



Environment

Water & Environmental Sanitation Network (WES-Net India)



Food and Nutrition Security Community

Solution Exchange for WES-Net India and Food & Nutrition Security Community Consolidated Reply

Query: Details of Biofuel Operations, from Balaji Industrial & Agricultural Castings, Hyderabad (Experiences).

Compiled by Pankaj Kumar S., and Gopi Ghosh, Resource Persons; additional research provided by Ramya Gopalan, Research Associate and Bidisha Pillai, Senior Research Associate

16 November 2006

Original Query: Ravi Prasad Garimella, Balaji Industrial and Agricultural Castings, Hyderabad

Posted 29 September 2006

I am working as Central Coordinator with a small-scale industry in Hyderabad.

In the recent past, we have seen both national and state governments promoting biofuel through various projects and initiatives and we are interested in setting up operations on biofuel. In this regard, I request members to kindly share their experience of the process, technology and issues related to biofuels, specifically on:

1. The various types of Biofuel species being promoted and where can good quality saplings be obtained from; relative merits/ demerits of these various biofuels, the technology for extraction, oil content, etc. Members may also like to list the support being provided by Agriculture and other government departments to farmers for extension and support.
 2. The economics of biofuel production and processing, e.g. the economic calendar that farmers should follow – time periods for planting, seeding, production; opportunity cost of growing biofuel versus other crops/ trees, etc.. Please also list the major marketing channels for biofuel available today.
 3. Members may also offer information/ suggestions on current and proposed policy and economic instruments that would encourage farmers to take up biofuel production (such as Minimum Support Price, marketing support, buy-back arrangements, etc.).
-

Responses received with thanks from:

1. Ravi Chellam, UNDP, New Delhi ([Response 1](#); [Response 2](#))
2. [Debadutta Ku. Panda](#), MP Associates Pvt. Ltd., Bhubaneswar
3. [Deepthi Harkar](#), ICRISAT, Hyderabad
4. Rahul Banerjee, Aarohini Trust, Indore ([Response 1](#); [Response 2](#))
5. Mahtab S. Bamji, Dangoria Charitable Trust, Hyderabad ([Response 1](#); [Response 2](#))
6. [B C Choudhury](#), Wildlife Institute of India, Dehradun
7. [H.S. Sharma](#), Consultant, Gurgaon
8. [Kiran Kumar](#), SKG Sangha, Kolar, Karnataka
9. K.V. Peter, Kerala Agriculture University, Thrissur, Kerala ([Response 1](#); [Response 2](#))
10. R. Santhanam, Indian Society of Agribusiness Professionals (ISAP), New Delhi ([Response 1](#); [Response 2](#); [Response 3](#))
11. [Sachin Sinha](#), Rajiv Gandhi Watershed Mission and Biofuel Promotion Committee, Madhya Pradesh
12. Prabhjot Sodhi, UNDP GEF Small Grants Program, New Delhi ([Response 1](#); [Response 2](#))
13. [A. Bandyopadhyay](#), Indian Council of Agricultural Research (ICAR), New Delhi
14. T.S. Krishnan Iyer, Development Oriented Operations, Research & Surveys, Noida ([Response 1](#); [Response 2](#))
15. K.V. Peter, Kerala Agriculture University, Thrissur ([Response 1](#); [Response 2](#))
16. [Kanishk Negi](#), Society for Promotion of Wastelands Development (SPWD), Udaipur
17. [Kalyan Paul](#), Pan Himalayan Grassroots Development Foundation, Ranikhet, Uttaranchal
18. [Viren Lobo](#), Society for Promotion of Wastelands Development, Udaipur
19. [K. D. Singh](#), New Delhi
20. [Abdul Rahman Ilyas](#), Agri Science Park, ICRISAT, Hyderabad
21. [Shailendra Tiwari](#), Seva Mandir, Udaipur
22. [Ajit Seshadri](#), The Vigyan Vijay Foundation, New Delhi
23. [V.D. Sharma](#), VBS Purvanchal University, Jaunpur, Uttar Pradesh
24. [V. Palaniappan](#), Centre for Ecology and Research, Thanjavur, Tamil Nadu
25. Prabhjot Sodhi, UNDP GEF SGP, New Delhi and R. Jagannathan, FABCON Engineers, Hyderabad ([Joint Response](#))
26. [Jyoti Parikh](#), Integrated Research and action for Development (IRADe), New Delhi
27. [Jyotsna Bapat](#), Senior Consultant, New Delhi
28. [S. V. Anil Das](#), Asian Development Bank (ADB), New Delhi
29. [Biplab Ketan Paul](#), Lokvikas, Ahmedabad
30. [Nachiket Mor](#), ICICI Bank, Mumbai
31. R. Jagannathan, FABCON Engineers, Chennai ([Response 1](#); [Response 2](#))
32. [V.V. Damle](#), Confederation of Indian Industry (CII), Pune

Further contributions are welcome!

Summary of Responses

Growing global energy requirements, fast depleting petroleum resources and increased pollution require societal response to minimize ill effects of global warming and climate change. In this background, the query on biofuels provided an opportunity for members to discuss alternate energy options through large-scale bio fuel production in India.

Discussing **biofuel sources**, members mentioned that biodiesel could be obtained from edible seeds (e.g. soybean, palm, coconut, castor, mahua, etc.); non-edible seeds (e.g. jatropha, pongamia, neem, rubber, etc.); bioethanol from cereal crops, sugar bearing crops, sugarcane molasses, bamboo, and welsh grass; and biogas from anaerobic digestion of animal and plant wastes.

A major focus of the discussion was on **jatropha**, which members reported was a drought resistant plant growing relatively quickly in varied agro-climatic regions. Members highlighted [alternate applications](#) of jatropha, traditionally grown mainly on farm bunds as live hedge and used as soil binder, medicinal plant and for making soap while more recently, jatropha oil has been identified as diesel substitute and hence a cleaner alternative to fossil fuels. Respondents felt that promotion of jatropha would put unproductive lands to use, enhance farmers' livelihoods and replace sugarcane molasses for ethanol production, thus reducing negative effects of sugarcane cropping on environment.

In spite of its positives, members indicated that jatropha cultivation had **production constraints** such as high initial costs, a gestation period of three years and lack of a standard package of cultural practices for growing jatropha. Additionally, farmers did not have adequate information on source of quality plant material and on pests and diseases of jatropha. Members stressed that currently there was no grading to promote seeds with the best oil content. They also rejected the popular perception that jatropha required very little inputs, and cited field trials showing that the crop required adequate irrigation and nutrient inputs to maximize yields. Thus, farmers lacked estimates of assured yields expected, making it difficult for them to calculate the costs and risks. Members reported that the current cost of biodiesel production from jatropha is more than the prescribed procurement price of Rs. 25, making it better suited for European than Indian markets, defeating the objective of energy security.

Further, members underlined the **environmental implications** of large-scale jatropha promotion, stressing that its monoculture on good agricultural lands could cause productivity losses on neighboring lands, and suggested intercropping jatropha with food crops. Diversion of good agricultural lands for jatropha could also reduce food security, especially with regard to staple crops like millets and sorghum, the mainstay of the diet of the poorest. Another concern members expressed was the ingress of jatropha into forests and wastelands and subsequent loss of biodiversity. Additionally, they emphasized that the necessity to trim jatropha plants into hedges would not contribute as significantly to carbon sequestration as much as other trees would. The relevance of jatropha in meeting 2010 emission targets was also questionable, said members, as it has to be blended with diesel.

The discussion also raised **socio-economic impacts** of jatropha promotion. Firstly, members feared that current emphasis of planting jatropha on "wastelands" could be disastrous to the poorest, who depend on a wide diversity of products from these lands. Leasing out such "wastelands" to private companies or individuals could also induce a trend of land grabbing, further reducing the commons available. In this context, respondents wondered whether the cost of raising jatropha at five times the cost of native species was judicious. Quoting a study from [Rajasthan](#), respondents warned that jatropha could turn into a **debt trap** for farmers in case of a crop or market failure, since it required very high inputs, and since it was being promoted through bank loans without any protective insurance for farmers. They quoted instances of soyabean and [safed musli cultivation](#), where after much hype and promise of great returns, farmers suffered huge losses.

In this background, members felt that **alternatives to jatropha** such as biogas could be explored, which had synergistic linkages with animal husbandry and agriculture. Similarly,

members cited a [gasifier plant](#) in **Madhya Pradesh** running on Khejri twigs. Producing ethanol from agriculture wastes may also be preferable to planting jatropha on agriculture lands or wastelands.

Respondents listed **government policies and programmes** on jatropha such as the National Mission for Development of Biofuels, aiming to encourage jatropha production on about 12 million hectares. Likewise, various state governments have initiated lucrative schemes for tripartite buy-back between private companies and farmers. Members also reported that the Railways were planting jatropha and entering into MoUs for purchase of biodiesel in some places. Issues that came up during a [Government - CII initiative](#) in **Rajasthan** were also presented in this regard.

Pointing to a lack of empirical studies on **economics** of jatropha production, members provided data to show that with an initial investment of about Rs. 33,000 per hectare in first three years, the estimated yield could be 7,500 kg of jatropha seed per hectare (normally containing 30% of oil by weight) in the 4th year. With current purchase price of seed being about Rs. 6 per kg, a return of Rs. 45,000 per year could be obtained from 4th year.

