Biomass feedstocks and the climate implications of bioenergy

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Slides adapted from Reid Miner NCASI
On the landscape, the single-plot looks like this
In year zero, the plot is harvested and the wood is burned for energy.
After regeneration begins, the growing biomass sequesters small amounts of CO2 annually.
Year 2

2.1
Over time, if carbon stocks are returned to pre-harvest levels...

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...the net emissions over this time are zero.
single plot analysis

Biomass energy

Fossil fuel energy
single plot analysis

Biomass emissions will be higher initially because more fuel is needed to generate the same amount of usable energy.
single plot analysis

Biomass energy

Fossil fuel energy

Break-even time
If carbon stocks decline because biomass feedstocks are being removed.

Stock loss relative to pre-harvest stocks

Break-even time
Looking at all areas that will be needed to supply wood to a given operation

YEAR 1: Harvested and burned for energy
Forest regrowth equal harvest at the end of the first rotation – how you account for the baseline is critical.

YEAR 2: Harvested and burned for energy.
When harvesting equals uptake
Harvesting biomass from plots that were not previously managed
Biomass energy

Fossil fuel energy

Cumulative CO2 combustion emissions

Net Cumulative CO2 combustion emissions

Time

Time

Biomass lower from here forward
Biomass from an afforestation project

- **Biomass energy**
  - Cumulative net biomass emissions remain below zero

- **Fossil fuel energy**
  - Cumulative fossil fuel carbon emissions continue to increase indefinitely
Don’t we get more sequestration by not harvesting?

When forest carbon benefits saturate (i.e. the trees stop growing), the benefits of “no harvest” stop.

The time to saturation and carbon uptake curves are very site specific.
Biomass from previously unmanaged forests; fossil fuel credited with sequestration.
Biomass energy
Including forest conversion to lower carbon stocks

Fossil fuel energy
Including “no harvest” carbon storage benefit

Net Cumulative CO2 combustion emissions

Cumulative CO2 combustion emissions

Time

Biomass lower from here forward
Key information that is needed and not currently available

- Emissions from use of bioenergy (gross and net)
  - By fuel type
  - By region
  - By sector
- Categorization of biomass feedstocks used
  - Conditions under which it was grown
  - Type of material (e.g. waste vs. product)
Without bioenergy emissions and feedstock information

• Net ghg emissions will be underestimated by a significant amount over the next several decades
• No basis for comparing the relative merits of bioenergy versus fossil fuel
• Standing stock of forest biomass will be undervalued and could be significantly reduced
  ▫ Creating potential shortages of other products derived from biomass e.g. paper, timber – leading to leakage