

Biofuels: A New Wave of Imperialist Plunder of Third World Resources

Arnold Padilla

Introduction

The major justifications behind the current biofuels rush, namely high oil prices and climate change, are the natural results of a world economic system that is under the monopoly control of transnational corporations (TNCs).

The aggressive competition among corporations for market domination and increased rates of profit has led to wars of aggression and massive market speculation, which drive oil prices up. Likewise, as competition intensifies, the unplanned global economy has produced enormous amounts of commodities and wastes that have caused unprecedented harm to the environment, such as the case of climate change.

But the paradox is that while it is big business that is primarily behind the problems that biofuels are supposed to be addressing, it is also the one steering the global initiative for large-scale biofuels production and trade.

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There is no major shift therefore in the framework with which to address the issues of global energy security and global warming, and expectedly the biofuels phenomenon has only raised more questions in addition to its actual impact on energy security and climate change, such as food insecurity, rural poverty, and under-development.

Recent trends

Today's primary biofuels are ethanol and biodiesel. Bioethanol aka grain alcohol, is made from starch plants (like corn, wheat and cassava), sugar plants (beet and cane) and sometimes cellulose plants (trees). Meanwhile, biodiesel is also an alternative fuel made out of natural ingredients such as coconut oil, soya bean or vegetable oils. (**See Annex I for Generations of Biofuels and Recent National Developments in the Biofuel Industry**).

The World Resources Institute (WRI) notes that "while fossil fuels still account for more than 95% of the global transportation market, biofuel pro-

duction is growing at roughly 15% per year, a rate over ten times that of oil".¹ Indeed, reports show that biofuels production has been expanding at breakneck pace in recent years.

In 2005, global bioethanol production reached 44.88 billion liters, or almost 47% higher than its production the previous year. From 2001 to 2005, global bioethanol production has been averaging almost 28.65 billion liters annually and growing by almost 22% per year. The 2005 bioethanol production is 20 times the average production in the mid-1970s and almost three times the average production in the early 1990s. (See **Table 1**)

The US and Brazil are the world's two largest producers of bioethanol accounting for around 36% each. (See **Table 2**) Bioethanol provides

roughly 40% of Brazil's non-diesel fuel and 2-3% of the US's non-diesel fuel.

Sugar cane and corn are the most important crops for producing bioethanol, each supplying more than 40% of the global feedstock used to produce bioethanol.² In the US, corn accounts for almost 93% of total bioethanol production capacity and 83% the total number of plants that process bioethanol feedstock. (See **Table 3**)

On the other hand, the global production of biodiesel reached 3.76 billion liters in 2005, or more than 71% higher than production in 2004. From 2001 to 2005, the world was producing an average of 2.09 billion liters of biodiesel a year while annual production growth rate by almost 35 percent. The 2005 biodiesel production was

Table 1. Global annual production of bioethanol, 1975-2005

Period	Million liters
1975-1980	2,187
1980-1985	8,797
1985-1990	14,534
1990-1995	16,333
1995-2000	18,707
2001	18,676
2002	21,715
2003	27,331
2004	30,632
2005	44,875

Compiled by Earth Policy Institute

Table 2. Distribution of global bioethanol production, by country, 2005

Country	Million liters	Share
US	16,214	36.1%
Brazil	16,067	35.8%
China	3,800	8.5%
India	1,700	3.8%
France	910	2.0%
Russia	750	1.7%
S. Africa	390	0.9%
Spain	376	0.8%
Germany	350	0.8%
Thailand	300	0.7%
Rest	4,017	9.0%
Total	44,874	100.0%

Processed by IBON Research based on Earth Policy Institute data

Table 3. US ethanol production by feedstock, 2006

Plant Feedstock	Capacity (million gallons/year)	% of Capacity	No. of Plants	% of Plants
Corn <i>a</i>	4,516	92.7%	85	83.3%
Corn/milo	162	3.3%	5	4.9%
Corn/wheat	90	1.8%	2	2.0%
Corn/barley	40	0.8%	1	1.0%
Milo/wheat	40	0.8%	1	1.0%
Waste beverage <i>b</i>	16	0.3%	5	4.9%
Cheese whey	8	0.2%	2	2.0%
Sugars & starches	2	0.0%	1	1.0%
Total	4,872	100.0%	102	100.0%
<i>a</i> - includes seed corn				
<i>b</i> - includes brewery waste				

Source: Environmental Protection Agency, Office of Transportation and Air Quality "Renewable Fuel Standard Program - Draft Regulatory Impact Analysis" September 2006, EPA420-D-06-008

also 20 times the average production in the early 1990s. (See **Table 4**)

Germany is the leader in biodiesel production accounting for 51% of the global total while France is a far second with 15 percent. (See **Table 5**) Collectively, members of the European Union (EU) account for nearly 89% of global biodiesel production. Around 80% of Europe's biodiesel is from rapeseed and sunflower seed.