Members also provided details of oil extraction through single stage or double stage expellers, and estimated that for a viable corporate project processing 7,000 to 10,000 tons oil per annum, 4,000 to 6,000 hectares of plantation would be needed. Since this was a large area not possible for corporates, members suggested evolution of appropriate Public-Private-Community partnerships. The purchase price for biodiesel fixed by Ministry of Petroleum and Natural Gas was Rs. 25 in 2005, but was currently Rs. 26, and only companies listed by the Ministry are allowed to procure the biodiesel, reported members.

Suggesting **policy and economic instruments** to encourage biofuel production, members felt that the government should allow SHGs to produce and sell biofuel. They also wanted the government to relax current restrictions on biodiesel procurement by selected companies and to encourage more local use of biodiesel. In this context, members cited a project from [Tamil Nadu](#), which formed Self Help Groups (SHGs), and their federation to credit, produce, process and market biodiesel.

Among **precautions** in promotion of biofuels, members suggested that biofuels not be promoted indiscriminately on all lands, and socio-economic and environmental cost-benefit analysis precede the same. To pre-empt land grabbing, degraded lands, if leased out for plantation, should remain the property of communities and not be leased to individuals/ companies. They suggested formulation of a comprehensive strategy for jatropha promotion comprising of a standardised package of practices, adequate training and information, access to quality planting material, and crop insurance for farmers. Initial investment for establishing jatropha plantations could come from Government programmes like NREGA, suggested members.

In **conclusion**, the discussion highlighted the potential of biofuels as clean futuristic fuels and in promoting livelihoods and rehabilitating degraded lands. However, given the implications for national energy security and local food security, members warned against indiscriminate and unplanned expansion before ensuring clarity on ecological, equity and economic issues. They underlined the crucial importance of putting in place requisite technical, institutional, financial, security and extension mechanisms before opening common lands to jatropha on a large scale, as this may endanger livelihoods of millions of poorest households.

Comparative Experiences

Madhya Pradesh

Lessons from Safed Musli for Jatropha Cultivation (from [Rahul Banerjee](#), Aarohini Trust, Indore, [response 1](#))

About two years back some firms from Maharashtra popularized the production of safed musli, a herb among farmers. Initially, farmers got good returns because firms bought their output and distributed them as seeds for other farmers. However, soon the farmers who had bought the seed for lakhs of rupees found no buyers and suffered tremendous losses. This experience provides lessons while advocating cultivation of jatropha with regard to biofuels.

Biofuel Plantations meeting MP's Energy Needs (from [Sachin Sinha](#), Rajiv Gandhi Watershed Mission and Biofuel Promotion Committee, Madhya Pradesh)

About 1.5 lakh hectares of biofuels (@ 2500 plants per hectare) planted in wastelands and farm bunds in the last 2 years makes it the largest plantation in India. However, this is 0.5 % of state area and if successful, fulfills only marginally the 5% supplementation aim of fossil fuel consumption envisaged by Planning Commission. Nevertheless, it remains low cost and eco friendly option for meeting energy needs in MP's rural areas due to the low carbon emissions.

Gasification Technology for Power Generation (from [Jyotsna Bapat](#), Senior Consultant, New Delhi)

While setting up TARAGram, there was no grid connection, Development Alternatives (DA) decided to try out the technology of gasification for power generation by using local Khejari twigs as bio fuel. The power generated supports a flourmill for base load & various machines in DA's Orchha centre. Due to legal limits on electricity production and distribution, the power produced is used in limits by the village for their homes and by Tara Haat for drying paper. Read [more](#)

Tamil Nadu

Community Promoted Energy Plantation of Jatropha (from [Prabhjot Sodhi](#), UNDP GEF Small Grants Program, New Delhi, [response 1](#))

The UNDP Small Grants Programme supported a small pilot initiative in Tamil Nadu under its bio-diesel program with an NGO called Vinmathee Educational and Rural Development Society. The program has promoted cultivation of Jatropha in over 100 acres of degraded lands with 79 households from the village of Manapparai in the district of Trichy. The approach involves farmer based SHGs with all interventions facilitated by NGOs. Read [more](#)

Rajasthan

Study on Standardization of Jatropha Practices (from [Kanishk Negi](#), Society for Promotion of Wastelands Development (SPWD), Udaipur)

A study done by SPWD on promotion of jatropha in 6 states found a lack of standardization of practices for cultivation, management and harvesting of jatropha for various agro climatic zones and soil types with no guidelines for the same. No government department has come up with guidelines and the Agriculture Department, Rajasthan refused to comment on cultivation practices of the plant indicating that recommended practices will be clear only after 3-6 years.

Alternative Applications of Jatropha (from [Shailendra Tiwari](#), Seva Mandir, Udaipur)

In Seva Mandir's area of operation, farmers traditionally grow Jatropha (locally called *Ratanjot*) on the edges of their cultivable and non-cultivable land as a live fence as livestock do not eat it. Additionally, once planted, it grows for years under rainfed condition, withstanding extremely high temperatures. The farmers harvest the seed for extracting oil used in making soap and sell a majority to local vendors while keeping a fraction of the produce for domestic use.

Related Resources

Recommended Organizations

Biofuels India, Mumbai (from [Kiran Kumar](#), SKG Sangha, Kolar, Karnataka)

Contact Person: Gopala Krishna Murthy Karamcheti; biofuelsindia2000@yahoo.com

<http://www.biofuelsindia.co.in>

A training, consulting & marketing firm in the field of biodiesel manufacturing, jatropha plantations & nurseries, project financing and carbon trading

Lokvikas, Gujarat (from [Biplab Ketan Paul](#), Lokvikas, Ahmedabad)

Saket House, 1, Panchsheel Society, Usmanpura, Ahmedabad 380013, Gujarat; Contact Person:

Biplab Ketan Paul; Tel: 91 79 7551931, 7552873; Lokvikas@rediffmail.com

<http://www.lokvikas.org/>

For information on their project in rural Gujarat aimed at energy usage optimization

Integrated Research and Action for Development (IRADe), New Delhi (from [Jyoti Parikh](#))

C-50 Chhota Singh Block, Asian Games Village Complex, New Delhi 110011; Tel: 91 11 2649

5522, 5564 6622; Fax: 91 11 2649 5523; jparikh@irade.org, kparikh@irade.org

<http://www.irade.org/>

Recommended for their articles on bio diesel and information on the recently concluded Energy Conclave 2006

Petroleum Policy and Analysis Cell (PPAC), Ministry of Petroleum & Natural Gas (from [R. Santhanam](#), Indian Society of Agribusiness Professionals (ISAP), New Delhi, [Response 2](#))

http://ppac.org.in/oil_prices_taxes.htm

Recommended as the concerned Department to monitor bio-diesel pricing and for information on the same

Vinmathee Educational and Rural Development Society (VERDS) (from [Prabhjot Sodhi](#), UNDP GEF Small Grants Program, New Delhi, [Response 2](#))

Near Jothi Micro Factory, Trichy Main Road, Manaparai – 621 306, Trichy District, Tamil Nadu;

Tel: 91 4332 260575, 260477

For the implementation of the UNDP GEF SGP project on community promoted plantation of Jatropha for creating alternative livelihoods and energy options for communities

Fabcon Engineers (from [R. Jagannathan](#), [Response 2](#))

Mobile: 9444383085

For the field of design, manufacture, erection and commissioning of Bio diesel plants and conducting tests with various edible and non-edible oils for biofuel.

Recommended Websites

From [Ramya Gopalan](#), Research Associate

Ethanol in India

<http://www.ethanolindia.net/>

This website aims to promote the production of ethanol bringing together all the information and useful links required - information and useful links

Biodiesel WWW Encyclopaedia

http://www.castoroil.in/reference/plant_oils/uses/fuel/bio_fuels.html

Provides comprehensive resources for bio-diesel - inputs and information on various aspects of biodiesel, with relevant web links on biodiesel related topics

Biofuels Abstracts

Cabi Publishing

Click [here](#) to view link

Contains up-to-date, relevant information about all aspects of biofuels and bioenergy

Recommended Documentation

Decentralized Energy System India (DESI) Power, Orchha (from [Jyotsna Bapat](#), Senior Consultant, New Delhi)

http://www.desipower.com/field_experience/orchha.htm

Provides details of generating power with biomass gasification as experienced in the TARAGram Centre set up

Wastelands Atlas (from [Sachin Sinha](#), Rajiv Gandhi Watershed Mission and Biofuel Promotion Committee, Madhya Pradesh)

<http://dolr.nic.in/fwastecatg.htm>

Provides a classification of wastelands as indicated by the National Remote Sensing Agency (NRSA)

Bio Diesel Purchase Policy (from R. Santhanam, Indian Society of Agribusiness Professionals (ISAP), New Delhi, [Response 2](#))

Ministry of Petroleum and Natural Gas, Government of India, 9 October 2005 (in Hindi)

<http://petroleum.nic.in/Bio-Diesel.pdf> (Size: 1.42 MB)

Presents a detailed outline of the policy

Don't call it wasteland (from Ravi Chellam, UNDP, New Delhi, [Response 2](#))

Manshi Asher, Editorial The Times Of India, 12 Oct, 2006

<http://timesofindia .indiatimes. com/articleshow/ 2151679.cms>

Questions the use of the term wastelands in the context of land use patterns in India, which bears relevance to large-scale cultivation of jatropha and other biodiesel plants.

