

Identifying Environmentally Preferable Uses of Biomass Resources

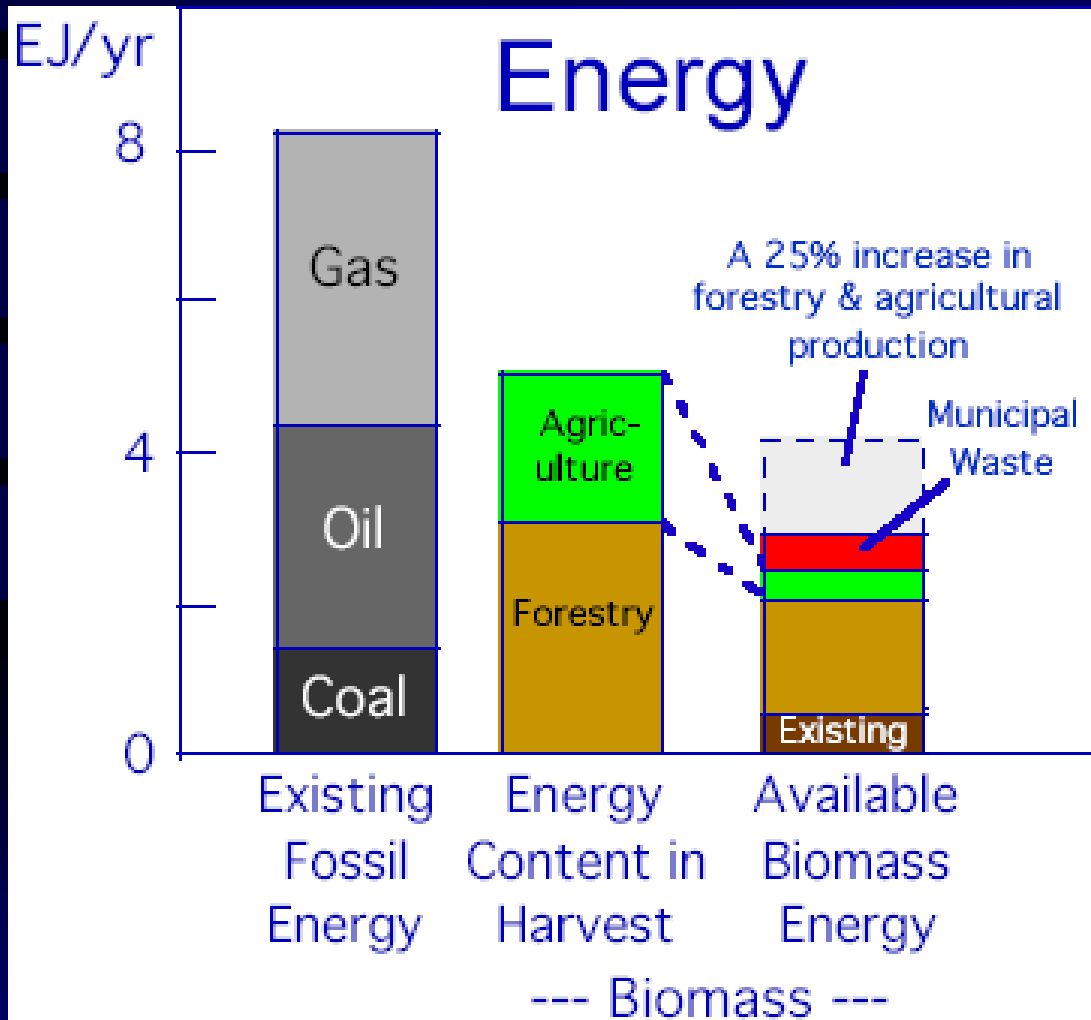
IEA Task 38 Workshop

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Motivation



Biomass is
“scarce” –
even in
Canada!

Where can we
use it best?

