Challenges and Science Needed to Describe Sustainable Biofuel Production

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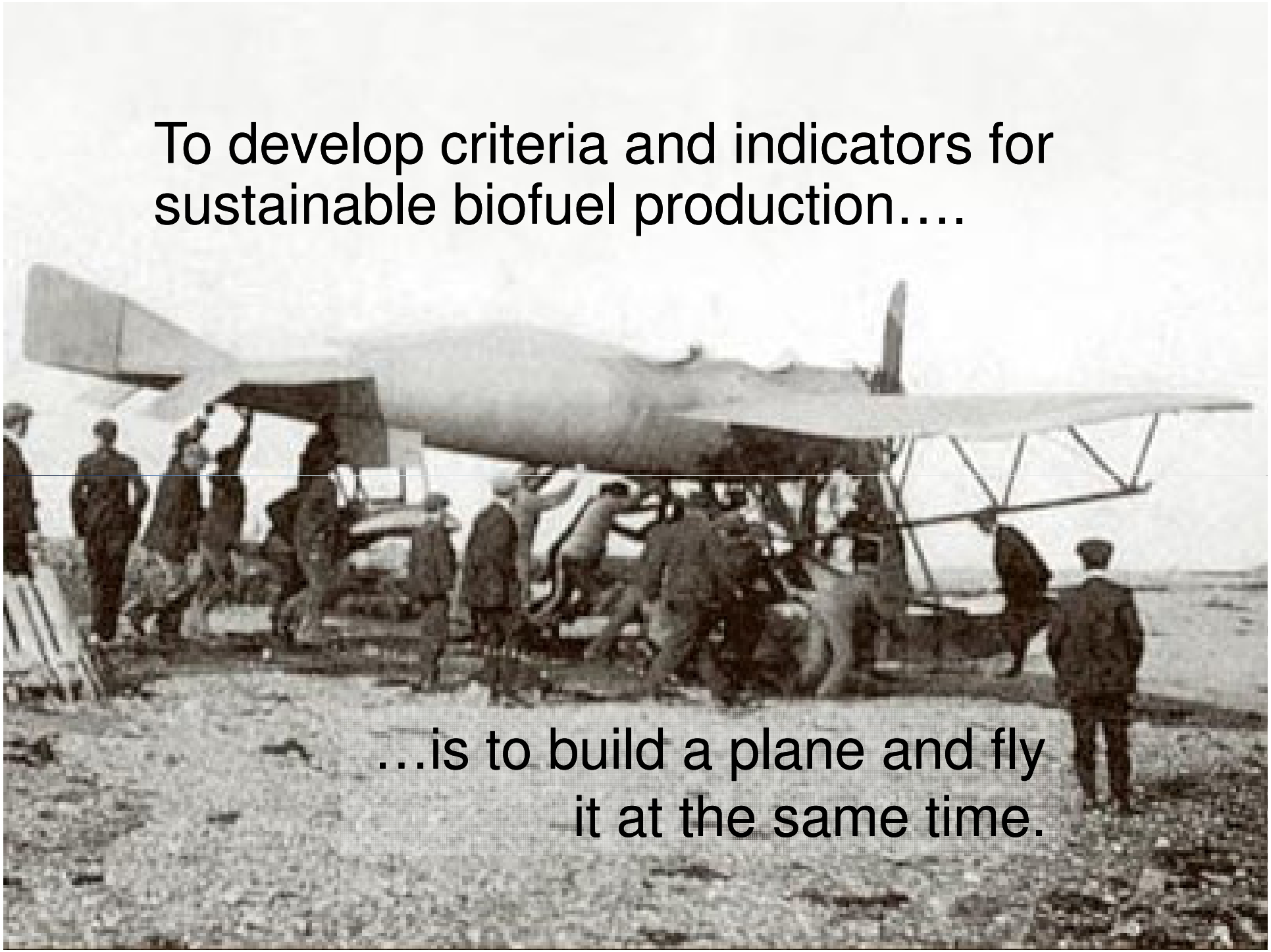
Multiple Benefits from Rural Landscapes

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

Multi-objective perspective needed for success throughout the supply chain

To develop criteria and indicators for sustainable biofuel production….



