A geographically explicit approach for price determination of forest feedstocks under different next generation biofuel production scenarios – The case of Sweden

Ismail Ouraich
Outline

• Objective
• Model description
  – Demand, Supply, Geography
• Soft linkage with BeWhere-Sweden
• Some initial results
Objective

- Simulation of price dynamic of forest biomass via
  - A simple demand vs. supply framework
  - Geographically explicit at gridcell level
  - Focused on domestic markets
    - i.e. no international trade
Supply curves are estimated based on gridcell-level data on:
- Forest biomass availability
- Harvesting costs

• Demand schedule at gridcell level from BeWhere-Sweden
Supply, Demand, Prices...

- Prices are determined based on regionalized juxtaposition between demand and supply
  - The dots represent a particular demand node at gridcell level
  - The circles represent the max range covering potential supply gridcells
Linkages to BeWhere-Sweden

• Generate a matrix of new “market” prices;

• The “market” prices matrix is used as an input to the BeWhere-Sweden model
  – Represents an updated cost matrix for the forest feedstocks, which is geographically explicit

• Reiterate the process for all the scenarios in the BeWhere model
  – to simulate demand-side pressures on the forest feedstock markets
Initial results
Demand for biomass

• No change in the spatial distribution of demand pressure

• Change only observed for the magnitude (or the level) of the demand

• Holds for all the forest biomass types included in the analysis
Initial results
Demand - Sawlogs final felling

BAU scenario

5TWh scenario

10TWh scenario
Initial results
Demand - Pulpwood final felling

BAU scenario  5TWh scenario  10TWh scenario
Initial results
Demand - Sawlogs thinning

BAU scenario

5TWh scenario

10TWh scenario
Initial results
Demand - Pulpwood thinning

BAU scenario

5TWh scenario

10TWh scenario
Initial results
Price for biomass

• Spatial distribution of price changes does not track spatial distribution of demand pressure
  – Holds for 5TWh and 10TWh scenarios

• Spatial distribution of price changes differs based on the type of harvest operation
  – Final felling vs. Thinning

• Biofuel production targets (or scenarios) might affect the spatial distribution
  – But relatively minor
Initial results
Price for biomass

• Spatial distribution of price changes exhibits relatively larger impacts in the southern and middle parts of Sweden
  – Holds for 5TWh and 10TWh scenarios

• High supply, but also high demand clustering owing to population density, industrial cluster, etc.

• However, relatively large impacts can be observed in the northern regions as well
  – Especially for biomass obtained via the thinning operation
Initial results
Sawlogs final felling – 5TWh

Supply

Demand

Price (%change)
Initial results

Sawlogs final felling – 10TWh

Supply  Demand  Price (%change)

MAP OF SWEDEN 0.5km x 0.5km

Legend

Supply - Sawlogs final felling (in m³/year)
- 0 - 90000
- 90000 - 190000
- 190000 - 280000
- 280000 - 380000
- 380000 - 470000

Host industries
- DH system (city)
- Chemical pulp mill
- Mechanical & paper pulp mill
- Refinery & petrochemical
- Sawmill

MAP OF SWEDEN 0.5km x 0.5km

Legend

Demand - Sawlogs final felling (in m³/year)
- 0 - 330000
- 330000 - 650000
- 650000 - 980000
- 980000 - 1310000
- 1310000 - 1640000

Host industries
- DH system (city)
- Chemical pulp mill
- Mechanical & paper pulp mill
- Refinery & petrochemical
- Sawmill

MAP OF SWEDEN 0.5km x 0.5km

Legend

Price - Sawlogs final felling (% change)
- 0.0 - 0.4
- 0.4 - 0.8
- 0.8 - 1.3
- 1.3 - 1.7
- 1.7 - 2.1

Host industries
- DH system (city)
- Chemical pulp mill
- Mechanical & paper pulp mill
- Refinery & petrochemical
- Sawmill
Initial results
Pulpwood final felling – 5TWh

Supply

Demand

Price (%change)
Initial results
Pulpwood final felling – 10TWh

Supply

Demand

Price (%change)
Initial results
Price spatial distribution - Sawlogs final felling

5TWh scenario

10TWh scenario
Initial results
Price spatial distribution - Sawlogs thinning

5TWh scenario

10TWh scenario
Initial results
Price spatial distribution - Pulpwood final felling

5TWh scenario

10TWh scenario

Map of Sweden
0.5km x 0.5km

Legend
- Price - Pulpwood final felling (% change)
  - 0.0 - 0.3
  - 0.3 - 0.6
  - 0.6 - 0.9
  - 0.9 - 1.2
  - 1.2 - 1.5
- Host industries
  - DH system (city)
  - Chemical pulp mill
  - Mechanical & paper pulp mill
  - Refinery & petrochemical
  - Sawmill
Initial results
Price spatial distribution - Pulpwood thinning

5TWh scenario

10TWh scenario
THANK YOU