



FUELWOOD CONSUMPTION, UNCERTAINTY OVER RESOURCES AND PUBLIC POLICIES: WHAT IMPACTS ON THE FRENCH FOREST SECTOR?

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International Energy Workshop –2009 Venice

PLAN

- The context
- The model
- Policies simulated
- Results

FUELWOOD AND CLIMATE POLICIES

- Following EU objectives, France aims at increasing the share of renewables in its energy mix to 20% in 2020.
- Since France has the fourth forest cover in Europe, biomass energy is expected to play a major role in meeting this objective.
- In 2005, fuelwood represented 4% of the whole energy consumption and 50% of renewable energy.

FUELWOOD AND CLIMATE POLICIES

- French forests are considered under-harvested, as only 60% of the annual increment is exploited.
- An additional harvest of $\sim 30 \text{ Mm}^3$ for fuelwood and pulpwood seems possible without decreasing stock.
- Fuelwood as the variable of adjustment of climate policies in France.
- But uncertainties on:
 - Available stock
 - Stock dynamics

WHAT STOCK IS HARVESTABLE?

Total physical stock

About
300Mm³

All biomass
volume

Economically harvestable stock

About
60Mm³

Depends on
prices,
harvest
costs

Supplier behaviour

3 PhD students are
working on

Depends on products
prices, individual
preferences

UNCERTAINTY ON STOCK DYNAMICS

- We need to assess rate of increment of the biological stock.
- Climate change effect on the rate of increment.
- Partnership with French forest inventory service (IFN) and French National Agronomical Research Institute (LERFOB, biologists).

GENERAL PROBLEMATIC

- On the one hand : we need policies to boost fuelwood demand, on the other hand: uncertainties on stocks.
- Are these policies sustainable?
- We need a model that represents French forest sector in order to:
 - Simulate effects of policies on the French economy.
 - Represent French forest stock.
- the economical module describes consumers, suppliers and trade agents behaviour.
- The biological module describes stock dynamics.

OTHER MODELS

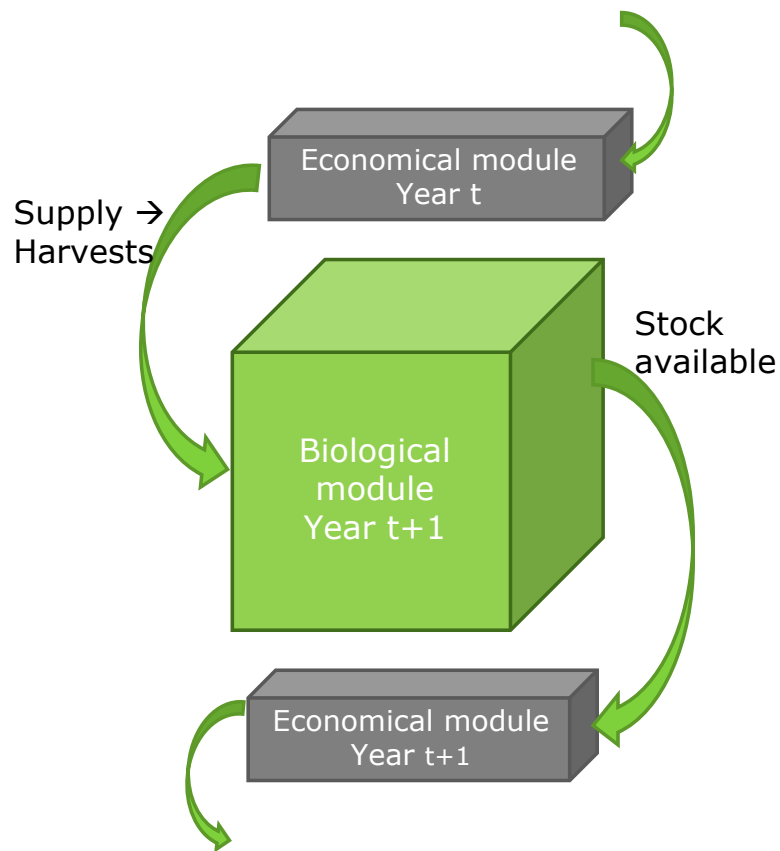
- There are already some very good forest sector models : Global Forest Product Model (Buongiorno et al., 2002), EFI-Global Trade Model (Kallio et al., 2004).
- But:
 - they do not represent precisely French biological stock dynamics.
 - They consider domestic products and foreign products as perfect substitutes.

