

Biodiesel Initiatives in India: Problems and Prospects

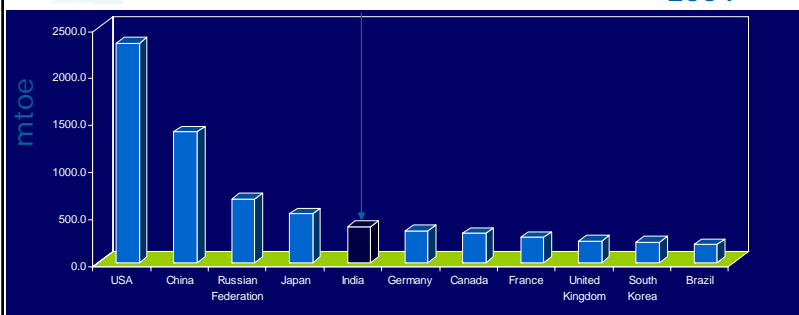
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Energy Demand

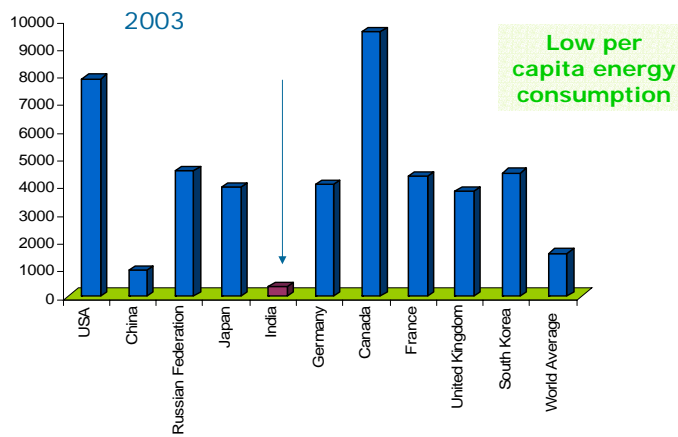
India is the Fifth Largest
Energy Consumer

2004

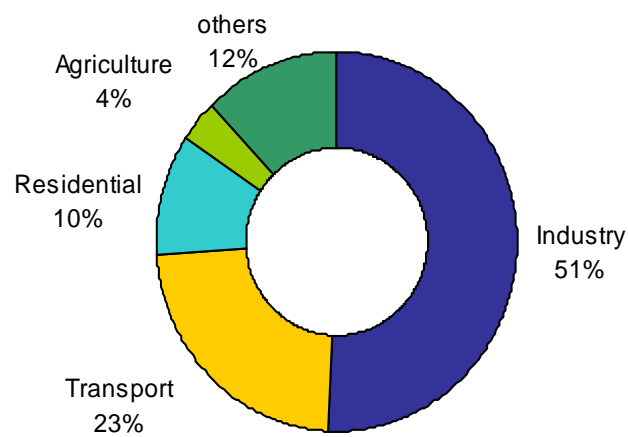


Source: BP Stats 2005

Per Capita Energy Consumption (kgoe)

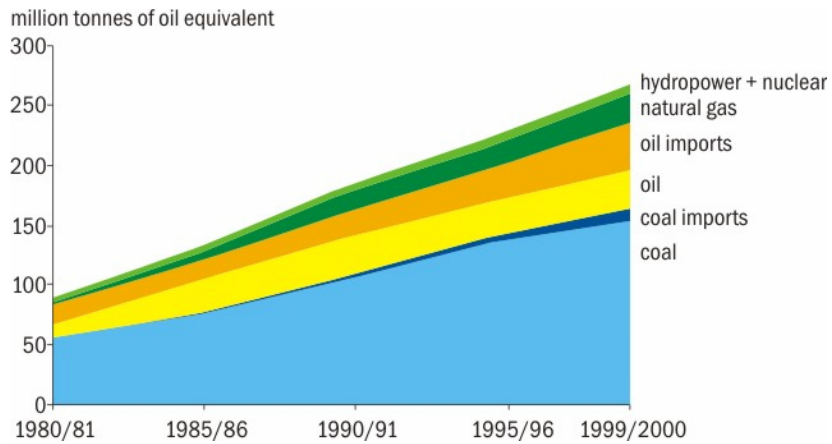


Commercial Energy Consumption Profile



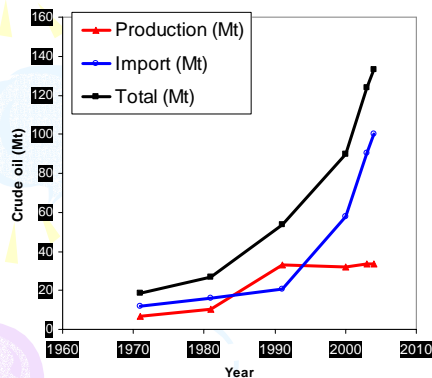
Source: Compiled by TERI

India's Primary Energy Supply



Source. Compiled from various editions of TERI Energy Data Directory & Yearbook

Why biofuels



- Major chunk of the oil demand met through import
- Huge drain of foreign exchange reserves
- Shift to next generation fuels and increased utilisation of renewable sources is needed

BIOFUELS – GoI Programme

- GoI: Committee on Biofuels, July 2002.
- Report submitted on April 2003
- Recommended :
 - Ethanol [sugarcane (molasses)] for blending with petrol (gasoline)
 - Biodiesel (*Jatropha curcas*) for blending with High Speed Diesel.

Current Status: Ethanol

2003

- 5% ethanol blending in petrol made mandatory in 9 states and 4 UTs w.e.f January 2003.
- Around 0.2 million kl of ethanol procured during 2003-04

2004-05

- Sugarcane production suffered due to drought conditions in several parts of the country
- Mandatory blending later made subject to availability.

