

Agricultural Biotechnology-based (Green) Enterprise Development for Sustainable Rural Livelihood and Economic Growth:

Opportunities with Biofuel in Select Asian Economies

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Structure of the Presentation

- * Emerging Context of Biofuels
- * Green Enterprise: Biobased Economy
- * Biofuels in Asia: **First Round** China; India; Thailand; Philippines; South Korea and Malaysia.
- * Global Promotion and Financial Incentives
- * WTO, Standards and Other Trade Related Issues
- * Policy Recommendations

Emerging Context

- **Coming over the Stigma**

Biofuel being less competitive than their counterparts from the crude oil category and being very expensive and inconsistent in the quality and supply.

- **Crude Oil Price**

Continuous increase in crude oil prices, their adverse environmental impact, and international commitments for Kyoto Protocol have motivated a growing number of countries to implement “**agro-energy**” policies. Energy Equivalence (1 litre of petrol = 1.5 litres of ethanol).

- **Demonstration Effect/Kyoto Commitments**

Brazil and the United States are the major producer of biofuel having share of 70 per cent. Recently EU has also launched a major programme on biofuels enumerated in the EU Biofuels Directive for development and imports of biofuels.

- **Hope for WTO (!) and Rural Development**

UN Foundation; in case of Brazil it is also being considered as a prime policy prescription for rural development.

Emerging Context

- Growing application of new technologies in making biofuels:
 - cost effective;
 - consistent in quality;
 - available for large commercial supply;
 - expansion of technology frontier and
 - advanced techniques to produce biofuel from cellulose waste and biomass production
- Now the focus is on less expensive and effective raw material and production techniques for producing biofuels.
- Though ethanol production in the period 2000 to 2005 has more than doubled still it is just 2 per cent of the world's petrol supply. In the same period the biodiesel consumption has gone up more than four times still it is just 0.2 per cent of diesel consumption.
- This indicates that much more efforts are required to **enable producers** for adopting new technologies for a **large-scale supply** of biofuel.

Early Mover Advantage

- Brazil which moved amongst the first few countries in this area has mastered the **art of cost management**.
- EU (15), US and Canada would require 30 to 70 per cent of their current **crop area** to replace 10 per cent of their transport fuel while Brazil would need only 3 per cent. (UNCTAD 2005)
- Being on sugarcane for ethanol production the cost of ethanol is least in Brazil and it has largest **fleet of vehicles** running on ethanol – 4 Million and almost 1million as flexi fuel vehicles.
- Brazil has 7 million **direct jobs** in rural areas and 3.5 indirect jobs in urban to semi-urban areas.
- **Strict Environmental Preservation Guidelines** in Brazil. 70 % Sao Paulo
 - Standards for fertilizers/pesticide usage
 - Development of Disease resistant varieties
 - Regulations on green cane harvesting
 - Guidelines for industrial processes linked with alcohol

Conceptual Framework on Green Enterprise Development

- Biobased economy is expanding fast. USDA for voluntary biobased products labeling program for the biobased products to provide them a distinct identity.
- “Commercial or industrial products (other than food or feed) that are composed in whole or in significant part of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials.” Farm Security and Rural Investment Act, 2002, US.
- In recent past, the scope for agriculture biotechnology based bioproduct development has expanded many folds.
- **At the institutional level**, it covers issues like developing **synergistic mechanisms for multi-state/multi-institutional collaboration** and to build strong regional and national support.
- **At the policy level**, it raises issues ranging from the role of genomics in developing the emerging bioenergy and bioproduct economy, to the involvement of private institutions and economic development activities.

Contours of Green Enterprises

- In developing countries, bio-product based agro-revolution offers a new development paradigm which is **attracting large enterprises** transforming the dynamics completely.
- Interests from major investors, corporations, private equity funds and hedge funds are **changing the scale and magnitude** of the green enterprises.
- In biofuels, larger plants have lower costs of production and have greater economies of scale, which make them **more competitive than** the cooperatives.
- **Agriculture giant** Archer-Daniels-Midland Company (Singapore and Malaysia) basically dealing in grains entered in the ethanol production and now has a share of almost 25 % of the US market. **Rest with small time producers** like farmers' cooperatives.
- Oil-refining firms are establishing backward linkages
- The contours of the green enterprises would be defined also as part of the **path dependency model** in which firms would prefer to do what they are already doing for biofuel production

Emerging Contours of Green Enterprise for Biofuels Production

Firms Establishing Forward Linkages like

Archer Daniels- Midland Company dealing in grains enters in bioethanol production own 25 per cent of US bioethanol market).

Also in this category are the Farmers' cooperatives which are also entering in the ethanol production

Source the feedstock from existing sources.

Source from members of the cooperatives.

Firms Finding Backward Linkages like many oil firms entering in the Bioenergy crop production to retain their fuel share in the market.

There are firms, which are switching over their product profile to produce ethanol with the existing production capacities for instance firms producing polypropylene in India are abandoning current products and upgrading their plants for ethanol production.

Source to be located through cooperatives or open market etc.

Entry at the Middle of Value Chain like several new starts up firms for instance Green Sprit Fuel in Europe has entered in biofuel production.