Source: BIOCAP



Methodology

- Life-cycle GHG analysis
- Evaluation of existing studies – some based on GHGenius model, wood residues made from scratch
- Presentation of data per tonne of input and also per hectare for biomass energy crops
- Electricity background mix modified (4 scenarios: large hydro; low-emission mix; 50% coal; 75% coal)
- Sensitivity analysis (varied input data for yields, future technology efficiencies, transport distances)
- Quantification of crude oil displaced
- Reality check (technology, economic, other emissions)



Phase 2

Feedstock-to-Product Threads

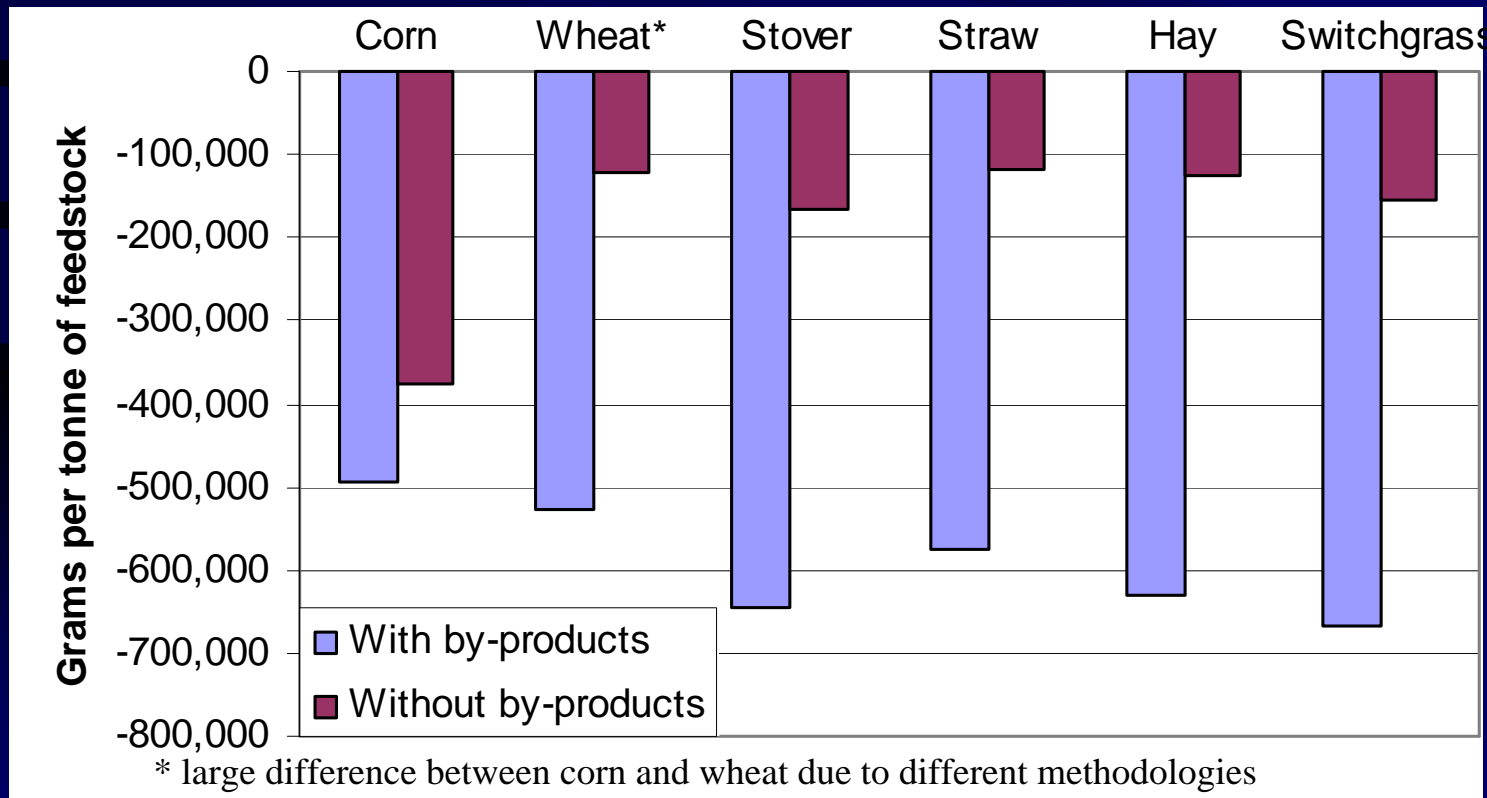
- Corn, wheat, corn stover, wheat straw, hay, switchgrass to **ethanol**
- Canola and soy oil, waste oil, animal fat to **biodiesel**
- Wood residue, short rotation forestry wood to **hydrogen**
- Wood residue to **electricity** and **CHP** (large and small-scale combustion, bio-oil, gasification)
- **MSW treatment** options (landfilling with and without gas collection, incineration, composting, digestion)



