MASBio

The Mid-Atlantic Sustainable Biomass Consortium

Bioproducts for the Bioeconomy

Webinar – December 9, 2020

Presented by:

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Images courtesy of European Biotechnology

Led by West Virginia University, **MASBio** is a regional network of universities, businesses, and governmental organizations dedicated to building robust, scalable, and sustainable value chains for biomass bioproducts in the Mid-Atlantic region.

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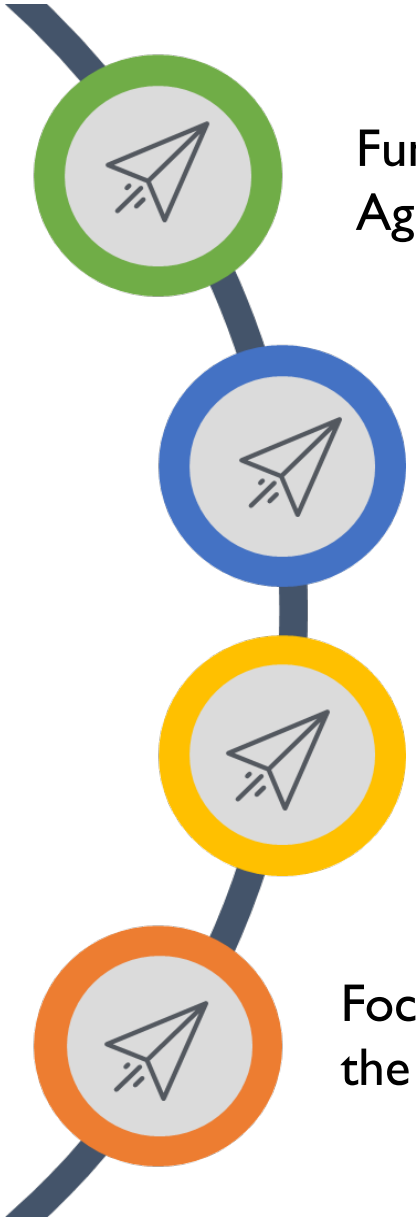
MASBio



Funded by US Department of Agriculture, National Institute of Food and Agriculture (NIFA)