ICRISAT to Produce Ethanol from Sweet Sorghum (from [Deepthi Harkar](#), ICRISAT, Hyderabad)

Newindpress.com, Hyderabad, October 2006 (registration required)

Click [here](#) to view link

Provides information on ICRISAT's experience in ethanol production

Project on Community Promoted Energy Plantation of Jatropha for Creating alternative livelihoods, energy options and Power Supply to Communities (from Prabhjot Sodhi, UNDP GEF Small Grants Program, New Delhi, [Response 1](#))

<http://www.solutionexchange-un.net.in/environment/cr/res20100601.doc> (Size: 38 KB)

Provides the objectives and other details of the UNDP GEF SGP project implemented by Vinmathee Educational and Rural Development Society (VERDS)

Spreading the word about manure (from [Sarah Figge](#), UN, New Delhi)*

Mark Steil, Minnesota Public Radio, October 27, 2006

<http://minnesota.publicradio.org/display/web/2006/10/26/manure/>

Accounts the new found respectability that 'manure' has acquired, discussing it as an alternate to the reduce the high energy costs of commercial fertilizers

* *Offline Contribution*

From [Ramya Gopalan](#), Research Associate and [Bidisha Pillai](#), Senior Research Associate

Biofuels: A reality check

Ranjit Devraj, InfoChange News & Features, June 2006

http://www.infochangeindia.org/agenda5_15.jsp

The article provides the realities regarding capacities of biofuels and the arguments for and against contending if the hype around biofuels is a worthy one

India pushes alternative fuels

Siddharth Srivastava, South Asia, Asia Times Online, 4 October 2006

http://www.atimes.com/atimes/South_Asia/HJ04Df01.html

Discusses the status of the Indian energy sector, future contingencies and the resulting emphasis on alternative fuels. Also see related articles

Jatropha Fever

Pankaj Oudhia, Debate, Down to Earth, 7 November 2006

Click [here](#) to view link

Questions the decision of Chattisgarh Government to promote Jatropha, which is poisonous and invasive and evaluates the potential market for jatropha diesel

Oil from a Wasteland - The Jatropha Project in India

Click [here](#) to view link

Explains the transesterification process by which jatropha plant oil is converted into bio diesel fuel and also accounts the experiment by Daimler Chrysler India testing the fuel

Indian State to Plant 160 Million Jatropha Plants in Quest for Bio-fuel Efficiency

Green Car Congress, April 2006

http://www.greencarcongress.com/2006/04/indian_state_to.html

Presents the case of Chattisgarh which will plant 160 million jatropha saplings in all its 16 districts this year with the aim of becoming a biofuels self reliant state by 2015

Potential for Biofuels for Transport in Developing Countries

Masami Kojima and Todd Johnson, Knowledge Exchange Series, ESMAP, February 2006

Click [here](#) to view pdf (Size: 181 KB)

This report responds to the increasing number of requests from developing countries to help assess the commercial viability of biofuels for transport in the next five to ten years

Liquid Biofuels in South Asia: Resources and Technologies

Linoj Kumar N.V. *et al*, Research and Information System for Developing Countries (RIS)

http://www.ris.org.in/article3_v8n2.pdf (Size: 217 KB)

This paper deals with the potential of biofuel production in South Asia in terms of availability of resources, existing processes and technologies.

Biofuel Laws in Asia: Instruments for Energy Access, Security, Environmental Protection and Rural Empowerment

M.P. Ram Mohan *et al*, Research and Information System for Developing Countries (RIS)

http://www.ris.org.in/article4_v8n2.pdf (Size: 130 KB)

This paper evaluates the laws relating to biofuels promotion and use in Asia

WTO Disciplines and Biofuels: Opportunities and Constraints in the Creation of a Global Marketplace

IPC Discussion Paper, October 2006

Click [here](#) to view pdf (Size: 942.89 KB)

This paper sets forth the range of WTO issues that could usefully be clarified in a debate on how international trade rules apply to the biofuels sector

Biodiesel around the World

Canadian Renewable Fuels Association, March 2006

<http://www.greenfuels.org/biodiesel/world.htm>

Provides information on the Biodiesel industry in Europe, Japan, United States and Canada

Toxicology, Biodegradability and Environmental Benefits of Biodiesel

Charles L. Peterson and Daryl Reece, Department of Agricultural Engineering, University of Idaho Moscow, 1994

<http://www.biofuels.coop/archive/toxicologyUIdaho.pdf> (Size: 13 KB)

Shows research results dealing with environment, toxicology, biodegradability, and recent emissions tests; data shows scope of biodiesel industry & its effect environment.

The Carbohydrate Economy, Biofuels and the Net Energy Debate

David Morris, Institute for Local Self – Reliance, August 2005

<http://www.newrules.org/agri/netenergyresponse.pdf> (Size: 1,020.75 KB)

Explains with case studies the importance of biomass given its unique characteristics and argues however, that biomass is one of many renewable fuels to rely upon.

The Economics of Biofuels

National Farmers Union (NFU) Information and Analyses, England and Wales, August 2006

<http://www.nfuonline.com/x9764.xml>

The document outlines the economics of biofuels both now and in the future

Biodiesel: Technology & Business Opportunities – An Insight

S Biswas, N Kaushik & G Srikanth

http://www.tifac.org.in/news/Bioenergy_1.htm#5

Presents the Indian scenario, current status of jatropha plantations, the advantages of biodiesel, and the process steps of converting jatropha to biodiesel

“Fame” Becoming “Famous”

Joseph Toscano, Science Tech Entrepreneur, June 2006

<http://www.techno-preneur.net/ScienceTechMag/june06/Fame.pdf> (Size: 250.97 KB)

Brief on the evolution of biofuels, positives and negatives, country wise developments in this sector and the issues of concern that need to be addressed.

Recommended Contacts

State Level Coordinators of Oil Companies (from R. Santhanam, Indian Society of Agribusiness Professionals (ISAP), New Delhi, [Response 2](#))

<http://petroleum.nic.in/Biodiesel.doc> (Size: 36 KB)

Lists state level coordinators of oil companies for registration as authorised suppliers of biodiesel in terms of bio-diesel purchase policy of ministry of petroleum and natural gas

Suppliers (from [Ramya Gopalan](#), Research Associate)

Petroleum Conservation Resource Association, National Biofuel Centre

<http://www.pcr-a-biofuels.org/supplier.htm>

Provides a list of suppliers of Jatropha curcas (Ratanjyot) Seeds and samplings

Recommended Upcoming Events

Biofuels Markets Africa (from [Ramya Gopalan](#), Research Associate)

Cape Town, South Africa, 30 November – 1 December, 2006

http://www.greenpowerconferences.com/biofuelsmarkets/Biofuelsafrica_capetown06.html

The Pan – African meeting place for Biofuels Industry presenting experiences from Brazil, Europe, India, with a special focus on South Africa and Pan African facilitation

Responses in Full

[Ravi Chellam](#), UNDP, New Delhi (response 1)

I have been following the way biofuels are being promoted in India, and I find our policy makers have not been able to adopt a holistic approach to this. This is being promoted as a sustainable green option, which it can be if certain safeguards are put in place. My fears are about converting agricultural lands and lands with natural vegetation (be it scrubland, grasslands or degraded forest lands - all of which are unfortunately categorized as wastelands and thereby completely negating the value of the native biodiversity found on these lands and the ecosystem services provided by these systems) into biofuel plantations. This can have huge impacts on the nutrition status and food security of the poorer sections of the society and the overall food production of India.

Second is the problem of vast single species and even aged plantations. This can have impacts in terms of overall soil productivity and on the local biodiversity especially insects and other invertebrates and also reptiles, amphibians, birds and small mammals. At least some of the species that are being promoted are exotic species, exotic to India if not exotic to the eco-region/ biogeographic zone in which they are being promoted and planted. Exotics have long term negative effects on the resilience and productivity of ecosystems and there have been no assessments at all of these issues.

I am not aware of the cultivation techniques that are being recommended and I hope that there will be no adoption of a high input model (fertilizer, pesticides and water) as these can also exacerbate the problem. My view is that the entire policy and approach on biofuels needs a holistic review from a sustainability and equity perspective.

I hope the members will find these useful in their thinking on the subject.

[Debadutta Ku. Panda](#), MP Associates Pvt. Ltd., Bhubaneswar

This is to address the queries of Mr. Ravi Prasad regarding biofuel.

The wood and fruit of Jatropha, *Jatropha curcas* (L) can be used for numerous purposes including fuel. This oil plant or physic nut is a multipurpose and drought resistant large shrub. Though it is native of tropical America, it now thrives throughout Asia. It grows in a number of climatic zones in tropical and sub-tropical regions of the world and can be grown in areas of low rainfall and problematical sites. Jatropha is easy to establish, grows relatively quickly and is hardy. Being drought tolerant, it can be used to reclaim eroded areas, be grown as a boundary fence or live hedge in the arid/semi-arid areas.