1. The context

2. The model

3. The policies

4. Sustainability

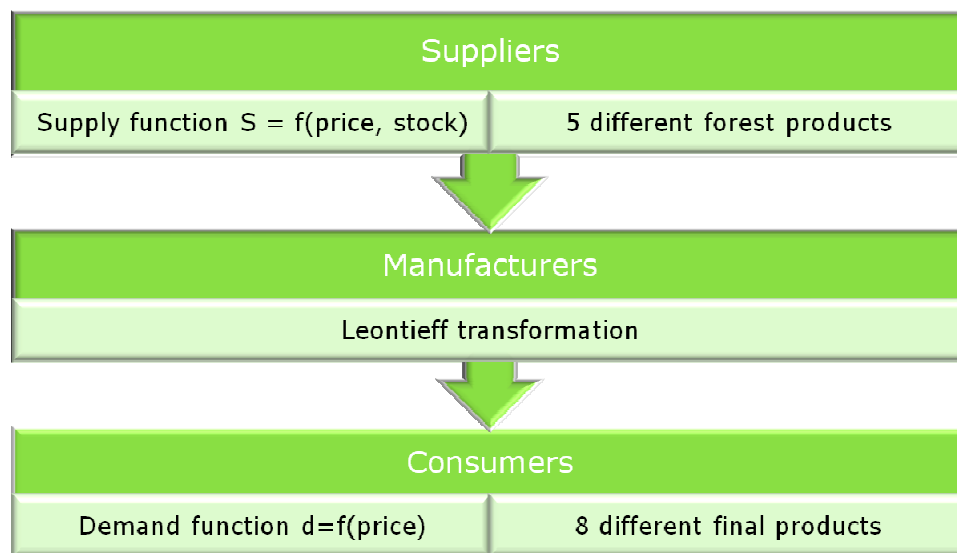


Every year maximization of an objective function in economical module gives the supply level

Supply level is translated in harvest level in biological module

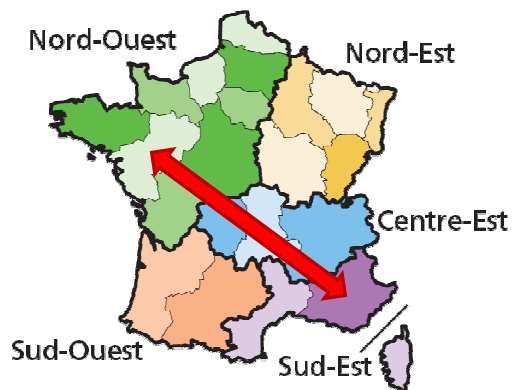
Recursive and modular structure

ECONOMICAL MODULE



REPRESENTATION OF TRADE (1/2)

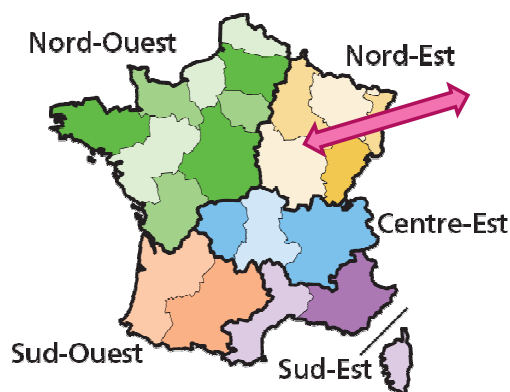
- Between two French regions :



- Trade follows Samuelson theory (1952): given volume supplied, volume demanded and prices of two regions and given transportation costs between those regions, what is the best allocation.