The UN estimates that in the next 15-20 years, biofuels would supply about 25% of the world's energy needs. By 2020, global bioethanol production would reach 120 billion liters while biodiesel production, 12 billion liters. Oil giant Exxon Mobil projects that biofuels, together with wind and solar, will contribute about 2% of the world's total energy supply in 2030. Biofuels production, including bioethanol and biodiesel, will increase from 1 million barrels per day (MBD) in 2005 to 3 MBD in 2030.³

Medium-term projections peg global bioethanol supply and demand to increase by 2010 from 2005 levels by more than 84% and 93% respectively. Most of the increases in supply and demand are anticipated to come from Asia. In the medium-term, bioethanol exports are expected to come from Brazil, the US, Asia, and Africa with EU countries as the primary market. (See **Table 6**)

In general, it is expected that Third World countries would be the primary suppliers of biofuels while First World countries would be the primary consumers. The UN Energy and Overseas Development Institute projects that by 2011, 20% of Brazil's bioethanol production will be exported to the US market while the greatest increases in biodiesel trade will come from exports from Malaysia and Indonesia to the EU market.

The limited agricultural land in the US, Europe, Japan, and other industrial countries would not

Table 4. Global annual production of biodiesel, 1991-2005

Period	Million liters
1991-1995	187
1996-2000	663
2001	1,068
2002	1,488
2003	1,932
2004	2,196
2005	3,762

Compiled by Earth Policy Institute

Table 5. Distribution of global production of biodiesel, by country, 2005

Country	Million liters	Share
Germany	1921	51.1%
France	557	14.8%
US	284	7.5%
Italy	227	6.0%
Czech Rep.	136	3.6%
Austria	85	2.3%
Spain	84	2.2%
Denmark	80	2.1%
Poland	80	2.1%
UK	74	2.0%
Rest	234	6.2%
Total	3762	100.0%

Processed by IBON Research based on Earth Policy Institute data

Table 6. World fuel ethanol supply and demand (in million cubic meters)

Country/Region	Supply				Demand			
	2003	2004	2005	2010	2003	2004	2005	2010
Brazil	14.7	15.4	16.0	20.5	13.0	13.5	14.0	18.0
US	10.6	13.1	13.6	19.0	10.7	13.9	14.2	18.0
Canada	0.2	0.2	0.5	0.8	0.2	0.2	0.5	0.8
EU	0.5	0.7	1.5	8.0	0.5	0.7	2.0	11.7
Asia, etc.	1.0	1.2	2.0	13.0	0.0	0.5	1.0	12.6
Total	27.0	30.6	33.6	61.3	24.4	28.8	31.7	61.1

Source: FO Licht (2005) as adapted in "Global biofuels trade" by Sergio C. Trinidad, XV International Symposium on Alcohol Fuels, San Diego, CA, USA, September 26-28, 2005

be enough for large-scale biofuels production that these industrial countries hope to achieve, thus the need to locate biofuels production in poor countries where agricultural lands are abundant. Besides it has been noted in technical studies that the most energy-efficient biofuel feedstock are sugarcane and palm oil, and the most suitable places where these 'energy crops' may be grown are in poor countries where the tropical and sub-tropical climates are perfect for production.

Meanwhile, cash-strapped neo-colonies have been rushing to pass pro-biofuels legislation to take advantage of the expected huge demand. Among the countries that have recently passed pro-biofuels laws are Argentina, China, Colombia, Ecuador, India, Indonesia, Malawi, Malaysia, Mexico, Mozambique, Senegal, South Africa, Thailand, Zambia, and the Philippines.

Undermining food security in all dimensions

Food security is a highly controversial issue in the biofuels debate. Even Big Oil has raised the possible impact of first generation biofuels like ethanol and biodiesel on food security, although simply in an effort to slow down the biofuels rush in order to consolidate its position in the industry. At any rate, the threat is real, given the current state of hunger and undernourishment around the world, the existing structures of poverty and hunger, and the intensity and driving force of the biofuels rush that aggravate the basic situation.

Latest data from FAO show that there are approximately 854 million undernourished people in the world, 96% of them are in poor countries. Hunger kills 25,000 people daily, two-thirds of them children under five years old. It kills more people than AIDS, malaria, and tuberculosis combined. Ironically, hunger incidence in poor countries is higher in rural areas where food production takes place.

