

# Opportunities and Challenges of Biofuels for Agriculture and Food Security of Developing Countries

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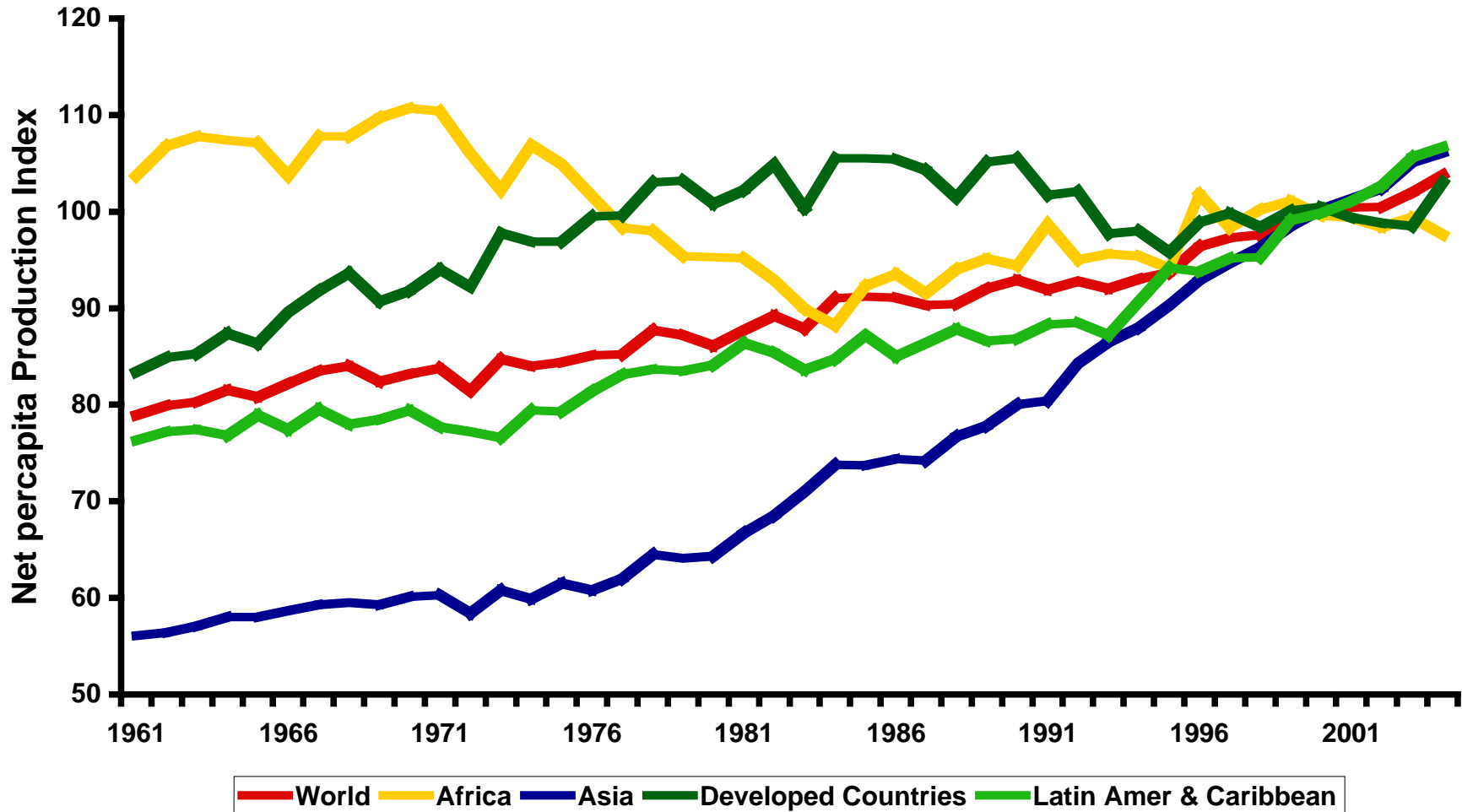
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# Agricultural Background

- **Ag population 2.5 billion people**
- **800 million people food insecure**
- **In developing countries:**
  - **50% of employment**
  - **15% of GDP**
- **Agriculture is an ecosystem based enterprise**
- **Biofuels is a link between energy and agriculture**

