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Comments for the Biomass Research and Development Technical Advisory Committee

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on behalf of the
American Society of Agronomy
Crop Science Society of America
Soil Science Society of America

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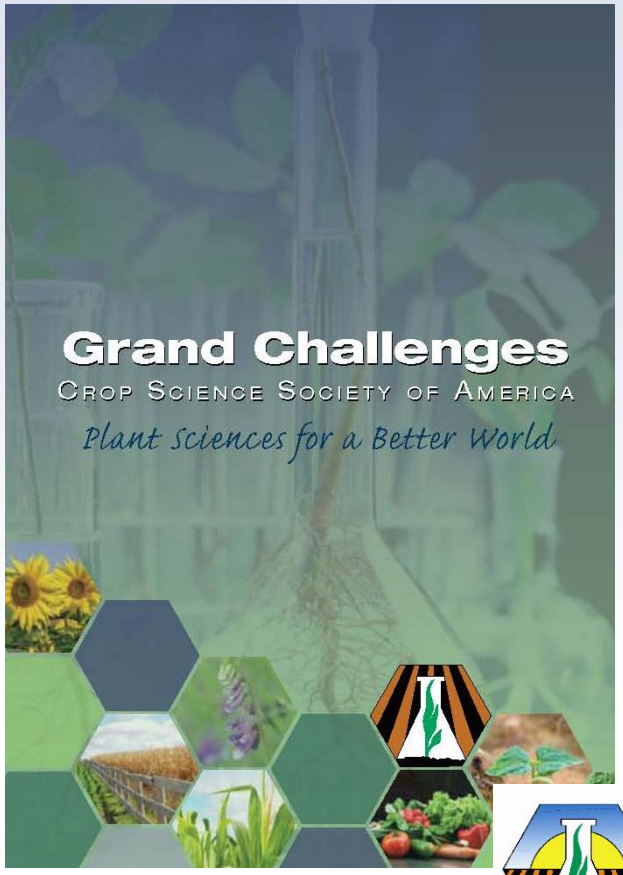
The Grand Challenge

- Development of sustainable bioenergy crops and cropping systems is indeed a grand challenge.

https://www.crops.org/files/cssa-grand-challenge-layout-7-2011-updated.pdf



The Grand Challenge

- The '*Third Generation*' perennial feedstocks have distinct advantages, including:
  - carbon sequestration,
  - soil conservation/building vs. loss,
  - nutrient capture,
  - low input requirements, and
  - high yield-potential.

