BOOK OF
ABSTRACTS

FORESTS & SOCIETY TOWARDS 2050

STOCKHOLM 2024

26th WORLD CONGRESS IUFRO

FORESTS & SOCIETY TOWARDS 2050

Stockholm, Sweden
23–29 June 2024

Predicting bilateral trade flows in wood markets by using gravity models and neuronal networks

T2.1 Accounting for risks and uncertainties in forest-based businesses, sectoral projections, and policy design

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Abstract: Trade data are often inconsistent and fragmented, economic shocks jolt market response behaviour, and effects ramify across sectors and countries, which are highly interwoven via international trade in a globalized economy. Therefore, uncertainty is an important factor in modelling international trade flows. One of the first attempts to deal with these issues was the gravity model of trade. These started as mere econometric models to explain bilateral trade flows and became popular in wood market analysis as they gained empirical evidence. Over time, the theoretical foundation has improved, and with it, predictions made with such deterministic models have become even more precise. Nowadays, data driven machine learning methods such as artificial neuronal networks (ANN) offer the possibility to further enhance accuracy in the predictions of complex non-linear relationships. However, the major disadvantage of such data-driven modelling procedures is that the resulting parameters of ANN cannot be directly interpreted. Thus, this "black box" approach has the potential to reduce uncertainties in the prediction of existing bilateral trade flows while simultaneously having reduced explanatory value compared to deterministic gravity models. Against this background, the aim of this study is to compare the ability to predict bilateral trade flows of ANN and gravity models. Therefore, we apply both methods to model bilateral trade flows for different types of forest products on a global scale for the same sets of data. Our results show that the data-driven ANN tends to predict existing bilateral trade flows in wood markets more accurately than gravity models and thus can help to further tackle uncertainties in general trade projections. However, forecasting with ANN is only possible in case that no structural changes are implemented in this procedure, as ANN are explicitly trained to match the existing data. This is where deterministic models can deliver more reliable results.