# Agricultural Production by Selected Country Groups



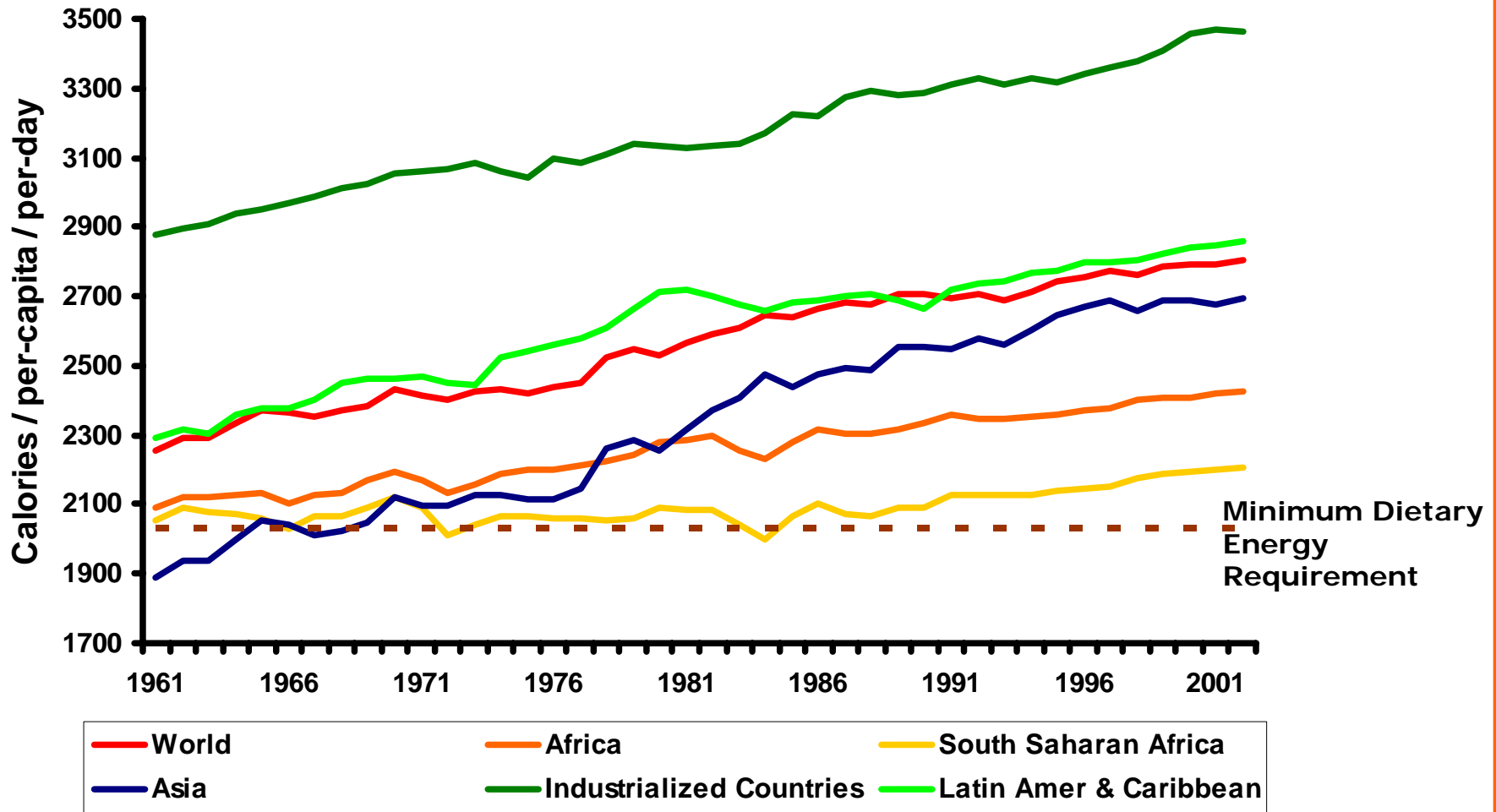
Source: FAOSTAT 2005

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# Food Security: A Global Production Problem ?