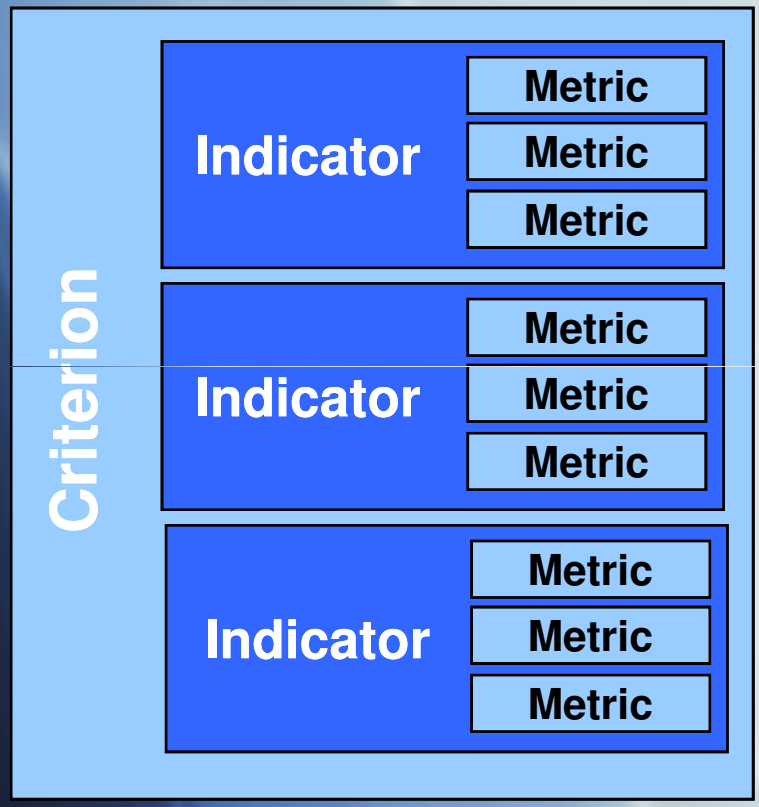
…is to build a plane and fly it at the same time.

Many Efforts Addressing Sustainability

- Roundtable on Sustainable Biofuels*
- Global Bioenergy Partnership (GBEP)*
- Sustainable Biodiesel Alliance*
- Sustainable Forestry Initiative
- Keystone Alliance for Sustainable Agriculture
- Council on Sustainable Biomass Production*
- BRDi - Sustainability Interagency Working Group*

* Specific to biofuels

Definitions for Biofuel Sustainability Descriptors



- **Criteria** - categories used to evaluate the environmental, economic, or social performance of biofuels.
- **Indicators** - measurable outcomes of a criteria; a means for measuring or describing various aspects of the criteria.
- **Benchmarks** (metric) - quantitative values or qualitative statements representing current industry practice.

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Sustainability Interagency Working Group

Courtesy: Alan Hecht, US-EPA

Initial Filters Used to Consider Inclusion

- Attributed to the biofuel supply chain
- Important to users and stakeholders
- Appropriate applicable scale
- Science and technology exist to measure
- Data exist, or data could be collected
- Data can be expressed graphically
- Data collection is economically feasible

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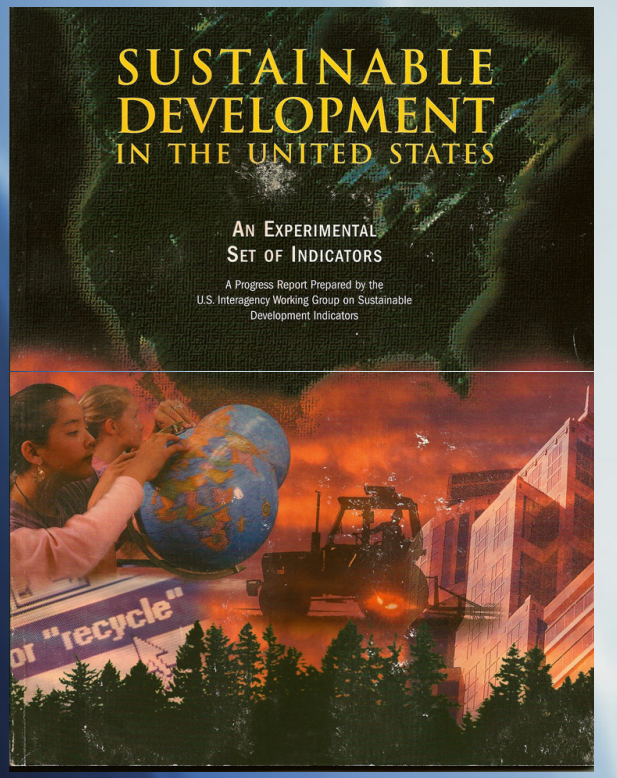
An Experimental Set of National Indicators