Ethanol

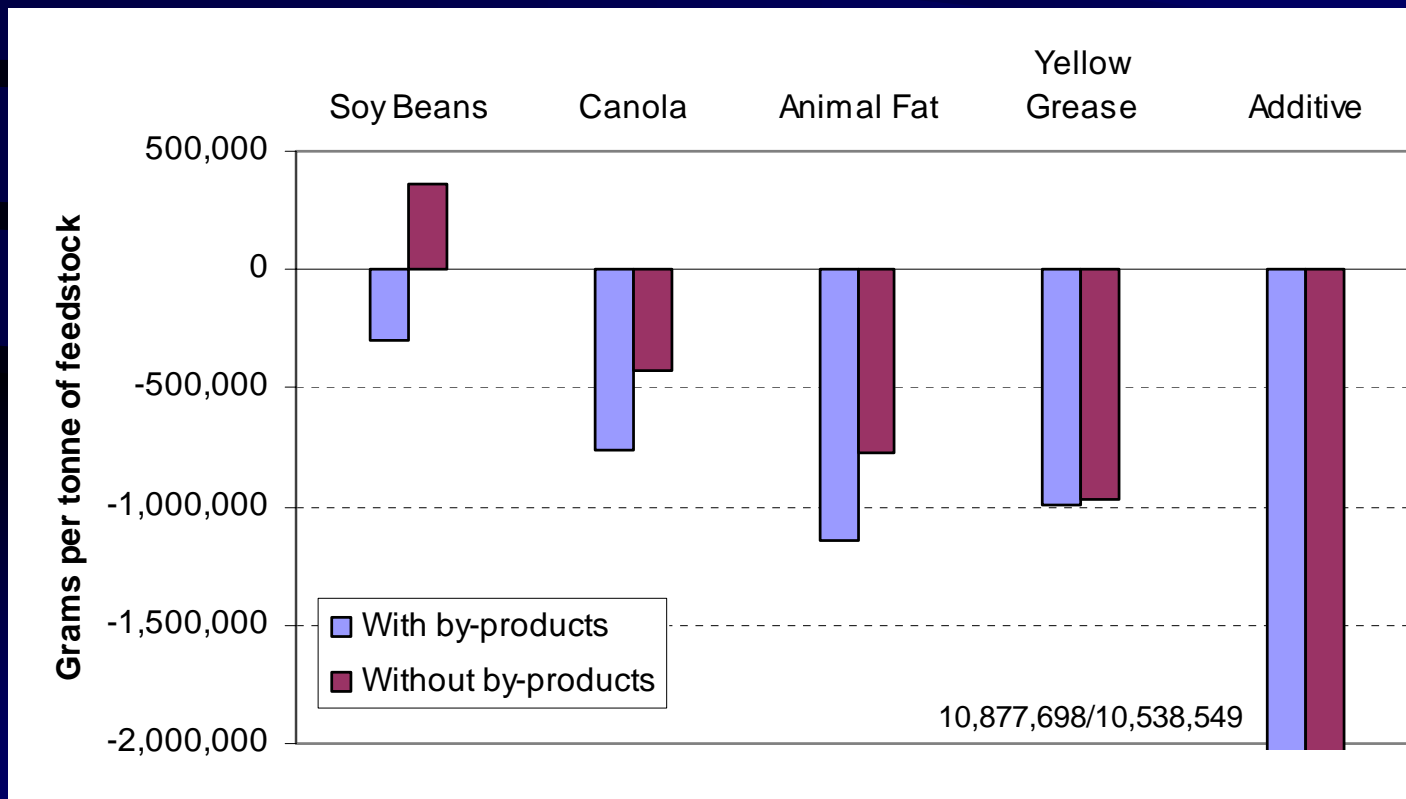
Starch-based fermentation process uses fossil fuels for process energy, yields animal feed as a co-product.

