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## Biofuels and Resource Use

Selected Points

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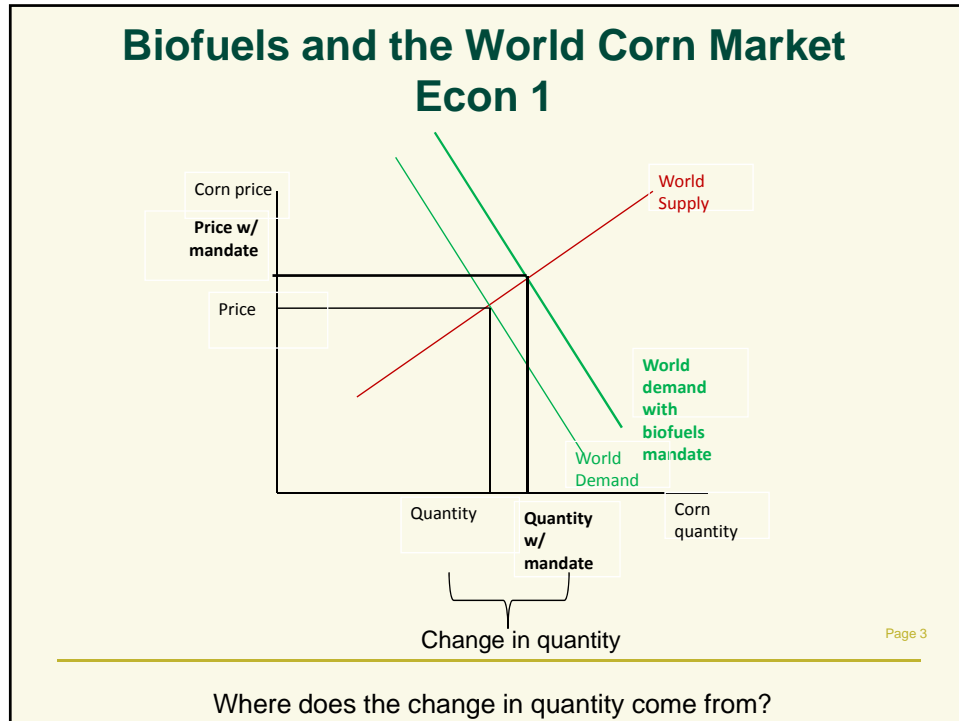
May12, 2009

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### Are biofuels the best use of sunlight?

- Plants don't capture much solar energy (about 5 %, when growing)
  - Chlorophyll tuned to specific frequencies
  - Only works when the plant is growing
- Perennials are better than annuals
  - Longer growing period
  - Don't need to grow as much new root structure
- Plants versus photovoltaics
  - Plants – 4.5 kWh per sq m, best second gen.
  - Photovoltaics – 10.8 kWh per sq. m with today's commercial systems





### Where does the change in quantity come from?

- Increases in yields
  - More fertilizer
  - Better crop varieties
- Increases in area
  - Reduced area of other crops (e.g., corn instead of soybeans)
  - Conversion of non-crop lands to corn production

## Where does the change in quantity come from?

- Depends on
  - Where farmers see higher corn prices AND
  - Whether they can respond
- John (east central Illinois) sees higher corn prices
  - Reduces soybean area
  - Might reduce filter strip along Vermillion River
- Ibrahim (Tanzania) sees higher corn prices
  - No nitrogen fertilizer available so no yield response
  - Expands crop area by cutting down forest
- Yadav (India) doesn't see higher corn price so no response



## What about palm oil for biodiesel?

- Replace tropical forests
- In Indonesia, some expansion onto tropical peat lands (large GHG emissions)
- Very important in non-energy uses (cosmetics to ice cream)



## What about burning waste?

- What waste?
  - John (East Central Illinois) – plows corn stover to maintain soil organic material
  - Ibrahim – uses it for fuel
  - Yadav – uses it for animal feed

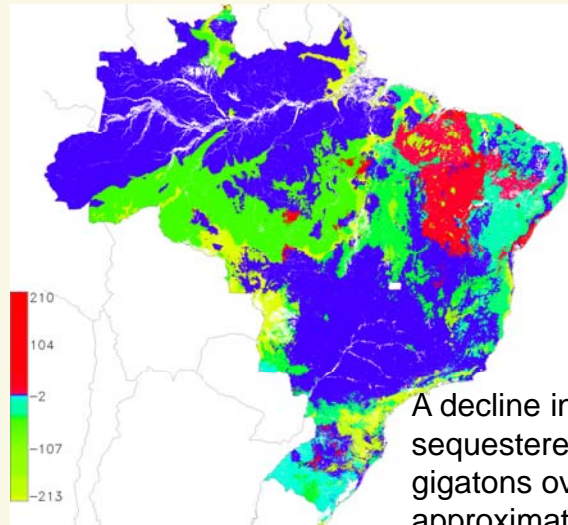


## From qualitative to quantitative

- Assumptions must be made



### Change in Brazilian Land Use and Carbon Pool from Biofuels Price Increase



A decline in carbon sequestered of 20.4 gigatons over approximately 20 years.

Mt carbon per ha. Source: Nelson et. al., 2008

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