The seed of *Jatropha* contains viscous oil (50% by weight), which can be used for manufacture of candles and soap, in the cosmetics industry, for cooking and lighting by itself or as a diesel/paraffin substitute or extender. This latter use has important implications for meeting the demand for rural energy services and also exploring practical substitutes for fossil fuels to counter greenhouse gas accumulation in the atmosphere.

[Deepthi Harkar](#), ICRISAT, Hyderabad.

The following information on ICRISAT ethanol production may be useful.

ICRISAT to Produce Ethanol from Sweet Sorghum

Newindpress.com, Hyderabad, October 2006

<http://www.newindpress.com/NewsItems.asp?ID=IEU20061011140537&Page=U&Title=Hyderabad&Topic=0>

[Rahul Banerjee](#), Aarohini Trust, Indore (response 1)

I would like to second Ravi Chellam's note of caution regarding monoculture of exotic species on vast tracts of land. I am writing in to add something regarding the worry expressed by him as to whether the high input method of cultivation will be used or not. If high output has to be obtained from monoculture then I am afraid that high inputs of fertilisers, water and pesticides will have to put in. Even after that there will not be any surety of a good crop and so the same kind of problem that farmers of cash crops are now facing will come up then also.

There have been little or no rigorous empirical studies of the economics of the production of bio-fuel crops. The escalating prices of diesel have made the production of bio-fuels attractive and so they are being promoted by commercial interests without any concern for the social and environmental consequences of such indiscriminate large scale plantation of exotic varieties.

I would like to draw the attention of members to another such bubble that has just blown up. In Madhya Pradesh, about two years back some firms from Maharashtra popularised the production of safed musli, a herb among farmers. The initial farmers got good returns because the firms bought their output and distributed them as seeds for other farmers. The scheme worked in much the same way as chit funds do by paying high interest to earlier depositors from the deposits of newer depositors. So inevitably, like these fly by night chit funds, the safed musli bubble also has burst this year and farmers who had bought the seed for lakhs of rupees have found no buyers and suffered tremendous losses. There is every possibility of the same thing happening with bio-fuels with the added danger of poisonous species like *jatropha* spreading throughout the countryside. In Madhya Pradesh the massive cultivation of soyabean primarily for the export of soyameal to the USA to feed its beef cattle has already severely affected the production of pulses, sorghum, maize and millets, which were the mainstay of the diet of poor agricultural households.

Now mass cultivation of bio-fuel crops will drive a further nail into their coffin of malnutrition.

[Mahtab S. Bamji](#), Dangoria Charitable Trust, Hyderabad (response 1)

I fully agree with the views expressed by Ravi Chellam. Much as biofuels are needed, planning has to be done very carefully to ensure no adverse impact on food and nutrition security and biodiversity.

B C Choudhury, Wildlife Institute of India, Dehradun

I could not agree more with Dr. Ravi Chellam. Biofuel promotion for meeting at least a small fraction of our fuel needs is an important contribution. There are countries in the world where sugarcane based biofuels are already in use. Due to this, the huge expansion of sugarcane in the agriculture sector is showing its impact on ground water and soil quality due to the use of various types of chemicals.

The recent expansion of Jatropha plantations is another case in point. Interestingly, the Railway ministry has started planting Jatropha on their land. I am sure the ministries concerned with this - particularly the Ministry for alternate energy, Ministry of petroleum, agriculture, rural development, etc. may have been looking this as a possible avenue to pursue. However it is important for the Ministry of Environment and Forests to analyse whether this activity will further diminish the forested area by infringing in to so-called Wastelands, which unfortunately are termed so due to lack of canopy cover.

As far as policy initiatives on this are concerned the Indian Institute of Petroleum in Dehradun may have something to contribute.

H.S. Sharma, Consultant, Gurgaon

Why we are supporting jatropha plantation for biofuels and wasting lands, which can be used grow food grains so as to reduce India's imports. Why sir? Germany has already developed a bacteria based process for converting cellulose based materials to biofuels, which can be used to produce biofuels from agriculture wastes.

Kiran Kumar, SKG Sangha, Kolar, Karnataka

I coordinate the activities of SKG Sangha, an NGO from Kolar, Karnataka.

I wish to share with members that Mr. Krishnamurthy, the founder and MD of "Biofuels India" can be helpful in this regard. His web site is "<http://www.biofuelsindia.co.in>"

K.V. Peter, Kerala Agriculture University, Thrissur, Kerala (response 1)

Renewable source of energy is pro-nature and green. Solar, wind and geothermal energies are the cleanest but costly for establishment and are location specific. Plant based energy source is therefore to be given prime attention considering dwindling petroleum resources and consequent cost escalation. Biodiesel from seeds, bioethanol from carbohydrates and biogas from anaerobic fermentation of fats and carbohydrates are natural energy sources. Soybean, oil-palm, coconut, castor, etc. are now sourced for biodiesel in addition to Jatropha. Sugarcane molasses, bamboo, welsh grass etc are other sources for ethanol. All animal and plant wastes also yield biogas on fermentation. Malaysia insists on using palm oil to the extent of 15% in diesel to save on fossil fuels. With rapid industrialisation in India there is no way out but to tap all sources of energy, particularly plant based energy. India has cultivable wastes where energy plantations can be

established. Care, vigil and above all the use of good science, will make energy plantations pro-nature. We cannot neglect this vital area.

R. Santhanam, Indian Society of Agribusiness Professionals (ISAP), New Delhi
(response 1)

This refers to the concerns raised by Dr. B.C. Choudhury. Renewable fuels and alternative energy sources is part of a knee jerk reaction to the horrifying impact of Global Warming. The world is in search of alternatives to an extractive and exploitative mode, where renewables are currently not taken care of. Both the rich and poor nations need to be concerned about the implications of Global warming, food security and related environmental impacts for each set of actions. In this context biofuels are most important.

Sachin Sinha, Rajiv Gandhi Watershed Mission and Biofuel Promotion Committee, Madhya Pradesh

To add to what has been said, firstly jatropha plantations are being recommended by GOI ministries and state governments only on wastelands, not farm lands. Secondly, wastelands are well classified as per NRSA wasteland atlas, AISLUS (Min of Agriculture, GOI) land classification data and those of National Wasteland Development Board under DOLR (Min of RD) and also under Ministry of Environment and Forests. No biofuel plantations are being done on farm lands unless and until it is cleared for standard agro-practices by ICAR, which will take another couple of years if not more.

More importantly, jatropha has been existing in various parts of this country on farm bunds and has been used both by farmers in their own wisdom and by agencies associated with natural resource management as a useful soil binder. Next, market for jatropha seeds as an inert solvent in toiletries and as a laxative in ayurvedic medicines has long existed. This has been the case much before it came to recognized as a biofuel plant. There has been little threat to biodiversity all these years.

Of course now that it has been promoted on a much larger scale, the issues of biodiversity will need to be looked into. Given that almost 20% of the country is wastelands where little grows, such plantations can help in natural resource management, as has been demonstrated in many projects. A judicious mix can be a possible option. One also needs to look at the livelihood opportunities it can generate for poor and the marginal farmers. Organising SHGs on such lines for cultivation of Biofuel on wastelands is an interesting possibility.

In Madhya Pradesh, we have planted biofuels an equivalent of 1.5 lakh hectares (at the rate of 2500 plants per hectare) in wastelands and farm bunds in the last 2 years, making it the largest plantation by any state in the country. However, this is just about 0.5 % of the state area and will, if successful, fulfill only a small fraction of the 5% supplementation aim of fossil fuel consumption envisaged by the Planning Commission.

On the other hand, it also helps the environment as it is a no sulphur/ little carbon emission fuel, making it eco friendly and a low cost option to energy needs (for fuel and electricity) in remote rural areas.

Prabhjot Sodhi, UNDP GEF Small Grants Program, New Delhi *(response 1)*

I am glad that you have raised some very important questions and issues on the emerging new trends in biofuels. Firstly, I wish to share with members that UNDP Small Grants Programme has supported a small pilot initiative in Tamil Nadu under its bio-diesel program with an NGO called Vinmathee Educational and Rural Development Society. The program has promoted cultivation of Jatropha in over 100 acres of degraded lands with 79 households from the village of Manapparai in the district of Trichy. The approach that has been followed in the project is as follows:

1. The farmers have been selected through SHGs in the villages. They have agreements with the NGO to raise jatropha crops through the respective SHGs. Only those farmers who are members of SHGs have been taken up in the program. An informal federation of the SHG representatives at village level has been formed to manage and execute the program. Although the federation has its own identity and a name, it has not been registered yet as the bye-laws are being discussed with members.

2. An NGO is facilitating all interventions with SHGs and the federation. For this, it is taking up awareness and capacity building programmes and working out the economics and the opportunity costs in the program. Training modules have been designed and Dr. R Jagannathan from Fabcon Engineers, an experienced person in biofuels, is guiding the program.