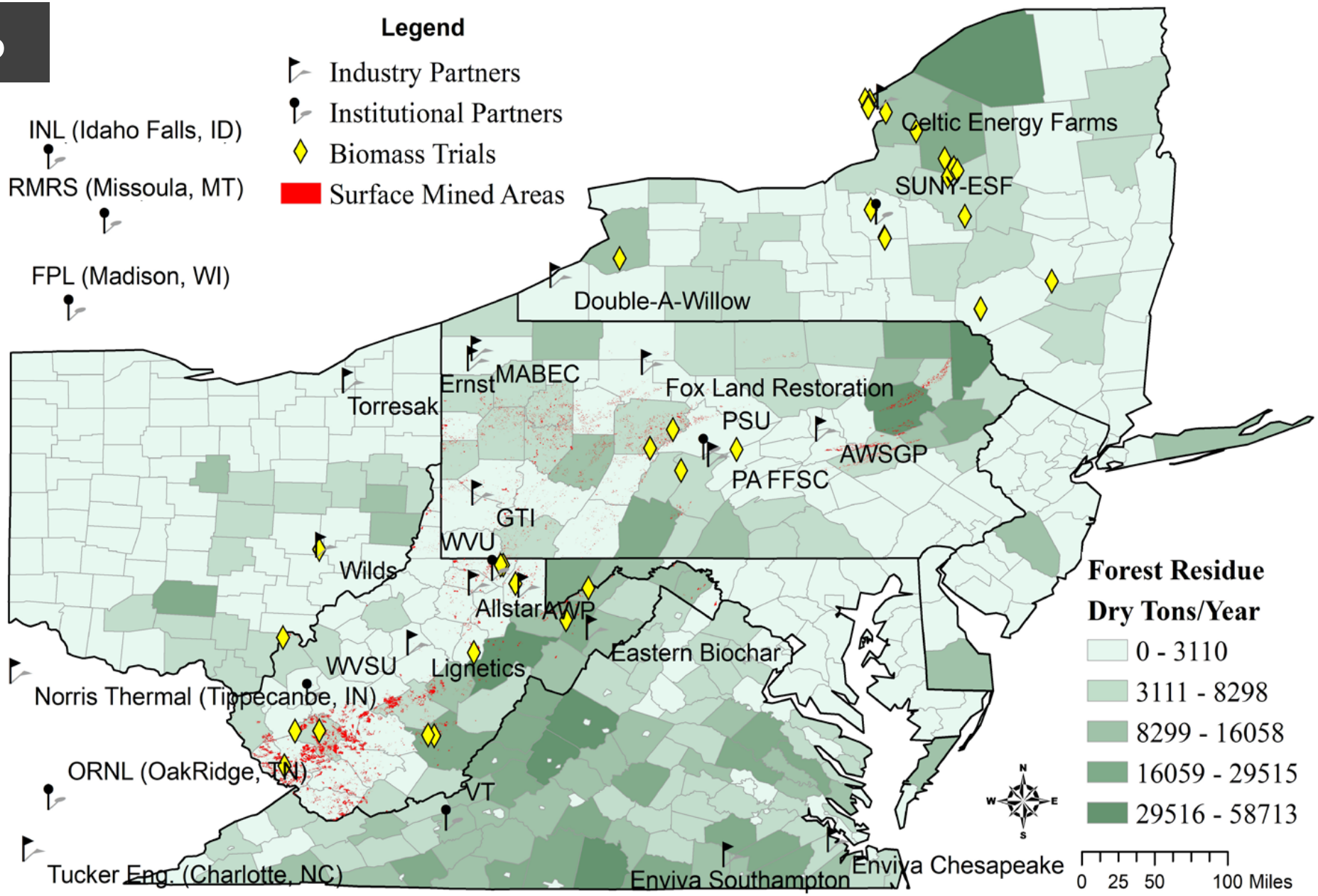
One of several regional 5-year projects across the US for development of industries to develop biofuels and bioproducts

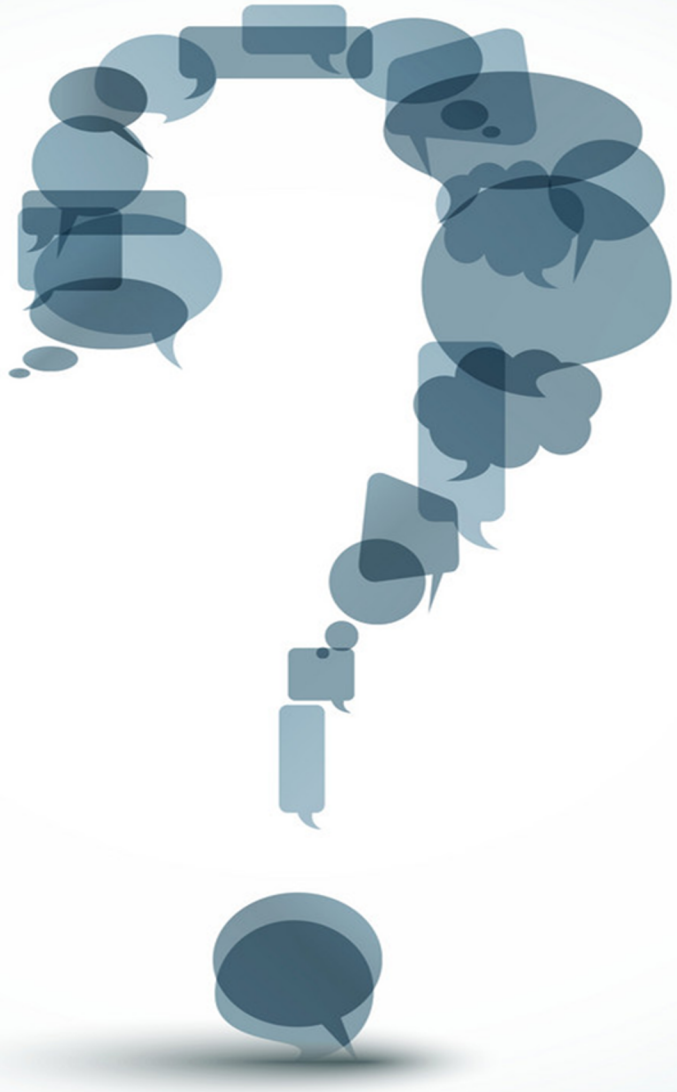
OBJECTIVES:

