

Sample Content of the Comprehensive Jatropha Report

This e-book provides representative sample content to assist a reader in evaluating the Comprehensive Jatropha Report.

PlantOils.in is the definitive resource for information and inputs on emerging biofuels such as Jatropha. In addition to being an online hub, the PlantOils.in team is also a regular contributor to various online and offline forums.

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Who will benefit from this report?

1. Entrepreneurs wishing to understand the Jatropha industry and the current and future business opportunities in this market.
2. Companies in the biofuels and alternative industries exploring the Jatropha energy domain
3. Companies and entrepreneurs wishing to understand the current status and future potential for Jatropha in bio-plastics and other bio-chemicals.
4. Investment banks and financial investment companies keen on funding ventures in the biofuels industry.

Highlights of the report

Facilitating Decisions – Special emphasis on inputs that facilitate business and research decisions for the Jatropha industry

Authoritative - Prepared by PlantOils.in, the leading global resource for bio-based products.

Well-researched - Highly researched data and information, with an emphasis on data that facilitate decision-making. Includes real life case studies, and provides balanced opinions to help the reader distinguish hype from reality.

Regularly Updated – Latest updated version prepared last week of August 2009.

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Sample Topic: Jatropha Yield

Based on the various estimates made by experts and data, the following are the consolidated yield data for Jatropha seeds

Year	Range of Reported Yields per hectare (T)	Most likely average yield per hectare (T)
1	0.250-1.25	0.50
2	1-2.5	1.5
3	2.5-5.0	3.0
4	5 – 6.25	5.0
5	6.25 – 7.5	6.5

Also provides comparative indicative yield data for Jatropha seeds with and without irrigation, Jatropha real life yield data for various countries, and yield data under best case scenario.

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Sample Topic: Jatropha Seed Prices & Trends

Average Seed Prices of Jatropha

Year	Average Seed Price (\$/Kg)
2005	0.1
2006	0.12
Jan 2007	0.12
July 2007	0.14
Jan 2008	0.2
Jul 2008	0.22

Quotation of prices from various countries, likely prices of Jatropha seed in future and real-life prices of seeds are also provided in this chapter.

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Sample Topic: Typical Processes & Equipments of Jatropha Oil Refinery Plants

1 – Degumming

2 - Neutralizer

- Soap/gums tank
- Water/oil/gravity separator
- Lye/brine/hot water tank
- Neutralized oil tank
- Oil pump
- Soap stock pump
- Hot water pump

3. Dewaxing

4 - Bleacher

- Barometric condenser
- Catchall
- Earth dozer
- Bleached oil tank
- Filter press
- Filter pump
- Vacuum pump

5 - Deodorizer

- Catchall
- Storage tank
- Cooler
- Polish filter

- Pump
- Vacuum system

Other Equipments in a Jatropha Oil Refinery Plant

- Electrical/cables
- Pipe, valves, fittings
- Instruments/gauges
- Insulation
- Cooling tower
- Reactor
- Centrifuge
- Tray drier
- Crystallizer
- Pressure filter
- Distillation assembly
- Thermic fluid heater
- Chilling plant
- Vacuum nutch
- Air compressor
- Cooling tower
- Elevators
- Conveyors
- Gears
- Pressing worm and gears
- Worm wheel
- Plunger pumps

This chapter provides detailed descriptions of the step-by-step processes of Jatropha oil production and machineries involved in each process.

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Sample Topic: Jatropha Meal Prices

The deoiled extract of Jatropha seed finds uses as an organic fertilizer. While there are no formal price data available for Jatropha meal, based on the value of its ingredients and prices for comparable products (such as castor meal), we estimate the Jatropha meal will fetch a price in the range 75-90 \$ per T on average.

Value of Press Cake (Europe)			
Components	Seed (%)	Price \$ / kg	Value \$ /kg
Crude Protein	15	1.36	0.2
Lignin	20	0.2	0.04
Fiber	15	0.2	0.027
Carbohydrate	10	0.34	0.04
Total fractionated press cake			0.31
Un- fractionated press cake	60	0.048	0.027
Oil	35	0.82	0.29

Source: Plant Research International, www.pri.wur.nl/

Notes: \$ to euro conversion taken as 1.36\$ = 1 euro

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Sample Topic: Jatropha Oil Biodiesel?

Can Jatropha Oil be an Efficient Biodiesel?

This question is answered by analyzing the following:

- Characteristics of oils or fats affecting their suitability for use as fuel
- Characteristics of efficient biodiesel
- How does the biodiesel derived from jatropha oil rate on the above aspects?
- Based on the above three aspects, preliminary inference for “Can Jatropha Oil Make a Good Biodiesel?”