With the magnitude of hunger, it is common knowledge by now that hunger is the result of structures that perpetuate poverty – a global economic system that plunders resources of neo-colonies, deprives the mass of direct producers the control of the means of production, and concentrates social wealth in the hands of a few. Millions of people in the Third World are hungry

because centuries of colonialism and neo-colonialism have relegated their agriculture as source of cheap raw materials and semi-processed products for the markets and industries of rich countries. The biofuels phenomenon thrives on these same structures and thus would only exacerbate hunger and poverty most especially in the Third World.

Food security, as defined by FAO, refers to a "situation that exists when all people at all times have physical, social, and economic access to sufficient, safe, and nutritious food that meet their dietary needs and food preferences for an active and healthy life". This limited definition lists four dimensions of food security, namely availability, affordability, stability, and utilisation, which despite their limitations are projected by the UN-Energy to be negatively affected by the large-scale production and global trade of biofuels.

According to the UN-Energy, the availability of food supplies could be compromised when agricultural lands, water, infrastructure, and other productive resources are diverted away from food production to biofuels production. Affordability or accessibility, on the other hand, could be undermined when biofuels production drives up commodity prices, in effect marginalising low-income net food purchasers. Stability, which refers to the time dimension of food security, could be affected by biofuels because price volatility from the petroleum sector is more directly and strongly passed on to the agriculture sector. Lastly, utilisation, which pertains to people's ability to absorb nutrients contained in their food and is closely linked to health and nutrition factors such as access to clean water, could be affected when biofuels compete with water supplies.⁴

The UN-Energy recognises, "at the current state of liquid biofuel production, food production and biofuel production are substitutes". Ethanol and biodiesel – the most widely commercialised biofuels today – rely on crops that directly compete with food crops for high-quality agricultural lands and other productive resources like water, the latter is an explosive issue by itself in the context of the global water crisis.

The world's biggest consumers of biofuels – the US and the EU – do not have enough agricultural lands suitable to grow energy crops. It is estimated, for instance, that allocating all the fal-

low lands in Europe (around 6 million hectares) for biofuels production represents a potential of only about 2.5-5% of the motor fuels consumed in Europe.⁵ To meet the EU target of obtaining 5.75% of transportation fuel needs from biofuels by 2010, as much as 30% of the region's agricultural lands could be needed to grow energy crops. In the US, it is estimated that an extra 1.6 million hectares of cropland will have to be found somewhere to replace corn production for food displaced by the 2005 Renewable Fuel Standard (RFS) target of 7.5 billion gallons of biofuels for transportation by 2012.⁶ In his 2007 State of the Union Address, Pres. Bush called for a mandatory 35 billion gallons of alternative fuel by 2017, increasing by almost five times the RFS target. The new target would require an additional 40 million acres (almost 16.2 million hectares) to grow the energy crop needed.⁷

These vast tracts of land needed to supply the growing demand for biofuels in the First World are found in the poor countries. Calculations by the UNCTAD show that the ratio of used land and unused land in developed and developing countries greatly differs: "In developed countries, most of the available land is used while in developing countries, the proportion of unused land is significant. Thus, in developing countries there is a considerable amount of unused land that could be cultivated for biofuels".

Conditions for the mass production of energy crops in developing countries are also several times better, i.e. cheaper wages and lower labor standards, numerous fiscal perks, etc. As already mentioned, technical studies conclude that the most energy-efficient biofuel feedstock are sugarcane and palm oil and the most suitable places where these energy crops may be grown are in poor countries where the tropical and sub-tropical climates are perfect for production. Another study claims that Malaysia and Indonesia have the highest biodiesel volume potential and cheapest production costs.⁸

The industrial countries would ensure of course that their domestic food production would not be undermined by large-scale biofuels production. To meet local biofuels demand, they would rather locate production in their semi-colonies where they can exploit the natural resources as well as cheap human resources, then import the processed biofuels or raw biofuel feedstocks at

cheap prices.

Proponents of biofuels argue that there are abundant agricultural lands in poor countries and that these countries can supply domestic requirements and global demand for biofuels without compromising their food security. In Tanzania, for instance, a study claims that around 300,000 hectares out of a total of 4.6 million hectares currently under crop would be required to match current fuel imports. But hunger in poor countries is already alarming even without biofuels due to distorted economic development. Even so, hunger in Third World countries is bound to worsen as their domestic agriculture is further restructured to produce energy crops for export.

Biofuels and environment: what's the real score?

Increased biofuels production means rapid expansion in areas covered by agro-industrial plantations where feedstock such as palm oil, corn, sugarcane, coconut, etc. would be produced. This means a further rise in the abuse of pesticides, herbicides, and other agrochemicals commonly used in large commercial plantations, and many of which have been known to inflict serious damages to the soil and people's health.

