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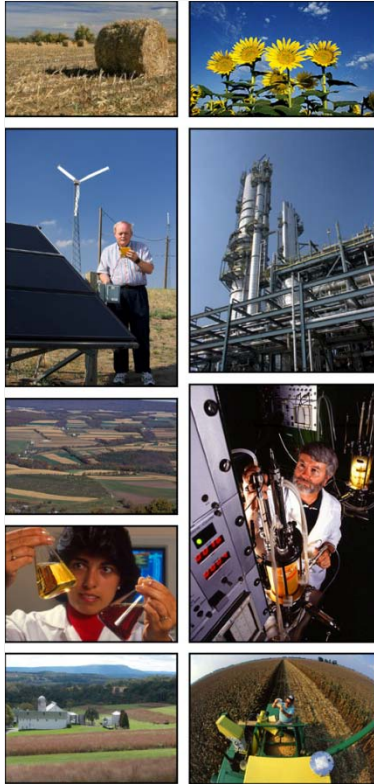
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Sustainable by Design: Creating New Biofuel Opportunities Across the United States

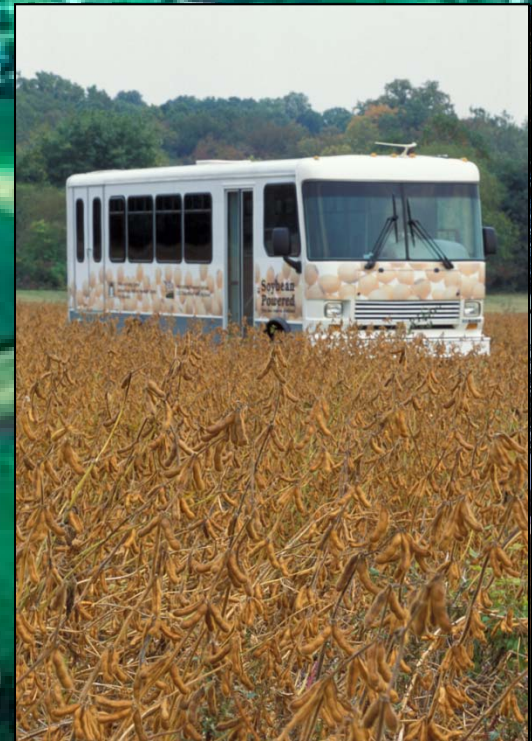
Agricultural Outlook Forum 2011
Crystal City, Virginia
February 25

Jeffrey J. Steiner
Agricultural Research Service
United States Department of Agriculture