Key Fuel Properties of Jatropha Oil and its Biodiesel

Properties	Jatropha Oil	Jatropha biodiesel	Diesel
Density, g/ml	0.920	0.865	0.841
Viscosity @ 40 °C, cs	40-50	4.5-5.2	4.5
Calorific value, MJ/kg	39.7	39.2	42.0
Flash point, °C	240	165-175	50
Cloud point, °C	16	13	9
Sulphur %	0.13%	0.13%	1.2% or less
Cetane Value	51	58.4	47.8

All the above four points are analysed in detail and we have come out with an inference for Jatropha biodiesel's suitability as a replacement for petro-diesel

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Sample Topic: Global Commercial Projects of Jatropha

Assuming an average investment of US\$ 300-500 per hectare, the expected growth path of the industry will lead to worldwide investments totaling US\$ 500 million to 1 billion every year for the next 5-7 years.

Jatropha Plantations Worldwide (2008)

Selected Countries	Jatropha Plantations (Ha)
India	1 Million
Brazil	100,000
Malasia	22,000
Indonesia	200,000
S. Africa	15,000
Malawi	55,000
Cambodia	20,000
Mozambique	300,000
Madagascar	17,000

Similar data on future Jatropha plantations, total current supply of Jatropha biodiesel in the world, future supply potential of Jatropha oil of top five countries, their quantities etc., are also discussed in this chapter.

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Sample Topic: Cost**8.2.1 Cultivation, Crop Management & Harvesting**

Cultivation - cost will be in the range of US\$ 600-700 / year per hectare. Includes seed or sapling cost, land preparation and sowing.

Crop care –cost will be in the range of US\$ 200 / year per hectare. Includes pruning, fertilizers, pesticides, irrigation etc

Harvesting - Harvesting cost will be in the range of US\$ 200 / year per hectare.

All the above estimates could vary depending on the region in which cultivation is done.

All costs in \$/hectare

Year	Cultivation	Crop Care	Harvesting	Total
1	700	200	200	1100
2 & above	0	200	200	400

Representative Working Out of Costs and Returns for Jatropha Cultivation

Year	Total Cultivation Cost (US\$)	Seed Yield/hectare (T)	Revenues (US\$)	Profits (US\$)
1	1100	0.50	100	-1000
2	400	1.5	300	-100
3	400	3.0	600	200
4	400	5.0	1000	600
5	400	6.5	1300	900
6 and beyond	400	7.0	1400	1000

Note: Revenues / T of seed = \$ 200, all costs given per hectare.

8.2.2.1 Oil Extraction & Refining*Cost of Extraction Using Oil Press*

Capital Cost	Operating Cost 1	Operating Cost 2
0.5 \$ per annual gallon	\$ 35 / T (approx 12 c per gal)	\$50/T (approx 17 c per gallon)

Cost of Solvent Extraction

Capital Cost	Operating Cost 1	Operating Cost 2
1 \$ per annual gallon	\$ 55 / T (approx 20 c per gal)	\$80 per T (approx 30 c per gallon)

Operating Cost 1: does not include amortization of capital costs; Operating Cost 2: equals operating cost 1 + amortized capital costs

Typical Biodiesel Cost Break-up

Cost Type	Cost / gallon (\$)	Cost / liter (\$)	% of total
Cost of feedstock	1.672	0.44	77.1
Cost of feedstock transport	0.076	0.020	3.5
Total feedstock			80.6
Cost of acid	0.011	0.003	0.5
Cost of base catalyst	0.103	0.027	4.8
Cost of sodium hydroxide	0.001	Negligible	0.1
Cost of methanol	0.122	0.032	5.6
Total chemicals			11.0
Cost of heat energy	0.022	0.006	1
Cost of electricity	0.004	0.001	0.2
Total energy			1.2
Cost of labour	0.026	0.007	1.2
Total labour			1.2
Depreciation	0.066	0.017	3
Total depreciation			3
Cost of maintenance	0.028	0.007	1.3
Cost of admin and overhead	0.006	0.002	0.3
Cost of marketing	0.03	0.008	1.4
Total overhead & maintenance			3.0
Total Cost	2.167	0.57	

Note: Above data for making Biodiesel from soybean oil for 30 million gallons per year plant located in the US, 2006 data. *Source:* Iowa State University, CIRAS

This chapter provides preliminary data for Jatropha cultivation costs and costs for methods of converting Jatropha into fuel.

Chapter 9 Jatropha Oil Prices

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Sample Topic: Current Price Data for Jatropha Oil

The following data essentially provide an idea of approximate prices necessary for the supplier in order to cover costs and make a small profit of 10%.

