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Report Highlights:

India's bio-fuel production and use industry is still in its infancy stage. Recent government policies for promotion of bio-fuels focus on promoting use of ethanol derived from sugar molasses for blending with petrol (gasoline) and production of bio-diesel from non-edible oilseeds for blending with petro-diesel. The Government's policy of November 2006 mandating five percent blending of ethanol with petrol has been partially successful, with about 250 million liters of ethanol estimated to be utilized in 10 states. However, despite government initiatives, India's current production of bio-diesel is not commercially significant.

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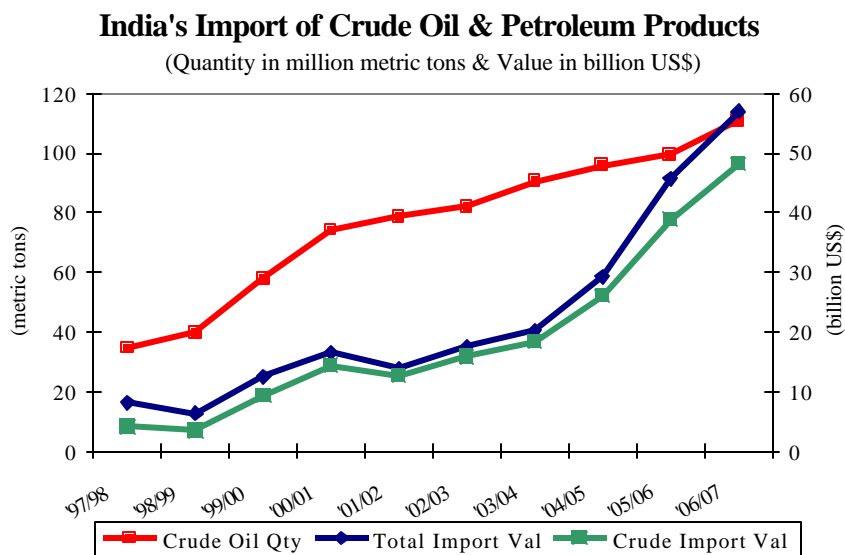
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BIO-FUELS POLICY OVERVIEW

Why Bio-fuels?

India is the sixth largest and one of the fastest growing energy consumers in the world, with a rapidly growing economy, rising population and an expanding number of middle-class consumers. Due to limited domestic crude oil reserves, India meets about 72 percent of its crude oil and petroleum products (diesel, aviation fuel, etc.) requirement through imports, which are expected to expand further in coming years. In the last three years, India's oil import expenditure has nearly doubled due to the escalation in global oil prices.



Given the escalation in global oil prices and continued growth in consumption of petroleum products, the consequent burgeoning expenditure on oil imports is of serious concern to the Government of India (GOI). The GOI is looking at ways to limit rising oil imports by promoting use of bio-fuels. Other factors driving the development of bio-fuel as an alternative renewable source of energy in India are:

- Efforts towards self reliance, the cornerstone of India's energy security strategy
- Adoption of environmental friendly fuels that will help India conform to stricter emission norms
- Support farmers by developing an alternative usage for sugarcane and byproducts
- Improving rural employment and livelihood opportunities
- Improve utilization of wastelands and other unproductive land for cultivation of other bio-fuel feed stocks

Food security is a national priority and therefore India cannot afford to use (or promote) either cereal grains for ethanol production or edible oil for bio-diesel production as is done in other bio-fuel promoting countries (E.U., U.S., etc). India is one of the leading importers of vegetable oil in the world as demand outstrips domestic production. Furthermore, food grain like wheat, corn and coarse cereals production has been relatively stagnant in recent years forcing India to import wheat in 2006 after being an exporter for several years. Recent rising global prices for cereals and vegetable oils have been a major concern for the government, which does not want to further aggravate the crisis by promoting the use of food commodities for bio-fuels.