3. The feasibility report has worked out the production system, process of collection of seeds from the farmers at Federation level and the average calendar for production of jatropha seeds from the 100 acres. At an average production of 3,000 kgs per acre in the 4th year, the total yield from 100 acres is expected to be 3, 00,000 kgs or 300 metric ton (MT). A calendar of the various permutations of farm size versus production has been worked out to aid farmers to estimate their yields. A single stage oil expeller of capacity 1.5 MT/day would provide 90 MT of oil from the above yield to the federation. The costs for managing oil expelling operations have been worked out for the project, to be set up as a supporting enterprise. Details are being worked out with farmers.

4. Detailed costs of plantation have been worked out and at a purchase price of Rs.6/- per kg for production of 300 MT per year, the federation needs Rs. 18 lakhs ($300,000 \times 6 = \text{Rs.}18,00,000$) as working capital. Linkages have been established with local banks to provide working capital for procurement of jatropha seeds. Agreements between the federation and the farmers are being signed. To build the initial capital base for the federation, village communities have initially contributed Rs.100/- acre through the SHGs for the plantations. Additionally, if Rs.500 per acre is contributed by the 79 families it will raise (79×500) Rs. 39, 500. It is also likely that more families will be joining in the program.

7. The NGO has procured seeds from the TN Agricultural University and has set up a nursery for 100,000 saplings in the village through 4 SHG women members. On an average 4,000 plants per acre have been planted last year, with a survival of 80% in first year. The cost of the sapling has been covered under the initial Rs. 100 per acre contribution by the farmer, and subsequent gap filling will be done by farmers. No cost for pit digging and plantations has been paid to them.

8. The cost of the single stage oil expeller with a 7 HP motor is about Rs.1.6 lakhs excluding the VAT charges. A double stage oil expeller for the same capacity of 1.5 MT/day (costing nearly Rs. 3.8 lakhs plus VAT) may be preferred as more oil can be extracted if the cake is processed twice. The machines made by Fabcon also have the flexibility of processing the seeds of Pongamia, Neem and other plants, thus making them available for additional processing and making them more cost effective.

10. The contact details of the NGO, the objectives and other details of the project are available on the following link: <http://www.solutionexchange-un.net.in/environment/cr/res20100601.doc>

Rahul Banerjee, Aarohini Trust, Indore (response 2)

Dear Prabhjot, some more clarifications are necessary to properly assess the impacts of this project -

1. Whether these degraded lands had no vegetation at all precluding their being used for grazing of livestock. If they were being so used then what alternative arrangement has been made for the grazing of livestock.
2. How has the average yield been arrived at ? Is this the yield that will be possible without any fertilisers or irrigation? Because the weight of the shelled dycoteledons of the seeds which are put into the expeller will decide the oil yield and not the seeds themselves.
3. The people who will be planting these jatropha plants will have to look after them for four years before they begin getting an yield. What about remuneration during this period?
4. How has the price of Rs 6 per kilo of unshelled seed been arrived at ? I ask because here in Madhya Pradesh it is selling at Rs 2 to 3 per kilo. Such a high price is only possible if the oil is extracted and sold to some end user directly without any intermediation by a middle man. Has such an end user been identified and has an agreement been entered into with them for the purchase of the oil at a price that can ensure the higher returns?
5. At what interest rates will the banks advance the loans to the SHGs? If they charge market rates then there is the possibility of a very high debt burden having accumulated by the time the plants begin yielding in sufficient quantities.

A. Bandyopadhyay, Indian Council of Agricultural Research (ICAR), New Delhi

Jatropha is useful and fuel needs etc. are fine but my worry is how much good land will be gobbled up by this crop which is wild and spreads fast because of greed of the planters (the signs are already there - all Indian Railways lands are not bad lands; some are very good for horticulture.) and by the act of nature. Further, to the best of my knowledge not much is talked about ecological consequences of Jatropha. Members may like to clarify these issues further.

R. Santhanam, Indian Society of Agribusiness Professionals (ISAP), New Delhi (response 2)

I wish to respond to section 3 of the query:

Current procurement price of Biodiesel by Oil marketing (a PSU) is Rupees 26.50/ litre. This price is valid until December 2006. The first price was fixed at Rupee 25/ litre in 2005. Petroleum Policy and Analysis Cell (PPAC) in Ministry of Petroleum & Natural Gas is the concerned Department to monitor bio-diesel pricing.

http://ppac.org.in/oil_prices_taxes.htm

The Bio Diesel Policy is spelt out in the URL: <http://petroleum.nic.in/Bio-Diesel.pdf>

A list of state level coordinators of oil companies for registration as authorised suppliers for supply of biodiesel in terms of bio-diesel purchase policy of the ministry of petroleum and natural gas is given in: <http://petroleum.nic.in/Biodiesel.doc>

T.S. Krishnan Iyer, Development Oriented Operations, Research & Surveys, Noida
(*response 1*)

It has been pointed out many a times that the nomenclature “wastelands” is itself a misnomer. Lands not cultivated for a few years are generally called wastelands. It would be better to call them uncultivated land. However, much of this wasteland could be brought under cultivation. A country like ours needs to bring such land under cultivation. As mentioned by members, a better option is to find ways and means of using agricultural waste for growing bio fuels rather than using good lands for the same unless one is very sure about the economic returns as well ecological ill-effects of promoting such plantations.

K.V. Peter, Kerala Agriculture University, Thrissur (*response 2*)

We are editing a book on “Plants for Renewable Energy”. Plants yielding bio diesel, ethanol and green gas have been included in the same. Please share information on additional plants which should be included other than jatropha, sugarcane molasses, soybean etc. Please also indicate resource persons and institutions related to these crops.

Kanishk Negi, Society for Promotion of Wastelands Development (SPWD), Udaipur

There is no doubt that some thing concrete needs to be done to counter problems like climate change, depleting petroleum resources and increasing pollution which are affecting much of our day to day lives. And biofuels are one such means to counter them. However, there is lack of clarity as to how they should be promoted. The National Mission for Development of Biofuels talks of covering almost 12 million ha of land with Jatropha to supply biofuels. Various state governments have also come with lucrative schemes.

SPWD has done a study on promotion of jatropha in 6 states. The main findings of the same are:

1. There is a lack of standardization of practices for cultivation, management and harvesting of jatropha for the various agroclimatic zones and soil types and no guidelines for the same are available. No government department has come up with any guidelines. The Agriculture department in Rajasthan has refused to comment on the plant in terms of cultivation practice, etc. saying that trials are still on and recommended practices will be clear only after 3-6 years.
2. There is no grading mechanism to remove subjectivity and standardize the price of seed.
3. It is promoted as a hardy crop which does not require any water or minimum water and fertilizer input. But there is literature that contradicts this and promotes it as crop requiring regular irrigation and nutrient input for better yield. Figures of investment during first year range from Rs.12,000/ha to Rs. 22,000/ha totalling to Rs. 33,000/ha for 3 years. The need for investment reduces after 3 years after the plant establishes itself. But the initial cost may be hinderance for many farmers and if returns are not good it may prove unprofitable for him. Also, as against what is commonly said, it cannot give a profitable yield if grown on any soil and degraded lands and the investment required in such cases would be much higher.
4. There is no literature or study dealing with diseases and pests affecting Jatropha and any preventive or remedial measures; this is important as farmers operate on meager margins of investment and returns. Any crop failure/pest attack can affect them greatly.

5. The monetary value of jatropha depends on the oil content in the seed. The oil content varies from 15 to 35 % in the seed. The oil content in the seeds is not measured while distributing plants for cultivation. Seeds with lower oil content could substantially reduce the income. The average oil content in Rajasthan, which is supposed to contain one of the best varieties of jatropha, was found to be 25% (requiring 4 kg of seed to be crushed for 1 litre of oil). Some literature on the subject mentions oil content as high as 45-50 % which is very difficult to confirm.
6. There is no insurance for farmers growing jatropha in most parts of India. Exceptions to this are D1-Mohan in Tamil Nadu and Oriental Insurance in AP. Details of these crop insurance needs to be studied for enhancing effectiveness.
7. No assured information on the yield per ha or per plant is available, as this varies from a few kgs to a couple of tonnes.
8. There is an overall lack of proper planning for procurement and building forward linkages for seeds and oil extraction units.
9. The government is encouraging farmers to go for jatropha cultivation by means of various incentives like subsidy on drip irrigation, supporting labour cost of pit digging, etc. under various government schemes.
10. Various state governments are coming out with provisions for giving land on lease to private companies for plantation. This could well be seen as an opportunity to grab land as land once leased is seldom seen to return to the state once the lease period expires.
11. The cost and technology involved in processing Jatropha oil to make biodiesel prevents its sale at Rs.25/lt as fixed by government. Markets of European union with an annual demand of 9 million tonnes till 2020 present a more viable option. However, in this case the energy security of India will be defeated. Also the returns to farmers would be miniscule in such a case, as cost calculations suggest that if seeds are sold for more than Rs.6/kg, the resulting biodiesel will be financially unviable. Lack of clarity on the exact yield further aggravates this sense of insecurity.
12. Most of the land available with the communities is being used in one way or the other (fodder, grazing, fuel wood etc) and is not really "waste", contrary to popular conception. Careful planning with the people needs to be done for selecting lands for plantation. Currently this is not being done.
13. No matter how much jatropha is touted in policy circles or by the private sector, the farmers who are to grow it are still not clear of the issues attached to it. Many are just going in because it is being proposed as next big thing while many are still skeptical and hesitant to go for it. Many farmers in Chattisgarh perceive it as the enthusiasm of the Chief Minister and question its continuity after the current government goes out of power.
14. In some states there is a tripartite arrangement between Private company-Banks-Farmers. Companies go for buy back arrangement with the farmers and the high cost of jatropha cultivation is taken care by loans provided by banks on the guarantee of the buyback scheme. The loans are to be repaid by farmers once the yield is sold to company. A major concern in this kind of arrangement is that in case of any pest attack or crop failure by other means, how farmers would repay the loan. Also, if the price promised to farmers is not given due to lower quality produce (due to subjectivity in grading seeds) what would be the fate of loan repayment and farmers' future? A similar case of loan non repayment has been observed in stories of cotton farmers
15. Also the choice of Jatropha to meet the deadline to follow improved pollution emission norms by 2010 as per the Indian Motor Vehicle Act is highly questionable. This is

because it makes blending of biodiesel essential. Indigenous species like Pongamia would not qualify for such use due to their long gestation period.