An example is paraquat, one of the most widely-used herbicides in the world and among the major concerns today of environmental activists. In July 2007, the EU Court of First Instance banned Syngenta's paraquat due to questions on its safety to humans and animals.⁹ But while the decision affirmed the health and environmental risks linked to paraquat, the use of this toxic agrochemical would further spread along with the development of additional palm oil plantations. Paraquat is "an essential tool" in palm oil plantations, according to Syngenta.

As noted by PAN AP and Tenaganita in their research in Malaysia, paraquat has been a major cause of concern due to continued poisonings suffered by plantation workers—especially pesticides sprayers who are mostly women. Workers on estates are frequently employed as sprayers for six days a week, ten months a year or more, and therefore have a high degree of exposure to the chemical. The greatest risks to workers of fatal and serious incidents are during mixing and loading of spray equipment, where con-

tact with the chemical concentrate occurs. Fatal accidents have also been described due to prolonged contact with the diluted paraquat spray during application. Conditions of use in many developing countries, including rapidly growing ones like Malaysia, make it difficult to follow label instructions and recommendations. Paraquat causes daily suffering to an extremely large number of farmers and workers. Problems resulting from paraquat exposure are found around the world: from the United States to Japan and from Costa Rica to Malaysia.

The main reason pesticides are so prevalent in the world today is that there is a huge multi-billion dollar industry behind them, exerting undue influence on international standard setting bodies, national governments, and local communities. The enormous influence these chemical corporations wield, because of their economic power, is a major factor in the persistence of pesticides in agriculture despite the mounting evidence of environmental contamination, human poisonings, and greater yields achieved when the chemicals are replaced by agroecological practices.

The pesticide industry is highly competitive, constantly jostling for control of the market. Over recent years a series of mergers and buy-outs has resulted in 80 per cent of the global pesticide trade being controlled by just 10 companies, the top six companies (Syngenta, Bayer, Monsanto, BASF, Dow and Dupont) accounting for 70 per cent of the market, and the top 10 controlling 80 percent of global agrochemical sales. While the 6 companies dominate the market, there is also a growth of national pesticide industries in developing countries (India, Taiwan, China, South Korea, Mexico, Brazil), as well as growth among 'generic' pesticide producers. Five of these are also in the top ten seed companies, and hence control huge portions of the agricultural sector worldwide. It is critical to note that many of these very pesticide companies, which have also bought over seed interests, are also the biggest most powerful genetic engineering (GE)/biotechnology companies in the world as well. These companies now identify and market themselves as the "Life Sciences" industry, in an effort to appear positive and to promote an image of superior scientific credibility.

The promotion of monoculture-based production

brought increasing use of agro-chemicals, and by 1997 the global sales of pesticides amounted to US\$32 billion. The market totalled over \$27 billion by 2002. In 2003 the global market for conventional crop protection products (excluding sales of agricultural biotechnology based products) totalled over US \$26 billion. By 2006, the global market value for conventional crop protection products fell slightly by 2.5% (in nominal US dollar value) to reach \$30,425 million. And according to CropLife International (to which all these companies belong), in 2006 "the value of the market for plant biotechnology-based products, comprising sales of seed of herbicide tolerant (HT) and insect resistant (IR) crops, continued to advance by 14.2% to \$6,050 million". (See www.panap.net/uploads/media/APRN_Article_FINAL_Jm_6_Oct_07.doc)

As noted by Silvia Ribeiro of the Action group on Erosion, Technology and Concentration (ETC) in their report of April 2007, *"All the companies which produce transgenic crops -Syngenta, Monsanto, Dupont, Dow, Bayer, BASF- have investments in crops designed specially for the production of biofuels such as ethanol and biodiesel. They also have collaboration agreements in a similar vein with Cargill, Archer Daniel Midland, Bunge, transnational companies which dominate the global trade in grains."*

Ribeiro more recently noted that, *"All this is creating new powerful corporate alliances. For example, Monsanto and Dow have just signed an agreement to create GM seeds that will combine in the same plant both resistance to 8 herbicides as well as making them insecticides. This in part reflects the recognition that GM seeds create resistance to herbicides and therefore require more and more. And if the seeds are not for human use it will be possible to use more toxic herbicides in greater quantities"*.

Proponents of biofuels try to downplay the possible consequences that the sudden shift to mass production of energy crops may wreak on the environment. The UN-Energy, for instance, recognizes, "where crops are grown for energy purposes, use of large-scale mono-cropping could lead to significant energy loss, soil erosion, and nutrient leaching". But it hastens to add that this problem could be overcome through responsible farming.¹⁰

But the question is whether biofuels corporations and national governments of cash-strapped Third World countries can maintain sustainable farming practices when global demand increases and competition intensifies? As an official of DuPont said, "the demand for corn (for ethanol) could be so dramatic that it could change farming practices". The official added that instead of rotating corn with other crops, farmers would be pressed to grow corn year after year, strain the soil, and allow the build-up of insects and diseases.¹¹ To correct this problem, DuPont and other biotech firms propose to make genetically modified corn and other energy crops, which could create another host of problems.