2005-06

- Ethanol supply expected to improve during 2005-06
- Procurement of ethanol to restart

Jatropha for Bio-diesel Production

- Food security and bio-diesel.
- India is net Importer of edible oils
- Utilization of wastelands (63.85 million hectares)
- Low gestation period
- Drought hardy
- Not grazed
- High oil content & yield
- Easily propagated both by seed and cuttings.

Current status: Bio-diesel

State Government Initiatives

- Formation of nodal agencies for bio-diesel development/ draft bio-diesel policies
 - e.g. Chhattisgarh, Uttaranchal, Rajasthan, A P, TN etc.
- Different Approaches
 - Uttaranchal – un irrigated degraded forest land – JFM model
 - Chhattisgarh – Waste land, fallow land, agriculture land – JFM, contract farming
 - AP
 - Jatropha – agriculture land
 - Pongamia – Forest department

Current status: Bio-diesel

- **Industry initiatives**
 - R&D (engine trials, process technology, etc)
 - Jatropha plantations
 - Bio-diesel production facilities
- **Wide variations in reported Jatropha yield**
 - Variations from 1 –12 tonne of seed/ha
 - Variations due to inputs and agro-ecological conditions
 - Difficult to cross-check claims
 - Very few existing mature plantations
- **Concerns of farmers**
 - Buy-back arrangements and returns
 - Example of palm-oil often quoted in South India

Regional suitability for biofuel plantations

- **Identification of suitable regions for Jatropha and Pongamia**
- **Agro-ecological approach**
 - Soil, climate and physiographic parameters
 - High , moderate and poor
- **Semi-arid and sub-humid tropical areas suitable for Jatropha and Pongamia**

Projected cost of Bio-diesel

- Large uncertainties in key variables
 - Seed procurement price (Rs 6 – 9/kg)
 - Selling price of de-oiled cake (Rs 2 – 6/kg)
 - Selling price of glycerol (Rs 10 – 60/kg)
 - Scale of production: direct effect on investment as well as efficiency
- Projected production cost
 - Bio-diesel: Rs 22 – 40/litre

Sustainability

Impacts on agriculture and food production

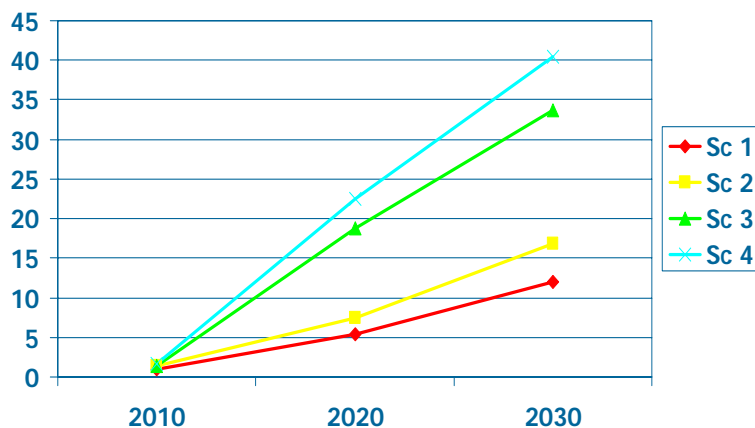
- Positive:
 - Would help arrest degradation of soils in waste lands.
 - Additional land may come under the food crops.
 - Availability of cheaper fuel for irrigation and mechanical power.
 - Additional income to farmers by growing Jatropha/ pongamia on farm bunds, fallow land, etc.
- Concerns:
 - If large scale food grain areas shift to bio-diesel plantations : food security, biodiversity

Sustainability

Environmental Impacts

- Positive:
 - Greening of waste lands
 - Reduction in air pollution from engine exhaust
 - Nutrient recycling:
 - De-oiled cake is a good manure;
 - Pongamia leaves is a nitrogen fixer
 - Reduction in GHG emission: LCA ???
- Concerns:
 - Toxicity of Jatropha seed and oil
 - Remedies: Detoxification, Awareness generation
 - Threat to bio-diversity if mono-culture Jatropha is promoted
 - May not be an immediate concern
 - Remedies: inter-cropping; promoting multiple species

Diesel Requirements Met (%)



Contemporary issues

- **Integrated demonstration projects**
- **Focussed R&D**
- **Coherent bio-fuel policy**

Integrated demo projects

- **Need: well crafted integrated projects (Field-to-wheel)**
 - **From different feed stocks & end use combinations**
 - **Test various models.**
 - JFM
 - Contract farming
 - Cooperative
 - **Financial viability**
 - **Social & environmental impacts**
 - **Entire value chain (Field-to-wheel) for different bio-fuel feed stocks & end use combinations.**

Coherent Bio-fuel Policy

- Time bound targets & bulk users
- Incentives & promotional measures
 - Exemption in duties and taxes
- Quality standards
- Framework for public-private partnership
- Roles and responsibilities of
 - central ministries
 - state governments
 - coordinating mechanism
- Research priorities

TERI's Initiatives

- Superior germplasm collections
- Centre of Excellence for oil testing
- Mycorrhizal inoculations
- Standardization of plantation models and agronomic practices
- Observation on health and hygiene
- Experience in execution of large scale plantations
- Working with corporates
- Genetic improvement

Revenues from polluting chimney' s at Korba



Plantation at Alkali Chlore sludge dumps



Reclamation of Lagoon



Plantation models: block plantation



Intercropping



Boundary plantation



www.teriin.org

Thank you.