

The Importance of tracking combined land carbon change effects of increased wood and ag biomass energy demand

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Main points

- Given large scale bioenergy demands and multiple wood and ag biomass sources
- Given shifts in biomass sources over time, e.g. from forest biomass to herbaceous crops
- It may not be accurate to account separately over time for carbon recovery for wood and ag biomass sources
- Tracking of forest sources alone can show large carbon losses
- Tracking of forest + ag together shows large carbon recovery

U.S. Energy projections – 3 bioelectric power scenarios

Baseline—Reference case from 2010 U.S. Annual Energy Outlook (AEO) projection

Two cases for Renewable Energy standards

RES10 = 10% of electric power from renewables by 2020

RES20 = 20% of electric power from renewables by 2020

After 2030 bioelectricity production is held constant

FASOM-GHG

Linked model of U.S. agriculture and forest sectors

80 year projections

Dynamic optimization to simulate markets (max PNV consumer plus producer surplus – gives optimal investments)

Regionally-explicit, we report national results

Includes a bioenergy sector (bioelectricity, biofuels)

Includes GHG accounting – land carbon, HWP carbon, mgt emissions (e.g. harvest equipment)

Bioelectricity Feedstocks

Agriculture crop residues

Agriculture energy crops

Short-rotation woody crops

Logging residues

Milling residues and pulpwood

Bioelectricity Production

Direct firing 100 MW

Co-firing (with coal)

Greenhouse Gas Accounting

Land-based GHG accounting in forest and agriculture sectors from—

Carbon in forest and agriculture biomass and soils

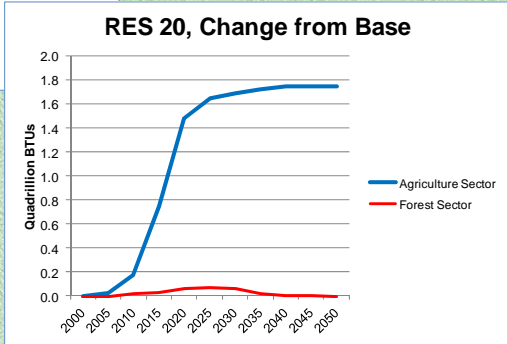
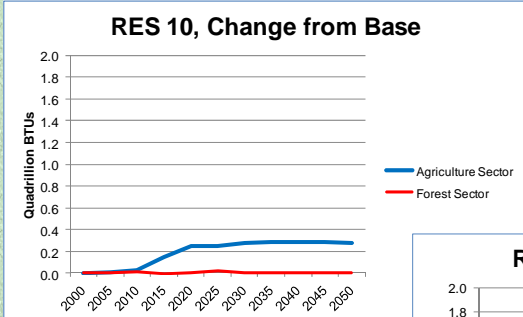
Carbon change due to movement of land
(afforestation/deforestation) between agriculture
and forest

Emissions from forest and agriculture production
activities (very small)

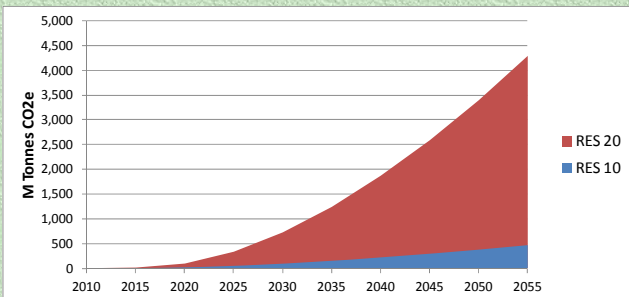
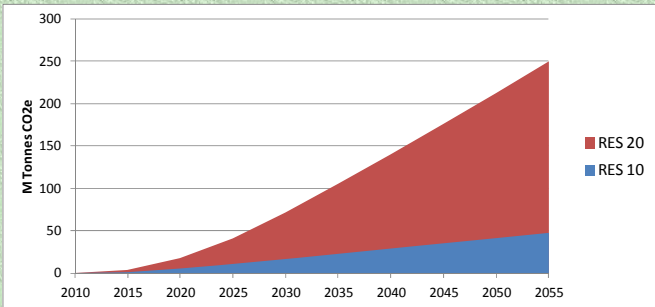
Emissions from livestock (little chg in our cases)

Carbon in Wood products (little chg in our cases)

Bioelectricity Production



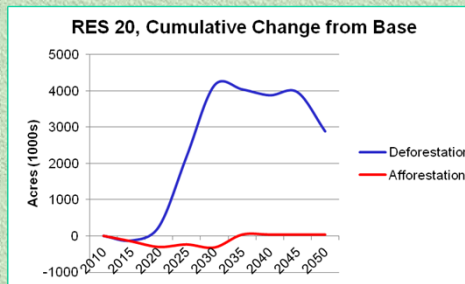
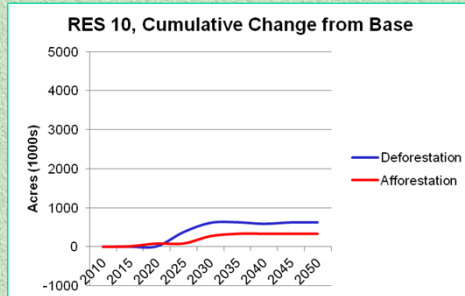
Cumulative extra biomass emissions