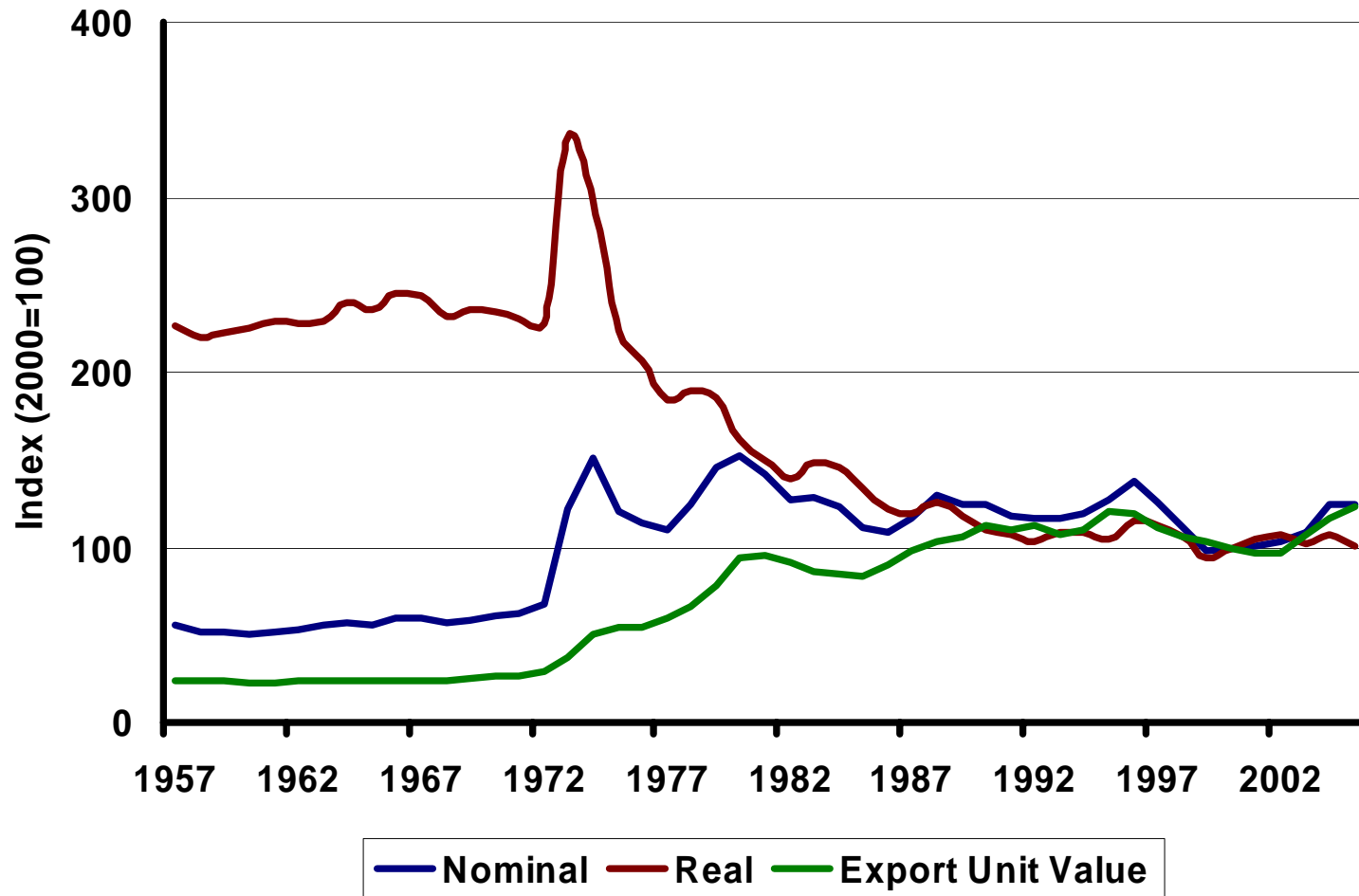
Source: FAOSTAT 2005

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# Agricultural Commodity Prices



Source: IMF

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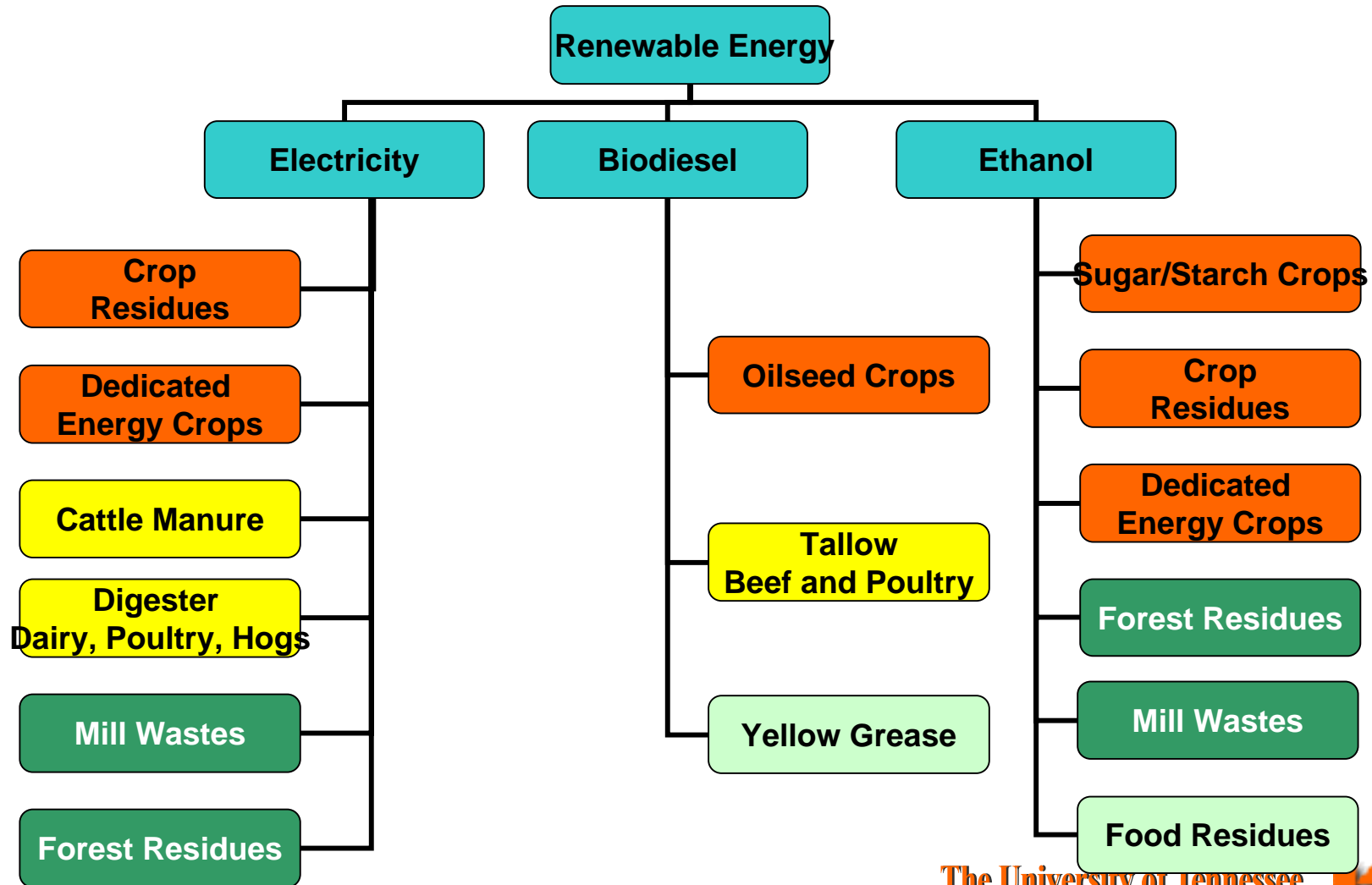
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# Biofuels Opportunity