Presented above are some of the issues which need to be taken care of before embarking upon jatropha promotion. Earlier experiences with Eucalyptus and Musli have shown the dark side of promotion of economic crops on farmers. Though biofuel is the need of the day and problems like climate change and increasing pollution could be effectively tackled through it, we need to be more cautious and take a more holistic approach in its promotion.

Kalyan Paul, Pan Himalayan Grassroots Development Foundation, Ranikhet, Uttarakhand

Domestic energy is a crisis in mountain regions, largely due to environmental degradation and population. We have been involved with the spread of biogas units as a viable appropriate technology option to provide clean cooking gas for four hours daily. This reduces the drudgery of head loading firewood for women and reduces the biotic pressure on scarce natural resources.

All farming families in the country possess sufficient domestic cattle to afford this appropriate technology. In order to spread this technology across the country, a new approach needs to be adopted.

Attempts at focusing attention on simple renewable energy options like biogas would be a more optimal strategy than investing huge sums of funds on monoculture of plants, which have very little use for farming communities. Besides, it is unfortunate that policy makers still find it difficult to understand the dynamics of sustainable farming systems and the relationship of croplands and forest areas, which act as support areas.

Cultivation of jatropha, at almost five times the cost of raising native species of grasses, shrubs and trees is ridiculous, to say the very least. It would lead to further shortages in availability of fodder grasses and other essential biomass. Ultimately, it would also have serious negative impact on conservation of biodiversity.

It is primarily a matter of understanding man and nature.

Viren Lobo, Society for Promotion of Wastelands Development, Udaipur

Some more issues:

1. The massive promotion of jatropha is linked to its use in Biofuel. In the method of promotion so far, the entire loss, if any, will be borne by the farmer. If by some chance other options for reducing emissions are found, the producers will be left high and dry.
2. High Investment in jatropha is required to promote high yield. Otherwise as a hardy crop, the yield of seed as well as oil are very low.
3. We need to explore a number of options for biofuel, as well as a number of options for reducing pollution. Can oil be produced from Butanol for instance? Perhaps we can meet the deadline without even resorting to such massive plantations of Biofuel.

Mahtab S. Bamji, Dangoria Charitable Trust, Hyderabad (response 2)

Thanks Kanishk. This is indeed very useful information. Last year at an oil technologists meeting, one Andhra Pradesh official – I do not recall his name –spoke on the success story of Jatropha in AP as well as India. Details perhaps can be obtained by contacting Dr. Yadav, Director - Indian Institute of Chemical Technology, Hyderabad. That symposium covered other biofuels as well. Most agriculture scientists that I have spoken to are skeptical on this issue.

[K. D. Singh](#), New Delhi

I have followed with interest the exchange of emails on Jatropha. I sincerely hope that this mission is implemented as an industrial undertaking with appropriate benefit-cost analysis including its socio-economic and environmental impact. In this context, I get reminded of my impressions of a visit of Koraput district, where industrial developments have been associated with environmental disaster and human misery, particularly affecting the tribal poor.

It is important to remember that land use and land use changes have important ecological implications and are intimately connected with development of the poorer sections of the society. Generally speaking, marginal people often inhabit marginal lands. Unplanned or hurriedly planned land use change, done in isolation, may in the long run end with similar experiences as I found in Koraput. There is need for utmost caution and care on the subject.

[Abdul Rahman Ilyas](#), Agri Science Park, ICRISAT, Hyderabad

Greetings!

I am really glad that the misnomer on Jatropha is widely shared on this platform and most of the responses have been very frank in depicting the reality. I would be further glad if Solution Exchange forward this to our Policy Makers to make necessary changes in the approach followed.

My opinion is we are giving too much of focus to Jatropha under the pretext of alternative fuel source - giving way for quacks and high level manipulators to take advantage of the scenario in converting it into a playground for personal benefits.

Jatropha, as a species, has been used as a fencing crop traditionally. Pushing this species as a mainstream crop will cut down the land available for food crops. Thus the policy should ensure that Jatropha is planted in waste and degraded lands. The ownership of these lands should not be with individual farmers but with a community institution, for which a framework similar to that in social forestry can be developed. Jatropha can be planted on such lands and every village can become a seed exchange bank to be directly monitored by the District Administration. The policy should ensure that the buying and selling happen through a regulatory body. No direct selling should be allowed, so that we can restrict the plantations to desired geographical locations and lands and things can be controlled, otherwise farmers will be influenced by companies to go in for low value crops like these on food producing lands. These are the problems I see in the current approach and policy.

[Shailendra Tiwari](#), Seva Mandir, Udaipur

I am working with Seva Mandir, Udaipur in southern Rajasthan since 1993. In our area of operation, farmers traditionally grow Jatropha (locally called *Ratanjot*) on the edges of their cultivable and non-cultivable land. It is grown as a live fence as it is not eaten by livestock.

Additionally, once it is planted, it grows for years under rainfed condition, withstanding and remaining green even in extremely high temperatures. The farmers harvest its seed for extracting oil which is used in making soap. A fraction of the produce is kept by the farmers for domestic use while the majority is sold to local vendors.

After the recent emergence of Jatropha as a biofuel, a huge campaign has been taken up to bring more and more area under its plantation. Right from petroleum companies to ordinary farmers, all are in a hurry to tap the economic benefits of this wonder shrub's energy plantations. We are all eager to cover all sorts of wastelands and even marginal agricultural lands under Jatropha. Of course, energy is the most profitable industry in the world.

However, there are some harsh realities associated with Jatropha. One, Jatropha has negative effects on other vegetation, and does not allow anything else to grow in its vicinity. That is why farmers grow Jatropha on the edges of their fields. Even under watershed development we grow it either on the edges as live fencing or along with trenches. It is never grown as a solo vegetation even in wastelands. Secondly, rural people meet their fuel, fodder and other requirements from different kinds of trees and grasses. These requirements of the people are much more important and vital than so called potential commercial activities.

To conclude with, I submit that we need to be very rational and should not encourage indiscriminate planting of Jatropha. Requirements of rural livelihoods are diverse and multifaceted. Hence we should try to achieve a fine balance between different types of vegetation to meet out diverse needs of the people. Earlier experiences of monoculture have been disastrous and we should not try to repeat them.

R. Santhanam, Indian Society of Agribusiness Professionals (ISAP), New Delhi
(response 3)

This answers and debates Mr Viren Lobo's remark: Can oil be produced from Butanol?

This has raised some questions on basic concepts, which I would like to share with WES members:

The objective behind tree plantations is to yield tree oil with the freshly captured energy from the sun as Bio energy - Bio fuel and hence bio diesel. Fresh Biomass creation through tree plantations captures some of the carbon in the atmosphere through photosynthesis. Ultimately, it reaches a plateau or equilibrium when carbon dioxide is no longer absorbed in such large quantities. This happens when the tree matures into its full canopy.

Carbon sequestration is not aided when the canopy is trimmed to shoulder height shrub like in tea, coffee plantations and in Jatropha. Pongamia does not lend itself to such trimming practice. It has to grow to its full height to blossom into full flower. Picking is also more difficult so as to not break the blossoms on the same branch carrying the mature nut. One has to balance the objectives between carbon sequestration and ergonomic design of the plantation for easy low cost harvest.

Hence merely converting a fossil fuel Butanol - petroleum fraction into another liquid fuel is not the answer to Global warming, since the carbon from the atmosphere is not trapped.

Tree plantations can help in carbon sequestration best, perhaps when organic farming methodology is practiced. Recycled biomass organic wastes from different sources can be stabilized using technologies like Biosanitiser. This helps in arresting breakdown into Green House

Gases (GHG). The bio energy in the biomass waste is converted into Biofuel through the complex soil biodynamic activity and creation of the vegetable oil molecule, through photosynthesis and other plant metabolism activity. Hence what is otherwise dissipated as GHG, is converted into tree borne oil.

