass stock (t/ha) and converted to million m3.
* **G**: Calculated from Global Forest Watch 2000 based on living woody biomass density (t/ha) and converted to million m3.
* **O**: Own data correction – if the area is greater than 1 and the growing forest stock smaller than 1, the stock is set to 1.
* **Z**: Stock growth set to zero due to insufficient or outdated data on forest growing stock development. This flag indicates that due to the lack of reliable data on stock growth, no estimation could be made.

# References

Buongiorno, Joseph; Zhu, Shushuai; Zhang, Dali; Turner, James; Tomberlin, David (2003): The global forest products model: Structure, estimation, and applications. Amsterdam and Boston and London: Academic Press.

Buongiorno, Joseph (2015): Global modelling to predict timber production and prices: the GFPM approach. In *Forestry* 88 (3), pp. 291–303. DOI: 10.1093/forestry/cpu047.

Buongiorno, Joseph (2021): GFPM-base2021. Available online at https://onedrive.live.com/?authkey=%21AEF7RY7oAPlrDPk&id=93BC28B749A1DFB6%2117056&cid=93BC28B749A1DFB6.

GFW (2024): GlobalForestWatch. Available online at https://www.globalforestwatch.org

FAO (2022): Global Forest Resources Assessment - Database. Available online at https://fra-data.fao.org.

TI-FSM (2024): TiMBA (Timber market Model for policy-Based Analysis). doi.org/10.5281/zenodo.13842384. Available online at https://github.com/TI-Forest-Sector-Modelling/TiMBA

WTO (2024): World Trade Organization - Integrated Database. Available online at https://www.wto.org/english/tratop\_e/tariffs\_e/idb\_e.htm.