Month & Year	Price (\$/MT) - FOB
Nov 2008	850
Mar 2008	800
Oct 2007	750
Apr 2007	725

This chapter also provides prices of other biodiesel compared to Jatropha biodiesel, and factors that affect the prices of Jatropha oil.

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Sample Topic: Companies Venturing into Jatropha

Mission Biofuels

Location: Mumbai, India

Line of Activity: Integrated global renewable energy company

Mission NewEnergy Limited is a global renewable energy provider with operations in Australia, Malaysia, India, China and Mauritius. Mission has a well-developed upstream feedstock business in India, focused on the use of Jatropha Curcas. The company has an extensive field network to manage harvesting, storage, extraction and transportation of Jatropha oil and seeds.

Mission Biofuels India Private Limited has:

- Access to over 360,000 acres of Jatropha cultivation with the goal to increase the acreage to 1,500,000 by 2009.
- Developed its own nurseries and seed procurement centers in India of which customers can buy the Jatropha seeds.
- Partnered with the leading Jatropha research centre The Energy Resources Institute (TERI), to implement optimum planting cultivation technologies and ensure highest yields are achieved.
- Partnered with leading Indian Farmers Organisations such as the DHAN foundation for effective outreach to the farming community.

Mission's contract farming Jatropha business will generate free cashflows in 2009, principally generated from the profitable sale of saplings to Mission's contract farmers. Growth in 2009 will take Mission's acreage to over 550,000 acres. Mission anticipates expanding its planted acreage to over one million acres by end CY2011.

Mission enjoys a ready and large market for Jatropha oil sales in India. The "Must Buy" government policy for Jatropha based Biodiesel imposed on large oil companies and exemption of excise duty, provide Mission with significant operating margins.

A favourable recent Indian government amendment makes Jatropha acreage eligible for Certified Emission Reductions (CERs). Mission had already commenced significant amount work towards registration with UNFCCC for CERs and based on its existing 354,000 Jatropha acres is poised to generate between 200,000 to 250,000 CERs annually. The current market price for CERs is Euro 12 (A\$24).

Website: www.missionbiofuels.com/

Detailed profiles, projects, Jatropha acreage and their research are provided for over 10 prominent companies that have ventured into the Jatropha biodiesel industry.

Chapter 11 Real World Status of Jatropha Energy Projects

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Sample Topic: Status of Jatropha Oil in Real World

11.3.6 Implementation Status of Prominent Companies

GEM Biofuels

GEM has signed a long-term off-take Agreement with Natural Fuel Limited, under which GEM will supply NFL with crude Jatropha oil as feedstock for its Singapore biodiesel facility. The Agreement is for a 10 year period, starting in January 2009, at a free on board delivery price of US\$500 per tone, adjusted for inflation, for the first 5 years. NFL is developing biodiesel refining facilities with production capacity in excess of 700,000 tones per annum (t.p.a.). GEM expects to produce around 20,000 tones of crude Jatropha oil by 2009.

Energem Resources Inc

At present Energem Biofuels Limited acquired 70% of a research and development company, in Mozambique and had spent approximately four years developing an optimal, integrated farming approach to a Jatropha-based biodiesel feedstock.

List of prominent companies and the status of this emerging industry with regard to the number of companies, existence of standards, key entry barriers and project implementation are provided in this chapter

Chapter 12 Investment & Financing

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Sample Topic: Some Sample Investments in Jatropha

The following tables provide sample data for some companies investing in very large scale Jatropha plantations.

Investments by Prominent Companies

Company	Investment (US\$)	Country Invested	Area (Hectares)
D1-BP Fuel	160 million	South Africa & India	1 million
Sun Biofuels	20 million	Tanzania	NA
GEM BioFuels	7.2 million	Madagascar	452,500
Energem Resources	55 million	Mozambique	60,000

This chapter provides inputs on sample investment data and the existing methods for financing such investments.

13. Business Strategies

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Sample Topic: Key Strategies

The following are the key strategies that companies and investors planning to enter the Jatropha biodiesel industry should consider:

1. **Talk to the Industry** – It is important that prospective investors and entrepreneurs talk to real life Jatropha growers in the relevant region before investing. Yields and related growth parameters vary significantly across the world and hence generalized data are not sufficient.
2. **Research Partnerships** - If you plan to invest significant amounts into Jatropha, it is worth having associations with universities and research labs that could help you in identifying and growing high yield varieties
3. **Ensuring Seed Supply** - A key success factor in the Jatropha biodiesel business is the availability of seeds at an affordable price. Hence, an investor should first ensure that he will have a regular supply of seeds – either by growing them himself or by having contractual captive farming.