It should be understood that Municipal wastes are a big source of GHG, since they are currently left to ferment. In the U.S., experiments have successfully run micro turbines using unscrubbed gas from landfills with MSW (with some H₂s as well) which generate electricity.

Stabilization of such wastes therefore is a big step in reducing GHG emissions. Stabilization into rich humus also helps agriculture. If such stabilized wastes can be used in tree oil plantations, then perhaps we can expect a better oil yield with reductions in cultivation costs as well, since fertiliser inputs and even pesticide inputs could be averted completely. Tree plantations help in improving the microclimate of the area. Whether such plantations are to be mono culture or diverse, is another debatable point. Some farmers in Maharashtra have planted Pongamia and Jatropha together!

Tree plantations should be encouraged on wastelands and not prime agricultural land, which may lie fallow for various reasons, lack of irrigation facility being the more common reason.

Tree plantations could be socially planned forestry, with full involvement and benefits coming back to rural poor as livelihood options. Corporates can live in a symbiotic relationship with investments in extension services, conversion of vegetable oils into bio diesel.

Ajit Seshadri, The Vigyan Vijay Foundation, New Delhi

Many candid views are emerging on jatropha. It is very apt to propagate biogas whose production is directly proportional to development and people. Co-feeding human sewage with biomass and gohar is an excellent option, and when such encouraging information comes from Mr. Kalyan Paul from Ranikhet a cold place indeed, then it can be sustained in most other regions, we have experience of kitchen waste based bio-gas plant working at All India Women's Conference at Delhi.

V.D. Sharma, VBS Purvanchal University, Jaunpur, Uttar Pradesh

Jatropha is used in various ways as medicine and edible oil; biofuel is the latest innovative use. Due to its property as biofuel, it has been given new nomenclature i.e. diesel plant. This is why it has created huge market potential and commercially beneficial returns. People belonging to different sectors of society, interested in business and in reaping maximum profits with very little efforts are showing their interests in growing and marketing of Jatropha/Ratanjot. Ratanjot means a plant that enables an increase in eye sight. .

V. Palaniappan, Centre for Ecology and Research, Thanjavur, Tamil Nadu

Jatropha, Jatropha, Jatropha - everybody is talking about it and nobody seems to study the pros and cons of it and advice people accordingly. Jatropha is also being used to cheat farmers, NGOs, officials as some spurious people are promising heavy returns to farmers and are collecting money from innocent people. Such spurious claims need to be stopped by the Government.

[Ravi Chellam](#), UNDP, New Delhi (*response 2*)

This piece questions the very use of the term wastelands in the context of land use patterns in India. This is of course in response to the location of SEZs but has equal relevance to large-scale cultivation of jatropha and other plants for biodiesel.

The article can be viewed at the following link

Don't call it wasteland

Manshi Asher, Editorial The Times Of India, 12 Oct, 2006

<http://timesofindia .indiatimes. com/articleshow/ 2151679.cms>

[Prabhjot Sodhi](#), UNDP GEF SGP, New Delhi and R. Jagannathan, FABCON Engineers, Hyderabad

First we answer Rahul Banerjee's questions, and later provide more details.

A. The project area chosen was practically a wasteland, and only some water resistant crops were grown in the agriculture fields. The communities do not have much livestock related activities.

B. Village people have agreed to enclose small areas for growing Jatropha and appreciate that a gestation period will be involved in getting the returns. They feel that over time the benefits will be more than the present status.

C. You are right, Rahul. The oil expeller unit is being installed and the oil will be sold through the SHGs. MOU has also been entered into with Southern Railways in January 06, and details of agreement to supply oil in year 2008/09 are now being worked out along with other terms and conditions such as quality control, price, payment terms, etc.

Other details are as follows:

1. Bio Diesel Fuel can be produced from edible and non edible seeds. However, the preferred species are Jatropha, Pongamia (Karanja) , mahuva, neem, rubber and palm kernel. You are aware that palm oil cannot be imported to India for non-edible purposes. We give below the varieties of Jatropha.

1. Jatropha curcas
2. Jatropha gossypifolia
3. Jatropha glandulifera
4. Jatropha hyeynei
5. Jatropha integerrima
6. Jatropha maheswaraii
7. Jatropha multifida
8. Jatropha tanjorensis
9. Jatropha villosa var
10. Jatropha nana Dalz
11. Jatropha podagrica Hook
12. Jatropha hastate Jacq

Out of these, normally we prefer Jatropha curcas as it is non toxic.

2. The extraction of oil from *Jatropha curcas* seed is done with the help of an Expeller (either single stage or double stage). The residual cake is toxic and can be used only as a manure (there will be 5% oil in the cake) or the technologies for biogas can be explored for digestion of the same.
3. For all practical purposes, we consider percentage of extraction of oil from seed to be in the range of 30 to 31%. The oil is further processed for manufacturing of Bio Diesel Fuel.
4. There are many individual agencies and Government Agriculture Department that provides support for procurement of seeds/seedlings. Government departments also give a subsidy for plantation and cultivation of *Jatropha curcas*. In Tamil Nadu, this programme comes under DRDA.
5. Economics of Bio Fuel Production and Processing

Considering the availability of seed @ Rs.7/kg as landed cost. Glycerine, is a by product obtained from biofuels and amounts to 13% of the total quantity of S Vegetable oil sold in the market @ Rs.50/kg.

Returns from *Jatropha* / Acre (from 3rd year)

Sl. No.	Year	Plant/yield	Total	Amount
1.	3 rd year	3.0 kg	3000	21000
2.	4 th year	3.5 kg	3500	24500
3.	5 th year	4.0 kg	4000	28000

6. Marketing

The Ministry of Petroleum has issued a notification vide their letter dated 9.10.2005 and has announced that oil marketing companies will buy the Bio Diesel fuel @ Rs.25/ltr.

In our opinion the Bio Diesel Fuel produced by Farmers can be marketed locally to cater to the needs of slow speed diesel engines like diesel pump, tractor etc. which will be economical for local people, considering the manufacturing cost of Bio Diesel Fuel @ Rs.30/litre as against the present price for Diesel at Rs.36/ltr. In our opinion, local village people can form cooperative societies exclusively for Bio Diesel Fuel production. (Cultivation, extraction of oil and production of Bio Diesel Fuel)

7. In our opinion the Government can give a subsidy so that the producer is able to sell his seed @ Rs.5/kg and the Government should not bring in any imposition that Bio Diesel produced in the villages cannot be used for local use and should be sold only to the oil marketing companies.
8. The Bio Diesel Fuel produced in villages can be used even to produce power. Bio Diesel can be used for pressure stoves instead of kerosene stove, which is under development stage.

Jyoti Parikh, Integrated Research and action for Development (IRADe), NewDelhi

This is an excellent forum for exchanging ideas.

Are there groups out there in West Bengal, Assam, MP and Chhattisgarh working in the area of biomass for energy in rural areas? We would like to involve them in the projects we may have on Bio-energy. Please write to me and see our articles on bio diesel on the website www.irade.org

Jyotsna Bapat, Senior Consultant, New Delhi

There is an interesting project by Development Alternatives, where they have been able to use the local Khejari twigs as bio fuel. They are able to support an independent mini power plant of 100 Megawatts (electrical).

When TARAGram was being set up, no grid connection was available for the centre. At that time, DA decided to try out the new and upcoming technology of gasification for power generation. The power generated supports a flour mill for base load and various machines in DA's centre in Orcha, Madhya Pradesh. The economics and models for distribution have been worked out and are provided at the following link:

http://www.desipower.com/field_experience/orchha.htm

The unit provides full time employment to five people and the cost of the power production works out to be cheaper than power supply. However, the current law does not permit independent production and distribution of electricity. So besides modeling and showing that the power plant can function effectively, they are not able to go beyond. They use the power produced in drying the hand made paper marketed by the Tara Haat.

The rest of the power is used for one fan and two light bulbs in each house in the village.

S. V. Anil Das, Asian Development Bank (ADB), New Delhi

Just a small correction on the Development Alternatives Orchha project. The power of the plant is 100KW (Kilo Watts) and not 100 MW (Mega Watts).

Biplab Ketan Paul, Lokvikas, Ahmedabad

Lokvikas is a NGO in North Gujarat (<http://www.lokvikas.org/>). We are working on a small project in energy usage optimization in rural Gujarat.

Initially we had some problems as we faced the mistrust of the community. This is because the Govt. of Gujarat took stringent mechanism on energy theft and as there were many instances of energy theft in the villages, the community thought we are actually tracing energy thieves. But now we are successful in getting good responses, especially with the support of our SHGs. We are successful in convincing the community for savings electricity through use of Compact Fluorescent Lamps, and they are doing it.

We have also analyzed how the energy needs (more precisely - fuel wood use) in the village are gulping up the green cover from village commons and are planning to promote energy plantations for the community where SHGs can be the owners and can save the green cover of the village common.

We are also finding that deep tube wells in the villages are heavy users of electricity and are not

very keen to improve their efficiency or save energy, as there is no economic incentive for this from their point of view.

[Nachiket Mor](#), ICICI Bank, Mumbai

We are keen to develop commercially scaleable financing models for biofuels and would love to hear ideas on that.