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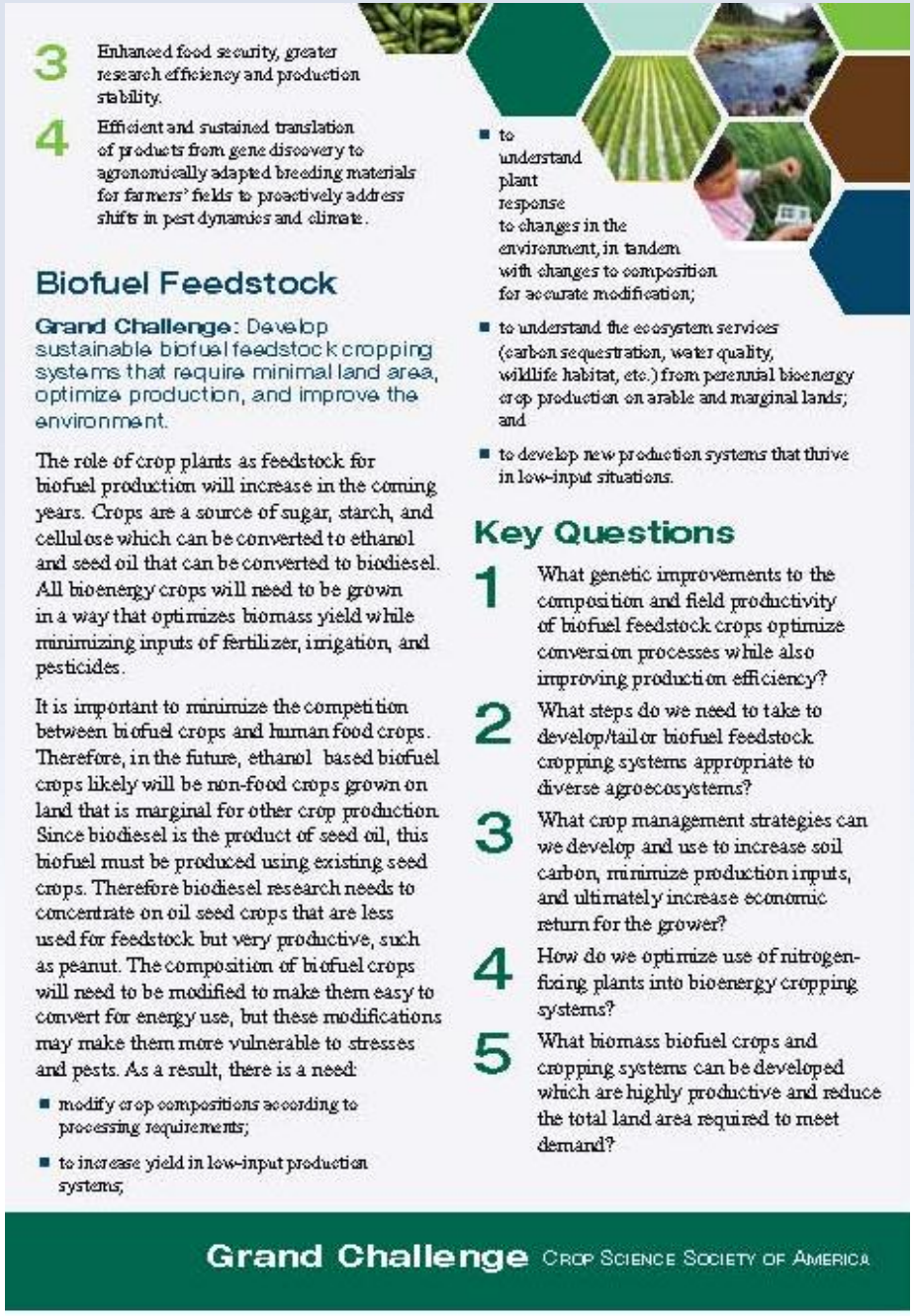
The Grand Challenge

- Key Questions and Expected Outcomes are listed in the CSSA Grand Challenge booklet.
- In summary, we encourage continued and enhanced R&D support for 'Third Generation' perennial feedstocks.



3 Enhanced food security, greater research efficiency and production stability.

4 Efficient and sustained translation of products from gene discovery to agronomically adapted breeding materials for farmers' fields to proactively address shifts in pest dynamics and climate.

Biofuel Feedstock

Grand Challenge: Develop sustainable biofuel feedstock cropping systems that require minimal land area, optimize production, and improve the environment.

The role of crop plants as feedstock for biofuel production will increase in the coming years. Crops are a source of sugar, starch, and cellulose which can be converted to ethanol and seed oil that can be converted to biodiesel. All bioenergy crops will need to be grown in a way that optimizes biomass yield while minimizing inputs of fertilizer, irrigation, and pesticides.

It is important to minimize the competition between biofuel crops and human food crops. Therefore, in the future, ethanol based biofuel crops likely will be non-food crops grown on land that is marginal for other crop production. Since biodiesel is the product of seed oil, this biofuel must be produced using existing seed crops. Therefore biodiesel research needs to concentrate on oil seed crops that are less used for feedstock but very productive, such as peanut. The composition of biofuel crops will need to be modified to make them easy to convert for energy use, but these modifications may make them more vulnerable to stresses and pests. As a result, there is a need:

- modify crop compositions according to processing requirements;
- to increase yield in low-input production systems;
- to understand plant response to changes in the environment, in tandem with changes to composition for accurate modification;
- to understand the ecosystem services (carbon sequestration, water quality, wildlife habitat, etc.) from perennial bioenergy crop production on arable and marginal lands; and
- to develop new production systems that thrive in low-input situations.