- **Transportation Fuels Consumption:**
  - **Gasoline: 21 m barrels / day (Ethanol 3%)**
  - **Diesel: 21 m barrels /day (Biodiesel 0.2%)**
- **Equivalent of:**
  - **Ethanol: 30 million barrels / day**
  - **Biodiesel: 23 million barrels / day**
- **Hypothetically:**
  - **Ethanol: 300m ha of sugar or 590m of corn**
  - **Biodiesel: 225m ha of palm**

# Feedstock Diversity: An Opportunity for Agriculture and a Technological Challenge



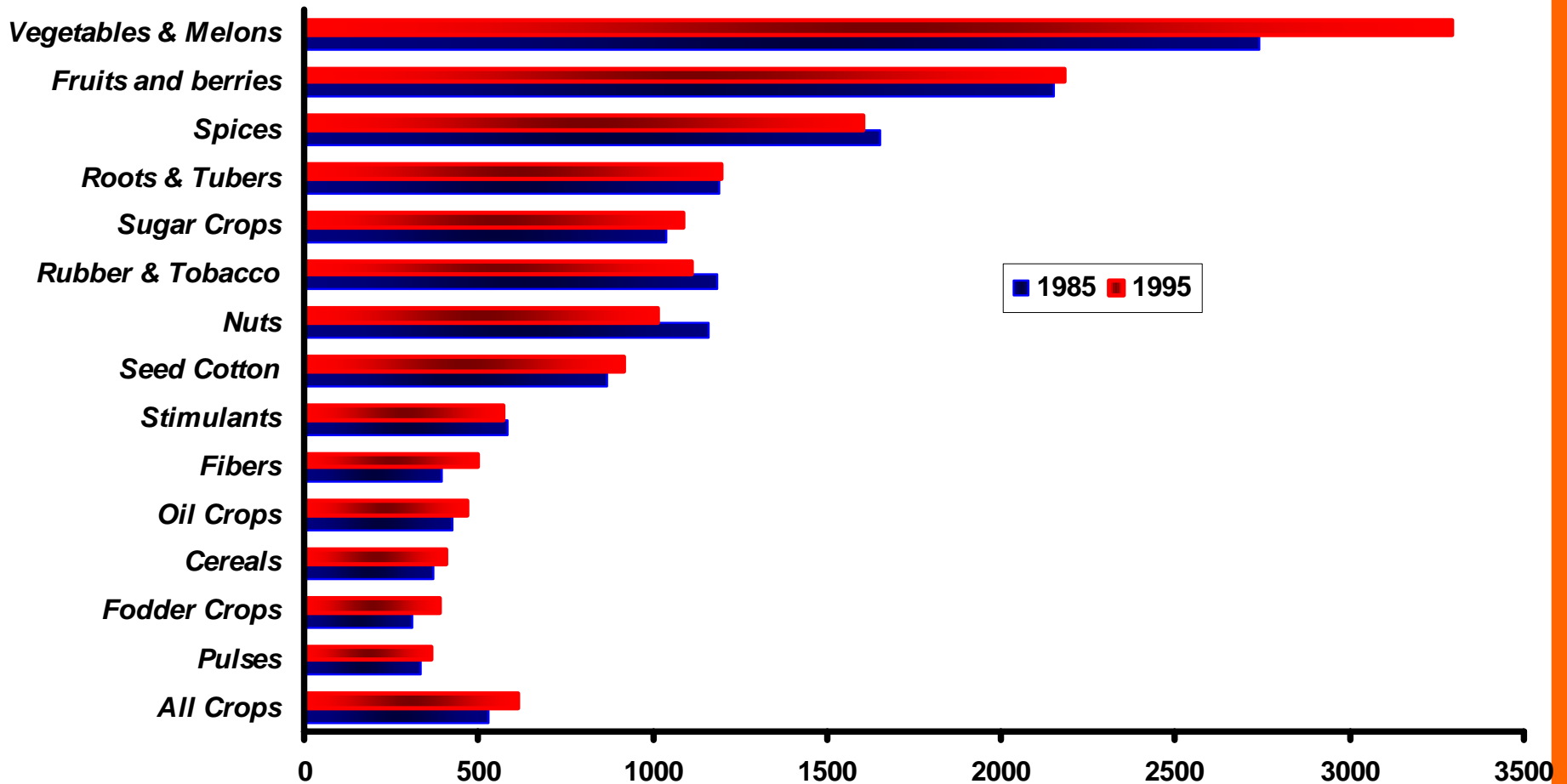
# Changes in Arable Land

	<b>Increase of arable land 1961-2003</b>	<b>Arable land that could be brought back</b>	<b>Potential arable land that could be added</b>
<b>United States</b>		<b>14,000,000</b>	
<b>European Union</b>		<b>6,000,000</b>	
<b>Canada</b>	<b>4,800,000</b>		
<b>Australia</b>	<b>2,600,000</b>		
<b>Brazil</b>	<b>37,000,000</b>		<b>100,000,000</b>
<b>Argentina</b>	<b>6,400,000</b>		
<b>China</b>	<b>39,000,000</b>		
<b>India</b>	<b>5,900,000</b>		
<b>Former URSS</b>		<b>33,000,000</b>	
<b>Others</b>	<b>31,873,000</b>		
<b>Total increase</b>	<b>127,573,000</b>	<b>53,000,000</b>	