India is one of the world's leading producers of sugarcane and sugar, and most rectified spirits (alcohol) and ethanol are derived from sugar molasses, a byproduct of the sugar industry. Bio-diesel production efforts are focused on using non-edible oils from plants (*Jatropha curcus*, *Pongamia pinnata* and other tree borne oilseeds) and animal fats like fish oil. However, the government does not want the 'new' bio-fuel feedstock crops to compete with food crops for scarce agricultural land. Hence, the focus is to encourage the use of wastelands and other unproductive land for the cultivation of these relatively hardy bio-fuel crops. An estimated 55.3 million hectares are considered wastelands/barren lands in India, which could be brought into productive use by raising bio-diesel crops. As bio-fuel crop production is highly labor intensive, its cultivation would also provide additional employment to the vast rural population in India. Nevertheless, bio-diesel production from non-edible oilseeds, etc. is still in the research and development stage in India.

India's evolving strategy for promoting production and use of bio-fuel is two pronged:

- Promote the use of ethanol derived from sugar molasses for blending with gasoline
- Promote the use of non-edible oils for blending with diesel.

Ethanol Policy

The commercial production and marketing of ethanol-blended gasoline started in January 2003, when the Ministry of Petroleum and Natural Gas launched the first phase of the ethanol blended petrol (EBP) program that mandated blending of five percent ethanol in gasoline in nine states (out of a total of 29) and four union territories (UT) (out of a total of 6). The program was implemented only partially as ethanol was not consistently made available by the sugar industry to the oil companies due to a decline in sugarcane/sugar production. Ethanol supplies to the oil companies came to a virtual halt by September 2004. The recovery in sugar and molasses production during Indian sugar marketing year (MY) 2005/06 (October/September) resulted in a renewed interest in the ethanol program. In August 2005, the government brokered an agreement between the sugar industry and oil marketing companies to enable the purchase of ethanol, and the ethanol program restarted in a limited number of designated states and union territories.

With a strong resurgence in sugarcane/sugar production in MY 2006/07, the GOI announced in September 2006 the second phase of the EBP program that mandates five percent blending of ethanol with petrol (gasoline) subject to commercial viability in 20 states and eight Union territories with effect from November 2006. This would require about 550 million liters of ethanol during MY 2006/07, all of which has to be sourced domestically. Oil marketing companies floated open tenders for ethanol from the domestic producers. Subsequently, bids have been finalized and the EBP program has started in about 10 states. The EBP program was not implemented in other states due to high state taxes, excise duties, and levies, which makes the ethanol supply for blending commercially unviable. Once the second stage of the ethanol program extends to all target states, the government plans to launch the third stage wherein the ethanol blend ratio will be raised from five percent to ten percent.

Efforts to produce ethanol from other feed stocks like sweet sorghum, sugarbeet, sweet potatoes, etc. are at an experimental stage. The government also supports research conducted by non-profit organizations for identifying sweet sorghum cultivars suitable for semi-arid wasteland that can be used for ethanol production. A few research organizations have also initiated research for the utilization of crop cellulose waste for the production of ethanol.

There are no direct financial assistance or tax incentives for the production or marketing of ethanol or ethanol-blended petrol. However, the GOI offers subsidized loans (2 percent

below market rate) from the government–held Sugarcane Development Fund for up to a maximum of 40 percent of the project cost to sugar mills for setting up an ethanol production unit. Government does provide financial support for research and development on ethanol production undertaken by public and private sector organizations.

Bio-diesel Policy

In April 2003, the GOI launched a National Mission on Bio-diesel that identified *Jatropha curcus* as the most suitable tree-borne oilseed for the production of bio-diesel, and focused on promoting plantations of *Jatropha* on wastelands. The GOI's Planning Commission set an ambitious target of 11.2 million hectares to be planted with *Jatropha* by 2012, in order to produce sufficient bio-diesel to blend at 20 percent with petro-diesel. The Ministry of Rural Development was designated as the nodal ministry for the mission that envisages a demonstration phase of targeting 400,000 hectares under *Jatropha* planting over a five-year period. The demonstration phase will involve identifying suitable *Jatropha* cultivars, developing nurseries and providing subsidized planting material to farmers in various agro-climatic regions. Several state governments and official entities have been proactive in the adoption of the bio-diesel program, but with varying degrees of success. Besides the state governments, Indian Railways has launched an ambitious *Jatropha* plantation project on railway land adjoining the railway tracks. The demonstration phase will be followed by a self-sustaining expansion of *Jatropha* cultivation on 11.2 million hectares aimed at achieving the planning commission's bio-diesel production 10 percent blending target by 2012.