Source feedstock from dealers in Futures market. This firm has agreement with Euronext.Liffe.

Source: Prepared by the author

Emergence of Flex-Fuel Vehicles

- In economies, the industry supported the idea of biofuel based vehicles and advanced the technology frontiers. For instance **Honda automobile** company from Japan plans to launch 100 per cent ethanol based models in Brazil by the end of 2006.
- The Research Institute of Innovative Technology for the Earth (RITE) of Honda Company announced production of ethanol, based on soft biomass including cellulose and hemicellulose found in leaves and stalks of plants, such as rice.
- Similarly in the US market, Japanese automaker would focus on diesel and hydrogen powered vehicles as alternatives to gasoline models instead of Flexi Fuel Vehicles (FFVs).
- Another Japanese company, Toyota Motors has also announced launching of FFVs in early 2007 in Brazil.
- Peugeot SA in France has announced to support government's efforts to promote the use of FFVs, and will introduce in 2007, two models able to run on gasoline as well as E85, a biofuel consisting of 85% ethanol. Peugeot already produces flex-fuel versions of its cars in Brazil, which represent 80% of its total sales in the country. The Peugeot 307 and the Citroen C4 will be offered with flex-fuel motors from mid-2007 throughout Europe, a company spokesman said.

Emergence of Flex-Fuel Vehicles

- In 1992, General Motors introduced “Flex-Fuel” technology in the North American market and at present, more than 1.5 million such vehicles exist in the US.
- In Brazil, studies for the application of this technology were started at Bosch in 1994, considering the possibility of "Flex-Fuel" vehicles replacing the exclusively alcohol vehicles. In August 2002, the Brazilian Government announced IPI tax reclassification for vehicles provided an assurance that “Flex-Fuel” vehicles would receive the same fiscal treatment as alcohol vehicles. This gave a major boost to the industry.
- Ford introduced a “Flex-Fuel” prototype in 2002 and “Flex-Fuel” Fiesta in mid-2003. This encouraged the vehicle manufacturers to consider the possibilities of turning Brazil into a production center for “Flex-Fuel” vehicles, both for the domestic market and for exports.

Source: Based on Alfred Szwarc (2006) The flex-fuel vehicle option, UNICA; Reuters (2006). Toyota eyes Growth in Brazil through FFV Plan, September 20; Manila Bulletin (2006). Carmaker Honda produces Ethanol from Novel Feed Stock, September 20, Manila.

Biofuel in Asia

- * High oil import bill in the Asia Pacific region led to launching of programmes set for promoting production of biofuel crops.

- **Advantages of biofuel production**
 - Rural livelihood security
 - Production of feed crops
 - Employment Generation

- Traditional Sources of Supply: Corn; Soybean; Coconut; Jatropha and Palm.

- Cost and Conflicting Public Policy Objectives
 - Impact on prices of edible products
 - Food Security Concerns
 - Implications on other (more than 30) agro industries like poultry; starch manufacturers, livestock feed and for snacks units etc.

- * **Consolidated Entry with Second Generation Fuels**

Cost of Production for Biofuels: Economic Lessons

Activities	Rate (Rs. / Kg)	Quantity (Kg)	Cost (Rs.)
Seed	5.00	3.28	16.40
Cost of collection & oil extraction	2.36	1.05	2.48
Less cake produced	1.00	2.23	(-) 2.23
Trans-esterification	6.67	1.00	6.67
Less cost of glycerin produced	40 to 60	0.095	(-) 3.8 to 5.7
Cost of Bio-diesel per kg			19.52 to 17.62
Cost of Bio-diesel per litre (Sp. Gravity 0.85)			16.59 to 14.98

Source: Planning Commission Report on Bio-fuels (2003).

Biofuel In India

- India has set up a National Biofuel Development Board (NBDB), headed by the Prime Minister.
- It was decided to make 5 per cent ethanol blending in petrol mandatory in select nine states in 2003 January. The plan, however, ran into trouble in 2004 due to a poor harvest of sugarcane and subsequent shortage in ethanol supply. Subsequently, as a result the government made ethanol doping conditional, highlighting the need for an assured supply of ethanol.
- **National Oilseed and Vegetable Oil Development Board (NOVOD)** has launched several support programmes for biofuels. It has developed quality planting material, improved jatropha seeds having oil contents up to 1.5 times of ordinary seeds etc.
- The target area for jatropha plantation identified by NOVOD is **1719 hectares** in various states. It also provides support for development of improved oil expellers.
- **'New and Renewable Energy Policy Statement' 2005**, from the Ministry of Non Conventional Energy Sources -energy sector a net foreign exchange earner by 2021-22.