U.S. Interagency Working Group on Sustainable Development Indicators
December 1998, Washington, D.C.

Criterion: Environmental (16)

Indicators: Surface water quality, atmospheric ozone status, soil erosion rates, outdoor recreation use.

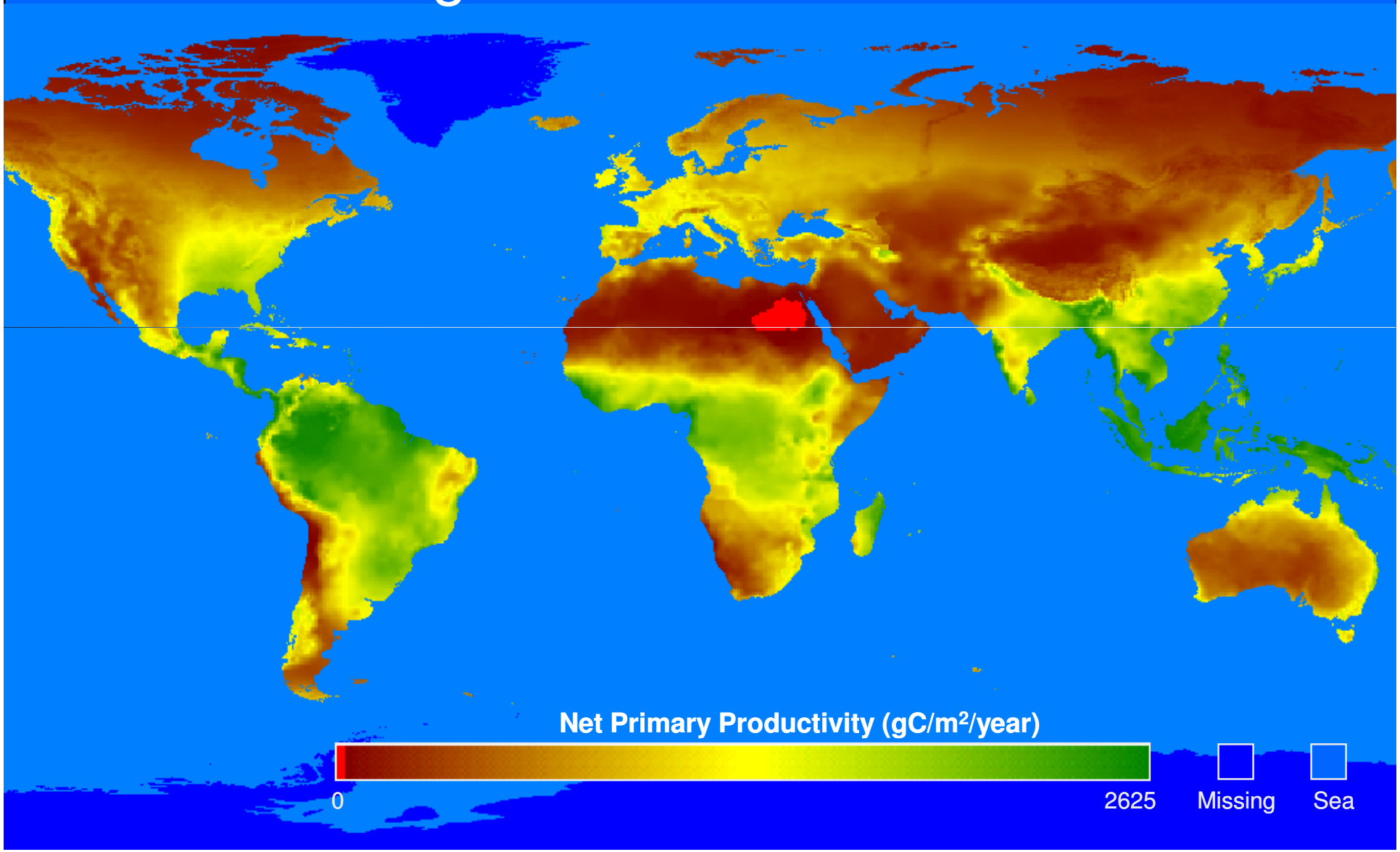
Criterion: Economic (13)

Indicators: Federal debt to GDP ratio, unemployment, home ownership rates, labor productivity.

