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Opportunities to Scale up Promising Feedstock Genotypes

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BETO Deploying Purpose-Grown Energy Crops Workshop
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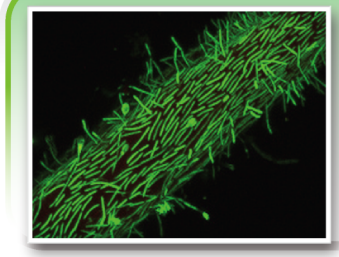
Process-advantaged Poplar and Switchgrass Feedstocks

Populus

Panicum

Native Perennial Plants
Domesticated, high-yield, stress-resistant feedstocks

Clostridium thermocellum



Carbohydrates-First via Consolidated Bioprocessing with Cotreatment

Fermentation Intermediates

Native Lignin

Catalytic Dehydration and Oligomerization

Catalytic Lignin Depolymerization

Hydrodeoxygenation

Pseudomonas putida

Lignin-First via Reductive Catalytic Fractionation

Solid Carbohydrates

Lignin Oil

Consolidated Bioprocessing

Hydrodeoxygenation

Fermentation Intermediates

Catalytic Dehydration and Oligomerization

Increased soil carbon inputs
Improved wind and water erosion control
Lower chemical inputs
Increased wildlife habitat
Lower feedstock storage impacts
Removal of groundwater contaminants

Sustainable Aviation Fuels
Cycloalkanes
Branched alkanes
Aromatics

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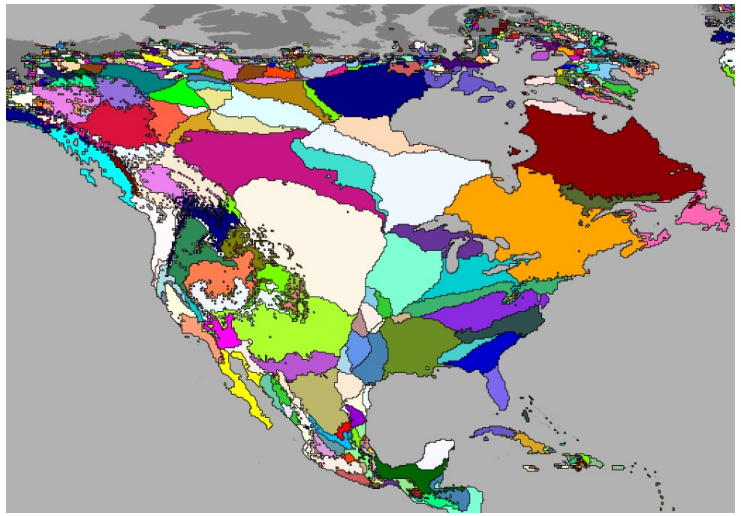
Deploying advanced energy crops

Process-advantaged energy crops with superior sustainability traits

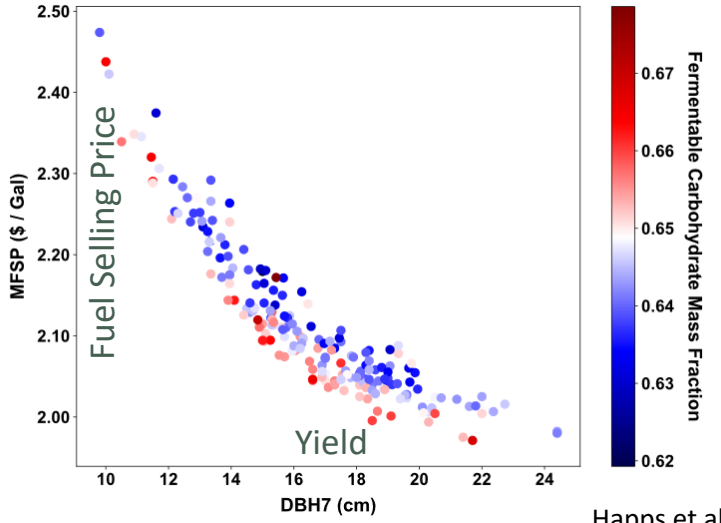
Distributed field trials to test performance across climate and land quality gradients

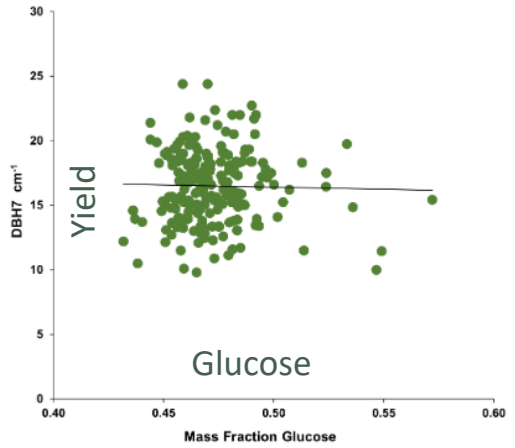
Lagergren et al. (2021). *Climatic clustering and longitudinal analysis with impacts on food, bioenergy, and pandemics.*



Develop scaling rules, predictive tools to derisk feedstock selection, management

- Yield and composition traits have been shown to be independent
- Advanced biology tools are available to tailor energy crop genotypes for varying climates, land types, conversion processes





Happs et al. 2021. BioFPR, 15: 176-188.

Data needs and knowledge gaps

- Breeding plots & larger field-scale trials of select high-performing genotypes complement each other
  - Traits that maximize yield for single plants may be different than in a densely-planted field
- Evaluate energy crops across gradients of land “quality”
  - i.e., comparing same energy crops on marginal & prime land controls w/in a given “climatype”
  - Quality influences by topography, soil texture, drainage, land use history, etc.
- Initial measurement of soil carbon, archiving of soil samples are critical
- **Recommendation: Colocation of replicated monoculture trials with larger-scale field trials**

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