

## The 2023 MWP Award – Full motivation

### Citation

The 2023 Marcus Wallenberg Prize is awarded to **Drs Darius Adams, Joseph Buongiorno, and Richard Haynes** for their original and groundbreaking development of the forest sector economic models TAMM and PAPHYRUS and its extension to the global forest products model GFPM. Their work laid the foundation for the development of global forest sector modelling and numerous national and regional forest sector models from the 1980s and onwards.

The TAMM and PAPHYRUS models combine in a pathbreaking way biological, statistical, mathematical and technological knowledge with neo-classical economic theory into highly useful empirical models. These models make it possible to analyse impacts of policies and other factors influencing forestry and forest industries globally as well as at regional and national levels. The scientific accomplishments of Drs Adams, Buongiorno and Haynes have contributed significantly to the understanding of vital interconnections in the global forest sector. Their work has enabled further development of forest sector modelling worldwide.

### Background

Population and income growth place increasing pressures on forests all over the world. Unsustainable forest use, climate change, deforestation, as well as changing policies and trade tariffs strongly influence global forests and forest management. The prize winners' work commenced in the 1970's when rapid developments in the forest sector took place driven by strong increases in demand and increased globalisation. Environmental concerns - such as the decline of the Northern spotted owl in the US Pacific Northwest and reports of forest dieback in Europe - as well as challenges related to international trade regulations led to increased interest in the future development of the forest sector. However, no tools were available for large scale holistic analyses of the likely future impacts of such concerns.

This was the situation the prize winners faced at the start of their research. Darius Adams developed in the early 1970's a forest sector model that had a rather detailed timber supply for types of softwood land owners. This included a rough trade model for the USA-Japan lumber trade and full coverage of the US forest products industries (Adams 1974). However, prices were set outside the model, and inter-regional trade within the US was not included. At about the same time, Richard Haynes (Haynes 1975) developed a spatial model of timber supply where trade between US regions was explicitly treated as driven by downward sloping demand functions. Haynes used a specialized heuristically designed algorithm to solve the general mathematical problem of estimating both trade and prices endogenously. After these important developments the prize winners started to work together, resulting in the first multi market spatial equilibrium forest sector model called the Timber Assessment Market Model TAMM (Adams and Haynes 1980).

TAMM covered only the US solid wood market, and Buongiorno's important early contribution to forest sector modelling was the development, of the model PAPHYRUS, which is a multi market spatial equilibrium sector model of the North American pulp and paper industries (Gilles and Buongiorno 1987). It had several similarities with TAMM, but included two major improvements: it used activity analysis to characterize production technologies (and their changes) and applied ordinary stepwise linear programming. The aforementioned research then laid the basis for the future development of both global and regional/national forest sector modelling based on neoclassical economic theory. The first global forest sector model was developed at IIASA (Kallio, Dykstra and Binkley 1987), followed later by the development of the global models GFPM (Buongiorno et al. 2003) and EFI-GTM (Kallio et al. 2004) as well as numerous national and regional forest sector models.

## Significance

The prize winners have laid the foundation for the development of global forest sector modelling based on neoclassical economic theory, and have also laid the basis for the development of numerous regional and national forest sector models of this kind. The spatial multi-market equilibrium modelling arising from the work of Adams, Buongiorno and Haynes has become an important branch of forest economics and quantitative policy analysis. Several models are currently operational in North America, Europe, and Asia, and applied for analyzing impacts of e.g.:

- Trade regulations
- Subsidies applied to energy supply
- Climate mitigation measures
- Climate change
- Carbon pricing
- Forest protection measures
- New biorefinery products.

Results from the present forest sector models provide industry and policy-makers with important information. Currently, global forests and forest industries face many new demands and challenges under rapidly changing climate and governance conditions. For example, the EU is developing several new legislative acts that could strongly influence future developments of the forest sector. However, the medium- to longterm impacts of these acts are at present difficult to foresee, and it is uncertain in which directions forest management and industry should move. Further development and use of forest sector modelling, building on the work of the laureates, will be increasingly important in order to guide policy making at various levels, taking into consideration the diverse forest resources in the EU and around the world.

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## Darius M. Adams



Darius M. Adams, Professor Emeritus at Oregon State University, Corvallis, OR, USA. He earned his Ph.D. in Wildland Resource Science at the University of California, Berkeley in 1972. From 1971 to the present day, he has served as a faculty member at University of Wisconsin, University of Montana, University of Washington, and Oregon State University.

Recognized as one of the foremost authorities on timber and wood products markets in North America, Dr. Darius Adams worked a.o. on sustainable feedstock production for the Northwest Advanced Renewables Alliance.

## Joseph Buongiorno



Joseph Buongiorno, Professor Emeritus of Forest Economics at University of Wisconsin-Madison, USA. He took his Ph.D. in Wildland Resource Science in 1972 at the University of California, Berkeley.

Examples of vital research are Tropical rain forest management, Effects of ban on tropical log exports, and Comparative advantages in trade of forest products.

## Richard Haynes



Dr. Richard W. Haynes, the US Forest Service Pacific Northwest Research Station, Portland, OR, USA. He received his Ph.D. in Forest Management, at the North Carolina State University, Raleigh, North Carolina, USA.

Richard Haynes specialized in assessing forest resources and markets and played a central role in important events leading up to and through formulation of the Northwest Forest Plan (NWFP) and other regional conservation strategies.