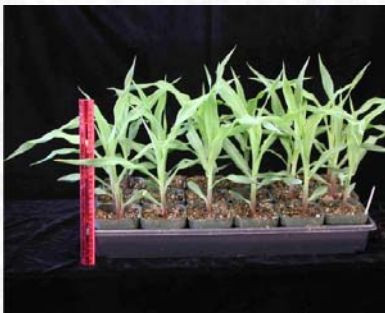
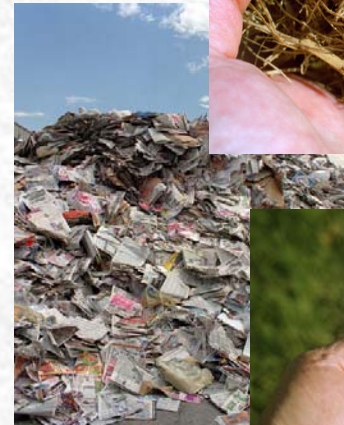


Tour: Biomass, Feedstock Production, Harvest and Storage Systems



Defining the Resource Base

- Wastes
 - Agricultural residues (cornstover, wheat straw, bagasse)
 - Yard waste
 - Municipal solid waste
 - Food processing waste (grain hulls)
 - Manure
- Dedicated crops
 - Conventional crops (corn and soybeans)
 - Herbaceous crops (grasses)
 - Woody crops (hybrid poplar, eucalyptus)



Calibration Point: Corn Grain

Conversion of total 2004 U.S. corn harvest to etOH would meet \cong 15% of current U.S. LDV fuel use.

$(11 \times 10^9 \text{ bu})(2.7 \text{ gal/bu})(0.645 \text{ gal gas/gal etOH})(20 \text{ mi/gal})$

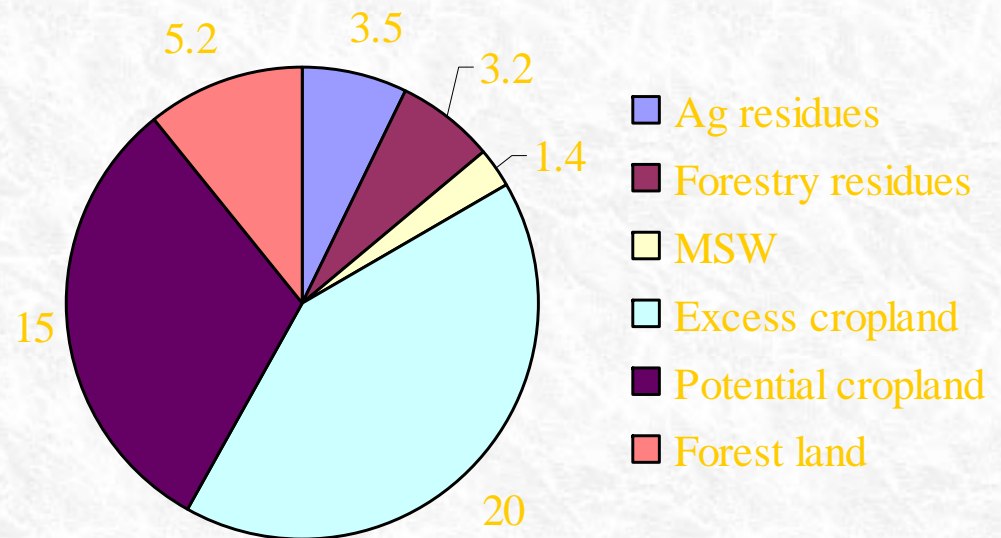
$= 3.8 \times 10^{11} \text{ vehicle miles}$