REPRESENTATION OF TRADE (2/2)

- Between a French region and the rest of the world:

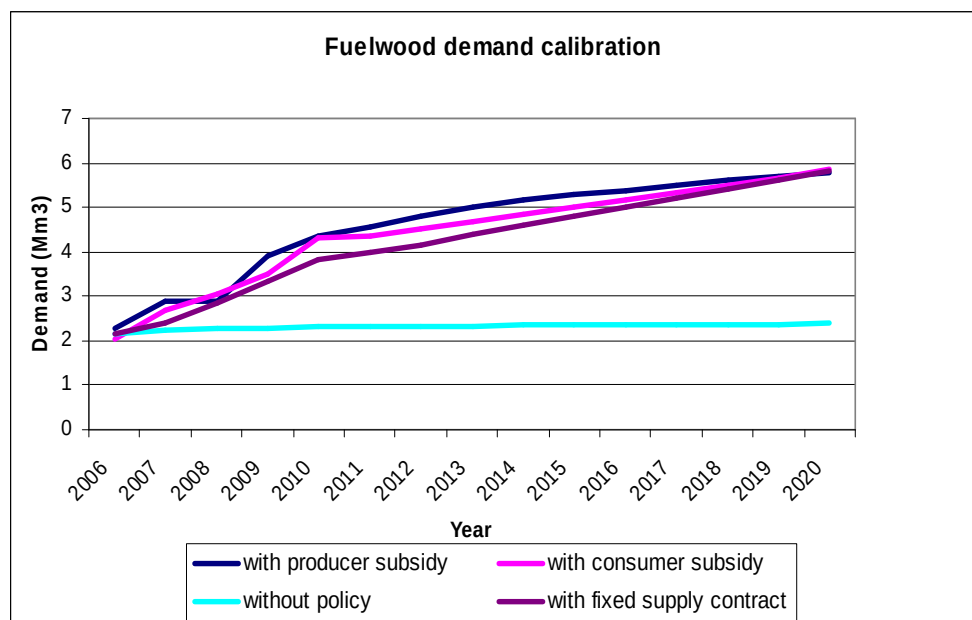


- Armington (1969): domestic and foreign products are imperfect substitutes (substitution elasticities are not infinite). We calculate imports and exports depending on prices and elasticities of substitution.

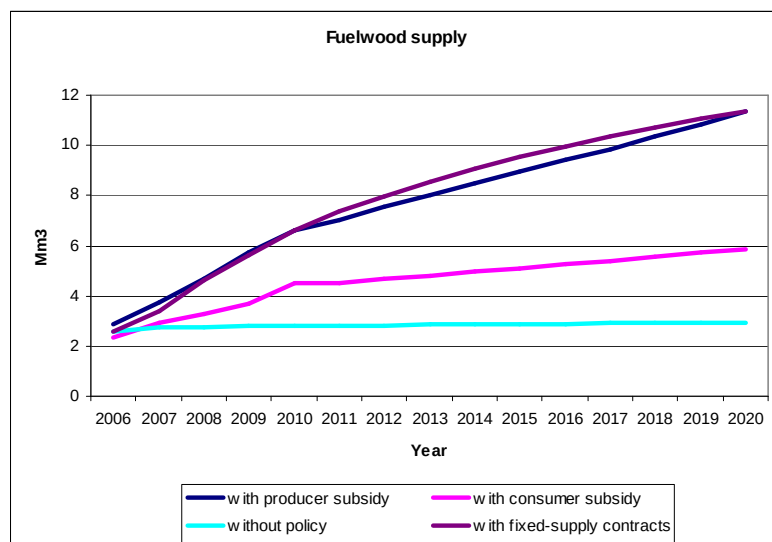
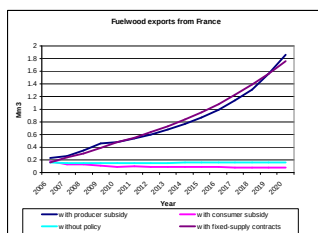
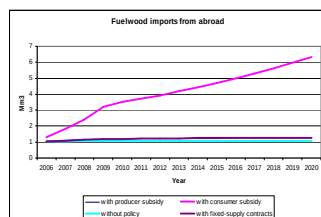
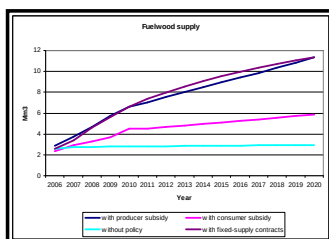
POLICIES SIMULATED

- First, fixed-supply contracts (biomass energy plant development).
- Second consumer subsidy.
- Third producer subsidy.
- All three policies are calibrated to increase fuelwood consumption by 3.5 Mm³ in 2020 relative to 2006 level
 - This represents twice the business-as-usual fuelwood consumption in 2020.
- We assume foreign price for all products remains constant over time.

