

# BIOFUELS FOR TRANSPORTATION:

*Global Potential and Implications  
for Sustainable Agriculture &  
Energy in the 21<sup>st</sup> Century*

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# Project Team

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# Outline

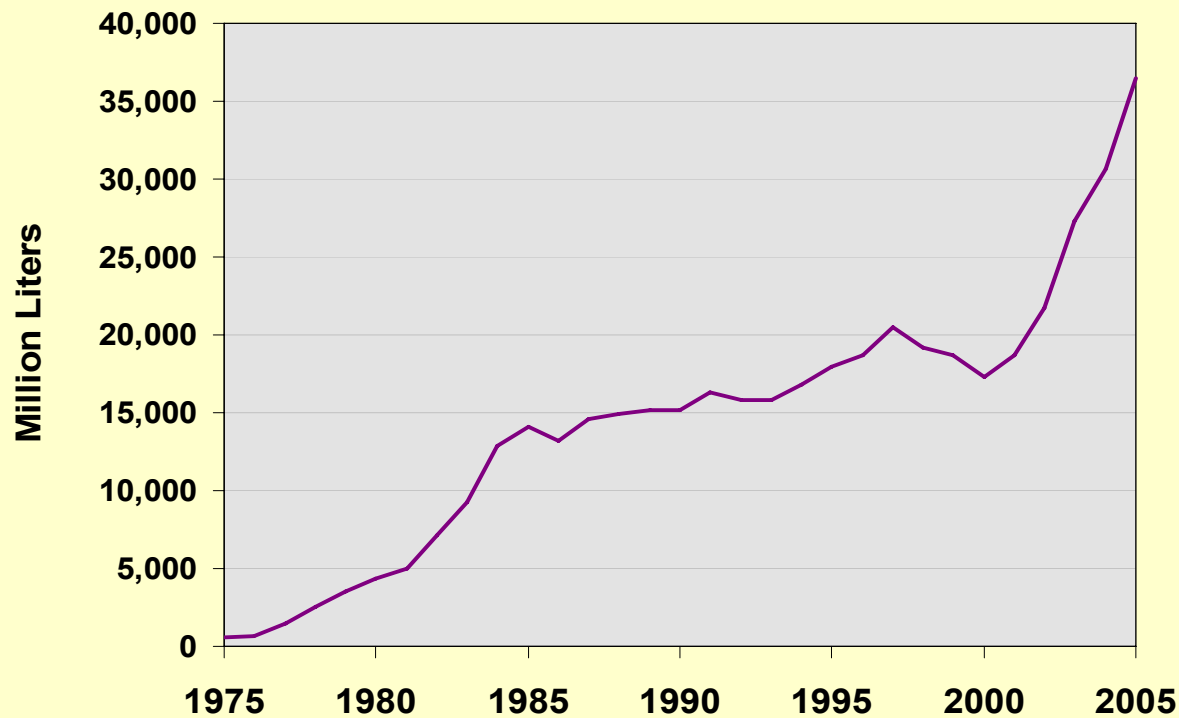
- Current Status
- Potential
- Key Issues
- Recommendations