Biofuel In India

- Allocations are being made of US\$ 10.7 million to support the cultivation of jatropha.
- Apart from this, the government is also providing support to 9 states for production of jatropha seeds. The estimation is that by 2009 India would have 3.1 million hectares of jatropha plantations.
- However, with the growing emphasis on jatropha plantation for biofuel production, the prices of jatropha seeds have gone up from Rs. 6 per kg while now it has gone upto Rs. 26 per kg.
- Department of Biotechnology (DBT) of Government of India has also launched the Mission programme on Bioenergy and Biofuel and a Micro-mission Project for developing quality planting material of Jatropha.
- Madurai Kamraj University DBT supported project is looking into the possibilities of constructing novel recombinant cellulolytic bacteria for ethanol production from the cellulosic material
- Central Salt and Marine Chemical Research Institute (CSMCRI), Bhavnagar and the Daimler Chrysler (DC) India has signed an agreement with CSMCRI to develop biofuel for their C-Class Mercedes- Benz.

Independent Initiatives launched by Select States in India

Proactive States	Strategy and Objective	Institutional Structure
Chattisgarh	20,000 hectare under jatropha. Clear plantation guidelines for private sector	Biofuel Development Authority
Andhra Pradesh	728,000 hectare land under jatropha	Separate Department to monitor and guide.
Tamil Nadu	Policy objective is to derive full diesel requirements from Jatropha.	

IBSA and COMESA to Promote use of Ethanol and Biodiesel

- The recently held IBSA trilateral announced joining up of the *International Ethanol Initiative* launched by Brazil.
- Also, agreed to boost cooperation on energy, including the development of alternatives to oil and possibly nuclear power.
- Indian state run Bharat Petroleum Corporation Limited is all set to buy stakes in Brazilian sugarcane projects so secure ethanol imports.
- There is also an interest in Common Market for Eastern and Southern Africa (COMESA) led by Mauritius to come up with a proposal of feed production for ethanol and biodiesel.
- India is likely to sign a Comprehensive Economic Partnership Agreement (CEPA) with COMESA, which includes countries like Egypt, Zimbabwe, Seychelles, Madagascar, Uganda, Kenya and Libya. India would help transfer the techniques for jatropha cultivation.

Emerging Biofuel Firms in India and their Operations

Firms	Area/Interest	Investment
D1 Mohan Bio Oil Limited	10,000 hectare of jatropha production in Tamil Nadu	
Bajaj Hindustan	Exports of Ethanol 5 Million liters	Investment of \$500 Million
Reliance Industries Limited	200 acres of Land at Kakinada, Andhra Pradesh	
Emami	Biodiesel Plant at Haldia, West Bengal	Rs. 15 billion
Godrej Agrovet	Gujrat, Mizoram	Rs. 5 billion
British Petroleum	TERI Jatropha Project	Rs. 9.4 billion
Vinod Khosla	Praj Industries Biofuel project	Rs. 117 crores.

Source: Collected by Author based on several sources.

Biofuel In Thailand

- National Biofuel Committee (NBC) to lay out a roadmap for biofuel production.
- The Ministries of Finance, Agriculture, Energy, Industry and Science and Technology support the NBC in its endeavours apart from many universities. The statutory requirement for mixing up for gasohol is gasoline with 10 per cent ethanol.
- The government has provided tax breaks for sugar industry to produce ethanol.
- The target is to achieve ethanol production capacity of 4.11 million liters a day by end of 2006 and biodiesel output at 8.5 million liters by 2012. Thailand, the world's top cassava producer, already converts some of the vegetable into fuel ethanol.
- Thailand's Foreign Minister while visiting Brazil has invited Brazilian firms to invest in Thailand and transfer technology for the production of bioethanol. *The goal for the consumption of biofuel is 1600 Mtoe by 2011 that is 3 and 8.5 million liters per day of ethanol and biodiesel respectively.

Biofuel In Thailand

- In Thailand, the goal for the consumption of biofuel is 1600 Mtoe by 2011 that is 3 and 8.5 million liters per day of ethanol and biodiesel respectively.
- In case of biodiesel, the blending of diesel with 10 per cent biodiesel by 2012 would be the target for which consumption of biodiesel required would be 8.5 million liters per day.
- The roadmap as being worked out by Thai authorities considers a time frame from 2005 to 2012.
- In these years the idea is to work on several fronts at the same time. In the period 2005-09 efforts would be made to plant 4 million rais of palm oil and invest for 1 million rais in the neighbor countries.
- In the initial year of this phase efforts are to be made to enhance the oil palm productivity from 2.7 to 3.3 ton /rai/ year. There is also a proposal to work on physic nut productivity and make it more rewarding for the growers.

Biodiesel Consumption and Sell Targets in Thailand

Year	Consumption (Mn. Lt/day)	Selling	Raw Material supply (Mn. rais/Year)
2005	0.03	0.6	0.26
2006	0.06	1.2	0.6
2007	0.36	7	0.67
2008	0.46	9	1.07
2009	0.76	15	1.4
2010	1.76	35	-
2011	3.96	79	-
2012	8.50	85	-