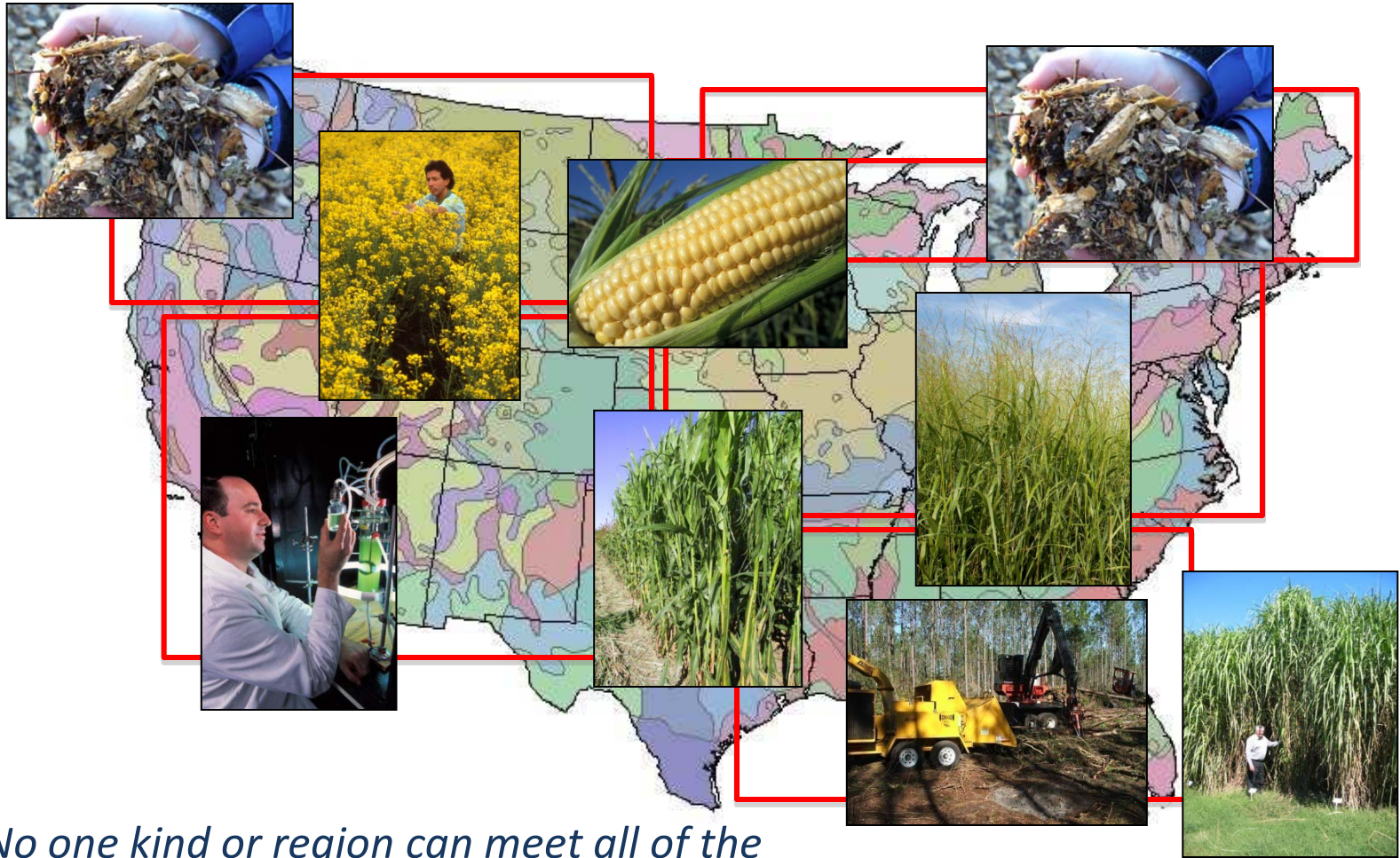
The Sustainability Challenge

Great expectations from rural lands:

- Ecosystem services: water, air, wildlife habitat & C-sequestration
- Income supporting farms, forests, and rural communities
- High quality, nutritious, and safe food products
- New bio-based consumer products, including bioenergy



Diversity of Environments, Commodities, and Challenges



No one kind or region can meet all of the nation's feedstock needs

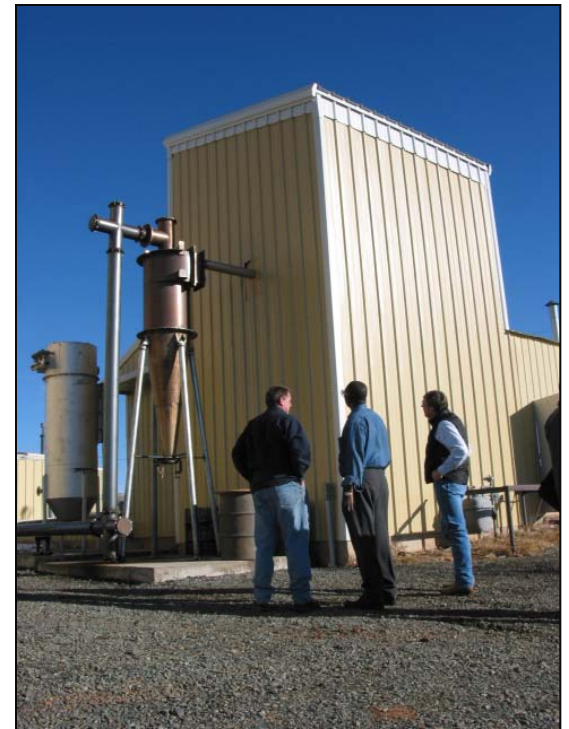
Range of Conversion Scales Needed



Large-scale



Local-scale



Farm-scale

One scale is not suitable for all situations

On-Farm Energy Opportunities



- Emerging scalable technologies to compliment existing production
- Turn agricultural feedstocks and wastes into energy products.
- New source of value-added income ...
... behind the farm gate.