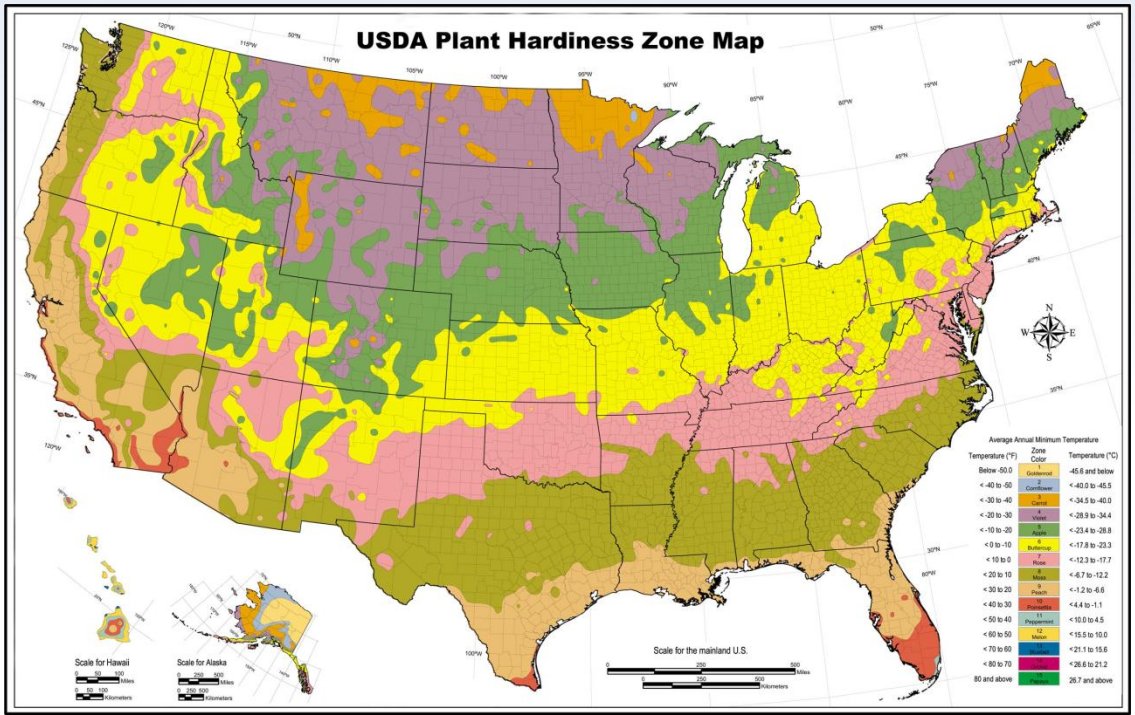
Key Questions

1. What genetic improvements to the composition and field productivity of biofuel feedstock crops optimize conversion processes while also improving production efficiency?
2. What steps do we need to take to develop/tailor biofuel feedstock cropping systems appropriate to diverse agroecosystems?
3. What crop management strategies can we develop and use to increase soil carbon, minimize production inputs, and ultimately increase economic return for the grower?
4. How do we optimize use of nitrogen-fixing plants into bioenergy cropping systems?
5. What biomass biofuel crops and cropping systems can be developed which are highly productive and reduce the total land area required to meet demand?

Grand Challenge Crop Science Society of America

Diversity of Feedstocks

- A diverse set of feedstock crops is needed, <u>even within a region</u>, to limit risks associated with production and ensure consistent supplies of biomass.