More such key strategies are provided to enable an entrepreneur to evaluate the industry better and form optimal strategies.

Chapter 14 Jatropha Oil in Various Countries

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Sample Topic: Jatropha Oil in Various Countries

Many countries around the world are actively promoting Jatropha cultivation for biofuels. Here's a snapshot.

Asia:

- India uses several incentive schemes to induce villagers to rehabilitate waste lands through the cultivation of oil bearing trees such as Jatropha.
- In China, the national oil companies are the dominant player in Jatropha project development.
- Myanmar pursues a rigid national plan on Jatropha expansion.

Africa:

- The governments in Senegal, Mali, Nigeria, and Ethiopia and (in particular) Zimbabwe has formulated policies which explicitly focus on the promotion of Jatropha.
- Many countries actively promote investments in renewable energies (e.g. Ghana, Tanzania, Malawi or Kenya) or facilitate the access of land to interested investors.

Latin America

- Specific targets or programs on Jatropha have been developed, among others, by the Mexican and the Colombian government.
- High expectations are on the Brazilian government which considers including Jatropha in its social biofuels program. This would have a great impact on project development in Brazil and the overall dynamics of the industry in Latin America.

This chapter provides detailed information of Jatropha projects, plantation, Jatropha companies, investment and government support for almost all the countries of the above given continents.

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Sample Topic: Jatropha Acreage in India

Scale of Jatropha Cultivation in India

	Expert Estimate	Projects Identified
2008	497,881 ha	407,635 ha
2010	1,179,760 ha	1,455,363 ha
2015	1,861,833 ha	5,479,765 ha

Inputs on land availability for Jatropha cultivation in India, states most suitable for Jatropha plantation, waste land available for plantation, and Jatropha yield are provided in this chapter

Chapter 16 Jatropha Research & Future Trends

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Sample Topic: Jatropha Research – Genetic Engineering and Hybrids

Genetic Engineering

This chapter provides data on some of the biotechnology efforts being tried for Jatropha, like improving seed yield, mapping genes and breeding, improving oil content in seed and improving oil quality and esterification properties.

Jatropha Hybrids

Philippine tests conclude that six hybrids of Jatropha create biodiesel that meets US, European standards - In the Philippines, tests by the Technological University of the Philippines and Chemrez Technologies have shown that Jatropha biodiesel from PNOC Alternative Fuels meets both US and European standards. Tests have now expanded the pool of Jatropha hybrids to six candidates that meet EN 14214 (Europe) and ASTM D6751 (US). The Philippines have a B1 and E5 mandate scheduled to go into effect in 2009, rising to B2 and E10 in 2011.

More Jatropha research information on genetic engineering, hybrid and efforts to increase yields are provided in this chapter.

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17.7 Jatropha Market Trends - Summary

Sample Topic: Companies

Currently, there are about 100 companies that are each cultivating over 500 hectares of Jatropha plant for biodiesel. The following table predicts the number of companies in the next 5 years.

Year	Number of Companies
2009	250
2011	350
2013	500
2015	700

Source: PlantOils.in

This chapter provides predictions for the future of Jatropha oil and biodiesel for the next five years and beyond. Predictions are provided for the various aspects mentioned in the list of contents.

Chapter 18 Biofuels Associations Worldwide

Sample Topic: Associations

Country	Name of Association & Organization	Address & Contact	Website
Seattle & Poland	Northwest Biofuels association	1301 5th Avenue, Suite 2500 Seattle, WA 98101 Ph: 206-389-8660, Fax 206-389-8651	www.nwbiofuels.org
USA	International Biofuels Association	700 12 th Street, NW Suite 700 Washington, DC 20005 Ph: 202-659-2979	www.internationalbiofuels.org
Australia	Biofuels Association of Australia	Level 5, Suite 2 320 Adelaide Street Brisbane QLD 4000, GPO Box 111 Ph:(07) 3010 9338	www.biofuelsassociation.com.au
South Africa	Southern African Biofuels Association	47 Oxford Road, Forest Town 2193, Johannesburg, Gauteng, South Africa	www.saba.za.org

Organization details provided for many countries will be useful for entrepreneurs wishing to take further steps in this industry

Price of the Comprehensive Jatropha Report

The price of the Comprehensive Jatropha Report is **US \$500**.

This price includes:

Free Updates: Customers who buy the report get three updated versions released subsequent to their purchase, at no additional cost

Expert Assistance: Customers also get to use the expertise of professionals @ PlantOils.in for no cost.

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