Biofuels

THE 2007 BORLAUG DIALOGUE

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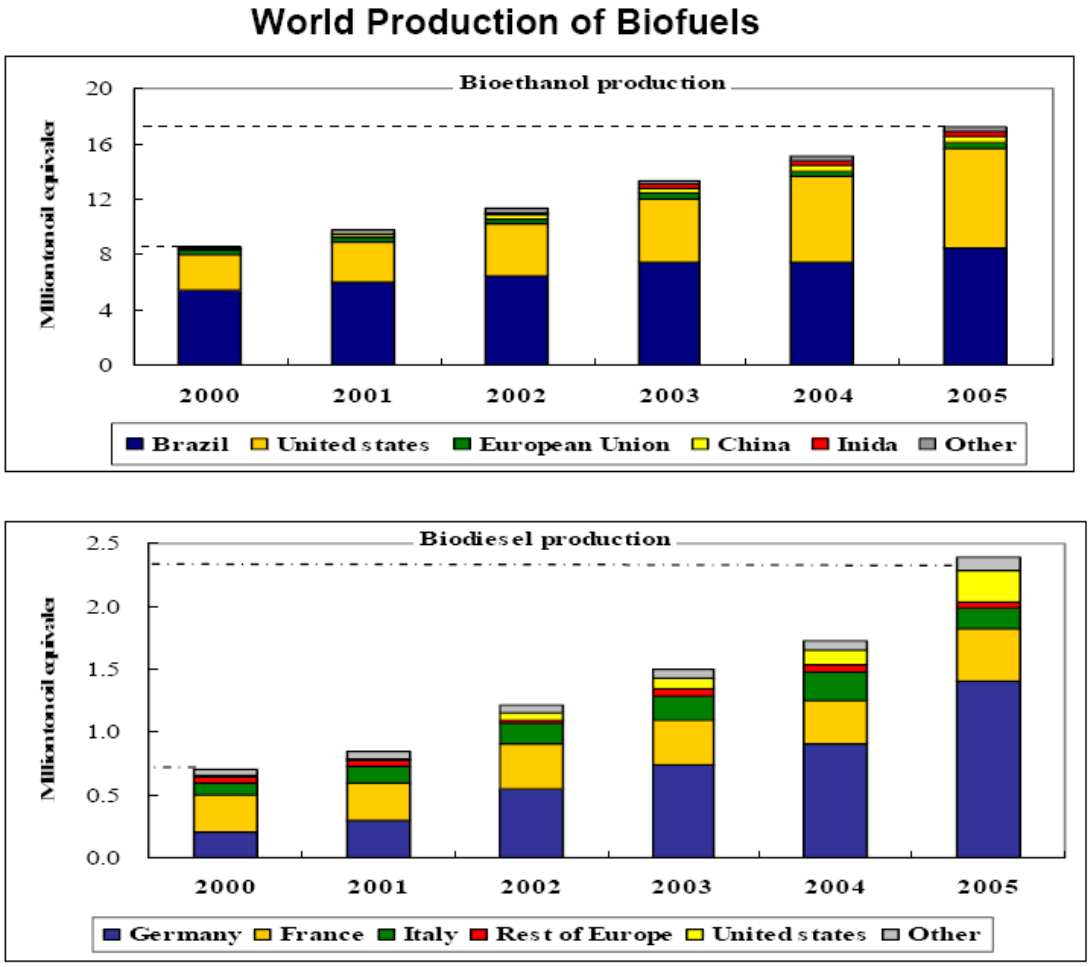
Structure of the presentation

- Global perspective
- Driving forces
- Potential challenges
- Indian Scenario
- Myths and reality
- Key issues
- Risks/risk mitigation options
- Project Green
- Way forward

Drivers for bio-energy

- **Reduce dependency on oil imports and focus on energy security**
- **Climate Change**
- **Reducing pollution**
- **Rural development (employment generation/enterprise de)**

