

India's Biodiesel Programme: promises and challenges

Varghese Paul

Fellow, Forestry and Biodiversity

TERI, New Delhi

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Structure of the presentation

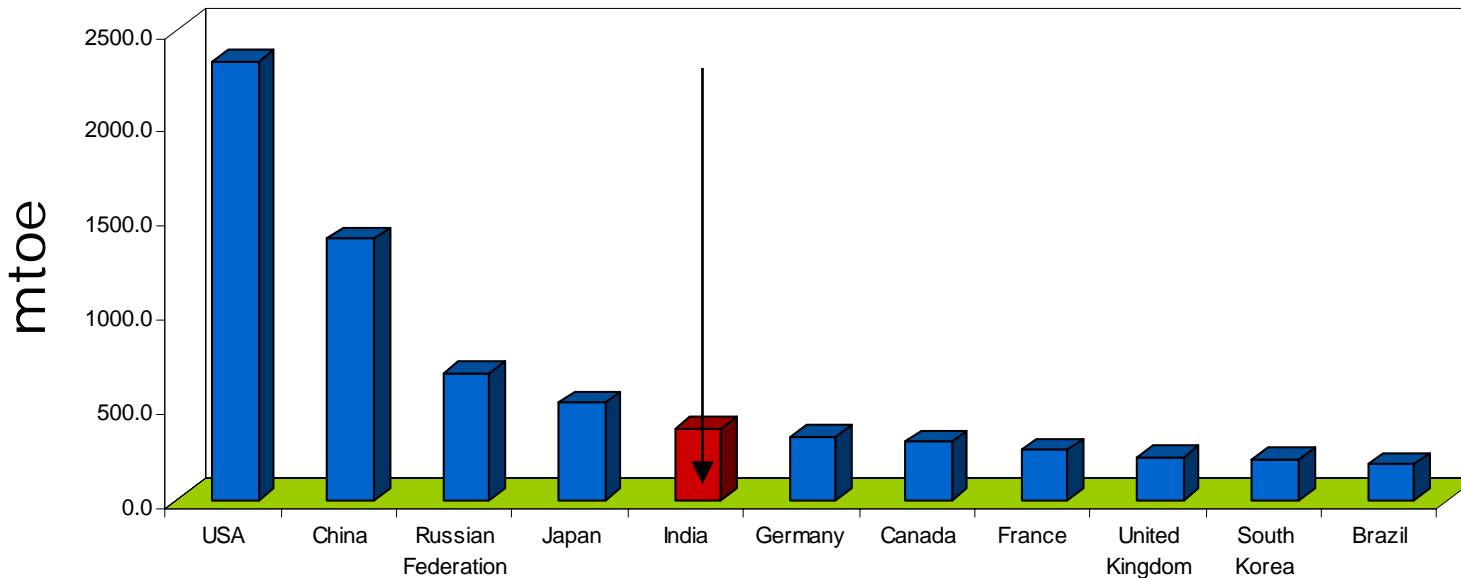
- India's Energy Scenario
- Biofuel Programme
 - Biodiesel programme
- Critical Issues
- Recommendations



India's Energy Scenario

2004

India is the Fifth Largest Energy Consumer



Source: BP Stats 2005

India's Energy Scenario(cnt'd)

- Indian economy is projected to grow 8-10% in the next two decades.
- Energy requirement to grow from 0.33 BTOE in 2003/04 to 1.35 BTOE in 2031/32
- Increased Oil dependency
 - At present more than 90% demand (transport sector) being met by oil.
 - 2003-04: 70 % oil requirement met through imports
 - By 2030 - 94% dependent on oil imports
- Alternate options: biofuels

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Why Biofuels?

- Environmentally superior fuel ?
- Energy security
- Reduced imports
- Potential for employment generation

Biofuel Programme

- Committee on Biofuels in April, 2003 recommended:
 - Ethanol from sugarcane (molasses) for blending with petrol (gasoline)
 - Biodiesel (*Jatropha curcas*) for blending with High Speed Diesel.
 - Non-edible tree borne oil seeds

Biodiesel Programme

National Biodiesel Mission

- Based on Jatropha
- First Phase (2003-2007)
 - Demonstration phase: covering 0.4 mha.
 - Expected to be completed by 2006-07.
- Second Phase (2007-12)
 - Self-sustaining expansion phase
 - Production of bio-diesel necessary for 20% blend by the year 2011-12.
 - Plantation in 11 mha of wastelands
- Programme not backed by adequate policy and finances

Biodiesel Programme (cnt'd)

- National Biodiesel Purchase Policy in October 2005
 - National oil companies to purchase biodiesel at specific centres at Rs 25 (\$.63)
 - 5 % blending
 - Current production cost: ~Rs 40 (\$ 1)

State level initiatives

- Wide variation in policy provisions, institutional mechanism, target land
 - Minimum support price for seeds in some states
 - Subsidy on planting material
 - Revenue wastelands Vs Forest wasteland
 - Contract farming, forest committees



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Lack of standardized package of practices

Cultivation practices not backed by adequate research

- Spacing
 - Irrespective of soil conditions, intercropping standard spacing of 2 x 2 m or 2.5 x 2.5 are recommended
- Irrigation
 - Jatropha requires irrigation for better fruiting and seeding
- Fertilizer
 - Is it desirable?
 - Role of biofertilizer
- Pruning protocol
 - Pruning is essential: but how much to prune?