[R. Jagannathan](#), FABCON Engineers, Chennai (*response 1*)

Please find below my suggestions and reactions on issues raised by various members:

Mr. Santhanam's comments - There is no point in revising the policy on the purchase price of bio fuel at this point. Instead, the Govt. should come out with a clear policy for manufacture and sale of bio fuel by SHG Groups.

Mr. K. V. Peter's comments - We can also derive bio fuel from any non edible seeds/oil like pongamia, neem, rubber seeds and also from palm kernels. (Palm oil can be imported to India only for edible uses).

Mr. T.S. Krishnan Iyer's comments - I agree with your point that there is no waste lands, but I would like to remind you that land not used by the land owner for cultivation can be used for cultivation of non edible plants. This will give them a better return and will also save our country from the crisis of importing crude petroleum.

[V.V. Damle](#), Confederation of Indian Industry (CII), Pune

Have been keeping track of the discussion on bio fuel. As part of our "CII Initiative for Backward Districts Development" being piloted at Dungarpur, Rajasthan, we have put up a proposal to the Rajasthan Government for promotion of Jatropha. In the process of developing this proposal certain issues and observations have come up, and our proposal is based on these considerations, which I would like to share here.

1. **Jatropha Plantations management:** It is true that Jatropha is a sturdy crop and survives under poor soil and moisture stress conditions. However, such plantations will take a very long time, about 7 years, to reach maturity and still the per plant output of seeds will be low raising the question of viability. Plantations observed under different water application conditions - daily watering, weekly watering, fortnightly watering and totally rainfed - drive home the point. The issue is that Jatropha plantations, to attract farmers, should have the promise of reasonably early and good returns. Also, low productivity and yield plantations will require larger land coverage and these necessarily being wastelands away from village habitats and homesteads would mean incremental efforts for plantations management. Farmers may not be in a position to commit that much time and effort.
2. **Minimum scale of biofuel plant and the commensurate plantation size:** Presently it seems that 7,000 -10,000 tons per annum output of biodiesel is the minimum viable plant for a Corporate project. This means about 20,000-30,000 tons of feedstock. If a low yield Jatropha plant is expected to yield 2 kg seed, it will be necessary to have 10,000,000-15,000,000 plants. If 2,500 plants can be planted in 1 ha, it will be necessary to cover 4,000-6,000 ha wastelands for 1 biodiesel plant. On the other hand if the per

Jatropha plant productivity for irrigated plantations were to be 5 kg, only 4,000,000-6,000,000 plants will be required. This means only 1600-2400 ha.

3. **Quality of output seeds:** This is also an important issue. If the oil content is 30% or 40% that will make a huge difference. Obviously better managed, including irrigation, plantations will have better oil content. Oil content can have significant implication towards cost of processing.
4. **Wastelands policy:** Different state governments are in the process of formulating wasteland policy for Corporate involvement. The suggestions include offering wastelands to Corporates on lease. But with such huge requirements for plantations this does not seem feasible for Corporates. The required amount of land will be spread all over the district in bits and pieces, and will be unmanageable for Corporates. This is a perfect case for Private-Public-Community Partnership. Government may make available wastelands to Panchayats and CBOs through a suitable legal instrument so that these entities can raise bank loans. The basic plantation may be established partly through grants (e.g. NREGA employment Fund) for digging pits and other labour requirements, and good quality plants may be procured by Panchayats and CBOs through bank loans on the basis of buy-back guarantees. Further labour requirement for plantation management may be similarly funded under employment programmes and the nutrition and other requirements for plant health and quick growth may be through bank finance. It will be in the interest of the concerned Corporates to provide extension services to farmers (partly funded by Govt. and partly by Corporates) to ensure good growth, productivity and quality. Good quality seeds will lower the processing costs and enable higher returns for everybody. The actual plantation management may be through SHGs. Panchayats can allocate plants to SHGs and/or individual women.
5. **Seed processing:** The initial crushing of seeds for oil extraction may be at village or cluster level through enterprises managed by SHGs or youth groups. Panchayats may be given the responsibility for managing seed collection for which the concerned Corporates can offer commission. This will ensure revenue to the Panchayats. The crude oil will go to the concerned Corporate and the oil cake can go to the community.
6. **Biogas using Oil Cake:** I think it is reasonably well established that oil cakes give good performance in biogas plants as compared to other feedstock. Jatropha oil cakes can address the issue of rural energy. The slurry can be recycled as organic manure for plantations. Thereby the largely organic matter gets exported and all the nutrients recycled.
7. **Recent research:** There are indications of research on manufacturing hydrogen cells from glycerol which is a byproduct of biodiesel.
8. **Inter/mixed cropping in Jatropha plantations:** If Jatropha plantations are inter/mix cropped with a mix of short and long duration plantations of, say, medicinal and herbal plants, the package as a whole may become more attractive to farmers. The short duration variety can enable incomes within 1-3 years, the medium duration Jatropha plantations if well managed can enable further incomes from 3-5 years and the long duration varieties, which should be very high value plants, can enable incomes say after 7-9 years. The selection of short duration varieties should be such that it serves as an incentive to farmers for better management of plantations. Watering of short duration variety will take care of watering of Jatropha and other plants. This is a concept borrowed from the erstwhile toungiya system of forest plantations management whereby forest labour was encouraged to cultivate lands between plantation rows till the canopy was established. This enabled good care of plantations as well. Once the canopy was established the labour would move on to the next plot. Mix/inter cropping will ensure bio diversity as a fairly large basket of medicinal and herbal plants can be grown in a district

level operation. The area required for medicinal and herbal plants are not expected to be as large as Jatropha plantations. Over a period of time more options can be evolved.

9. **Necessity for looking ahead:** There are many issues of R&D that require to be addressed. For example identifying plants that can co-exist with Jatropha, developing package of practices for mixed plantations, etc. require forward looking R&D.

[Prabhjot Sodhi](#), UNDP GEF SGP, New Delhi (*response 2*)

I think an excellent point has been raised by Mr Jagannathan; my reactions are that while the Government is putting so much emphasis on raising Self Help Groups (SHG), it is important that we create "income-enhancement" related projects at the SHG level, more so in remote and un-reached areas.

In one of our projects with Vinmathee Educational & Rural Development Society (VERDS), we are institutionalizing the mechanism that the community procurement and the sale of all the production of Jatropha will be done through SHGs. The SHG federation is not registered, but once the terms, policies etc. have been agreed upon by the all stakeholders, we may register it as a cooperative / trust to manage the program. The NGO has been working at the community level creating all the cohesive understanding and local ownerships.

Thus, it is important for us to flag the point that the government needs to **institutionalize a policy for procurement of Jatropha at the SHG level**, for it will give them a clear mandate / purpose for ensuring livelihood benefits. We need to develop local ownership, which is extremely necessary for sustainability.

Excellent forum created by the UN for exchange of knowledge!

Address of VERDS - Near Jothi Micro Factory, Trichy Main Road, Manaparai – 621 306, Trichy Dist., Tamil Nadu. Phone no(s): 04332 – 260575, 260477)

[T. S. Krishnan Iyer](#), Development Oriented Operations, Research & Surveys, Noida (*response 2*)

My view is that the land not cultivated by the cultivator could better be brought under cultivation of basic crops or horticultural crops, which would increase the agricultural and horticultural production. Especially in the context where the quantum of valuable agricultural land is already dwindling by creation of townships and construction of buildings (one can see how Noida township has replaced and is still replacing fertile agricultural land on the banks of Yamuna into concrete buildings and roads), where also the farmer could get income rather than attempting to grow a crop like Jatropha, which is surrounded by conflicting opinions on its various effects. At the same time research could be carried out for making bio fuel from agricultural waste or other seeds like neem.

[R. Jagannathan](#), Fabcon Engineers, Chennai (*response 2*)

Our company is in the field of design, manufacture, erection and commissioning of Bio diesel plants. We manufacture a series of plants ranging from 100lts/day to 3000 lts/day. Additionally, we have demonstration plants of capacity 10 litres/batch and 25 litres/batch.

We have also conducted tests with various edible and non edible oils and have been successful in using these for biofuel. In case you require any further details, please feel free to contact us at following numbers :

Factory: 04465376925
Cell: 9444383085

Many thanks to all who contributed to this query!

If you have further information to share on this topic, please send it to Solution Exchange for WES-Net at se-wes@solutionexchange-un.net.in or Food and Nutrition Security Community at se-food@solutionexchange-un.net.in with the subject heading "RE: [se-wes][se-food] Query: Details of Biofuel Operations, from Balaji Industrial & Agricultural Castings, Hyderabad (Experiences). Additional Response."

Disclaimer: In posting messages or incorporating these messages into synthesized responses, the UN accepts no responsibility for their veracity or authenticity. Members intending to use or transmit the information contained in these messages should be aware that they are relying on their own judgment.



Copyrighted under Creative Commons License "[Attribution-NonCommercial-ShareAlike 2.5](https://creativecommons.org/licenses/by-nc-sa/2.5/)". Re-users of this material must cite as their source Solution Exchange as well as the item's recommender, if relevant, and must share any derivative work with the Solution Exchange Community.



Solution Exchange is a UN initiative for development practitioners in India. For more information please visit www.solutionexchange-un.net.in