(1) Develop a sustainable and economically feasible biomass for value-added bioproducts system
(2) Encourage sustainable agriculture and forest management
(3) Stimulate business development in rural areas

Focus on biomass and the production strategies, policies, and markets relevant to the Mid-Atlantic region

MASBio Map


Legend
Industry Partners
Institutional Partners
Biomass Trials
Surface Mined Areas
INL (Idaho Falls, ID)
RMRS (Missoula, MT)
FPL (Madison, WI)
Celtic Energy Farms
SUNY-ESF
Double-A-Willow
Ernst
MABEC
Torresak
Fox Land Restoration
PSU
AWSGP
PA FFSC
GTI
WVU
Wilds
Allstar
AWP
Eastern Biochar
WVSU
Lignetics
Norris Thermal (Tippecanbe, IN)
ORNL (OakRidge, TN)
VT
Tucker Eng. (Charlotte, NC)
Enviva Southampton
Enviva Chesapeake
Forest Residue
Dry Tons/Year
0 - 3110
3111 - 8298
8299 - 16058
16059 - 29515
29516 - 58713
N
W
E
S
0 25 50 100 Miles



What Is Biomass?

- Biomass is renewable organic material that comes from plants and animals.
  - Wood, wood processing wastes, and forest residues
  - Agricultural crops and waste materials
  - Biogenic materials in municipal solid wastes
  - Animal and human waste

Different Types of Biomass

Forest Residues

Examples:

Residues from timber harvesting, forest thinning, land clearing e.g. tree tops, branches

Agricultural Residues

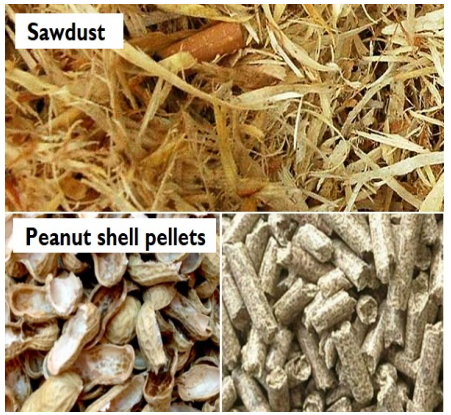
Examples:

Stover, stalk, straw, leaves, chaff, husks left in the field after crop harvesting

Purposed Grown Crop

Examples:

- Woody crops e.g. eucalyptus, willow, poplar
- Grass crops e.g. miscanthus, switchgrass, giant reed



Industrial Waste

Examples:

- Wood processing mills waste e.g. bark, chips, sawdust
- Crop processing waste e.g. peanut shells, cotton gin trash

Municipal Solid Waste

Examples:

- Woody waste e.g. yard debris, landscaping debris, construction & demolition debris
- Biogas from landfills

Images courtesy of (left to right): Biomass Magazine; Di Donato et al. (2015); Biomass Decision Support System (BDSS) & Cornell CALS; Celignis & Biomass Pellet Mill; ClarksvilleNow & Fuel Cell & Hydrogen Energy Association

MASBio Biomass Feedstocks




ENERGY CROPS

Non-food crops purposely grown for producing biofuels and bioproducts:

- *Switchgrass and shrub willow in MASBio*

Crops grown on marginal land:

- Re*claimed mine land*
- *Non-prime farmland, e.g. poor drainage, not level*

FOREST RESIDUE AND OTHER WOOD WASTE

SUPPORTS SUSTAINABLE AGRICULTURE PRACTICES AND GOOD FOREST MANAGEMENT

Images courtesy of (left to right): Biomass Decision Support System (BDSS), Cornell CALS, Biomass Magazine, NIFA

Ethanol as Fuel

Late 1970s

Oil Crises

Department of Energy Established

1977

Energy Policy Act of 2005 Introduced Renewable Fuels Standards

2005

Energy Independence and Security Act of 2007 Introduced Mandates for Renewable Fuels

2007

RFS

Other Laws Affecting Renewable Energy

Farm Legislation

Budget Reconciliation Legislation

Air quality legislation of the 1990s

Amendments and Rule Making

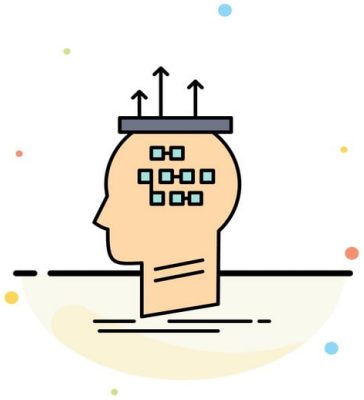
Cellulosic Biofuels: NEWBio Project

USDA NIFA Sponsored (NEWBio.psu.edu)

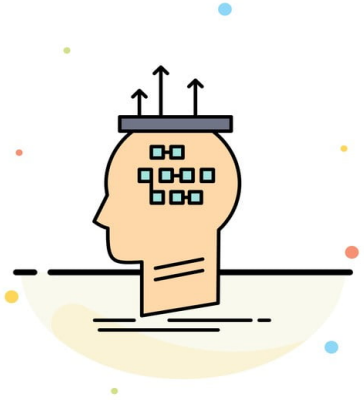
- Second generation—not made from food
- Renewable
- Derived from a variety of biomass feedstocks
- Advantage of carbon sequestration