Biofuel In the Philippines

- * In Philippines, the debate on usage of biofuel has intensified over the years. The Senate Bill (SB No. 226) proposes to make it mandatory to use ethanol as 10 per cent blend to gasoline and biodiesel B1 from coconut as an additive to diesel.
- * It is estimated that the 5 per cent blend would save the country \$160 million while 10 per cent blend would save as much as \$354.
- * Two years from passage of the law, all fuels to be sold will contain ethanol blend. As part of the bill it is proposed to have Philippines Biofuels Board (PBB) created which will oversee production and use of alternative fuels.
- * Critics raise effect on prices of agriculture commodities such as sugar, which would go in as inputs for ethanol production.
- * Chamber of Automotive Manufactures of the Philippines Inc. (CAMPI) has also raised doubts about the technical viability of the ethanol mandate by the government.
- * **Government has launched a P 100 billion (US \$ 2 billion) infrastructure focused five year pump priming programme for promoting biodiesel production in North Luzon Super-region (NLS).**

Biofuel In the Philippines

- * **Land bank of the Philippines (LBP) loan of \$100 million from WB and \$150 Million from the Japan Bank for International Cooperation.**
- * Another incentive is classification of all investments in ethanol production and blending as “pioneering” or “preferred areas” of investment, which entitle them for financial incentives.
- * In the Philippines biodiesel is being produced with the help of coconut, which adversely affects the food security concerns of this country: Jatropha an option.
- * Chemrez Inc. has exported 500,000 litres of coconut based biodiesel to Germany and to other Asian markets including China, Taiwan, South Korea and Malaysia.
- * Oil Firm Flying V has invested US\$ 1 Million inside the ClarkSEZ.
- * Pioneer Hi-Bred Philippines Inc.: Drought resistant high oil content corn variety for ethanol production in an area of 2.5 million hectares. The area under corn cultivation in the Philippines is around 600,000 hectares.
- * This has prompted Ford to announce a major flex fuel production plant at Manila with the cost of P2bn.

Emerging Biofuel Firms in the Philippines and their Operations

Local Company	Foreign Collaborator	Nature and Objective of JV
Far East Biofuels LLC	-	US \$ 20 million to produce 150,000 litre a day of ethanol.
National Development Corporation, Manila	Bronzeoak, UK	San Carlos Bioenergy Plant.
PNOC Alternative Fuels Corporation	Samsung, South Korea	Jatropha based biodiesel production in 120,000 hectare costing P6 billion. South Korean partner to provide finances.
Philippine Coconut Authority (PCA)	Mitui and Co. Ltd. Toyo Engineering Corp. (TEC)	Biodiesel Production using coconut oil as feed stock from a site covering 600,000 hectares

Biofuel in China

Energy demand growing at 15 per cent annually and oil imports are growing at 30 per cent. China is now world's second largest consumer of energy and it constitutes 12 per cent of the global energy demand. Coal continues to be the main source of energy (65 per cent).

- In China, the government is promoting ethanol and is financing nuclear, hydroelectric and solar power, aiming to increase renewable energy sources from 7 percent currently to 15 percent by 2020.

The ethanol production has also expanded in a major way. In 2006, China exported 500,000 tones of ethanol. The export destination is mainly the United States.

- However, back at home China proposes to address enhanced fuel demand with the help of biofuels. According to the IMF China's car fleet will expand 267 vehicles per 1000 people by 2030 from currently less than 20 vehicles.
- Twenty-First Century Oil Strategy, a \$100 billion futuristic programme.
- As part of this, government is targeting to replace in next five years 5 per cent of total gasoline used for which nearly 5 million tones of ethanol would be required

Biofuel in China

- * Government subsidises production at four plants with a combined annual capacity of 1.02 million tonnes, Ethanol plants in Henan, Anhui, Jilin and Heilongjiang provinces.
- * Promote non-food stock crops for biofuel production: food security concerns Options are Cassava, Sweet Sorghum and agriculture residue.
- * Plant in Guangxi Zhuang autonomous region, based on Cassava plant by the end of 2007, which would be the fifth biofuel production plant in China.
- * This plant would have capacity of 200,000 tonnes per year (tpy) and would be managed by state-owned grain trader COFCO. _
- * Some companies with the help of national government are establishing biofuel production facilities in many other countries. One of such company has invested in Nigeria, about \$ 90 million for production 150,000 metric tonnes of cassava based bioethanol.

Biofuel in South Korea

Urge for renewable energy sources is rapidly expanding given the fuel prices.

2005

South Korea 2.2 per cent; Denmark 13.2; France 6.4

Generated 5.01 million tons of oil equivalent (TOEs) in reusable energy.

Plans to raise the ratio of reusable energy consumption to 5 percent by 2011 by focusing on development of gas hydrate deposits and the pursuit of alternative energies such as bio-diesel and hydrogen fuel cells.

South Korea, entirely dependent upon imports to meet its oil needs, is the world's fifth largest importer of oil.

Biofuel in South Korea

- * South Korea has recently legislated through a decree that all domestic diesel must have at least 0.5 per cent biodiesel content which is proposed to be increased to 5 per cent by 2008 for lighter vehicles and 20 per cent for heavy vehicles.
- * The South Korean Ministry of Environment (MOE) and Ministry of Commerce, Industry and Energy (MOCIE) began working on biodiesel in 2002 as one solution for environmental, global warming and energy supply issues.
- * Government gives tax waivers to clean fuel, people can expect to pay about 7 won less per liter of biodiesel compared to regular diesel.
- * Malaysian Palm Oil Board (MPOB) of Malaysia and Korean Institute of Energy Research (KIER) of South Korea. The raw diesel would come from Malaysia and would be researched on for the Korean environment and Korean engines.