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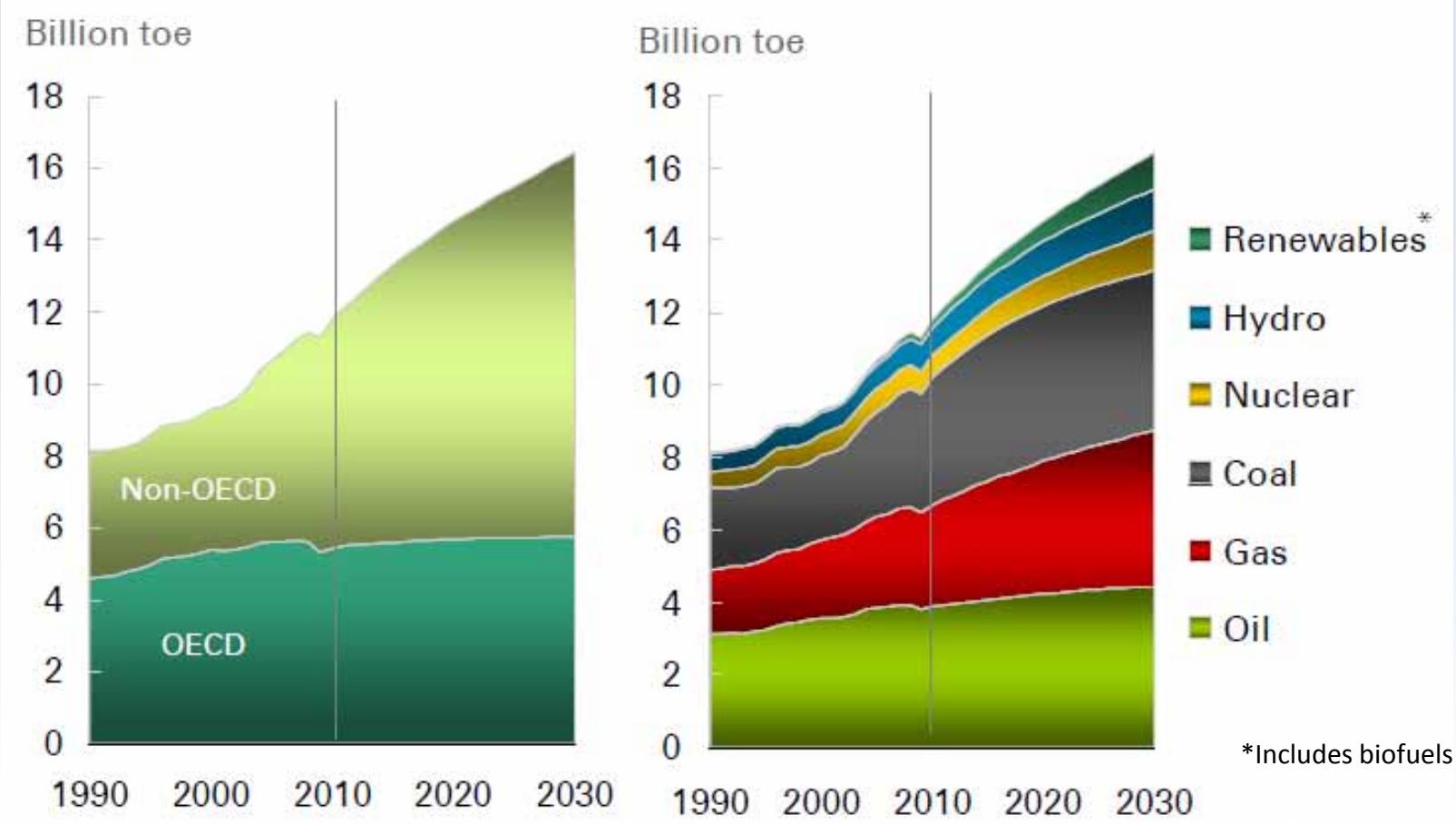
Impact

- Relative impact of bioenergy will depend on:
  - Feedstock availability
    - High-yielding adapted cultivars, optimized production systems, food vs. fuel circumvention, effective policy incentives
  - Conversion efficiency
  - Overall energy consumption/energy-efficiency
    - What percentage of the pie?
    - Challenge: increasing market share in an expanding market.

Energy use projections



Increased energy demand driven by increasing population and improving quality of life

Source: BP 2030 Energy Outlook

Questions?

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