The prospects for sustainable biofuels production are nil by the nature of capitalist production, which very easily compromises the environment for profits. This is even patently evident in how imperialist globalisation has eroded the ability of national governments to impose environmental regulations. For instance, the UK reportedly thought of enforcing an import ban on environmentally destructive fuels to mitigate the environmental risks linked to large expansion of biofuels production. But it dropped the idea because "mandatory environmental criteria would greatly increase the risk of international legal challenge to the policy as a whole". Consequently, it called for "some form of voluntary scheme" in lieu of a compulsory environmental standard.¹²

A quick look at how the World Trade Organization (WTO) has ruled on environmental concerns of member-countries is instructive. Two of the key findings of one study maintained that: (1) To date, all GATT (General Agreement on Tariffs and Trade)/WTO dispute panel discussions on environmental laws have required that the challenged domestic laws and measures be weakened; and (2) WTO rules have consistently been interpreted to mean that products cannot be treated differently according to how they were produced or harvested.¹³

Palm oil, one of the fastest growing mono-cropping plantations in the world even before the biofuels rush, is a particular environmental concern. In 2005, palm oil plantations worldwide covered a total area of 12 million hectares and were concentrated in Indonesia (5.3 million hectares) and Malaysia (4 million hectares).¹⁴ With the global biofuels rush, palm oil plantations are ex-

pected to expand more rapidly. Indonesia plans to develop an additional 20 million hectares for palm oil plantations while Malaysia is aggressively expanding in Sabah and Sarawak. Thailand also intends to enlarge its palm oil plantations by 64,000 hectares every year from 2004 to achieve a target of 1.6 million hectares by 2030. There is also aggressive expansion in Cambodia, Papua New Guinea, and Solomon Islands.¹⁵

Rising palm oil demand from Europe has brought about the clearing of huge tracts of rainforests and the overuse of chemical fertilizer in these countries. From 1985 to 2000, about 87% of Malaysia's deforestation was due to the development of palm oil plantations, according to the Friends of the Earth (FOE).¹⁶ With increasing global demand for biofuels, palm oil plantations are expected to expand more rapidly with grave consequences to the environment. Indonesia, for example, plans to develop an additional 20 million hectares of palm oil plantations.¹⁷ Worse, space for expanding palm oil plantations is often created by draining and burning peat land, which sends huge amounts of carbon emissions into the atmosphere.¹⁸ Biodiversity is also in peril as the natural habitat of various species (including endangered ones) is being transformed into "industrial forests" to plant energy crops such as palm oil for export.

In light of the increasing global concern over the sustainability of large-scale palm oil production, the Roundtable on Sustainable Palm Oil (RSPO) was launched in 2003 and became an organisation a year later. It was conceived as a global multi-stakeholder initiative with a principal objective of promoting the growth and use of sustainable palm oil through cooperation within the supply chain and open dialogue between its stakeholders.¹⁹ At present it has 195 ordinary members that include oil palm growers, palm oil processors and traders, consumer goods manufacturers, retailers, banks and investors, and NGOs involved in environment, nature conservation and development as well as 77 affiliate members (groups or individuals who are not actively involved in any of the mentioned sectors).²⁰

In November 2005, the RSPO adopted its "Principles and Criteria", which aims to provide a credible definition of sustainable palm oil production. Members are expected to observe the Principles and Criteria as mandated in the RSPO Code of

Conduct. But the RSPO is undermined by inherent contradictions among its members. Take the case of HSBC whose Malaysian and Indonesian subsidiaries are two of eight bank/investor members of the organisation. HSBC Malaysia is also a member of the RSPO executive board.

While HSBC projects a “green image” (in 1997, it became the first bank to incorporate environmental concern in relation to its business practices²¹), some of its clients are notorious Indonesian palm oil plantation companies that have been involved in, or accused of, environmental crimes. (See **Table 7**) Between 1994 and 2003, HSBC has helped arrange over US\$1.6 billion in loans and credits guarantees to the Indonesian palm oil sector.²²

Biofuels and the displacement of indigenous peoples

Another alarming concern related to the large-scale production and expansion of palm oil for biofuels is its impact on indigenous communities. The UN Permanent Forum on Indigenous Issues warned that the clearing of forests for the massive production of feedstock for biofuels threaten “the 60 million indigenous people around the world who depend on forests almost entirely for

their survival”. It cited the case of the Indonesian province of West Kalimantan, where around 5 million indigenous people could be displaced by the aggressive expansion program of the national government for palm oil production.²³

In some cases, indigenous peoples are doubly exploited because they become hired farmworkers in their own ancestral lands under exploitative production arrangements. Oxfam reported that indigenous peoples who were integrated in palm oil production system often incur huge debts to plantation operators to whom they are also obliged to sell their produce.²⁴ The social costs, of course, are not limited to economic impacts. For the indigenous communities, what is at stake is also the survival of their culture and way of life.