# Land Use Competition for Biofuels

Yield Per Hectare of World Crops – Int \$ / HA



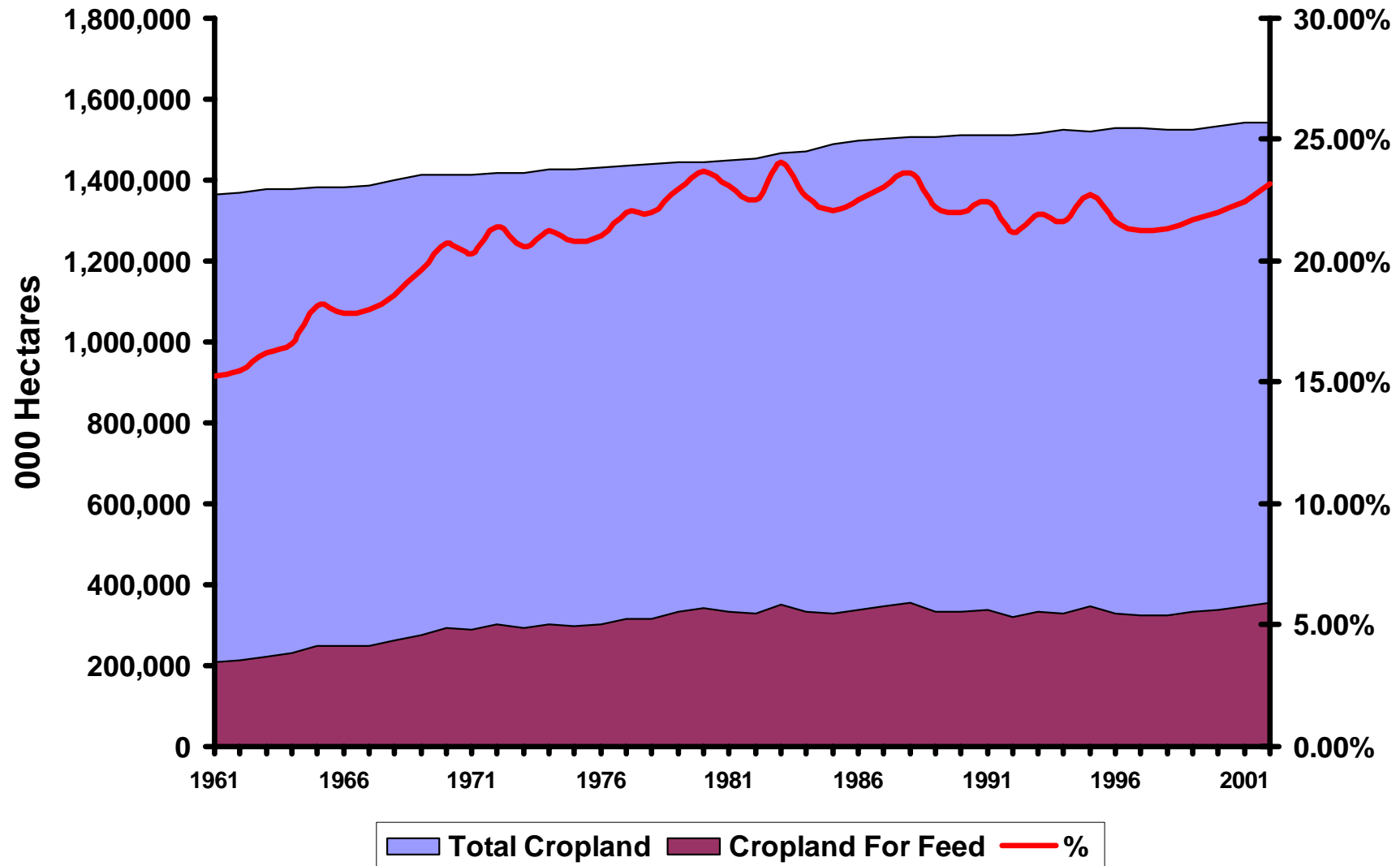
Source: FAO

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# World Land Use for Animal Feed crops