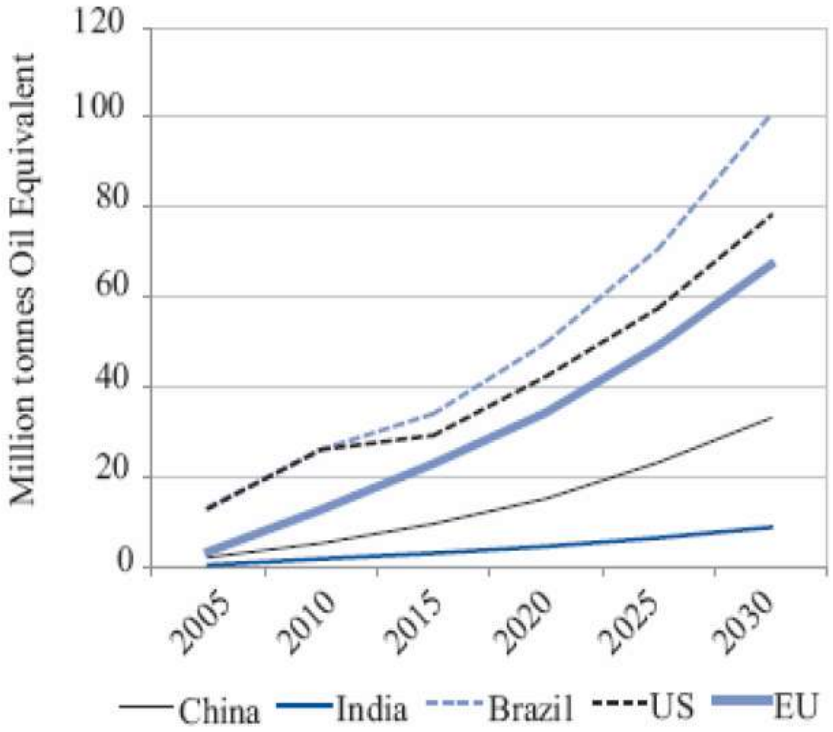
Total biofuel production



Source: IEA analysis based on F.O.Lichts – IEA *World Energy Outlook* 2006

Projected biofuel production

Projected Total Biofuel (bioethanol and biodiesel) Production in the Next 30 Years.



Source: Msangi, et al., 2007

Potential challenges

- **Trade barriers for bio fuels**
  - **Tariff barriers**
  - **Non tariff barriers**
- **Cost barrier**
- **Appropriate land allocation b/w energy ad food crops. (Food v/s Fuel concerns)**
- **Obtaining indigenous customized efficient processing technologies**

Potential challenges

- **At present there is no specific global customs classification**
- **Export subsidies and price support for different crops especially agriculture subsidies may have negative impact on the developing countries**
- **In India standardized excise duty on biofuels is expected to be 16%.**
- **Higher price of bio fuels than conventional fuels**

Potential challenges

- **Inexorably increasing bio fuel production may have serious implication on the prices of food crops**
- **Issues of appropriate land allocation between energy and food crops is of major concern**
- **Issues of food insecurity especially for poor**

Potential challenges

- **China (populous nation) food security has become a major concern**
- **Indonesia and Malaysia accounting for 90% pf global palm oil production have recently set aside 40% of their crude palm oil output for bio diesel production, leading to shortage of palm oil as food ingredient**

Biofuels Initiatives- Indian Government

- **The MoRD (Ministry of Rural Development) has been designated as the nodal ministry for launching the NMB (National Mission on Bio diesel).**
- **The MoRD has prepared a DPR (Detailed Project Report) on NMB with the help of TERI.**

Rationale for Indian Biofuel agenda

- **Estimates from TERI's Integrated Energy Model for India reveal- by the year 2030, India would be dependent on imported oil to tune of nearly 95% and indeed would be importing nearly 40% of it coal requirement too**

Rationale for Indian Biofuel agenda

- **Hence biofuel agenda has been given an emphasis to meet the following needs**
  - **To reduce dependency on oil imports.**
  - **To provide energy security, especially for rural areas.**
  - **To create employment for poor with high incidence of land degradation.**
  - **To address global concerns relating to carbon emissions**

Biofuel-Indian scenario

- **Indian economy continues to grow at the impressive rate - GDP 8.7% - 2005/06**
- **EIA estimates, India as fifth largest consumer of oil in the world during 2006**
- **India has 5.6 billion barrels of proven oil reserves, accounting for 2nd largest in Asia pacific region (behind China)**
- **Recognizing access to energy by poor as a major barrier to rapid growth, Indian Government has put great emphasis on biofuel production**

India : Diesel and Biodiesel demand projections

Year	High-speed diesel demand (million tones)	Bio-diesel at 5% blend (million tonnes)	Bio-diesel at 10% blend (million tonnes)	Bio-diesel at 20% blend (million tonnes)
2010	66.07	3.30	6.60	13.20
2020	111.92	5.60	11.20	22.40
2030	202.84	10.14	20.28	40.56

Myths and reality

NBM is expected to bring about 40 Mha of land under biodiesel activity, leading to an employment generation of approximately 7000 million man-days