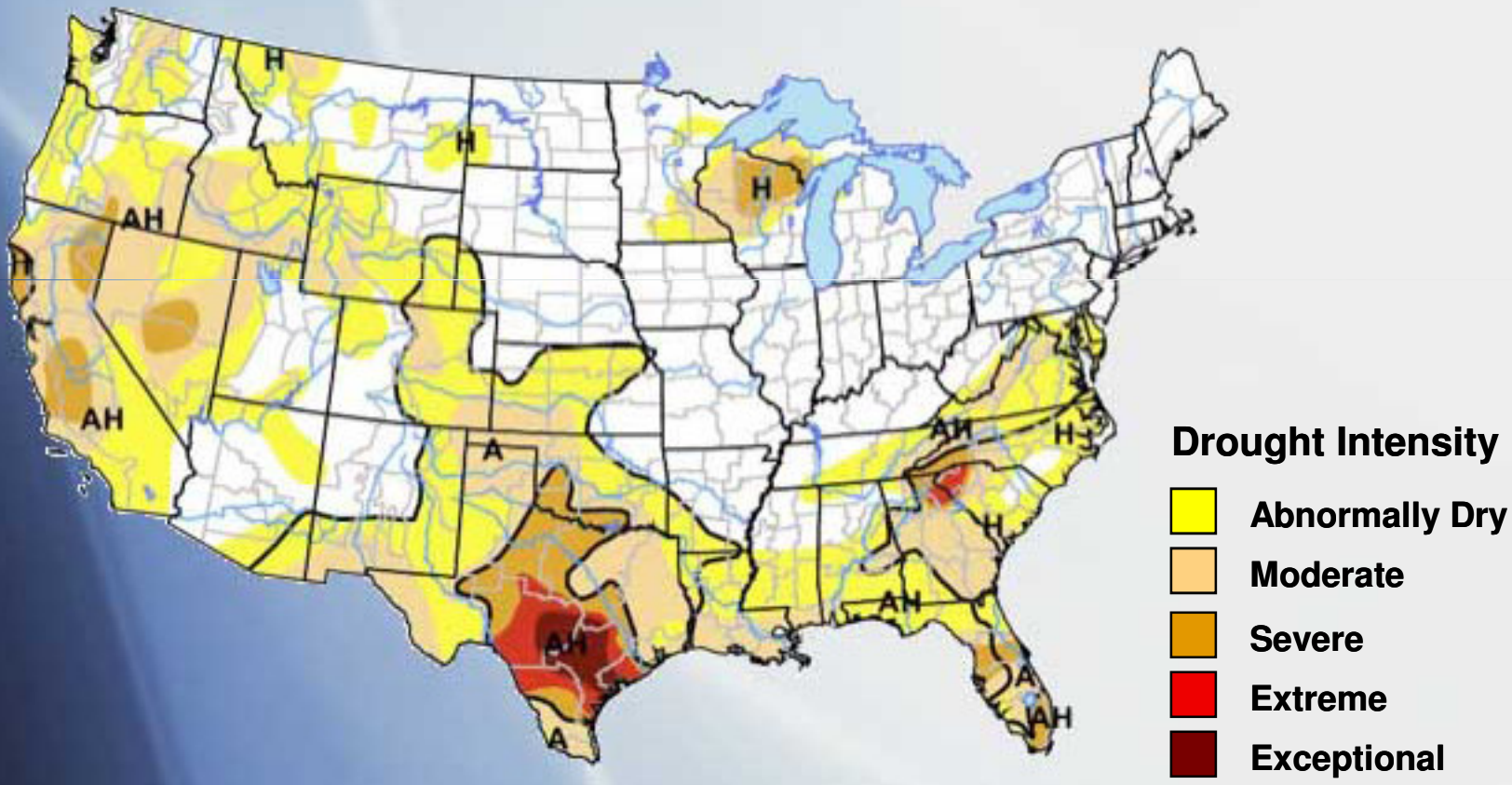
Criterion: Society (11)

Indicators: Educational level attainment, births to single mothers, crime rate, time & money contributions to charity.