Lignocellulosic hydrolysis process (Iogen) uses biomass residue for process energy, no co-products (acetic acid and pentose not counted)



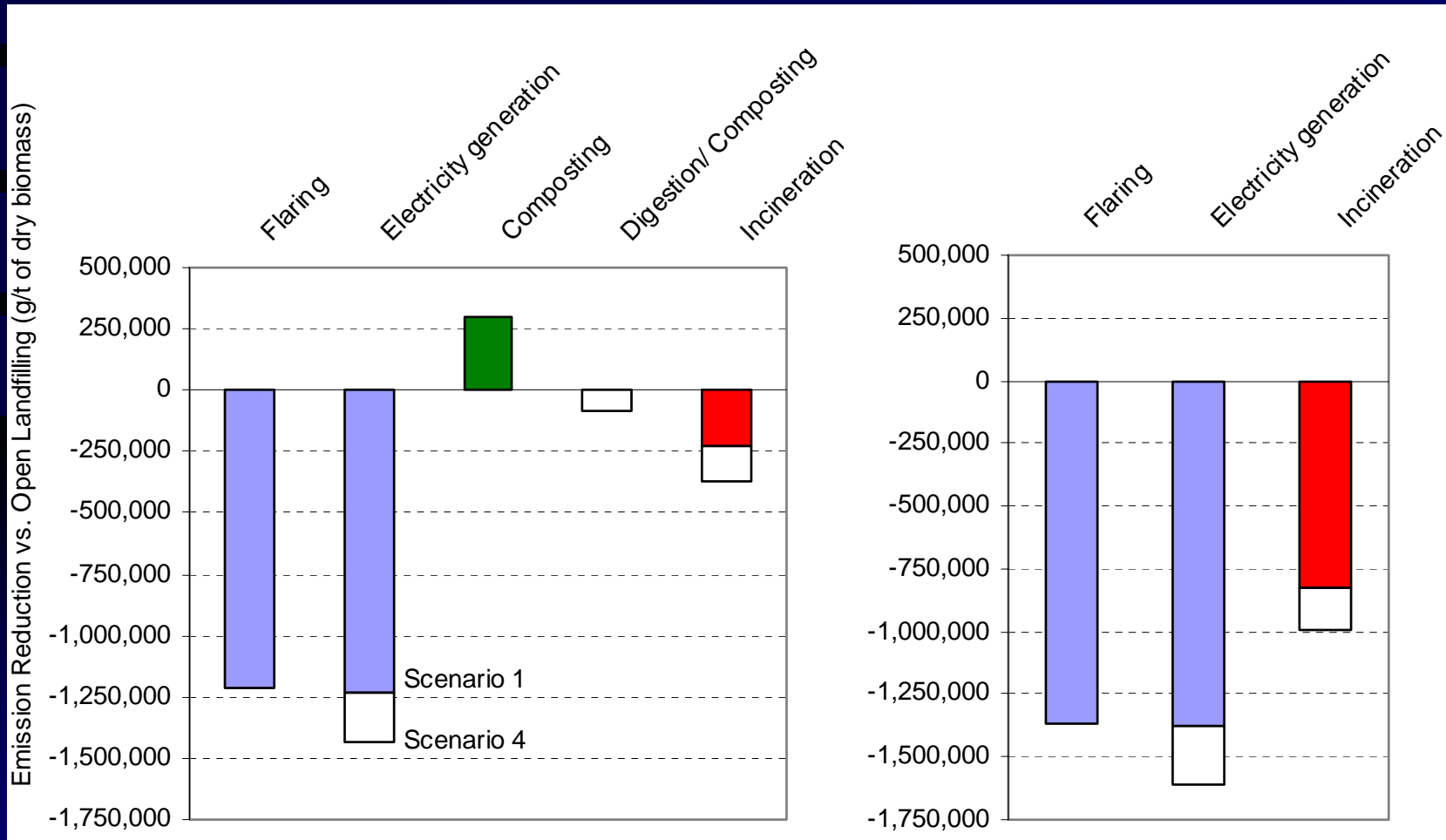
Biodiesel

- Glycerine is co-product of all processes; soy/canola meal only for virgin oil
- Soy oil yields are only 50% or canola oil yields per tonne of harvested biomass