Outcomes of NEWBio Project

Cellulosic biofuel still not economically feasible

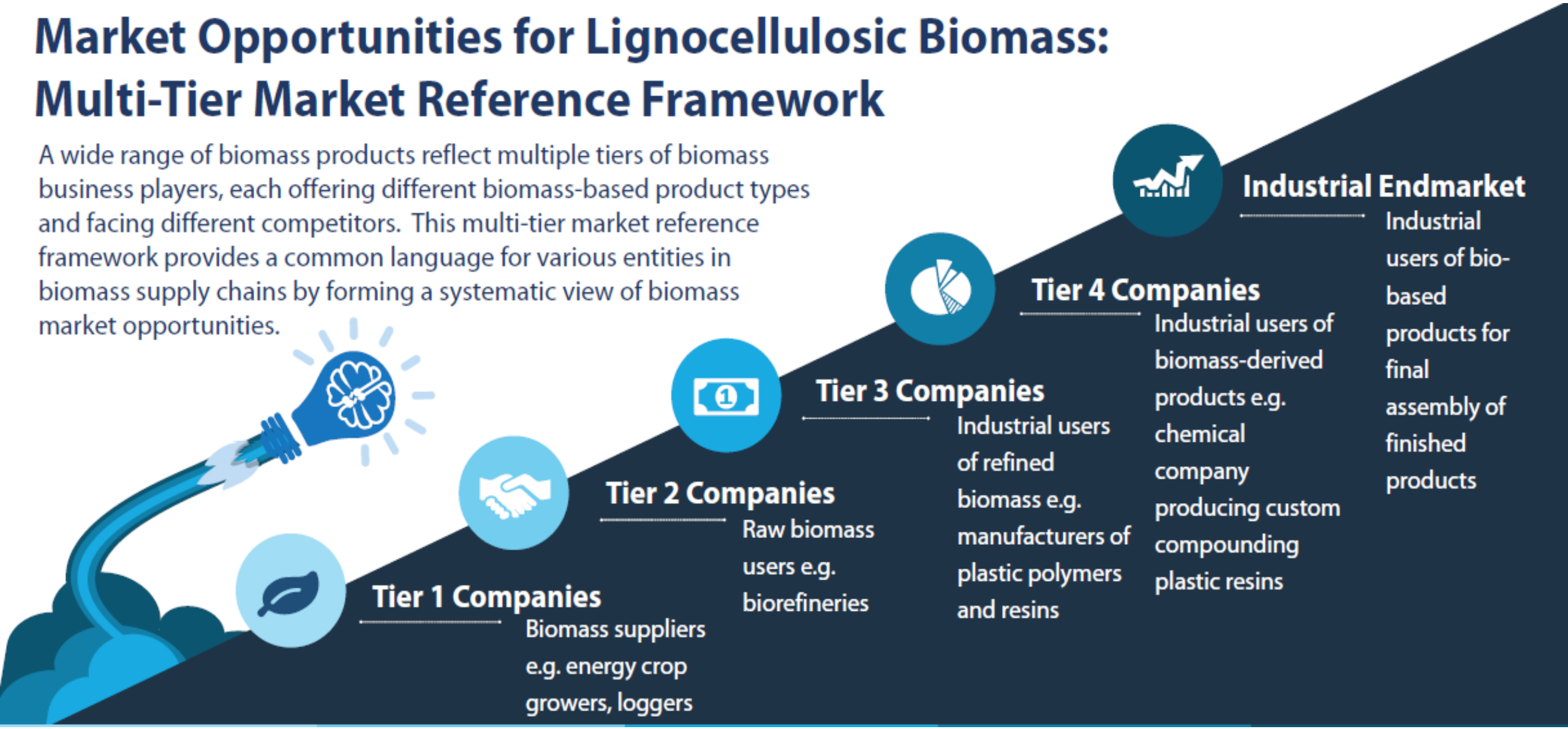


Strong reinforcement of the feasibility of other bioproducts



Market Opportunities for Lignocellulosic Biomass: Multi-Tier Market Reference Framework

A wide range of biomass products reflect multiple tiers of biomass business players, each offering different biomass-based product types and facing different competitors. This multi-tier market reference framework provides a common language for various entities in biomass supply chains by forming a systematic view of biomass market opportunities.



MASBio Target Bioproducts

Bio-Adhesives

Example (above):

Kiilto Biomelt glue – a plant lactic-acid-based, hot-melt adhesive – launched in Finland in January 2019

Biochemicals

Examples (above):

Wood-based bio-monoethylene glycol (bioMEG) and bio-monopropylene glycol (bioMPG) by UPM Biochemicals, Finland

Resins for 3D Printing

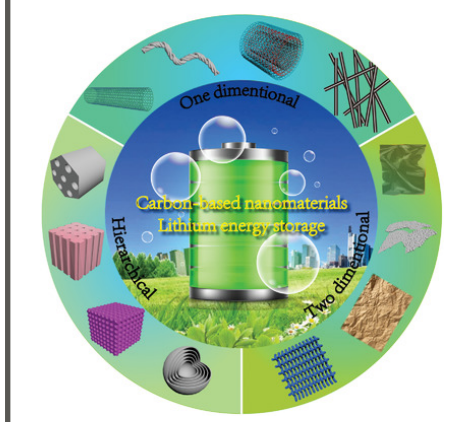
Example (above):

eResin-PLA – a plant-extracted PLA photosensitive resin – for LCD/DLP/SLA 3D-printing technology by eSUN, China

Carbon Products

Examples (above):