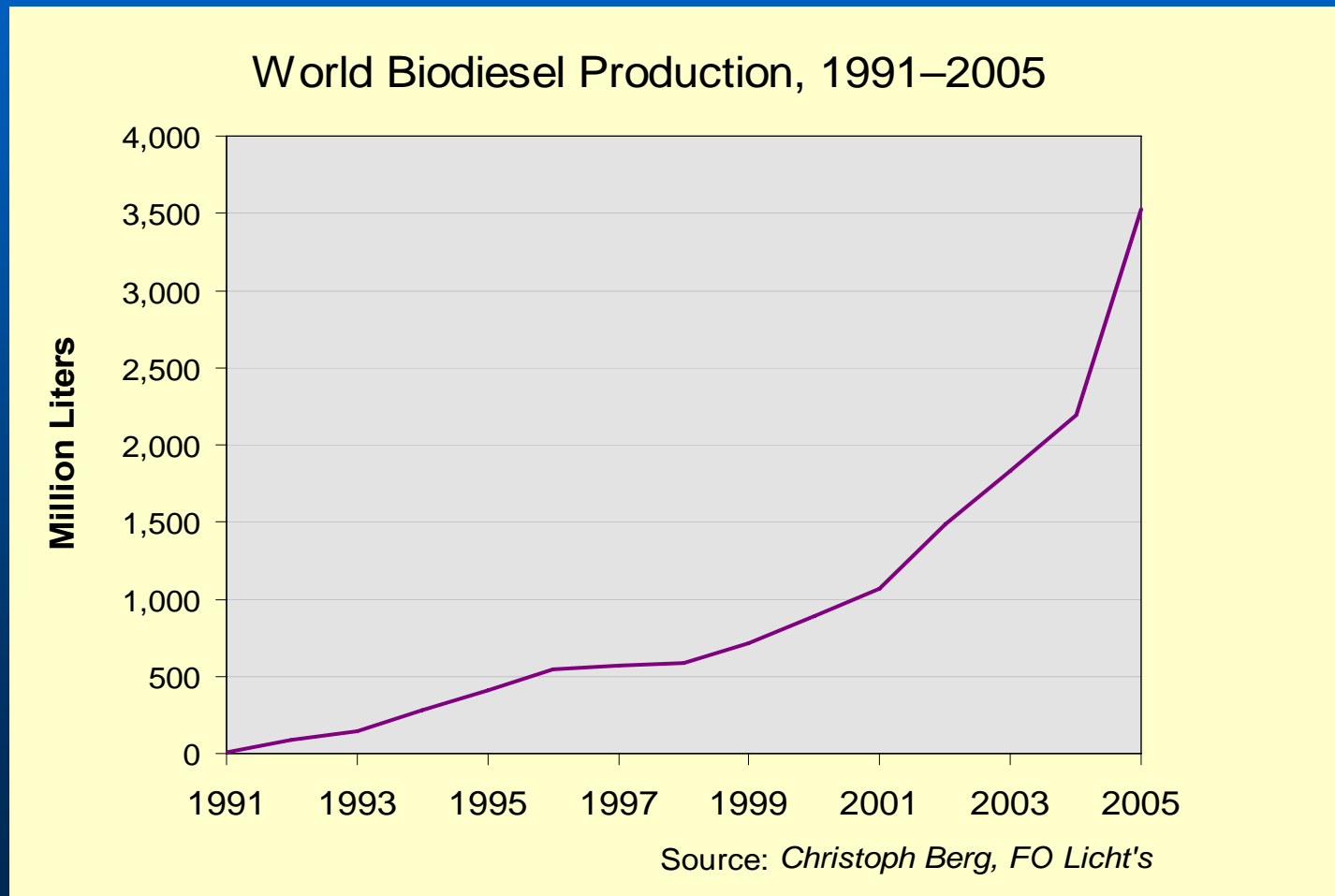
Photo Source: NREL 2006

# Current Industry Status - Ethanol

World Ethanol Production, 1975–2005



# Current Industry Status – Biodiesel



# The Future - Next Generation

- **Non-Food Feedstocks**
  - \*Sugar cane is a special case
- **Large-Scale Potential**
- **Dramatically Improved Environmental Impacts**
- **Conversion Technologies**
  - Enzymes
  - Gasification/Fischer Tropsch
  - Others

# Potential

- Global Estimates Vary Widely
- Germany: 25% Petroleum Displacement by 2030
- U.S.: > 1/3 Petroleum Displacement by 2025
- Utilization of Waste Streams
- Energy Crop Breeding
- Waste Bagasse at Sugar Cane Mills



Photo Source Above: NREL.  
Dried paper mill sludge is used  
as feedstock in the  
demonstration facility of a  
Biofine pilot plant in South  
Glens Falls, NY

Below: Worldwatch



# Key Issues

- Environmental Risks & Opportunities
- Constraints
- Development Impacts
- Trade & Standards
- Policy

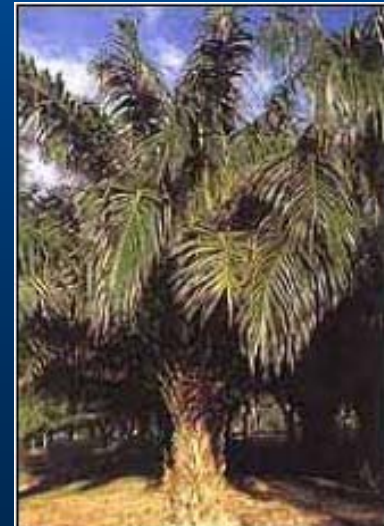


Photo Source: "Market Perspective" presentation by Luiz Corrêa Carvalho *Chairman of the Brazilian Sectorial Chamber of Sugar and Ethanol, Ministry of Agriculture* – given June 20, 2005, IEA, Paris.