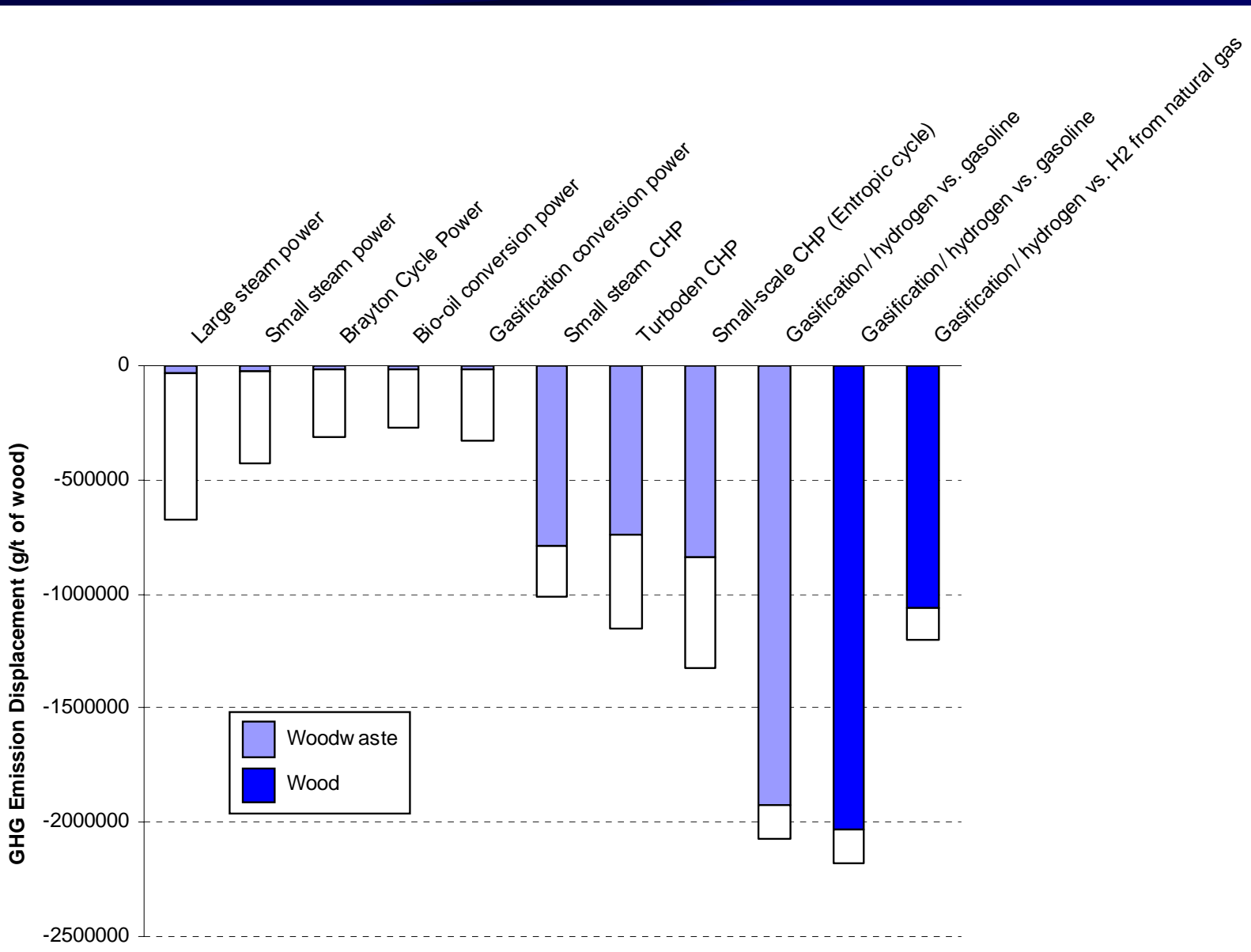


Biomass Fraction of MSW

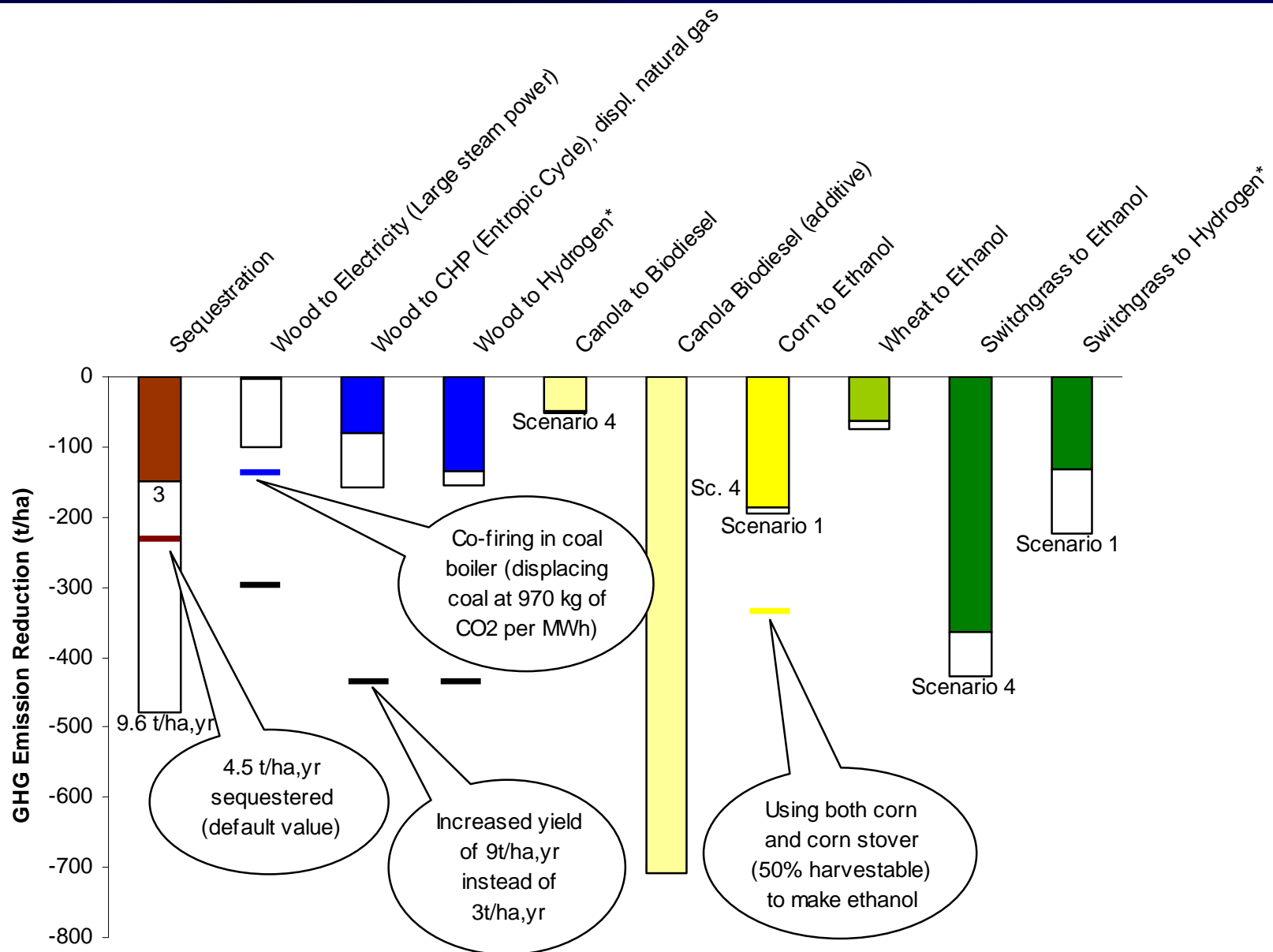
- Only non-paper fraction shown left
- Composting produces considerable amounts of methane
- About 50% of biomass sequestered in landfills



What to do with wood?



Synopsis – per ha



Results

1. Biomass should displace a high-C fossil fuel (gasoline vs. natural gas or even large hydro)
2. Use high-yielding energy crops - not canola, soy, wheat, corn
3. Look at afforestation as a a cheap alternative
 - Landfilling with gas collection isn't doing too bad overall
 - Have to look at some more options to gain a better picture of other threads (e.g. heat only).





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