Myths and reality

Jatropha is a hardy species that can be grown on any soil under any conditions

Key Issues

- **Package of practices not standardised**
- **Specific social, environmental, economic criteria yet to be developed**
- **No notification from Government on expected yields**

Key Issues

- **Many aspects such as cultivation (protection of growers' interests), processing (protection of investment in processing facilities), marketing (petroleum companies and gasoline outlets must fall in line), sale (securing a fair yet affordable price), consumption (quality standardization, pricing) and penalties or legal measures for non-compliance with rules set up for bio diesel have received very little consideration from the policy makers**

Risks and uncertainties for farmers

Issues	Risk
Complete failure of crop	Very low
Delayed/low productivity	Low
Refusal to pay back loans	Medium
Uprooting of plantation	Medium to high
Refusal to sell output to PG	High

Risk mitigation options

- **Loan Guarantees combined with crop hypothecation (How do you enforce?)**
- **Contract farming in case of inter-cropping and/or border plantations (with incentives for good management)**
- **Formation of a farmers' cooperative uptil stage of crude bio-diesel production (Risk pooling)**

Risk mitigation options

- Soft loans to farmers and buy-back
- Guarantee for purchase of seeds
- Arrangements for collection of seeds and oil expelling
- Selection of technology and economies for sales for transesterification

Risk mitigation options

- **Categorization of bio-diesel industry**
- **Duty and tax exemption for bio-diesel industry**

TERI - Project Green

- **Saplings grown in Nurseries by TERI**
- **Sold to farmers at pre-determined rates**
- **Plantation and management supervised by experts**
- **MSP Buy back arrangement with farmers; however, farmers free to sell in open market if offered a higher price**

TERI - Project Green

- **Seeds bulked to expeller unit to produce crude bio-diesel**
- **Crude bio-diesel sent to trans-esterification unit for refining**

Project Scope

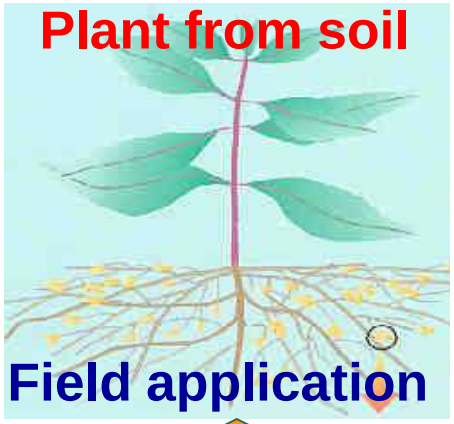
- **20 million Jatropha seedlings in blocks, intercropping and boundary plantation over 8,000 hectares**
- **Provide optimum technological support throughout the value chain**
- **Institutionalize backward and forward linkages**
- **Mobilize all the resources ,logistics and technical know how needed for the above objectives**
- **Conduct Environmental and Social Impact Assessment**

Mycorrhiza a new biological instrument

- **Making available nutrients from marginal soils**
- **Water use efficiency**
- **Disease protection**
- **Reduced chemical fertilizer needs**
- **Utilize organically bound minerals**

Mycorrhiza Technology

Plant from soil



Field application

Optimization of surface sterilization protocols

From soil

Development of hairy root cultures

to

laboratory

back to

soil

Mass production

Finished product

Formulation

Energy consumption in Jatropha

- **A 8000 Ha. Jatropha plantation (20 Million plants) consumes 21840 Gcal if conventional fertilizer is applied**

- **Now for the same plantation 4000 Million mycorrhiza propagules were applied leading to a saving of 21.8 Million Rs (US$ 0.52 Million)**

What poor farmers achieve

- **Reduced input costs up to 30 %**
- **Productivity increase 5 to 15 %**
- **Improved biological health of soil**
- **Resource use efficiency such as water and soil minerals**
- **Plants better equipped to sustain climate change impacts**