Challenges to Sustainable Biofuels



Challenges to Sustainable Biofuels



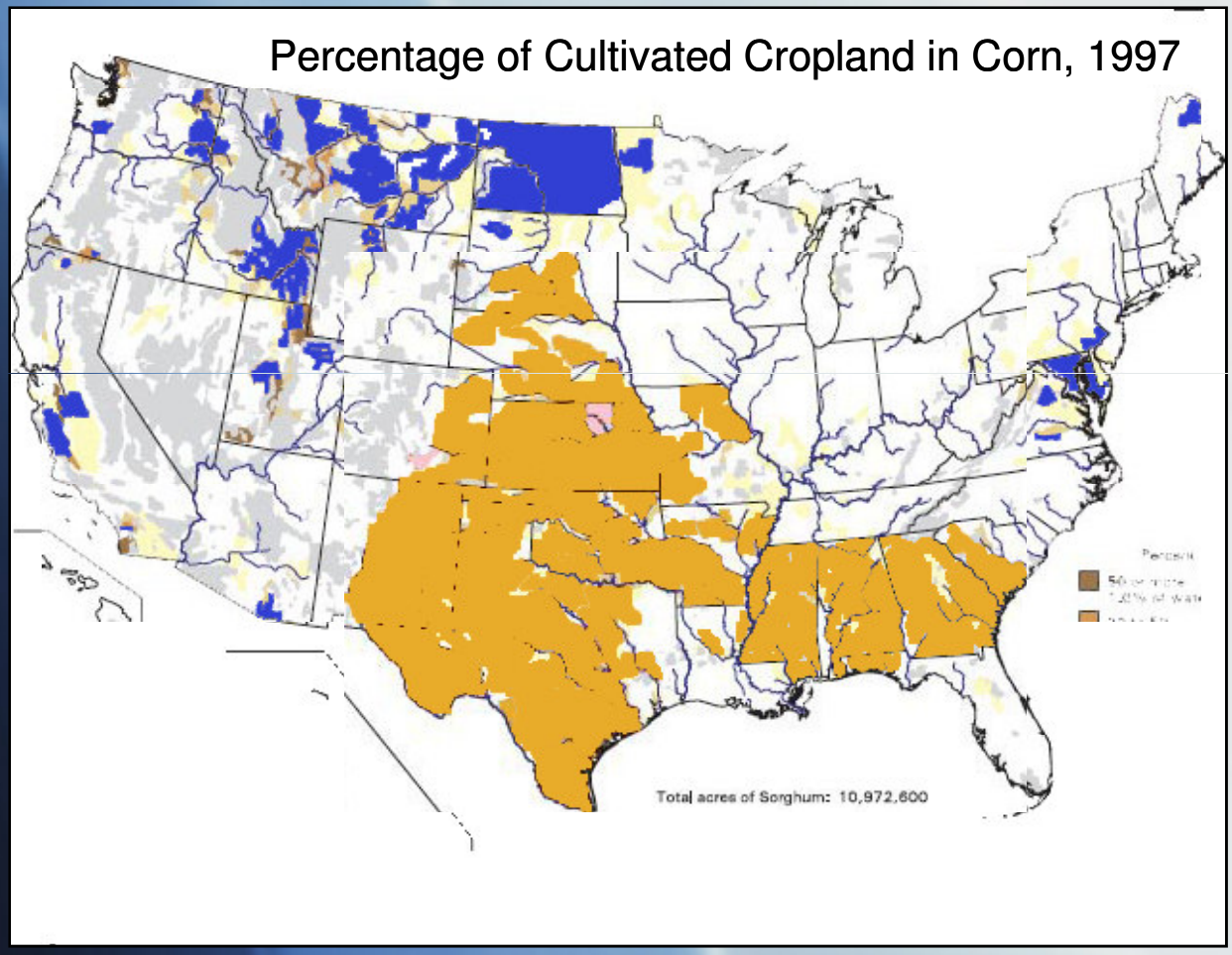
Challenges to Sustainable Biofuels

U.S. Nitrogen and Potash Fertilizer Imports, 2006.