In October 2005, the Ministry of Petroleum and Natural Gas announced a "bio-diesel purchase policy," by which oil companies would purchase bio-diesel and blend it with high-speed diesel (HSD) at a five percent blending ratio. This would take place in 20 procurement centers spread across major producing areas in the country, effective January 2006. The bio-diesel will be procured at a pre-determined price (reviewed every six months by the ministry), which currently is Rs. 26.5 (65 U.S. cents) per liter. Market sources report that the cost of production of bio-diesel is 40 to 80 percent higher than this purchase price, resulting in no sales of bio-diesel at the centers. The government does not provide any direct financial assistance for the production of bio-diesel or for investment on plant and necessary facilities. Although the central government has exempted bio-diesel of the central excise tax, most state governments do not provide any excise or sales tax exemptions for bio-diesel or bio-diesel blended diesel.

Ministries Involved in the Bio-fuels Sector

There are several ministries involved in policymaking, regulation, promotion, and development of bio-fuels sector in India. The Ministry of New and Renewable Energy has the overall policymaking role for promoting development of bio-fuels. They also support research and technology development for production of bio-fuels. The Ministry of Petroleum and Natural Gas has the responsibility of marketing bio-fuels as well as development and implementation of pricing and procurement policy. The Ministry of Agriculture handles research and development for production of bio-fuel feedstock crops (sugarcane/sweet sorghum, etc for ethanol; and *Jatropha* and other non-edible oilseed species for bio-diesel). The Ministry of Rural Development has responsibility over promotion of *Jatropha* plantations in the wastelands. The Ministry of Science and Technology supports research in bio-fuels crops, especially in the area of biotechnology.

New Bio-fuel Policy on the Way

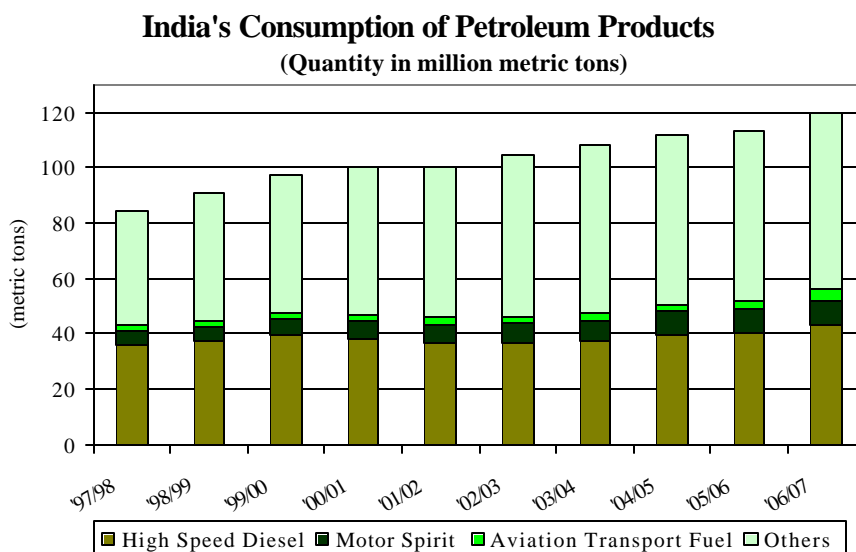
A National Bio-fuel Policy is under formulation in the Ministry of New and Renewable Energy that outlines the approach, strategy, targets, fiscal and financial incentives on various

aspects of bio-fuel development, purchase policy, research & development (R&D), capacity building and legislation for enabling the use of bio-fuels. The new policy, still in the draft stage, envisages 10 percent blending of petrol and diesel with bio-fuels by 2012, and recommends minimum support prices for bio-fuel crops like Jatropha and other non-edible oilseeds. The new policy also proposes setting up a National Bio-fuel Development Board. The National Bio-fuel Policy would require approval by the parliament, which may take some time.

BIO-FUEL MARKET CONDITIONS

Motor Vehicle Petroleum Based Energy Market

India's energy demand by the transport sector is expected to grow by 6-8 percent per annum to achieve the GOI's target economic growth rate of 9 percent per annum for the 11th five-year plan (2007-2012). Petroleum products consumption is likely to rise from 113 million tons in Indian fiscal year (IFY) 2005/06 (April/March) to 135 million tons by the end of the 11th plan in 2011/12¹. India's petroleum based energy demand by the transport sector is the fastest growing energy consuming sector, and will continue to grow steadily in the coming years due to strong growth in the economy, rise in income levels, and an increase in availability and choice of vehicles.