Wide variation : yield and oil content

Yield

Reference	Type of data	Reported yield on maturity
Agro-forestry Federation, Nashik (Patil and Singh 2003)	Primary data from block plantations	1.0-1.2 tonne/ha.
Planning Commission, 2003	Estimates for poor soil (Kutch)	1.6-2.5 tonne/ha.
	Estimates for average soil	3.3-5.0 tonne/ha.
Becker and Francis	Estimates for poor soils with low nutrient content	1.5-2.0 tonne/ha.
TERI (2005 a)	Estimates for rain-fed and irrigated conditions	3.0-5.0 tonne/ha.

- ❑ Oil content varies from 21-42 %
- ❑ Large number of nurseries mushrooming: poor quality planting material reaching farmer's field

High production cost

1\$=Rs 40

□ Variables that have strong effect on production cost

- 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

□ Production cost

- Bio-diesel: Rs 15.50 – 40/litre
- SVO: Rs 11-30/litre

Overemphasis on one feedstock

- Perceived advantages of Jatropha
 - Easy propagation
 - Wide adaptability
 - High yield ?
 - Low requirement of water ?
 - Pest Resistance?
- Large scale monoculture not desirable
 - Pests and diseases
 - Biodiversity
- Other TBO's like Pongamia (*Pongamia pinnata*) , Paradise tree (*Simarouba glauca*) and *Salvadora oleoides*.
 - Need to bring down gestation period through breeding programme

Comparison of Jatropha and Pongamia

Characteristics	Jatropha	Pongamia
Ecosystem	Arid to semi-arid	Semi-arid to sub-humid
Rainfall	Low to medium (200-1000 mm)	Medium to high (500 – 2500 mm)
Soil	Well drained soils	Tolerant to water logging, saline and alkaline soils
Nitrogen fixation	Not a nitrogen fixer	Fixes Nitrogen
Plant suitability	Wastelands, degraded lands, live fence for arable lands, green capping of bunds, shallow soils	Field boundary, nala bank stabilization, wastelands, tank foreshore
Plant habit	Mostly bush, can be trained as small tree	Tree can be managed as bush by repeated pruning
Leaves	Not palatable by livestock	Not palatable by livestock, used as green leaf mulch
Gestation period	Short, starts yielding during 3 rd Year, attains maturity at 6 th Year	Long, starts yielding after 4 th to 7 th year. Yield increases with increase in canopy.
Harvest	Fruits to be plucked	Fruits to be collected
Oil content	27-38% in seed	27-39% in kernel
Protein	38%	30-40%
Oil cake	As manure (4.4% N, 2.09 P, 1.68% K)	As manure (4.0% N, 1.0% P, 1.0% K)
Fire wood	Not useful	Good as firewood, high calorific value 4600 K cal/kg

Is wasteland the right choice?

- Whether yield estimates are realistic ?
 - NMB's calculations are based on average yield estimate of 3.75 tonnes of oil seed/ha/year
 - Under unirrigated conditions yield could be as low as 1.25-1.5 tonnes/ha/year
 - Land area required for 20 % blend increases from 11 mha to 28 mha

Is wastelands the right choice? (cnt'd)

- Out of 64 mha of wastelands, 40 mha considered suitable for Jatropha
- Competing demand for wastelands
 - Increasing forest cover: additional 31 mha required
 - Bamboo mission
 - Encroachment
- Getting adequate quantity of wastelands might be difficult

Impact on forest conservation

- Competition for land use with forestry activities
 - Wastelands
 - Degraded forest lands
- Planting Common Property Resources with *Jatropha* would result in diversion of pressure to forest lands for meeting fuelwood, fodder, fibre and timber requirements
 - CPRs provide 12-25 % of the household income in rural areas

Benefits from Carbon trade: an expectation not realized

- Carbon sequestration
 - Uncertainty over *Jatropha* reaching tree height (5m) as per Indian definition of forests
 - Pruning reduces effective biomass
 - Low density : 0.22-0.37
 - Effective sequestration would be low: 1.05 tonne C/ha/year
- Replacement of fossil fuel with biofuels
 - Potential, but methodological constraints

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Need for a Comprehensive R&D Programme

- Breeding programme to produce high yielding varieties with high oil content
 - Non-toxic cake
- Breeding programmes to reduce gestation period, especially for long gestation crops like Pongamia.
- Development of varieties that can tolerate adverse conditions

- Development of package of practices like optimum spacing under various agro- climatic conditions, quantum of inputs needed like irrigation, fertilizers, pruning protocol

Targeting both agricultural land and wasteland

Agricultural land

- Models
 - Along bunds
 - Intercropping
 - Minimum spacing of 5 x 2 m
 - No block planting
- Can learn from successful farm forestry models
- Food security?



Regulating Nurseries

- Certification of seeds/planting material
- Establishment of nurseries: a regulatory mechanism need to be in place

Farmer-industry tie-up

- R &D activities by private sector
- Contract farming
 - with buy-back
 - provides seedlings, other inputs, microcredit, technical back up
 - with out buy back
 - sale of high quality seedlings to farmers
- Successful examples from paper and pulp industry and matchstick industry

And finally...

- Need for a comprehensive
 - Land use policy
 - Biofuel policy

Thank you...