Biofuel in South Korea

- * Ecosolution Co. Ltd of Korea and POIC Sabah Sdn Bhd It has invested US \$ 64 million (RM 236 million) at Sabah in Malaysia for biodiesel production. Ecosolution has decided to expand its production capacity to 500, 000 tonnes per year (tpy).
- * Ecosolution Co. Ltd. and Golden Hope together are producing 8000 barrels per day (bpd) of diesel of the total demand of 2.2 million bpd in South Korea.
- * This has led to an emerging series of cross investments by Malaysian companies in South Korea. Malaysian leader Golden Hope Plantations Bhd, which is building facilities in Malaysia and the Netherlands this month, announced plans to build a 150,000 tpy biodiesel plant in Yeosu with South Korea's H-Plus Bio Ltd.
- * Ecosolution is already marketing 40,000 tpy multi-feedstock plant in South Korea. The major multinational corporation Samsung has invested in the Philippines for jetropa based biodiesel production plant in collaboration with the Philippines National Oil Company (PNOC)

Biofuel and Biotech Convergence

Should Brazil be followed in Asia with different climatic conditions like droughts etc.

Which feedstock to be opted for without affecting FFF Concerns!!

Development of biofuels with the help of cellulosic biomass called Second Generation Fuels (SGF). This largely covers the fibrous, woody, and generally inedible portions of plant matter.

China: Search on for Second generation

India: Focus on Jatropha but this year major plan

South Korea: Capacity for SGF related biotech research

Thailand: Finding alternatives in First Generation Fuels (FGFs)/Brazil

Philippines: FGFs

Malyasia: Partnering with South Korea/Netherlands

Emerging Biofuel Firms in Malaysia and their Operations

Local Company	Foreign Collaborator	Nature and Objective of JV
Golden Hope Plantations, Bhd	H-Plus Bio Ltd., South Korea	Biodiesel production plant in South Korea to produce 150,000 tonnes of biodiesel annually using palm based products.
Golden Hope Plantations, Bhd	The Netherlands	Palm based biodiesel production unit in the Netherlands.
Golden Hope Plantations, Bhd	Venezuela	Exported 34 Million. Tonnes to Venezuela.
Kulim Bhd	Peter Cremer Gruppe (German)	Production plant for biodiesel with capacity of 200,000 litres at Singapore to export to United States, EU and China. The German partner would invest US \$ 50 million for construction of biodiesel processed plant at the Jurong Island.
IJM Plantations Bhd (IJMP)	Indonesia	Bought 400,000 hectares for biodiesel production with investment of RM 74 Million.
PPB Oil Palms Bhd	Indonesia	Firm would invest RM300 million to RM 400 million annually over a period 2006 to 2010 to develop plantation infrastructure and processing facilities for bioethanol production.

Plausible External and Domestic Factors affecting Production in Asia

External Factors	Prices of Fossil Fuels (Pull factor)	This is the most important exogenous factor which influence the work on alternatives.
	Subsidy Regime (Push factor)	The emerging subsidy regime in US and EU may eventually affect the competitive character of these products from the developing countries.
	External Demand (Pull Factor)	The growing demand in EU and other developed markets may provide incentives to the Asian economies to consider industrial applicability of agricultural products
	Standards (Push/Pull factor)	This may continue to be the biggest challenge as globally there is still no agreement to govern international standards for ethanol and biodiesel
	IPR Regime (Push factor)	Given the growing need to explore for alternative bioenergy crops developments in agri-biotechnology may limit the access to technology.

Plausible External and Domestic Factors affecting Production in Asia

Internal Factors	Food Security Concerns	Asian Economies would need to resolve the dilemma of selecting between food security related agri production viz. a viz. energy-crop production.
	Domestic R&D Advances	Since food security is likely to be opted for, the domestic R&D agenda for cellulosic biomass based sources would have to be given due weightage.
	General Preparedness like emphasis on Flex Fuel Vehicles	Many Asian economies themselves are keen to opt for biofuel for self consumption but lack of preparedness by the vehicle producing firms is a big challenge for instance in India biofuel introduction is getting postponed every year. South Korea could overcome this with initial resistance.
	Managing Resource gap	One of the reasons behind lack of interest shown by the firms is absence of adequate incentives for which governments would have to identify resources.
	Economics of Cost	This is one of the key factors on the basis of which farmers and business community would make their decisions.