Vermont Community-based Biodiesel Facility



- 100,000 gallons per year
- Local production of canola
- Integrating regional biodiesel production
- Optimal economies of scale need to be determined



Grubinger
University of Vermont

Emerging Scalable Technologies

On-farm
gasification
reactor



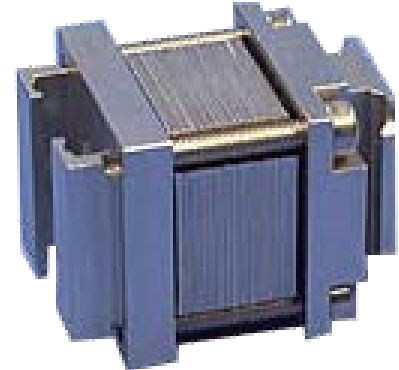
Farm Power &
USDA-ARS

Dry and wet biomass
gasification reactors



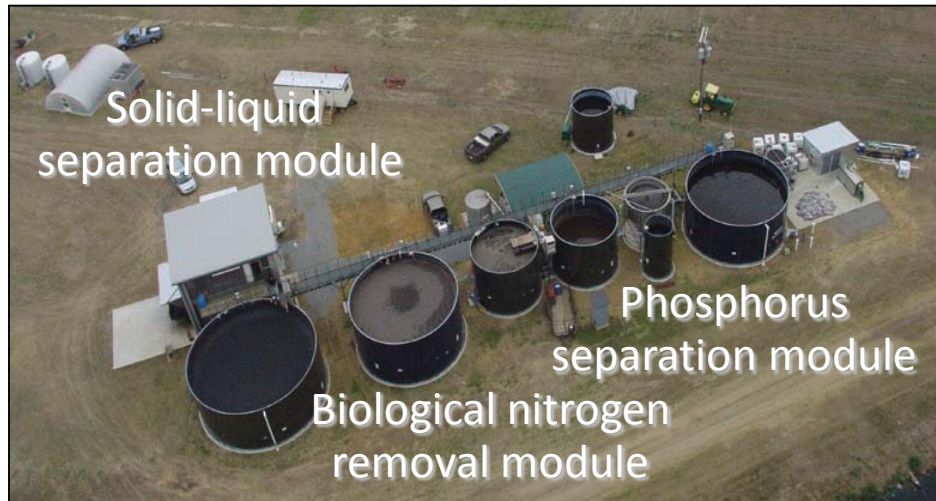
Pacific Northwest
National Laboratory

Microchannel
Fischer-Tropsch
reactor



Pacific Northwest
National Laboratory

Adding Value to Existing Agricultural Systems



Five-percent solids



- Integrate catalytic hydrothermal gasification reactor and Fischer-Tropsch microchannel reactor
- Reduce land requirements for waste management
- Income opportunity in addition to compliance

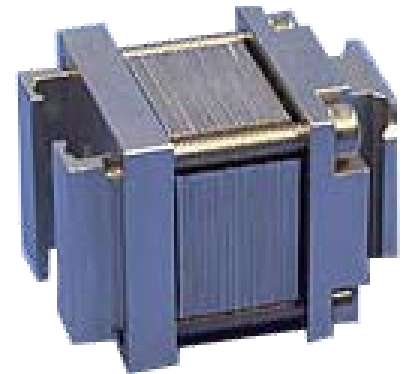
North Carolina Hog Operation



Dry and wet biomass
gasification reactors



Microchannel
Fischer-Tropsch
reactor



- Confined hog operations produce 10-million head per year
- Over 560,000 tons of manure available each year
- Conversion equivalent: at 60 gallon/ton would produce 33-M gallons.
- At \$1.90 per gallon equals \$63-million

Georgia Cotton Production

- Disposal of gin wastes
- Source of energy for seed cotton conditioning before ginning
- Blend cotton seed oil with alcohol for biodiesel production



Low value oil market



One : five waste

Georgia Cotton Industry Potential



- Two million acres producing 1.25 bales per acre
- Over 125,000 tons of gin waste available each year
- Conversion equivalent at 60 gallon/ton would produce 7.5-M gallons. At \$1.90 per gallon equals \$14-million

Also: Georgia peanut hulls could produce 12-M gallons

On-Farm Gasification Reactor



- Grass straw residues
- Synthesis gas (CO & H_2) produced
- 180 pounds of biomass/hour
- 80% of diesel replaced in a 100 kw generator

Joint venture between Farm Power, Rockford, WA
and USDA-ARS Corvallis, OR

Pacific Northwest Cereal and Grass Straw

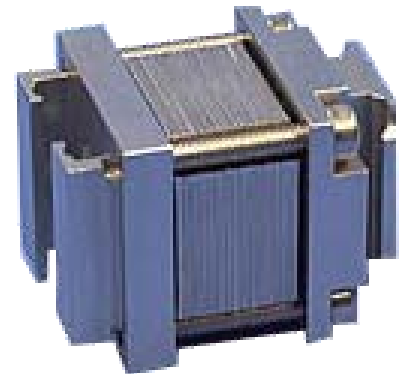


- Over 7-million tons of straw available, beyond the conservation requirement.

- 60-80 gallons per ton at \$1.90 per gallon equals \$800-million



Microchannel
Fischer-Tropsch
reactor



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