Over 80 percent of passengers and about 60 percent of freight are transported by road in India. With the rise in incomes, there is increasing dependence on personal modes of transport such as cars and two wheelers. The latest available statistics² indicate that the total number of vehicles has increased more than threefold, from 21.3 million (including 14.2 million 2-wheelers) in 1991 to 72.7 million (including 51.9 million 2-wheelers) in 2004. Market sources report that the motor vehicle population is projected to grow by 12-15 percent over the next few years. This growth is expected to fuel five to eight percent growth in the demand for petroleum-based energy in India. Diesel and gasoline (petrol) contribute to 98 percent of the energy consumed in the transport sector.

¹ Source: Petroleum Planning and Analysis Cell, Ministry of Petroleum and Natural Gas, GOI

² Source: Ministry of Surface Transport, Government of India

The current growth in transport activity is a significant environmental concern given the fact that India's carbon emissions are growing at an average of 3.2 percent per annum, making it one of the top five global contributors to carbon emissions. The GOI transport policy targets Euro-III and Euro IV norms for the vehicles, which will require clean quality fuel that can be achieved through adoption of bio-fuels.

An efficient implementation of India's bio-fuel program will likely go a long way in reducing India's growing expenditures on crude oil and other petroleum product imports and address environmental concerns.

Can India Meet Policy Targets?

Ethanol Policy

India has about 300 distilleries, with a production capacity of about 3.2 billion liters of rectified spirits (alcohol) per year, almost all of which is produced from sugar molasses, and not from sugar juice, food grains or other cellulose feed stocks. The government's ethanol policy has led to over 110 distilleries modifying their plants to include ethanol production with the total ethanol production capacity of 1.3 billion liters per year. The current ethanol production capacity is enough to meet the estimated ethanol demand for the five percent blending ratio with gasoline. However, for a ten percent EBP program, current ethanol production capacities will need to be enhanced by expanding the number and capacities of molasses-based ethanol plants, and by setting up sugarcane juice-based ethanol production units. Although some oil companies are pushing for imports of ethanol at concessional duty for blending with petrol, it is highly unlikely to get government approval.

Table 1: India's Ethanol Requirement for 5 Percent Blending with Gasoline
(Figures in million liters)

Item	2006/07	2007/08	2008/09
Molasses production (million tons)	11.21	12.15	12.15
Potential alcohol production ³	2690	2916	2916
Demand for industrial use, potable alcohol, etc.	1477	1515	1550
Ethanol demand for 5 percent blend in gasoline for the country (figure in parentheses is demand at 10 percent blend)	682 (1364)	741 (1482)	808 (1616)
Total demand	2159 (2841)	2256 (2997)	2358 (3166)

Source⁴: Industry sources.

Bio-diesel Policy

There has been negligible production of bio-diesel in India as the progress of *Jatropha* plantations has been very slow to date. For the estimated consumption of 43 million tons of petro-diesel (HSD) in Indian FY 2006/07, approximately 2.2 million tons of bio-diesel will be required for a 5 percent blend, which can be produced from about 2.1 to 2.5 million hectares of *Jatropha* plantation in full production. The total *Jatropha* plantation in the

³ "Potential alcohol production" assumes all molasses is converted into alcohol, and there is no diversion for feed, other uses, and wastes. The average production of alcohol per ton of molasses is estimated at 240 liters.

⁴ Official statistics on the production and distribution of molasses, alcohol, and ethanol are not available. This table was assembled from industry sources estimates.

country is currently estimated at only around 400,000 hectares, of which about 70-80 percent are new plantation (1-3 year old) that are not yet into production. Consequently, there are insufficient *Jatropha* seeds to crush for bio-diesel production units for sale to oil marketing companies for blending purposes. Although India's bio-diesel processing capacity is currently estimated at 100,000 metric tons per annum, most bio-diesel units are closed during most of the year.