Financial Incentives and Tax Breaks on Biofuel in Select Countries

Country	Financial Incentives	Tax Break	Source of Biofuel
Australia		-No Mineral Oil Tax (since 2000) on production -No tax on sales of Biofuel.	Pure Rape Methyl Ester (RME) used in engines
Finland		Tax incentive for reformulated diesel fuel (0,025 Euro/L)	Unmarked use of reformulated gasoline and diesel
France		Tax incentive adopted for VOME mixed with diesel (0,35 Euro/L) and for bioethanol (0,50 Euro/L)	Rape and Sunflower FAME used in engines. Sunflower methyl ester used as a domestic fuel blender.
Germany		No excise tax for biodiesel substituting standard fuels, either unblended or blended with fossil diesel in the vehicle tank.	Pure RME used in all kind of vehicles
US	\$100 million for providing low-interest loan and grants in research and development of new sources of biofuel.	<p>Tax deduction is available apart from breaks from local sales and use taxes on following activities for 5-12 Years.</p> <ul style="list-style-type: none"> ■ Fuel delivery vehicles and machinery, equipment. ■ Investments in buildings, equipment and labor for the purpose of manufacturing biodiesel, biodiesel feedstock ■ Qualifying buildings, equipment and land used in the manufacturing of alcohol fuel, biodiesel, or biodiesel feed-stocks. <p>Infrastructure and services that support the use of auxiliary power for heavy-duty vehicles.</p>	

Financial Incentives and Tax Breaks on Biofuel in Select Countries

Country	Financial Incentives	Tax Break	Source of Biofuel
China		Deliberating a cost-sharing and risk-sharing mechanism	
India		<p>Excise duty exemption proposed for pure biofuel and also for the blended form.</p> <p>Exemption is also proposed for the machines/equipments used for oil extraction.</p>	
The Philippines	Bio-ethanol producers would also get easy access to financing from the government's financial institutions.	<p>Wide range of fiscal and non-fiscal incentives:</p> <ul style="list-style-type: none"> - Exemption from tariff duties on importation of equipment and machinery. - Another incentive is classification of all investments in ethanol production and blending as "pioneering" or "preferred areas" of investment, which entitle them for financial incentives. 	

Production Costs for Biodiesel and Ethanol from Different Feedstocks, main Producing Countries, 2004

Country:	EU Biodiesel			EU Ethanol			USA Ethanol			EU Ethanol			Brazil Ethanol		
Biofuel:	Vegetable oil			Wheat			Maize			Sugar beet			Sugarcane		
Feedstock:	Qty.	LC/t	USD/t	Qty.	LC/t	USD/t	Qty.	LC/t	USD/t	Qty.	LC/t	USD/t	Qty.	LC/t	USD/t
Feedstock price	463.16	573.40		103.73	128.41		76.57	76.57		23.87	29.55		32.75	10.95	
Feedstock costs	490.95	607.80		362.11	448.30		244.66	244.66		307.82	381.08		486.98	162.80	
Energy use: Electricity, kWh	315.94			353.85			303.30			353.85					
Net Production costs	553.34	685.05		585.38	724.72		364.89	364.89		571.24	707.21		826.47	276.30	
Net costs, per litre of fuel	0.438	0.542		0.463	0.573		0.289	0.289		0.452	0.560		0.654	0.219	

Source: OECD Secretariat based on data provided in Smeets et.al (2005), Aglink database.

WTO/Trade Related Issues

- Address environmental goods on priority in the Doha round: Streamlining the tariff regime for the environmental goods.
- Though tariffs on biodiesel are already quite low but on the ethanol, it is still high for instance in the **US tariff is 54 cent per gallon.**
- Currently by the WTO Agreement on Agriculture and thus not eligible for the environmental goods negotiations. It is also suggested that the **subsidies to biofuel crops may be placed in the 'green box'** in the agriculture negotiations, which would make them exempt from cuts to payments that clearly distort production and trade.
- However, apart from trade, it is also the question of growing **cross investments in the sector** as in the case of Brazil there are several foreign companies, which have acquired sugarcane farms and processing units for production of bioethanol for their home markets.
- In case of international trade **there are three issues**, which are very important to analyse further. They relate to the IPR regime, impact of standards (or of lack of them) and thirdly the trade classification of the biofuels.

WTO/ *Intellectual Property Regime*

- Access to technology
Probably would be the biggest question before the developing countries. They may have farms, producers, right and desired environment for production but access to the gene technology at **a lower cost from non edible crops ?, second generation crops.**
- Presence of major TNCs
Growing consolidation in this sector may pose several challenges in terms of price cartels, broad patenting of gene sequences and selection of similar genetic combinations for hybrid development. Monsanto and DuPont alone now control 90 per cent of the corn seed market in USA and 70 per cent of Asian corn market, which are major energy crops there. Monsanto alone covers market share of 59 to 97 per cent of GM crops like GM Soybean (91 per cent), GM Maize (97 per cent),
- Biopiracy Issues with Jatropha and other varieties.

WTO/*Standards, SPS/TBT*

- As the trade in the agricultural energy products derived from biotechnology would expand, the issues related to the sanitary and phyto-sanitary measures (SPS) and technical barriers to trade (TBT) assume importance.
- Since EU, South Korea and Japan have been viewing the development in the biotechnology sector with caution the issues may act as a deterrent to the countries taking a policy decision in this context.
- These countries have been exercising their options as per the Article 5.7 of SPS providing scope for members to take provisional health measures when relevant scientific evidence is insufficient.
- EU asked for inclusion of precautionary principle in the ambit of the SPS agreement but WTO ruling on the import ban by the European Union of GM product becomes relevant.
- It is of importance to note that the US, Canada and Argentina raised this dispute as per the Article 5.2 of the SPS and not as violation of the Article 5.7 of the SPS.

