# Forest sector modelling in the Nordic countries: Norway

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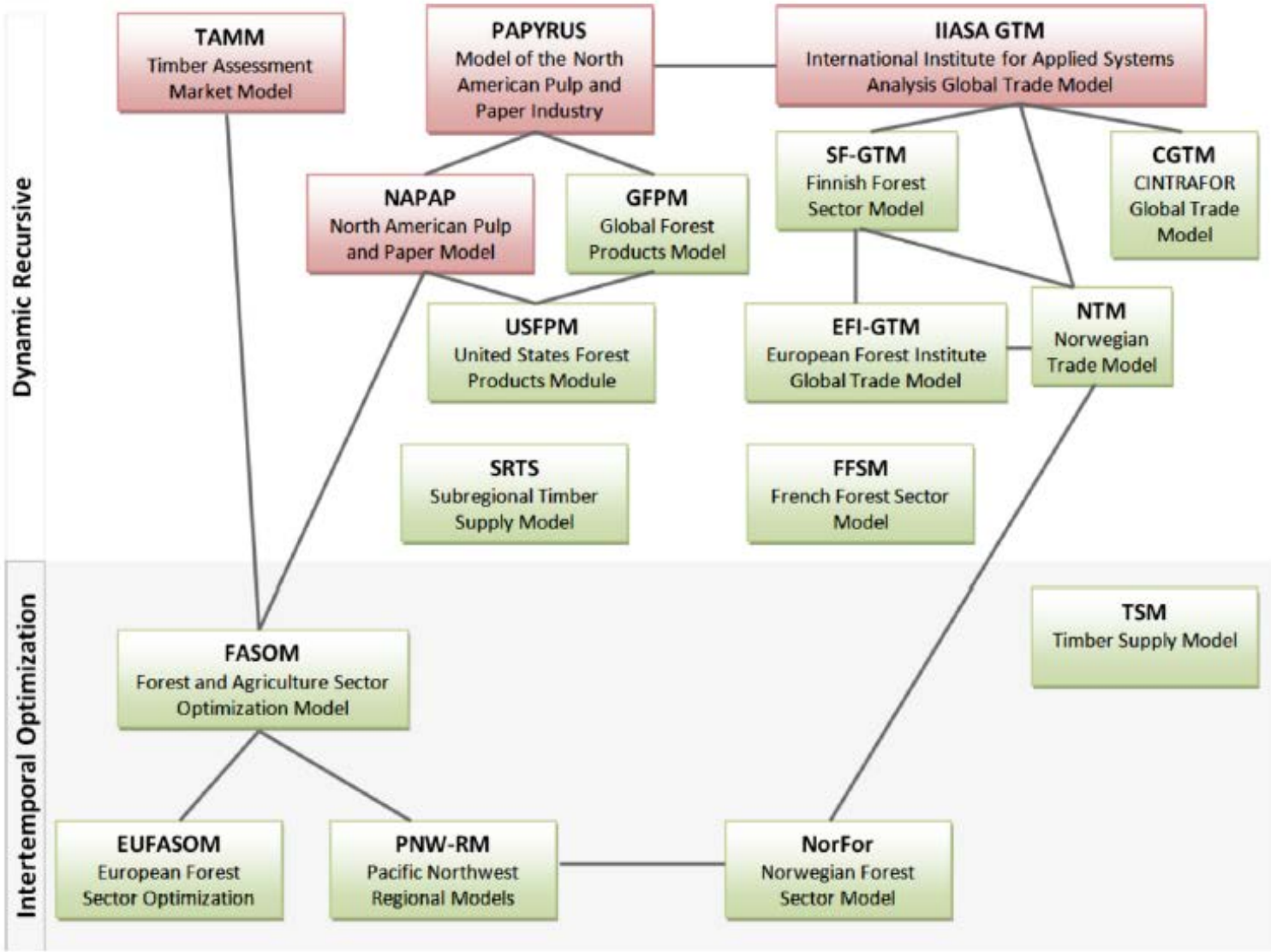
Dynamic Recursive
Intertemporal Optimization
TAMM
Timber Assessment Market Model
PAPYRUS
Model of the North American Pulp and Paper Industry
IIASA GTM
International Institute for Applied Systems Analysis Global Trade Model
SF-GTM
Finnish Forest Sector Model
CGTM
CINTRAFOR Global Trade Model
NAPAP
North American Pulp and Paper Model
GFPM
Global Forest Products Model
USFPM
United States Forest Products Module
EFI-GTM
European Forest Institute Global Trade Model
NTM
Norwegian Trade Model
SRTS
Subregional Timber Supply Model
FFSM
French Forest Sector Model
TSM
Timber Supply Model
FASOM
Forest and Agriculture Sector Optimization Model
EUFASOM
European Forest Sector Optimization
PNW-RM
Pacific Northwest Regional Models
NorFor
Norwegian Forest Sector Model