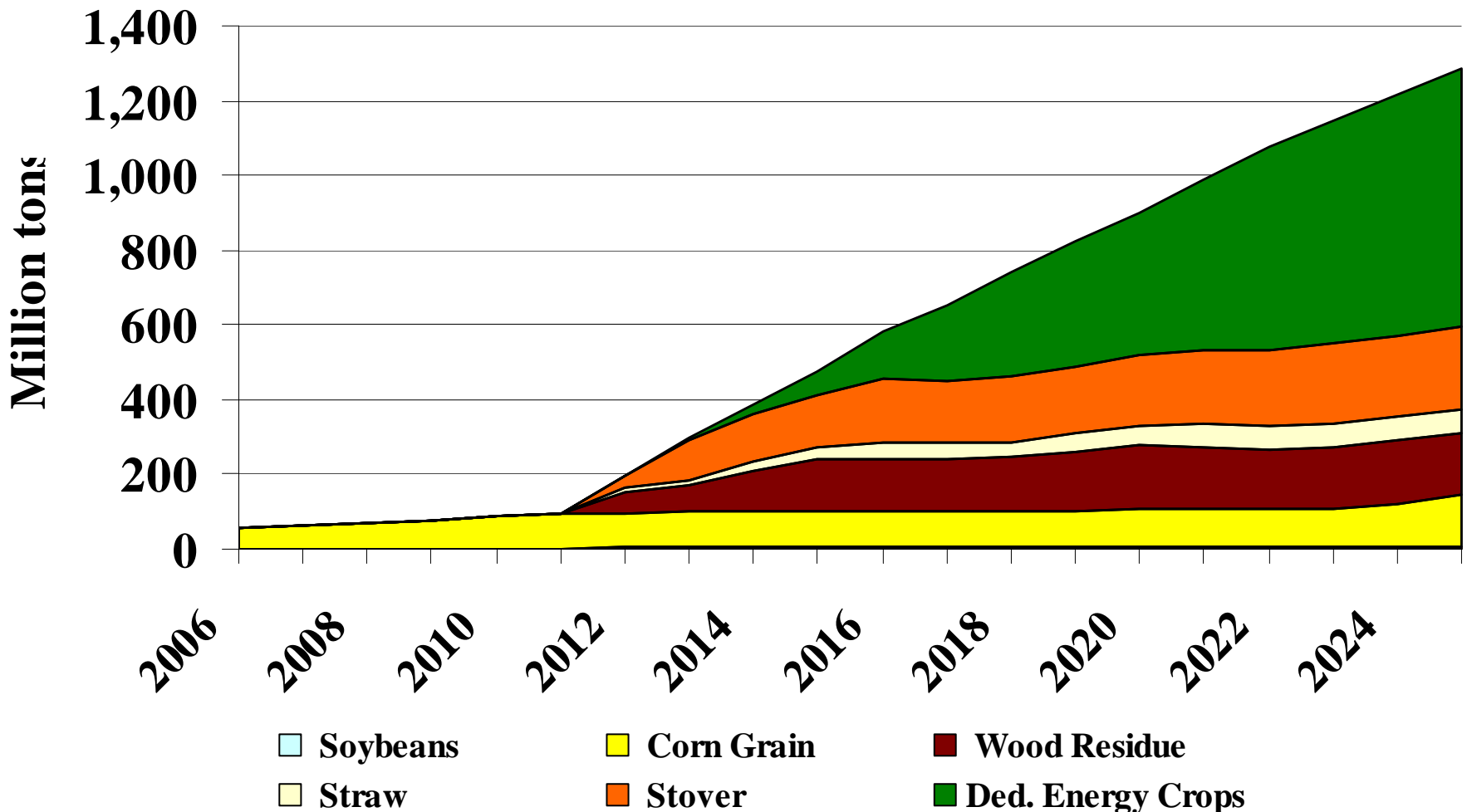
Source: FAOSTAT 2005

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# Potential Use of Ag Feedstock to Achieve 25x25' in the USA