Nursery

Intercropping with Wheat

Intercropping with Coconut

Intercropping with Sorghum

Way forward

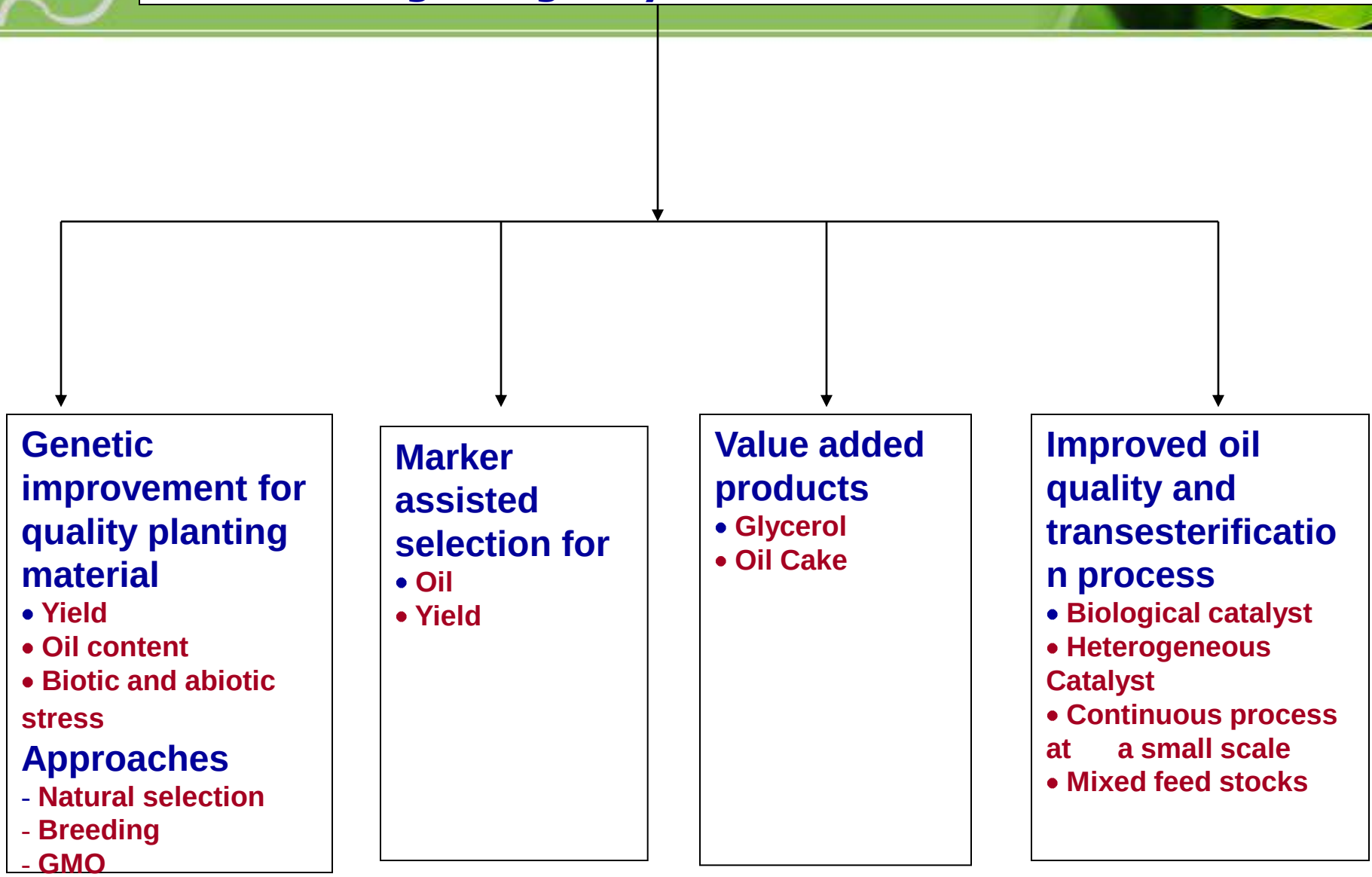
Way forward

- **Biofuels represent important opportunities and challenges, both globally and locally**
- **There is a need to identify and maximize sustainable development opportunities**
- **The costs and benefits of biofuels depending on the type of feedstock, cultivation method, conversion technology, geographical areas should be standardized**

Way forward

- **Major issues of trade barriers, especially tariff escalation should be addressed internationally**
- **International policies should be framed such that they don't undermine opportunities for developing country**

Newer Technologies for *plant and derivatives* improvement leading to higher yields and reduced emissions



Biotechnological interventions for Jatropha improvement

- **Pyramiding of economically important traits**
- **Developing plant varieties with improved oil content, quality and yield**
- **Developing site specific genotypes for different agroclimatic conditions**
- **Developing molecular markers linked to specific desirable traits**

Contd....

- **Design, development and testing of microarray and selection of genes important for oil production, abiotic stress tolerance and yield based on expression analysis**
- **Isolation and cloning of tissue-specific promoters for manipulating expression of value added genes**
- **Social, environmental and economic implications need to be carefully analysed**

Thank You