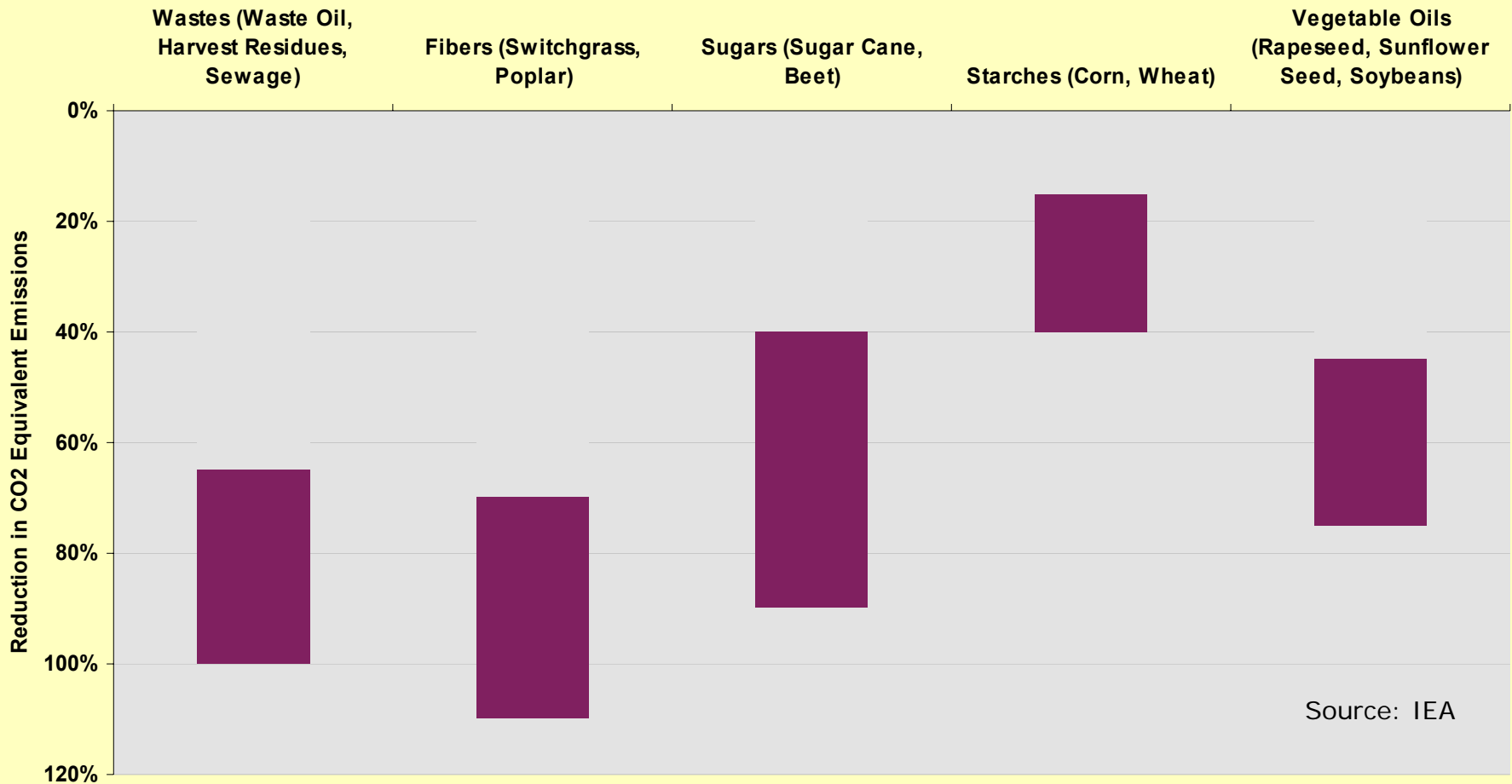
# Climate & Other Environmental Impacts

- Impacts can be positive or negative depending on:
  - Feedstock
  - Management Practices
  - Land Use Change
  - Process Energy



# Climate Impacts

Figure 11-2. Reductions in Greenhouse Gas Emissions per Vehicle-Kilometer (by Feedstock and Associated Refining Technology)



Source: IEA

# Environmental Risks

- Expansion of Cropland onto Sensitive Areas
- Overstressed Water Supplies
- Soil Degradation