Expectedly, conflicts over ancestral domains are increasing along with the rapid expansion of palm oil plantations. In West Papua, violence erupted between the indigenous group Muyu and employees of Korindo, a timber and palm oil plantation firm co-owned by Korean and Indonesian investors, in mid-August 2007. Human rights atrocities by the Indonesian military, which secures Korindo’s operations, were also reported.²⁵

Table 7. Controversial HSBC palm oil plantation clients

Client	Owner	Issues	HSBC involvement
PT Adei Plantations	KL Kepong Group	convicted of illegally burning down rainforest	Principal banker
PT Kerry Sawit Indonesia	PPB Oil Palms	involved in an ongoing dispute with villagers who are trying to protect one of the last remaining areas of primary tropical	Principal banker
PT PP London Sumatra	-	forests in their area cleared tropical indigenous rubber gardens & protected production forests to create oil palm plantations	Provided a \$132-M loan in 1996 (although has pulled out since 2003)
PT Agro Indomas	-	accused of breaking environmental laws & clearing forests in Kalimantan where plantations have been established next to water sources without the legally required buffer zone	Principal banker

Compiled by IBON Research based on data cited in “What’s your bank up to in the rainforest” by Daniel Elkan, *The Guardian*, May 29, 2004; accessible online at <http://www.profundo.nl/english/publications/hsbc.html> and “Corporate America, activists, and circumventing Washington: a new approach to environmental lobbying; green groups partner with corporate interests to bring changes in business practices” by Tina Butler, *mongabay.com*, April 27, 2005; accessible online at http://news.mongabay.com/2005/0427-tina_butler.html

Biofuels and genetic engineering: a dangerous liaison

According to the International Energy Agency (IEA), the main challenge today in biofuels production is how to increase crop yields in order to increase the benefits and lower the cost of producing biofuels. The IEA maintains that “high crop yields per acre and per energy input (like fertilizer) reduce cost, increase potential biofuels supply, and significantly improve the wells-to-wheels greenhouse gas characteristics of the final fuel”. Although it recognises that traditional methods such as selective breeding continue to play a main role, the IEA believes that latest biotechnology such as genetic engineering (GE) “offers an important new approach, particularly in the mid to long term”.²⁶

A genetic approach to biofuels supposedly eliminates the different problems that hinder the efficient massive production of feedstock for biofuels. GE adherents argue that the key to achieve the ambitious targets set by the US and the EU on biofuels lies not in improving the chemical processes that convert crops into ethanol or biodiesel. The energy crops themselves must be improved through GE if biofuels are to make a significant dent on petroleum consumption. Biotechnology can also diversify the agricultural sources for biofuels to solve the problem of limited feedstock supply in the face of rapidly growing demand.

Seed and biotechnology companies see “a big new opportunity in developing corn and other crops tailored for use in ethanol and other biofuels”. Firms like Syngenta and DuPont are now applying GE to design corn and soya beans for biofuels and other industrial uses.²⁷ Other companies are genetically modifying microbes to produce enzymes that will convert the cellulose in crop waste, wood chips and other plants into ethanol. Big Oil corporations such as Conoco Phillips, Chevron and Shell are also investing heavily in biotechnology.

Venture capital investment in biofuels has increased from less than US\$1 million in 2004 to US\$813 million in 2006, mostly flowing to biotech firms that apply GE to break down crops into alcohol. The development of biofuels is driving the growth of biotechnology from applications in medicine and agriculture to the industrial sector.

Public funds for GE researches are also pouring in as biofuels have climbed up in the agenda of the US and the EU. The US Department of Energy (DOE), for example, has awarded up to US\$385 million over four years to six companies to develop ethanol.²⁸

But socially responsible scientists have demanded caution at the minimum in using GE and in breeding genetically modified organisms (GMOs) because it has been proven that GMOs can inflict harm on people and the environment, not to mention how small farmers are further marginalised and disempowered by agribusiness TNCs that own GE technologies. While some believe that “energy crops may be an opportunity for the biotech industry to burnish its public image”, past concerns linked to GMOs such as cross-pollination with natural crops and plants that cause ecological distortion still hound the production of genetically modified (GM) energy crops.