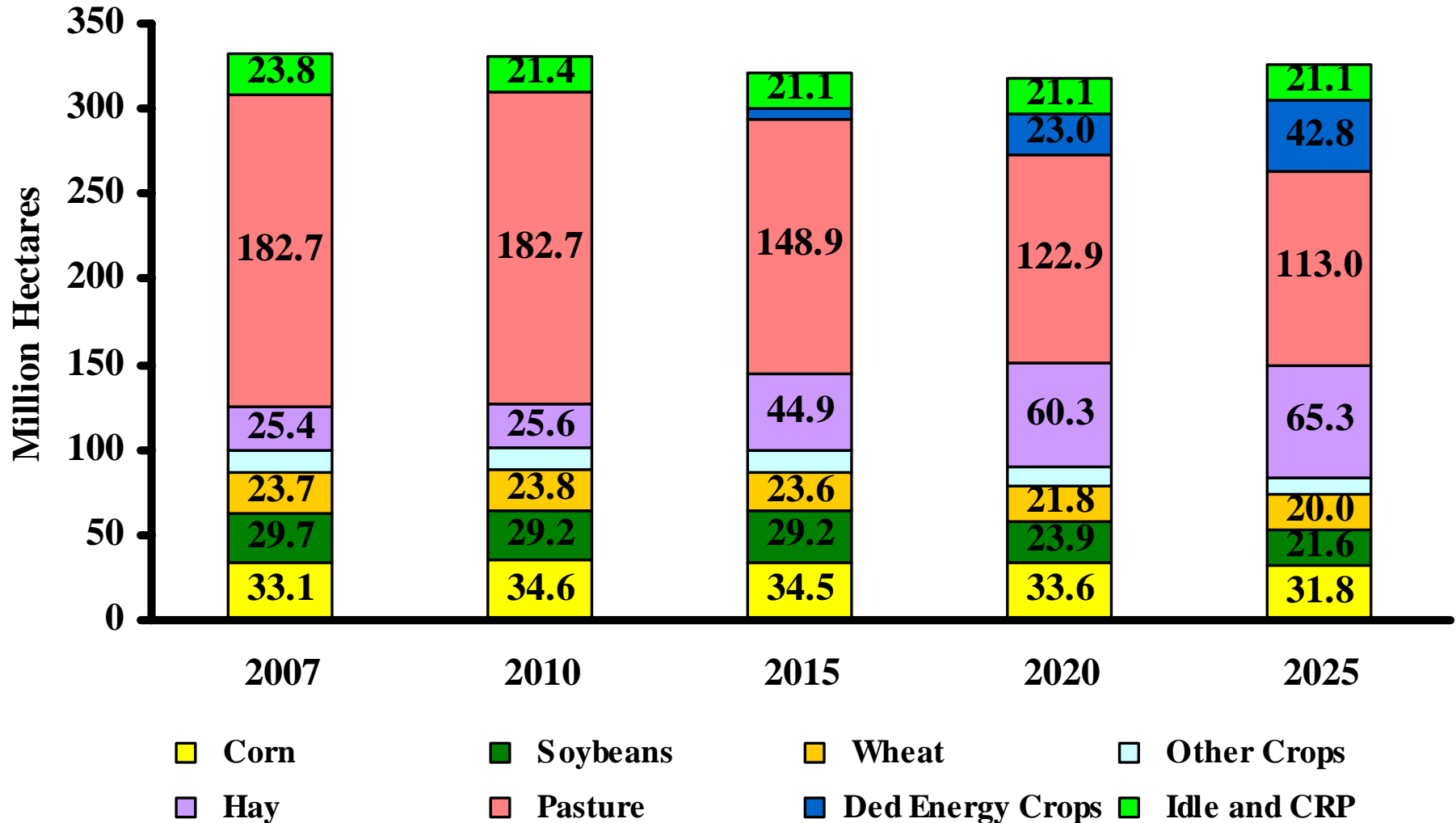


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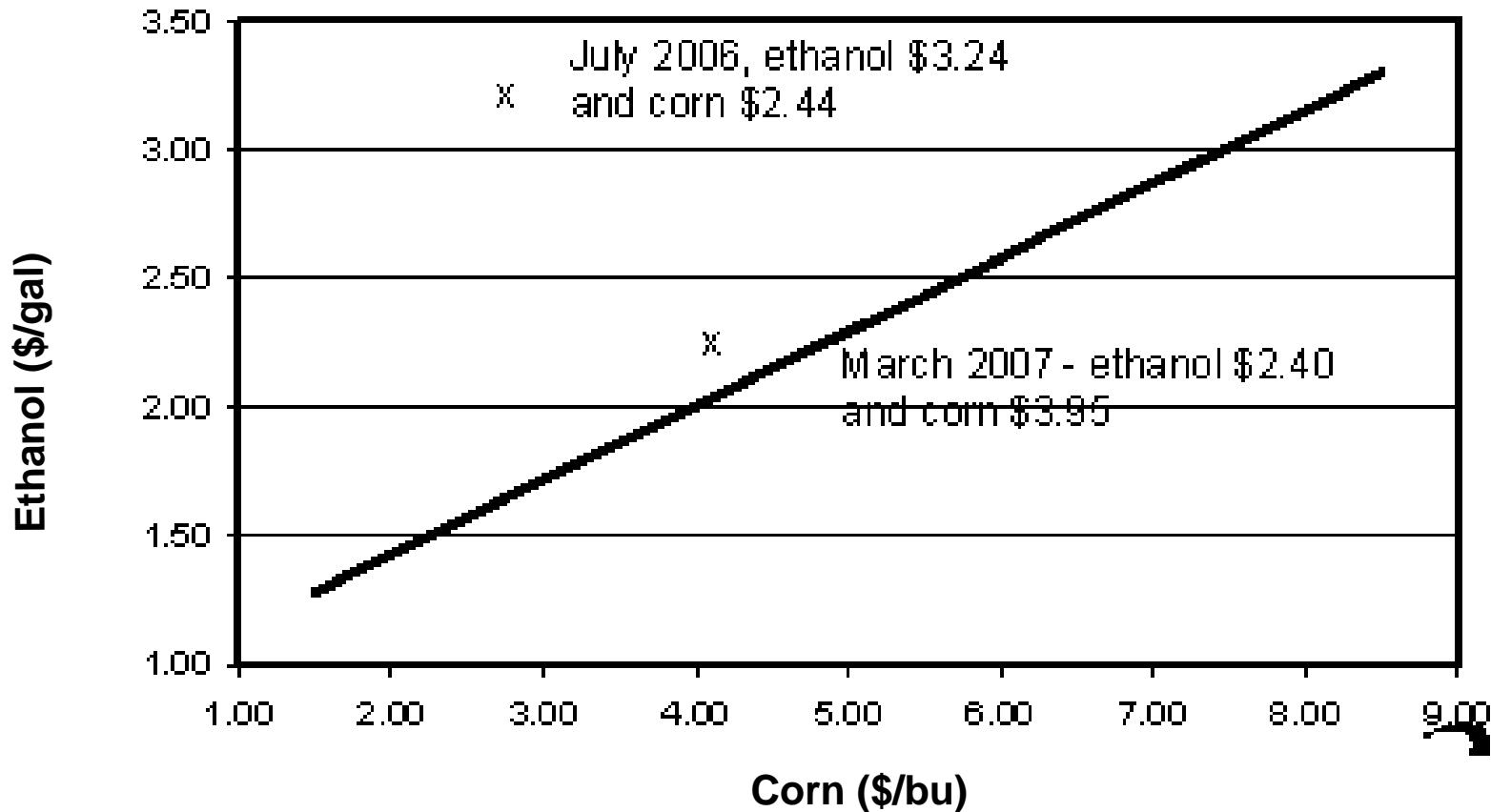
# Changes in Land Use: 25x'25 USA