# NTM3.0

- Exogenous forest growth, econometrically-derived timber supply
- Dynamic-recursive
- Time horizon 15-20 years
- Foreign trade regions as domestic

# NorFor

- Forest growth and management endogenous (stand simulated, ~9000 NFI plots)
- Perfect foresight, intertemporal optimization
- Time horizon up to 100 years
- Foreign regions pure trade regions
- Full GHG accounting

# Both

- Base year 2010
- Region = 19 counties + 2 foreign regions
- P&P industry on mill level, bioenergy and saw mills on county level
- Bioenergy market segments with demand functions and capacity constraints: stoves, water heating central , industry
- Demand for wood products f(price, GDP)

# Documentation and applications

NTM:

Bolkesjø (2004);

Trømborg and Sjølie (2011)

Impacts of bioenergy policies on bioenergy production and forest sector economy;

Forest conservation

NorFor:

Sjølie et al. (2011);

Trømborg and Sjølie (2011)

Climate change mitigation costs and potentials (also with albedo);

Now inclusion of ind. tree simulated stands and biodiversity indexes

# What are differences in practice between these models?


Taylor & Francis

Scandinavian Journal of Forest Research

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## An assessment of forest sector modeling approaches: conceptual differences and quantitative comparison

Hanne K. Sjølie, Greg S. Latta, Erik Trømborg, Torjus F. Bolkesjø & Birger Solberg

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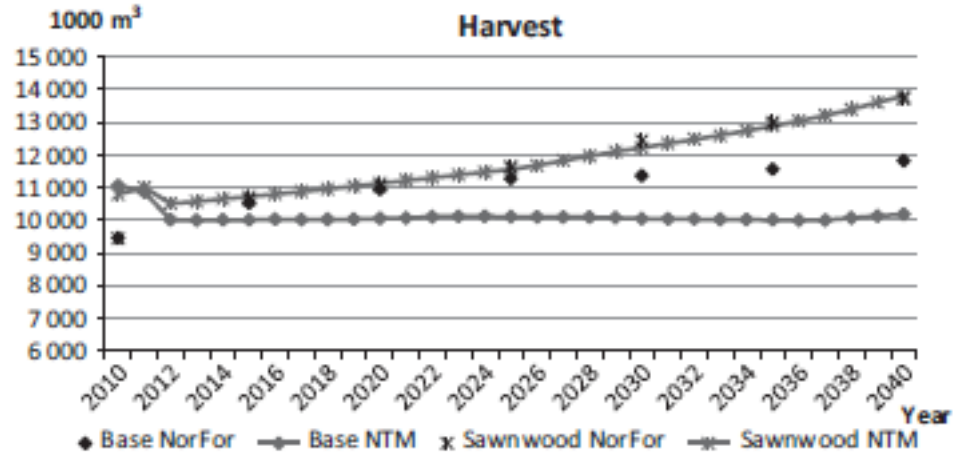
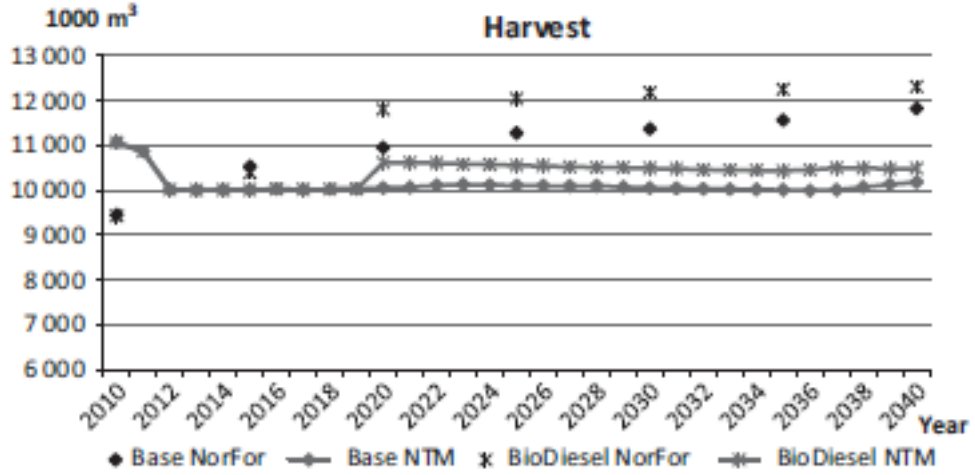
# Scenarios

- BAU
- *Sawnwood*: Demand growth of 2% p.a. additional to GDP-driven demand
- *Biodiesel*: plant consuming 1 mill. cbm operating from 2020