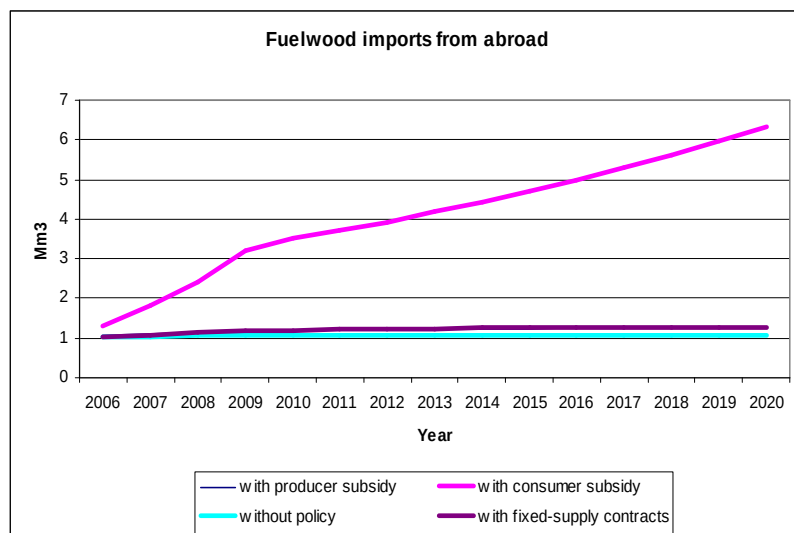
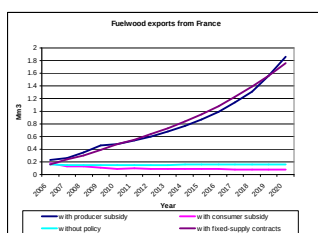
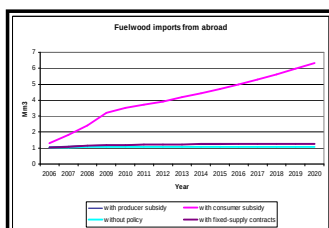
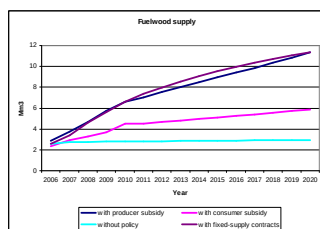
POLICIES CALIBRATION



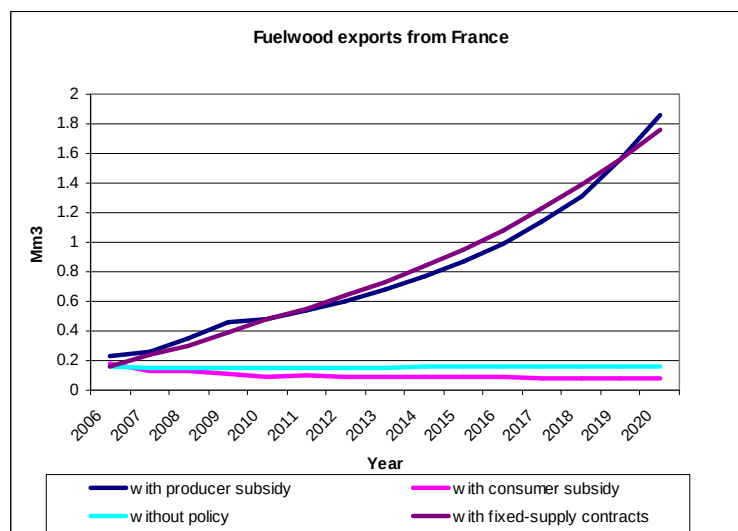
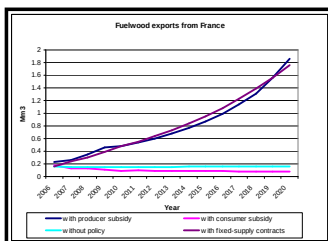
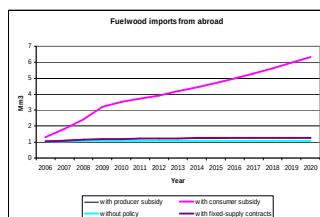
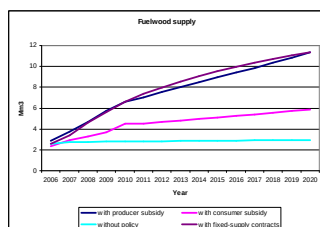
EFFECTS ON SUPPLY