But instead of slowing down on GE and addressing these legitimate issues first, biotech companies are lobbying to change existing precautionary regulations to cash in on biofuels. For instance, Syngenta is seeking the approval of its GM corn – modified specifically for energy production – for animal and food use in the US, Europe, South Africa, and elsewhere. Syngenta is trying to avoid the liability faced by Aventis in 2000, when its GM corn ‘Starlink’, approved only for animal use, ended up in human food.²⁹

The dangers posed by GMOs become greater with the application of GE on biofuels as species that live longer and spread more rapidly in the environment are targeted for genetic manipulation. Grasses have attracted a particular focus of GE experiments today since they are perennial plants that require far less irrigation and fertilization than corn and other traditional biofuels feedstock. A Monsanto technology supplier, for instance, is genetically modifying switch grass to have higher yields, withstand drought, and easily break down in an ethanol factory.³⁰

Another favorite target is trees, considered the latest in GE. An example is eucalyptus, which is genetically modified to become freeze-tolerant, fast-growing, and a biomass machine. Malaysian palm oil, already an important biofuels feedstock, is also in line for genome analysis by Synthetic

Genomics, a company founded in 2005 by J. Craig Venter (businessman-biologist of the Human Genome Project fame) utilizing modified microorganisms to produce ethanol and hydrogen as alternative fuels.³¹ This project is expected to boost ongoing efforts in the country led by the Palm Oil Research Institute of Malaysia (PORIM) to genetically enhance oil palm tree and maximise production.

The concept of GE by itself is already controversial because it raises valid moral and cultural questions on altering life. Worse, because the technology is monopolised by TNCs whose single motivation is profits, GE has become a tool for the increasing exploitation and marginalisation of poor farmers and indigenous peoples (IPs) in the Third World with serious consequences on the environment. Thus, using this questionable technology on biofuels within the framework of anarchic capitalist production only doubles up the miserable state of farmers, IPs, and their environment. (See **Annex II** for summary of major arguments against GE and GMOs.)

Green profits: corporate interests in biofuels

Record-high oil prices, rapid technological advancements, and generous support from national governments have converged to make the biofuels industry one of the favorite investment sites today of capitalists.

The UN Environment Programme (UNEP) reports that global investment that flowed into renewable energy reached US\$70.9 billion in 2006, 43% higher than the total in 2005. Of this amount, biofuels accounted for 26%, ranking behind the wind energy sector. Asset financing (which refers to money invested in renewable energy gen-

eration projects, whether from internal company balance sheets, debt finance, or equity finance) for biofuels accounted for around US\$4.85 billion. Public market investment for biofuels (refers to all new equity investment in quoted companies developing and manufacturing sustainable energy technologies and building and operating clean energy power generation capacity) accounted for about US\$3.08 billion.

Biofuels also accounted for the largest share in total venture capital and private equity (VC/PE) that poured into renewable energy in 2006, cornering 34% or around US\$2.92 billion out of the total US\$8.6 billion. VC/PE refers to all equity invested by venture capital and private equity funds into companies developing sustainable energy technologies or providing services to the sector.³² (See **Table 8**)

Biofuels has attracted some of the high-profile investors who have made a fortune in other businesses. In November 2005, Bill Gates invested \$84 million in Pacific Ethanol Inc., acquiring 27% of the company which through its wholly-owned subsidiary Kenergy Marketing LLC is engaged in ethanol marketing in the US.³³ Richard Branson, the man behind the Virgin Group – an international conglomerate of 350 companies that includes a transatlantic airline, music record companies, mobile phone service, etc. - has added Virgin Fuels to his businesses and intends to invest US\$400 million in renewable energy. Virgin Fuels holds a stake in ethanol firms in the US such as Cilion, VBV, Gevo, Indiana Bio-Energy, and Ethanol Grain Processors.³⁴ Vinod Khosla, one of the founders of SUN Microsystems, has been investing in several ethanol initiatives, the latest of which is an undisclosed sum in Gevo Inc, a California-based firm that produces advanced biofuels including butanol.³⁵ Khosla, to-

Table 8. Percent distribution of investment in sustainable energy by type, 2006

Technology	Global investment	Asset financing	Public market investment	Venture capital/private equity	Mergers & acquisition
Wind	38	64	11	16	41
Biofuels	26	15	25	34	11
Solar	16	6	46	21	20
Biomass & waste	10	11	4	2	4
Other renewables	10	4	14	27	24

Source: *Global trends in sustainable energy investment 2007*, UNEP

gether with Steve Case, founder of AOL, and supermarket magnate Ron Burkle are also bankrolling the Brazilian Renewable Energy Co. (Brenco) with initial funding of US\$200 million.³⁶ Investment tycoon George Soros is investing US\$900 million in a 150,000-hectare ethanol production project in Brazil.³⁷

Khosla and Soros's investments in Brazil are just among the hundreds of millions of dollars flowing in the poor countries from the First World. **Table 9** lists some of recent investments from the rich industrial countries in the Third World. The list includes the ethanol investment of Goldman Sachs, one of the world's largest global investment banks, in Brazil worth US\$216 million.