- 62% of Nitrogen fertilizer, 27% increase.
- 88% of Potash fertilizer, 22% increase.

USDA Economic Research Service

Challenges to Sustainable Biofuels



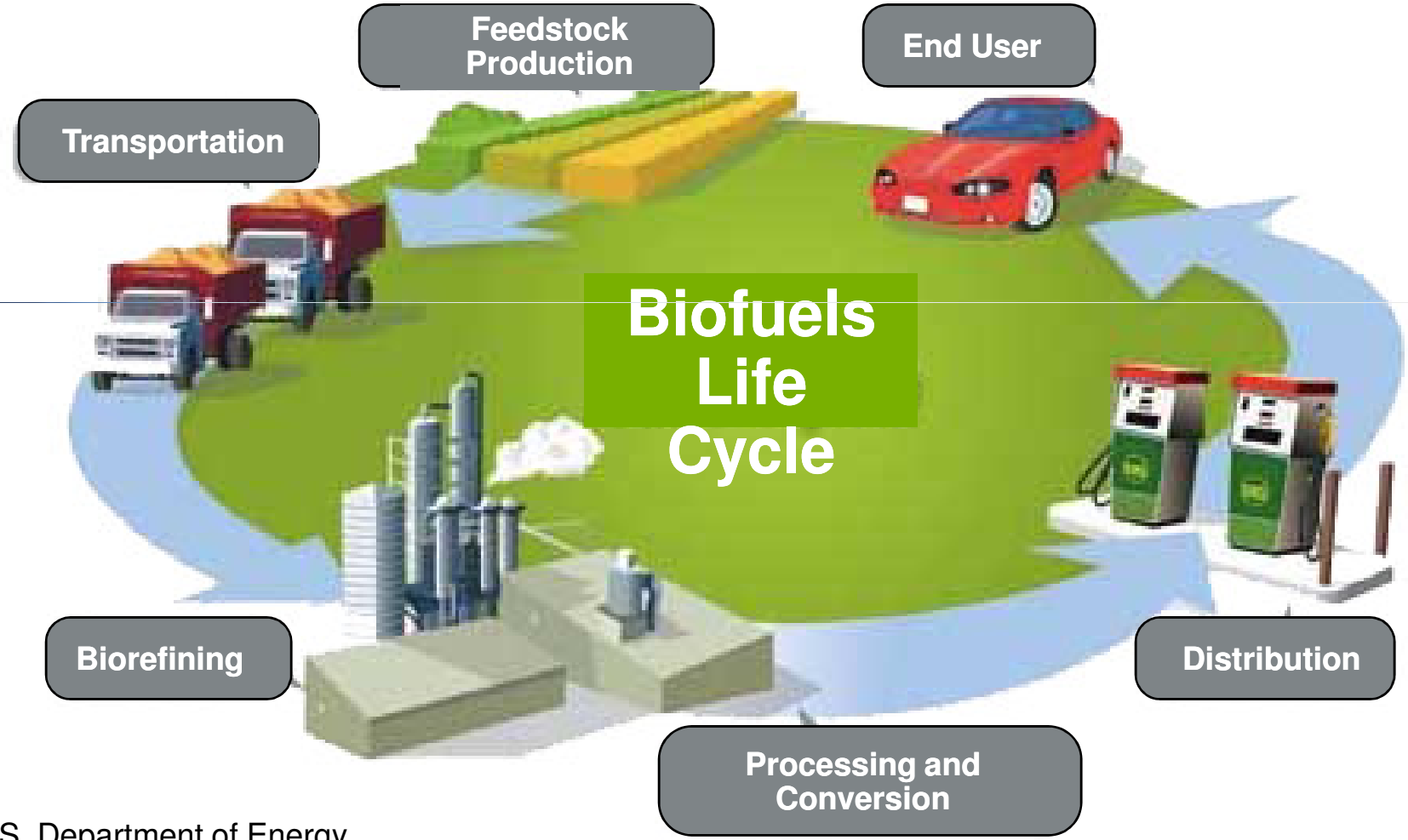
Corn

Barley

Sorghum

USDA Natural Resources Conservation Service