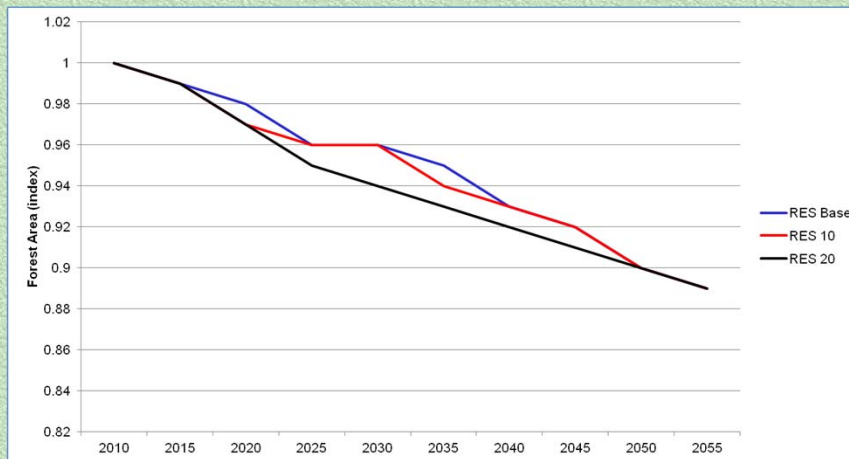
Forest Sector Land Change

RES 10 scenario, small increases in afforestation and deforestation

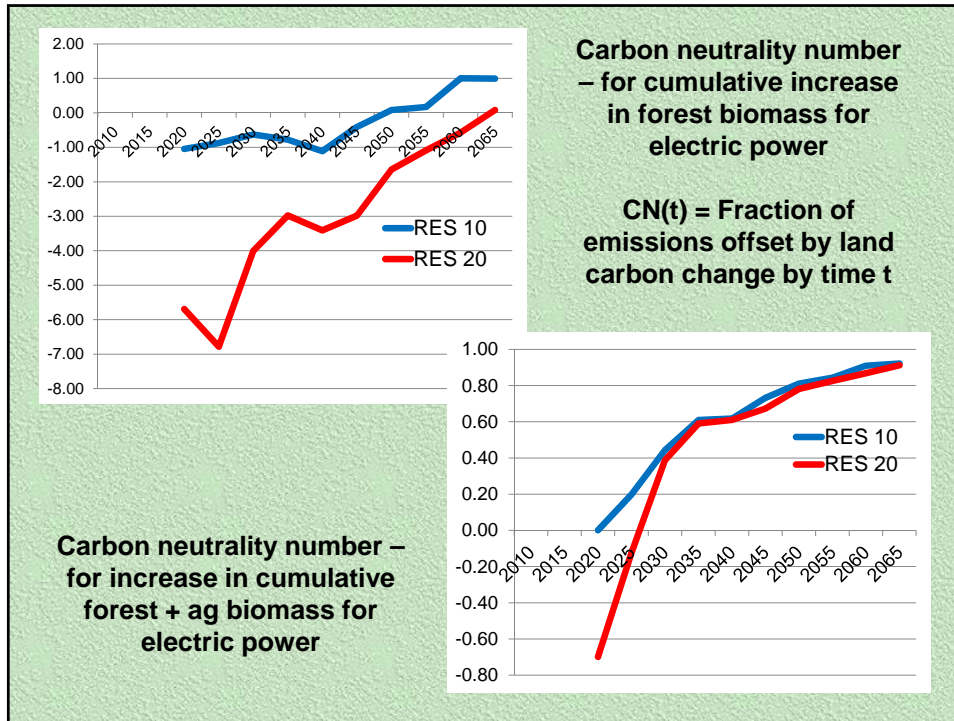
RES 20 scenario, decline in afforestation and large increase in land to agriculture



Forest Area



Under RES20 – large conversion to agriculture, reduced afforestation



Conclusions

Where forests and agriculture can both supply biomass
AND land use can change

Forest carbon recovery from forest biomass burning
can be very poor when there is conversion to ag land

However considering ALL forest + ag biomass
burning and forest + ag land carbon

Forest + Ag land carbon recovery can be very rapid

Implications for LCAs for bioenergy

General demand for biomass for energy can result in shifts of land from ag to forestry or forestry to ag.

To determine the carbon impact of increased biomass use on land carbon will require either

- 1) Modeling of scenarios that allow a) for mixed ag and forest supply and b) land use change or**
- 2) Explicit assumptions about sources of supply and extent of land use change**