# Price Impacts of 25x'25 in the US

Crop and Scenario	Projected for the Year:				
	2007	2010	2015	2020	2025
	\$/MT				
<b>Corn:</b>					
<b>Bioenergy Goals</b>	<b>77.3</b>	<b>100.2</b>	<b>95.1</b>	<b>96.9</b>	<b>115.1</b>
<i>Baseline</i>	<i>79.9</i>	<i>94.4</i>	<i>94.4</i>	<i>91.1</i>	<i>89.3</i>
<b>Wheat:</b>					
<b>Bioenergy Goals</b>	<b>115.6</b>	<b>118.3</b>	<b>125.4</b>	<b>144.7</b>	<b>148.9</b>
<i>Baseline</i>	<i>117.1</i>	<i>122.8</i>	<i>134.1</i>	<i>132.2</i>	<i>130.7</i>
<b>Soybeans:</b>					
<b>Bioenergy Goals</b>	<b>206.1</b>	<b>233.9</b>	<b>248.6</b>	<b>257.3</b>	<b>271.6</b>
<i>Baseline</i>	<i>203.4</i>	<i>224.1</i>	<i>229.8</i>	<i>220.4</i>	<i>214.3</i>
<b>Cotton</b>					
<b>Bioenergy Goals</b>	<b>1143.4</b>	<b>1143.4</b>	<b>1390.0</b>	<b>1412.5</b>	<b>1412.5</b>
<i>Baseline</i>	<i>1143.4</i>	<i>1143.4</i>	<i>1277.9</i>	<i>1277.9</i>	<i>1300.4</i>
<b>Energy Dedicated Crops:</b>	\$/dry ton				
<b>Bioenergy Goals</b>	<b>0.0</b>	<b>0.0</b>	<b>46.85</b>	<b>60.90</b>	<b>81.85</b>
<i>Baseline</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>

# Ethanol and Corn Cost Breakeven



Source: Tyner, W. and F. Thaleripour (2007), Future Biofuels Policy Alternatives. Purdue University.

# Role of Trade

- **Biofuels trade has a role: expand supply, reduce price pressures, new opportunities**
- **Biofuels trade has with very high risks: size of energy market, expansion of arable land into sensitive areas, overtake land holdings of small landholders**

# Impacts of Increase Commodity Prices in Food Security of Developing Countries

- Increase competitiveness of local production & traditional food crops.
- Increase Ag production capacity
  - Investment in research & technology
  - Investment in infrastructure
- To reduce impact on consumer prices must increase investment in and efficiency of local marketing system to reduce transaction costs



# Fostering Rural Development

- **Increase value of agricultural production**
  - Through higher crop prices
  - Through new agricultural activity: residues, energy dedicated crops
- **Increase non-farm economic opportunities**
  - Most pre-treatment and/or conversion for biofuels would occur close to feedstock production centers
  - Investment in infrastructure
- **Provide opportunities for local ownership of conversion industry**
  - Patterns of expenditure and purchasing, of local own businesses have stronger ties with rural communities
  - If incentives are necessary prioritize them to locally own operations

# Key Challenges

## ○ Biofuels technology

- Commercial introduction of cellulose to ethanol technology
- Integration of feedstock production and recovery of by-products for animal feed

## ○ Institutional development

- Strengthen land property rights and enforcing mechanisms to protect small holders
- Develop domestic institutional action to increase the productivity of local resources: infrastructure, marketing system, ag. extension, agricultural support mechanisms
- Develop and enforce sustainable criteria for production and conversion of feedstock into biofuels

# Key Challenges

(continuation)

- **Biofuels development strategy**
  - **Priority should be local production and utilization**
  - **Unrestricted trade could fuel environmental and social degradation**
- **Market driven brakes**
  - **Price of oil would fall as bioenergy industry expands**
  - **As the production of biofuels expands, cost of feedstock would increase**
  - **Expansion of the industry, although policy driven, should be consistent with market signals and technology developments**

# Concluding Remarks

- **Opportunity to develop domestic energy industry**
- **Opportunity for large inflow of resources to agriculture and rural areas**
- **Increase in productivity is key**
- **Land resources can cope with energy and food demand at reasonable prices**
- **Temporary safety net for urban poor and rural landless**
- **Sustainable criteria should play a key role in the development of the bioenergy sector**

# Thank You !

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# Impacts in Net Food Importing Countries

- **Biofuels opportunities**
  - Food processing and waste as feedstock
  - Participate in regional bioenergy industry
- **Increase Ag production capacity**
  - Investment in research & technology
  - Investment in infrastructure
- **Increase export opportunities**
  - Investment in infrastructure
  - Grant market access
- **Potential Reduction in Price of energy**
  - Increasing importance of biofuels should reduce price of oil
  - As biofuels expands prices of biofuels should also decrease