Sustainability Considered Throughout the Entire Biofuel Supply Chain



U.S. Department of Energy

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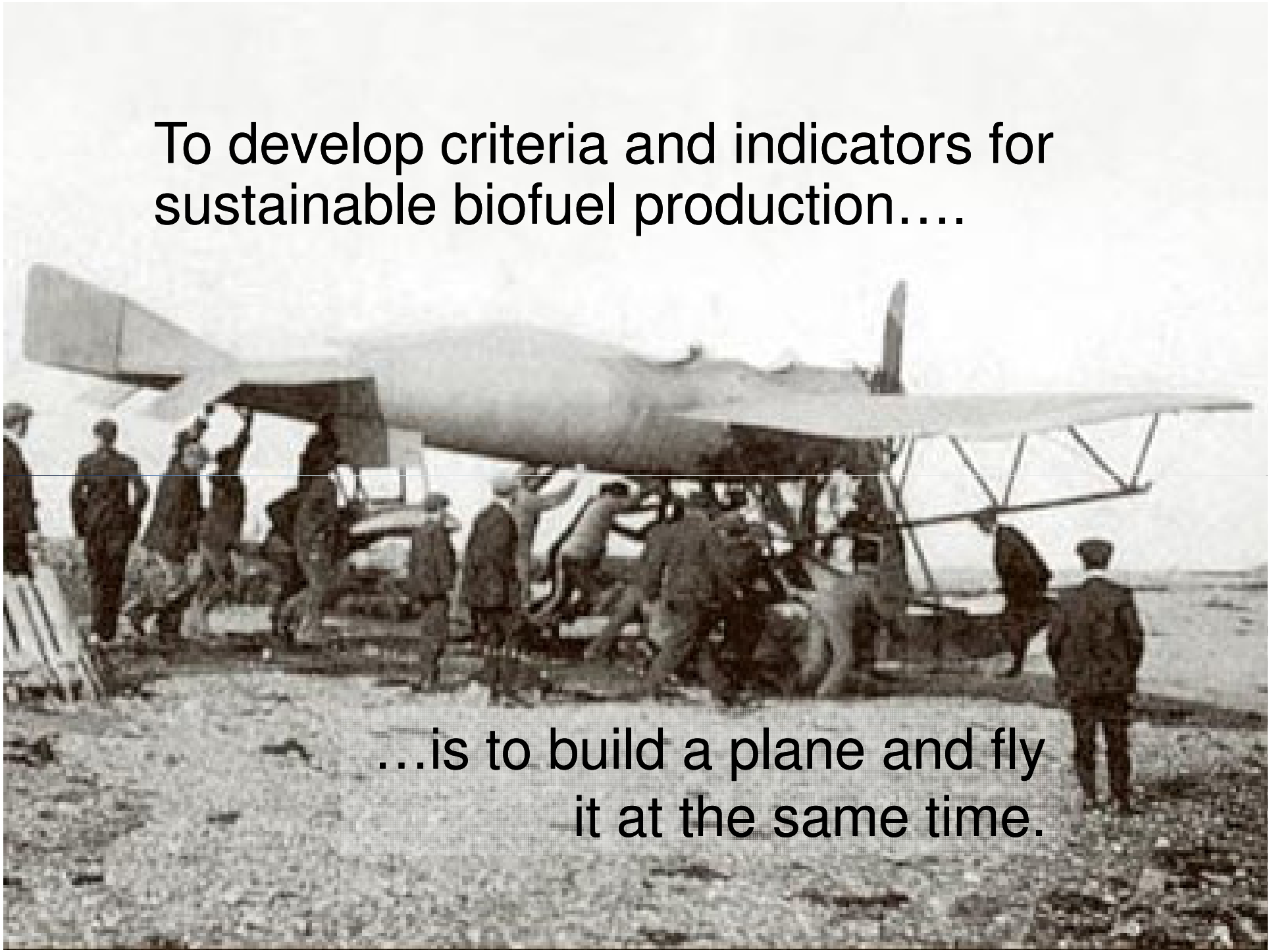

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