Biochar produced from hardwood and switchgrass biomass feedstock



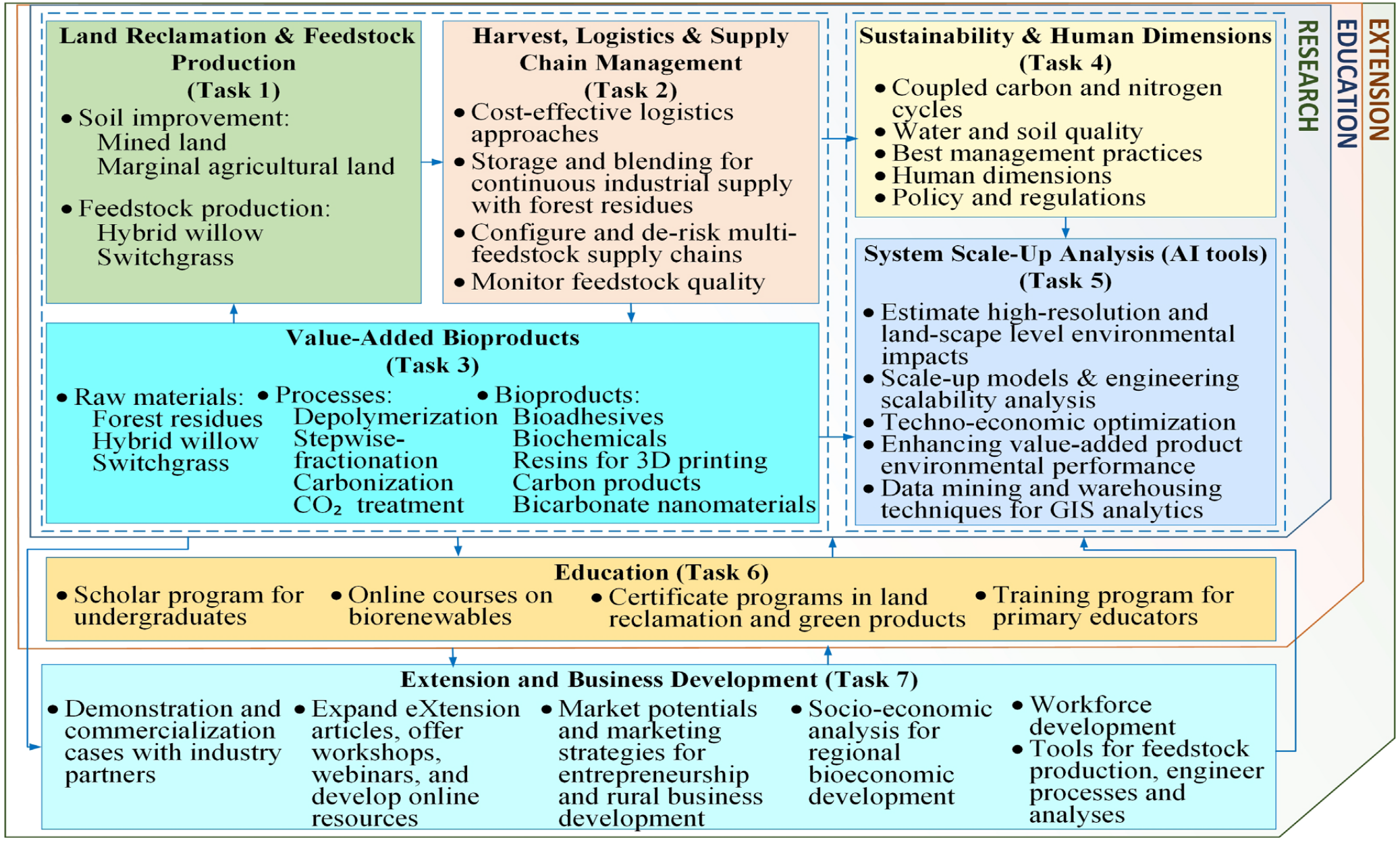
Carbon-based Bio-Nanomaterials

Example (above):

Carbon-based nanomaterials in lithium energy storage applications

Images courtesy of (left to right): Kiilto; Bio Market Insights; International Biochar initiative; Geng et al (2020)

Framework: Integrated Sustainable Biomass for Value-Added Products System



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Contacting the Speakers