With the petro-diesel (HSD) demand for 2011/12 estimated at 48.5 million tons⁵, approximately 4.9 million tons of bio-diesel is needed for achieving the target 10 percent bio-diesel blending by 2011/12. Realization of 4.9 million tons of bio-diesel from *Jatropha* requires 5.0 to 6.0 million hectares of mature plantations in full production, which seems not feasible at this stage.

Industry sources expect the bio-diesel blending program to gather momentum in the next 4-5 years, with expected improved availability of *Jatropha* seeds as more areas are brought under plantation and as the plantations mature. Government and industry sources are overly optimistic about *Jatropha* plantation prospects with estimates for expected area being projected from 7.0 million hectares to 11.2 million hectares. The new *Jatropha* plantations are expected to come into maturity in the next 3-4 years. However, it is too early to say if the program will fully succeed given following problems:

- Lack of good quality planting material and management practices leading to poor seed yields (vary from 1 to 5 kg per plant per annum).
- Lack of bank financing for *Jatropha* plantations, which is discouraging growers since the crop has a long gestation period compared to annual crops.
- Ownership issues with community or government-owned wastelands.
- Monoculture practices which raise environmental concerns about the impact on soil health and the water table.

Current Production Scenario

Ethanol Production

The progress of the second phase of the EBP launched in November 2006 has been slow as ethanol usage is subject to commercial viability. Due to a plethora of high taxes and levies, ethanol blending is commercially unviable in several states, particularly sugar/alcohol deficit states. Most states have a labyrinth of rules and regulations (inter-state movement, high excise duties, storage charges, etc) to control alcohol for the potable liquor industry, and these regulations are equally applicable on ethanol for blending purposes. Consequently, ethanol for blending with petrol in Indian sugar marketing year 2006/07 (October/September) is estimated to reach just 250 million liters against the target of 550 million liters.

The GOI is actively engaged in working with state governments to resolve the underlying issues constraining adoption of the EBP program in other states and hopes to resolve them in the next few months. Assuming the EBP program is effectively implemented in all target states, ethanol for blending with petrol in MY 2007/08 is forecast at 550 million liters.

⁵ Source: Petroleum Planning and Analysis Cell, Ministry of Petroleum and Natural gas, GOI

Table 2: Production & Distribution of Molasses, Alcohol and Ethanol

(Sugar marketing Year (October/September))			
Item	2005/06	2006/07	2007/08 (Forecast)
Total Molasses Production (million tons)	8.55	11.21	12.15
Molasses for:			
Alcohol Production (million tons)	7.45	9.21	10.05
Other Use (feed, other uses & waste) (million tons)	1.10	2.00	2.10
Total Alcohol Production (million liters)	1790	2200	2400
Opening Stocks (million liters)	483	730	1120
Imports (million liters)	0	0	0
Alcohol for:			
Industrial Use (million liters)	619	631	655
Potable Liquor (million liters)	747	765	780
Ethanol for Blended Gasoline (million liters)	100	250	550
Other Use (million liters)	77	84	85
Carryover Stocks of Alcohol (million liters)	730	1120	1450

Source: FAS/New Delhi estimates based on information from Industry sources.

Petroleum companies are currently buying fuel grade ethanol from the sugar companies at rates ranging between Rs. 19.0 to 21.5 (47-53 cents) per liter. The cost of production of ethanol depends on the price of molasses, which fluctuates widely during the season. Industry sources estimate the average cost of production of ethanol to range from Rs. 16 to 18 (40-44 cents) per liter at current molasses prices. With expected bumper sugar and molasses production and consequent depressed molasses prices in the remaining MY 2006/07 and MY 2007/08, the cost of production of ethanol is expected to remain low and the sugar industry will be encouraged to supply ethanol for the EBP program.

Table 3: Production and Distribution of Sugarcane for Alternate Use (million tons)

Sugar marketing year (October-September)			
Item	2005/06	2006/07	2007/08 (Forecast)
Total Sugarcane Production	281.17	315.53	325.00
Sugarcane Utilization for:			
Mill Sugar ⁶	188.67	250.00	260.00
Khandsari/Gur ⁷	58.76	40.53	37.00
Seed, Feed, and Other Use	33.74	25.00	28.00

Source: Industry and government sources.