WTO/Standards, SPS/TBT

- This may have major implications for those countries, which are contemplating to explore options within this line of argument. As the Para 7.428 of the **interim report on the dispute clearly states that the dispute comes under SPS** and not under any other agreement like the TBT etc.
- The SPS is one agreement which is very narrowly defined hence provide very little maneuvering space to the defending parties. Moreover, the view that Article 5.7 of SPS, under which precautionary principle is justified, is actually an exception to the Article 2.2 and 5.1 which basically expect members to base and maintain SPS **measures on sufficient scientific evidence.**
- Though biofuels are a highly processed product so may not face SPS because of being from biotech but otherwise standards may be a major issue.
- Developing countries should be assisted in reviewing and updating existing standards as also to develop and notify standards for new and renewable systems/devices for which standards have not yet been laid down at par or even higher than international levels.

WTO/Standards, SPS/TBT

- As of now there are three major producers, which, have already come out with programmes related to standards. They are the US, Germany and Austria. ASEAN has also launched regional discussion on such a framework.
- American Society for Testing and Materials (ASTM) has issued biodiesel standards D6751 in December 2001, which covers the use of pure biodiesel (B100) with conventional diesel fuel upto 20 per cent by volume (b20).
- Likewise, France (NF), Italy (UNI 10635) and Germany (DIN E51606) has issued bio-diesel standards in 1997. Sweden in 1996 and a common draft standards EN 14214 for European Union have also been issued. In India, ASTM 6751 standards are being followed.
- Pending finalization of their own specification and standards, Philippine may either adopt ASTM 6751 standards for USA or EN 14214 for the European Union.

Need for Strategic Response

Second-generation biofuel would largely involve development of biofuels with the help of cellulosic biomass.

US is working on a roadmap for achieving competitive cost of production for biofuels by 2012.

International Crop Research Institute for Semi Arid Tropics (ICRISAT), a CGIAR institute has launched a major research project to identify possible options for feedstock.

Support to SMEs. ICRISAT has identified sweet sorghum and has signed an initial agreement with a company to ensure wider supply of seeds. It has also established an advanced distillery for US\$7 million to convert the juice from the sweet sorghum stalk into bio-ethanol.

ICRISAT in collaboration with the Department of Agriculture's Bureau of Agricultural Research (DA-BAR) of the Philippines has also developed sweet sorghum hybrid called SSH 104 for the farmers.

How these details may help in Green Enterprise development!!!

Policy Recommendations

- The demand for biofuel is all set to expand in the Asia Pacific region, as more and more governments are identifying mandatory limits for blending of biofuel with gasoline.
- This motivation has also resulted from environment-based initiatives and to extent because of the Kyoto Protocol.
- There is need to launch Asia specific forums to help developing economies to assess their own biofuels potential for working out their own goals and facilitate resource mobilization efforts.
- These forums may also help in terms of promoting learning from other countries' experiences, and overcome non tariff measures for their exports of biofuel related products and finished products.
- Food Security Concerns

Adopt a cautious strategy to follow as with a growing world's population demand for both biofuels and food would put extraordinary **pressure on land**. Apart from this, the enormous **price increases** for agricultural products may have a negative impact on the net food-importing developing countries.

Policy Recommendations

- Environment and Biodiversity Impact

Adoption and production of biofuel on large scale may also have impact on biodiversity as is being discussed in context of deforestation in rainforests in Brazil and Borneo. This may be **problematic with 'low-intensity' biofuels such as rapeseed oil that require several** chemical inputs and have relatively low energy yields.

Promote monocultures on the farmland, completely devoid of biological diversity. Calculations from the OECD shows that Europe would need to convert more than 70 per cent of arable land in order to raise the proportion of biofuel used in road transport to 10 per cent.

- Lack of Access to Relevant Technology

Under the current regime of intellectual property rights, given the fact that largely it is the private sector, which is into the technology development, it may adversely affect the interests of those very governments, which are **doling out support to the infant industry**.

- Joint Efforts for Technology

Measures to be adopted in the South-South cooperation framework for technology development and its open sourcing so that the trade related intellectual rights regime do not pose major hurdles for the developing economies in terms of affecting their access to technology.

Policy Recommendations

- Subsidy a Solution!

Subsidy regime as is emerging in the US and other developed economies with the idea of shifting farm subsidies in name of energy security and the environment may end up with another axis for north-south divide.

US policy are a flat subsidy of 51 cents per gallon of ethanol used in fuel (about a third of what it costs to make), a mandate to use 7.5 billion gallons of biofuels a year nationally by 2012, and a 50 cents or \$1-a-gallon subsidy for biodiesel.

EC to extend subsidies paid to energy crop farmers to the eight member states that joined the EU in 2004. EU funding of €45 (\$57) a hectare from 2007. Subsidies of up to 50% of the costs of establishing energy crops on new land.

- **Indonesia** plans to seek as much as 23 trillion rupiah, or \$2.5 billion, to kick-start its nationwide program to produce, distribute and export fuels made from crops like oil palms and sugarcane. The government will put up 2 trillion rupiah in capital for a company that will finance biofuel projects.