EFFECTS ON IMPORTS

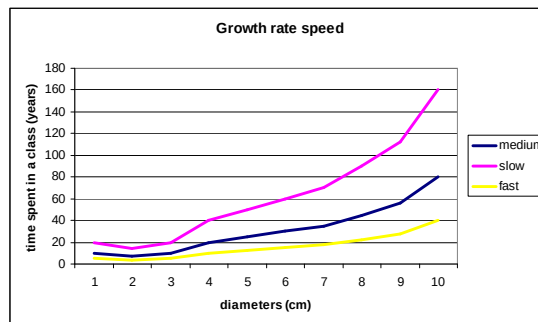


EFFECTS ON EXPORTS



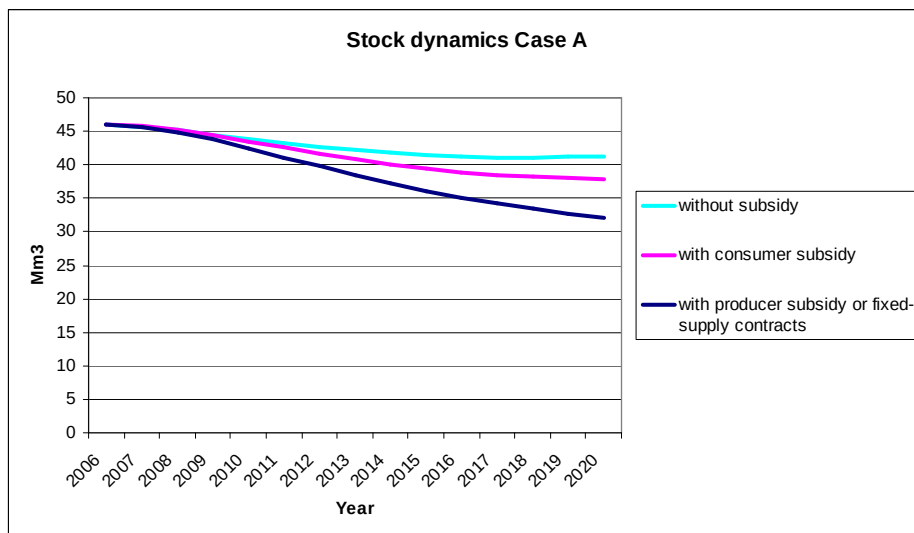
SUSTAINABILITY: HOW TO DEAL WITH UNCERTAINTY

Stock in 2006 (in % of the raw stock) growth rate	10%	20%	50%
slow	case A	case B	case C
medium	case D	case E	case F
fast	case G	case H	case I



SUSTAINABILITY: STOCK DYNAMICS

- Stock increases in all cases except in case A.



SUSTAINABILITY AND CARBON FLUXES

- We assume 4 m³ of fuelwood save 2.5 tCO₂ (ADEME, 2005).
- We assume 1 m³ of above ground biomass is equivalent to 1 tCO₂ (Pignard et al, 1999; CARBOFOR, 2004).
- Carbon stock decreases with all policies as substitution effect is lower than loss of forest biomass effect.
- However producer subsidy or fixed supply contracts lead to higher decrease owing to the increase in exports.

CONCLUSION

- There are large uncertainties about fuelwood stock, dynamics, and supply behaviors.
- We find limited evidence that a +3.5 Mm³ increase in fuelwood demand by 2020 would be unsustainable.
 - Though it can be under most stringent assumptions about stock availability and growth rate
- We find that policies to reach this target have potentially high costs.
- Now what if fuelwood demand increase by more (+21 Mm³)?

EXTENSIONS

- Rate of increment.
- Supply behaviour.
- Price elasticities of suppliers and consumers.
- Calibration and validation with past data.
- Land-use choice has to be considered on long-term.



THANK YOU!