The Indian sugar industry crushes about 70-80 percent of the sugarcane used for sugar production, with the balance cane used for local sweeteners (khandsari and gur), seed, feed and cane juice, chewing and waste. In years of bumper sugarcane production, the sugar industry may prefer to produce ethanol directly from sugarcane juice to avoid the sugar market glut and declining prices. There is considerable scope for increasing sugarcane yields from the existing acreage, which can also offer additional sugarcane for production of

⁶ Molasses is a byproduct of mill sugar.

⁷ "Khandsari" is a low-recovery centrifugal sugar prepared by open-pan evaporation. Gur is a crude non-centrifugal sugar in lump form prepared by open-pan evaporation.

ethanol directly from juice. However, sugarcane production is water intensive and India's irrigation water supplies are increasingly limited.

Since the production of ethanol directly from sugarcane juice requires additional investments for technological modifications, most mills are closely assessing the market demand for ethanol and the efficacy of the government's ethanol policy before making the necessary investments. Reports suggest that two sugar mills have tried production of ethanol from sugarcane juice on an experimental basis, but are not doing any commercial production. There are currently no foreign players in the Indian sugar (and associated distillery) industry, as it is one of the most controlled agribusiness-sectors in the country (see policy section of Sugar Annual IN7035). However, the increased consumption of ethanol by oil companies, and the production of ethanol from sugarcane juice by local companies may attract foreign investment in the future.

Bio-Diesel Production

India's commercial production of bio-diesel is almost negligible. Due to high edible oil prices⁸ in the domestic market, it is not economically feasible to produce bio-diesel from vegetable oils. The small quantities of *Jatropha* and other non-edible oilseeds procured by traders are mostly crushed for oil, which is used for lighting lamps and other non-edible uses.

A few entrepreneurs have established small plants (less than one ton per day) to extract bio-diesel, but the product is mostly sold in the unorganized sector, mainly for operating irrigation pumps and other agricultural uses. There are about 17-18 plants with a one to ten ton per day capacity that produce bio-diesel from edible oil waste (unusable oil fractions), animal fat and non-edible oil. Automobile and transport companies mostly buy their bio-diesel for R&D trial on their vehicles. The Indian Railways and other state-owned transport companies have set up experimental trial projects for bio-diesel production. Reliable production information on India's bio-diesel is not available, and a rough estimate can range anywhere between 200 to 500 tons per year.

Small and scattered *Jatropha* plantations at a large distance from bio-diesel producing units, and lack of efficient marketing channels result in high inefficiencies leading to high production costs. Industry sources estimate current bio-diesel production cost at anywhere between Rs. 35 to 45 (86 cents to \$1.11) per liter, much above the government advised purchase price (Rs. 26.5 per liter). Consequently, prices for the small quantities of bio-diesel purchased by automobile companies range between Rs. 50 to 60 per liter for experimental trials of their vehicles.

Many Indian corporations are venturing into bio-diesel production by initiating a memorandum of understanding with state governments to establish *Jatropha* plantations on government wasteland or contract farming with small and medium farmers. Several state governments have announced policies to encourage *Jatropha* cultivation, setting up bio-diesel plants and supply chains in their respective states. New local and foreign collaborations for production of bio-diesel are coming in some states, which could boost the country's bio-diesel production capacity to 1.0 million tons per annum in next two to three years.

Although the nascent bio-diesel industry has been lobbying the government to allow duty concessions on imports of vegetable oils (palm, soybean, etc) and their derivatives for

⁸ Due to domestic shortages and high import duties (45-90 percent) on vegetable oils.

captive consumption for biofuel production at their units, there are no positive indications for approval of such proposals.

Except for some experimental trials by research organizations, there is no commercial production of bio-fuels from other biomass.

Bio-fuel Import Regime

Although there are no quantitative or SPS restrictions on imports of bio-fuels, high duties on tariff lines associated with bio-fuels (see below) appear to make imports economically unviable. Given that the GOI's focus is on developing domestic bio-fuel production capabilities, there are no duty concessions for imports of bio-fuels or imports of feedstocks (maize, oilseed, and vegetable oils like palm oil etc) for production of bio-fuels. India does not export ethanol or other bio-fuels, nor does the government provide any financial assistance for exports of these products.