Policy Recommendations

Regional/Sub-Regional Level

- **Right Quality Seeds for Energy Crops**

Given the growing importance of feed crops some people even try to pass off uncertified seeds as 'hybrids' at higher prices in many rural areas.

Regional cooperation at ICRISAT may play a crucial role in terms of setting the standards for the region for select energy crop seeds apart from making available quality parentage for further multiplication.

- **Regional Initiative on Harmonisation of Standards and Classification**

In the absence of any international standard for quality of biofuels, Asian countries, at the ASEAN and other forums may consider to launch process for standardization of specifications to enable the products to actually become an energy commodity and be easily traded as is the case of gasoline or diesel.

As discussed earlier, the US and few select other countries have already launched their own standards. Apart from ensuring quality of products this exercise would also help in identifying right product groups as in some countries there is difficult tax regime that ethanol producers and imports have to face.

Policy Recommendations

National Level

Lands of Good Hope!

- The advances in biotechnology offer a unique opportunity to the tropical countries in this part of the world and are being described as lands of great hope.
- The biomass-based option to produce biofuel enables developing countries to produce this at a much lesser cost than any developed country may attempt to do this.
- Ethanol production in Brazil costs 20 euros-cents per litre as compared to 30 cents in the US and 50 cents in the EU. In case of some of the Asian countries this cost may be even lesser, for instance in Malaysia with palm oil based biofuel production. Since there are possibilities for two to three rounds of crops production in the Asian region, right research priorities may help in identifying alternative biomass based source materials.
- Develop ways and means for non-food markets for agriculture it may facilitate and induce producers for biofuel crop production. Asian economies would have to evolve measures to cope up with the pressures that the conversion to bioenergy crops may exert on the economies.

Policy Recommendations

National Level Actions (cont.)

- Food security concern is one of the most important dimensions of this. Since Malaysia and Indonesia have announced setting aside 40 per cent palm oil produced for biofuel production, the global prices of palm oil have gone up by 20 per cent. Similarly, prices of rapeseed an important ingredient in biofuels has also gone up 20-30 per cent in last one year.
- Once a clear switch over is made to say wheat or soybean the implications for food security may be very serious hence a well-considered move would help in the long terms.

Providing Financial and Technical Support

- Since, industry is in a nascent stage of development it requires policy and financial support along with economic incentives. The national governments may consider launching of financial support programmes for funding infrastructure, facilities, technologies and research and development that will move towards biofuel development.
- Financial assistance may be awarded for research and development of new and renewable energy and biofuel sources, including biomass and biofuel development infrastructure and facilities; and research and development to develop markets for alternative fuel byproducts

Policy Recommendations

- The governments would also have to think of encouraging the fuel stations to keep ethanol- blended fuels. In US the government provided \$1.5 million to 1000 pumps for conversions so as to enhance the availability.

Biofuel and Rural Development

- The growing support from the respective governments may help generate a large number of jobs in the rural areas where backward linkages would be established for a smooth supply of biofuel.
- It is estimated that the yield level for biodiesel is 1 MT/ hectare. In some Asian countries still many villages have no access to power and electricity. In India for instance, nearly 0.125 million villages and 56 per cent of the households there lack access to electricity.
- The Indian Government has announced coverage of these entire unelectrified census villages with 100 per cent household coverage by 2009. Grid electricity might not be universal as several remote villages are not likely to be covered by grid extension either because it is not cost-effective or feasible to do so.

Policy Recommendations

- In covering such remote villages the aim shall be to make available supply of a minimum lifeline consumption of 1 kwh / household / day of reliable and quality power of specified standards at reasonable rates, as a merit good. In this context options with biobased electricity generation may be explored for rural electrification.

South-South Cooperation

- As many of the Southern countries identify the synergies for cooperation in a pragmatic manner.
- Further, the flexibilities of market access rules play a special role in the European and other agricultural markets, the regulation and harmonization of SPS standards and norms as well as regulations concerning bio fuels should also be kept on the policy agenda.
- The Asian and Pacific economies may launch joint initiatives for education and outreach activities, a state procurement preference that favours biobased products, as well as new and improved ways to help spur consumer acceptance of the biobased products. Geerm plasm exchange programme.
- The recent launching of the United Nations efforts to support biofuel promotion through setting up of specialized institutional efforts may go a long way in this direction. UN promotion of bioenergy sources such as sugar cane or sunflower seeds to replace fossil gained new momentum with the inauguration of the **Secretariat of the Global Bioenergy Partnership (GBEP)** at FAO in Rome.

Policy Recommendations

Policies for Green Enterprise Development

- In the short term, updating of the inventory of existing networks, initiatives and institutions dealing with bio-energy and identify knowledge gaps may be relevant.
- In the long run the analysis of entry point for developing countries would be of great use.
- The idea of GED would take off once we have convergence of several of our policies together.
- Goods to be identified as Trade and & Environment Good and a means for CDM. Agro based Kyoto Commitments.
- Efforts by ADB and national efforts to supplement each other.