U.S. annual LDV use $\cong 2.5 \times 10^{12} \text{ mi/yr}$

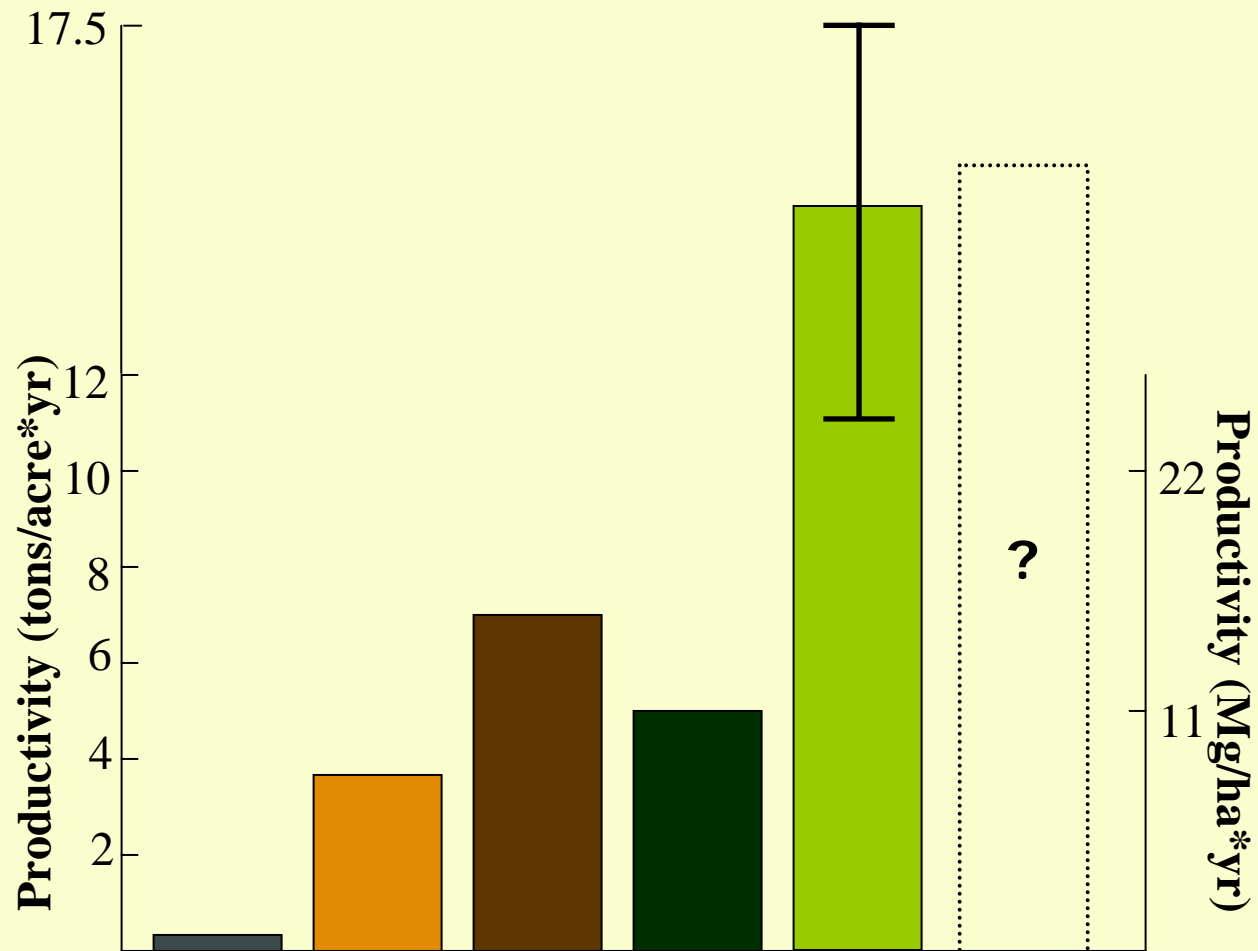
How Much Cellulosic Biomass Could Be Produced?

- Total potential in U.S. is about 48 EJ (48×10^9 GJ)
 - Could supply 50% of energy demand, or
 - Enough to replace all petroleum consumption and organic chemical production

Annual Biomass Production Potential in the U.S. (EJ)



Biomass Productivity



Cellulosic biomass (Pimentel group)

Corn kernels, US avg.

Corn - above-ground, US ave.

Switchgrass or short rotation forestry, simulated commercial avg., now

Miscanthus x giganteus, Illinois (Heaton)

Harvest, Storage, Transport

- Must be able economically harvest, store and transport biomass.
- Harvest and storage must be environmentally sound and preserve (or enhance) soil fertility.





Multiple indicators of system performance and sustainability

- Economic (profitability)
- Energetic efficiency
- Agronomic productivity
- Environmental quality
- Health (human and ecological)
- Social vitality and employment

Introductions

- Harvest Equipment
 - Stuart Birrell, Agricultural and Biosystems Engineering, Iowa State University
- Biomass Production
 - Kenneth Moore, Agronomy, Iowa State University
 - Matt Liebman, Agronomy, Iowa State University