# Other Constraints

- Competing Uses
- Trade barriers
- Infrastructure
- Technological Hurdles
- Public Acceptance
- Lack of International Fuel Quality Standards

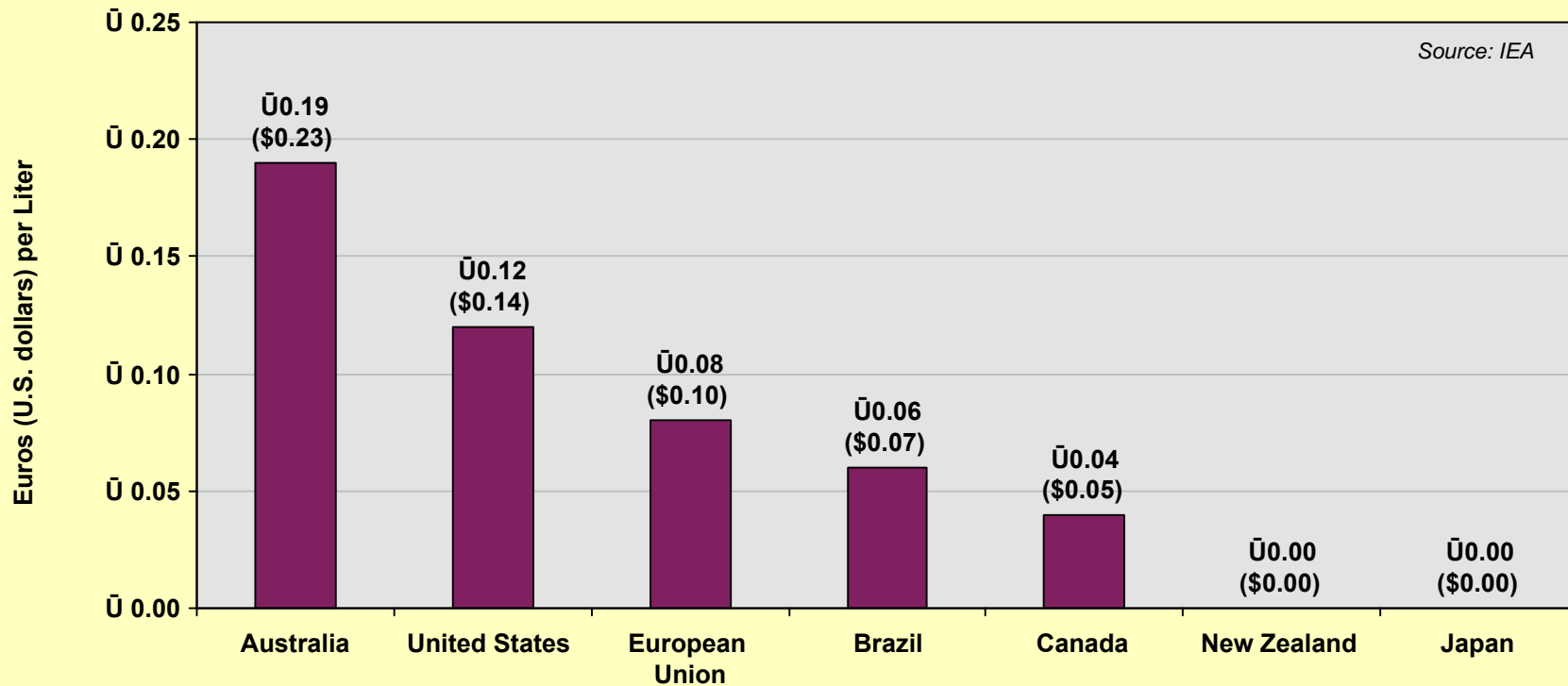


Photo Source: NREL 2006

# Development Potential

- Energy Security
- Rural Development
- Job Creation
- Large Biomass Potential in the Developing World

# Trade - Barriers



Ethanol Import Duties in Selected Countries, 2004

Domestic industry protection vs. global industry development

# Policies

- Tax Mechanisms
- Mandates
- Preferential Government Purchasing
- Investment Risk Reduction
- RD&D
- Environmental & Social Standards
- Certification Systems

# Recommendations

- Strengthen the Market
- Speed Transition to Next-Generation Technologies
- Protect the Resource Base
- Facilitate Sustainable Biofuel Trade
- Distribute Benefits Equitably
- Develop in Concert w/ Demand Reduction & Efficiency Gains





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