## *Sawnwood scenario*




## *Biodiesel scenario*




Harvest is more elastic in NorFor than NTM (=1);

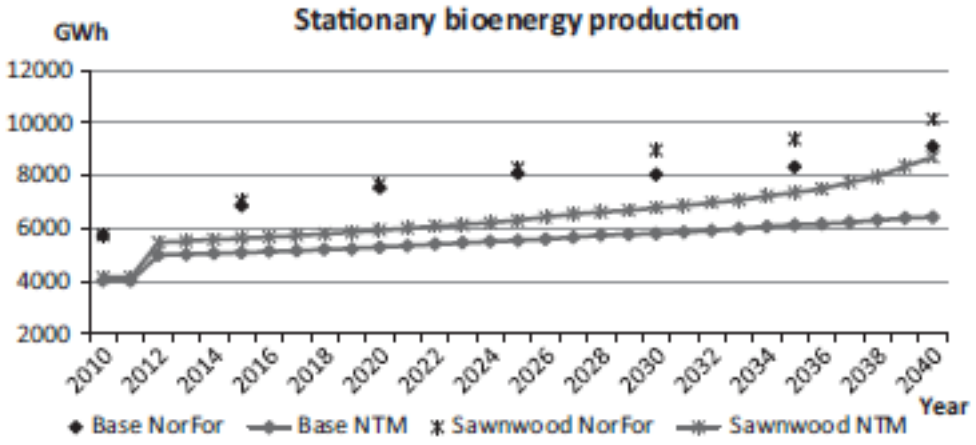
also higher in BAU

**NorFor:**

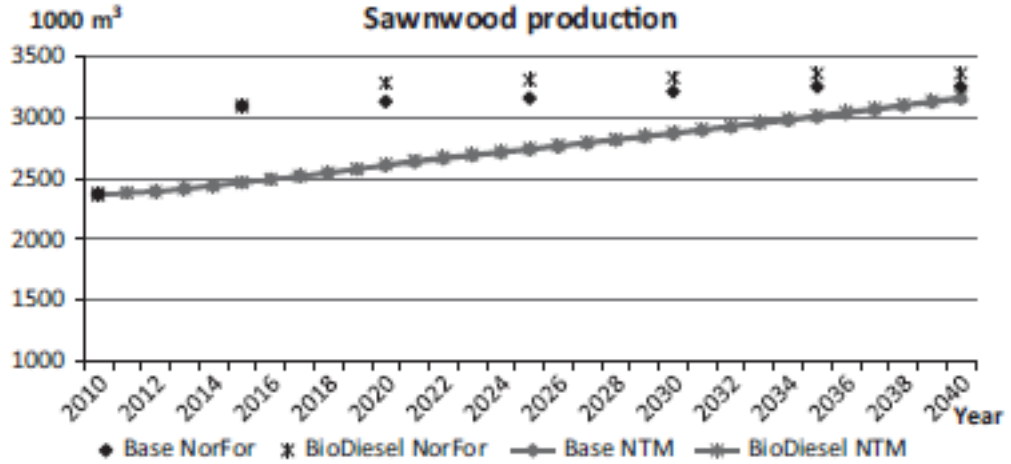
- interest rate 3%
- Accumulating growing stock -> low opportunity costs of increasing harvest (amenity values constant)
- Hold back timber for even higher demand

**NTM:** timber supply more closely tied to base year figures (no interest rate)

## *Sawnwood scenario*




## *Biodiesel scenario*




- Sawnwood production increases boost bioenergy in both models
- Biodiesel production some impacts on sawnwood production in NorFor, not in NTM
- Timber supply (again):
  - NTM: pulpwood and sawlogs independent (no cross-elasticity)
  - NorFor: stand-resource dependent (complimentary and substitutes)

# Intertemporal optimization Dynamic recursive

- ✓Is the harvest decision best described by profit/utility-maximizing optimization, Or

  by econometric-derived relationship between harvest and price, interest rate and growing stock, etc.

Dynamic-recursive models are (and should be) more closely linked to actual harvest behavior; data much more closely linked to base year. But relations only valid within historical ranges; and as long as timber supply is independent of forest management

Perfect foresight models rich in forest data and can provide long-term potentials; do not necessarily perform poorer in policy/economic analyses of deviations from base even if less closely tied to base year

# Intertemporal optimization Dynamic recursive

- ✓First, which problem is to be analyzed?
  - ✓ Forest carbon, forest management?
  - ✓ Impacts of policies and market changes on industry?
  - ✓ Year-to-year changes?
- ✓Forecast vs. potentials
  - ✓ Reflection of actual behavior
  - ✓ Potentials: Smoothness in sector economy
- ✓Data intensity vs. the problem in question
- ✓Both is best!