Table 4: India's existing import duty on tariff lines associated with bio-fuels

ITC HS Tariff Number	Total Import Duty (Percent ad valorem on CIF value)
2207.10 Ethanol denatured	198.96
2207.20 Ethanol undenatured	59.08
3824.90 Chemical products not elsewhere specified	36.82

Bio-fuel Trade

India has neither imported nor exported ethanol or other bio-fuels for fuel purposes. During years of low sugar production (MY 2003/2004 and MY 2004/2005), and the consequent molasses and alcohol shortages, India imported some alcohol, mainly for industrial use and potable liquor production.

Impact of Bio-fuels Feedstock on Food, Feed, and Trade

Production of ethanol for fuel purposes under the second phase of the EBP program has not been significant enough to impact production and trade of sugar for food and industrial use. Due to the recent bumper production of sugarcane/sugar, and consequently sugar molasses, fuel ethanol production has not impacted availability of molasses for feed and alcohol for other uses (industrial, potable liquor, etc.). When Phase III of the ethanol program is implemented, it may impact the availability of sugar molasses for use in cattle feed, and the use of alcohol for industrial and potable liquor. However, it is too early to provide a quantifiable estimate of that effect.

India does not produce any ethanol from cereal grains (maize etc), and thus, there has been no impact of the ethanol program on the domestic market for food, feed and trade of cereal grains and its byproducts. Similarly, as the bio-diesel program is based on the use of non-edible vegetable oil, bio-diesel production will not have an impact on feed, food, and trade of oilseeds, vegetable oils and other edible products.

BIO-ENERGY USE IN OTHER AREAS

Biomass-based fuels support over 80 percent of home energy use (mostly for cooking and heating) in India, and consist of agricultural byproducts (crop residues, cow dung, etc) and gathered fuel wood. Biomass is also used as industrial fuel by small and cottage industries in

the organized sector. Total biomass energy in the household sector and unorganized sector accounts for almost one-third of India's total primary energy consumption needs (540 to 550 million tons oil equivalent in 2006/07)⁹.

India launched a National Project on Biogas Development in 1981-82 with the objective of providing utilizing cattle manure and human waste for fuel¹⁰ for rural households along with manure for agricultural fields. Currently, there are about 3.9 million family type biogas plants, against an estimated target of 12 million biogas plants in the country. However, evaluation studies show that only about half of the installed plants are operational.

Biomass resources like crop residues, agro-industrial waste, fuel wood, etc., are also used for generation of electricity through biomass gasification. Some industries (sugar, paper pulp, rice mills, etc) are using the industrial waste for cogeneration of electricity and heat energy to meet their total/partial requirement, and/or sale of excess power to distribution grids. Industrial co-generation did not receive much attention in the past as cheap electricity and fuel were abundantly available. With the increasing electricity cost and unreliable supply of electricity from the public distribution grids, several industries are increasingly getting into co-generation. Currently, most of the cogeneration activity is sugarcane bagasse¹¹ based. However, there is significant potential in breweries, distilleries, rice mills, textile mills, fertilizer plants, etc. for undertaking cogeneration. The GOI has initiated several programs for promoting renewable energy sources including biomass based energy sources, details of which can be accessed from their website <http://mnes.nic.in/frame.htm?majorprog.htm>

Table 5: India's Biomass-based Commercial Energy Potential and Achievement

S No:	Source/System	Est. Potential (By 2032)	Achievement (By March 2007)
1	Bio Power (Agric Residues & Plantations)	61,000 MW	524.8 MW/1
2	Sugarcane bagasse based Cogeneration	5,000 MW	615.8 MW
3	Non-bagasse based biomass co-generation/2	-	45.8 MW
4	Biomass Gasifier	-	86.5 MW
5	Energy Recovery from Waste	-	63.2 MW
6	Family Type Biogas Plants	1.2 million	3.9 million

Notes: /1 – Megawatt

/2 – Cogeneration by other agro-industries like rice mills, pulp, etc.

Source: Ministry of New and Renewable Energy, GOI.

⁹ Source: Planning Commission (GOI) report on "Integrated Energy Policy", August 2006.

¹⁰ Biogas has 50 to 70 percent methane gas that is used for cooking and lighting purpose.

¹¹ Bagasse – crop waste after crushing of the sugarcane.