Big Oil and biofuels

An increasing number of Third World governments have passed new laws or designed pro-biofuels program to cash in on the growing biofuels market and facilitate large-scale production in their respective countries, giving the noble intention of pursuing national energy independence. Yet biofuels production remains fundamentally dependent on foreign investment, for export, and dominated by TNCs. Ethanol Africa, South Africa's first biofuels company, for instance, had its ethanol plant built by a German group, uses a patented extraction system from an American firm, and plans to list in London's Alternative Investment Market (AIM) to raise more capital for current and future projects. The reality is the global oil industry remains and will remain in the control of the Big Oil.

While some quarters note the efforts of the global oil cartel to undermine the shift towards biofuels due to the supposed 'threat' that energy crops pose on their business, the biofuels phenomenon does not in any way signal the end of the domination of Big Oil. The tremendous control that these giant oil TNCs wield on the industry – from exploration to its vast distribution network as well as technology, research, and development allows these companies to turn the biofuels rush into an opportunity to earn profits at a faster rate given the decreasing global demand for petroleum amidst high prices.

For biofuels to reach the end-consumers, they have to go first through the same retail network

that Big Oil controls. In fact, the oil TNCs are among the biggest distributors of biofuels. In 2006, British Petroleum (BP) blended 2.72 billion liters of ethanol into gasoline and strengthened its position as one of US's largest blenders of biofuels.³⁸ Meanwhile, French oil TNC Total has been actively involved in the development of biofuels since 1992. In 2005, the company strengthened its position as one of the key oil company players in Europe's biofuels sector by producing 390,000 tons of ethyl tertiary butyl ether (ETBE) in seven refineries and blending 321,000 tons of FAME into diesel fuel produced in eight European refineries.³⁹ Royal Dutch Shell is also one of the leading distributors of transport biofuels.

Big Oil has been consolidating its position in the biofuels market since 2005, funding researches on second generation biofuels and forging ties with universities, car manufacturers, biotechnology firms, national governments, civil society, and other stakeholders for various initiatives on biofuels. (See **Box 1**) The oil giants' approach to the biofuels phenomenon is perhaps best described by BP: 'Our strategy takes into account the need to acquire new capabilities and in the meantime gain access to conventional biofuels'.⁴⁰

Biofuels and rural development

Among the major arguments of biofuels supporters is that the large-scale production of energy feedstock would create jobs and increase income in the rural areas. The FAO claims that biofuels cannot only become leading sources of energy and ensure environmental sustainability, they can also be a key element in achieving the Millennium Development Goals (MDGs) of eradicating poverty and hunger.⁴¹ Rising demand for biofuels can lead to an 'agricultural renaissance' especially in developing countries where biofuels can be grown profitably, according to senior officials of the FAO.⁴²

Yet while some adherents of biofuels tend to make sweeping claims about the positive impact of biofuels on rural development and poverty alleviation, the UN-Energy expresses caution: "The benefits to farmers are not assured. [Growing biofuel crops] can be especially harmful to farmers who do not own their land, and to the rural and urban poor who are net buyers of food, as they could suffer even greater pressure on al-

Table 9. Some of the recent initiatives of First World corporations in Third World biofuels industry, 2007

Company	Home country	Initiative
Mission Biofuels	Australia	to build a 250,000-ton a year biodiesel plant in Kuantan Port, Malaysia
PetroSun	US	to form a new company in Brazil in order to establish an algae-to-biofuel operation
Toyo Engineering	Japan	plans to invest as much as \$99 M for a 300,000-kiloliter biodiesel facility covering 100,000 hectares of land in the Ilocos region, Philippines
Abengoa Bioenergy	Spain	signed an agreement to acquire the total capital of Dedini Agro group of companies, one of Brazil's largest ethanol and sugar companies, for 216 million euros (around \$305 M)
Lurgi	Germany	technical support to produce 100,000 tons of biodiesel in Guizhou, China
Trading Emissions	UK	invested \$66.1 M to construct 200,000-L a year biodiesel refining plant in Brazil
Sun Biofuels	UK	invested \$20 M into a biofuel processing plant & large-scale production of jatropha in 9,000 has. of land in Tanzania
Energem Resources	Canada	acquired 70% controlling interest in a biodiesel venture that would jatropha in Mozambique, targeting as much as 60,000 has. of land
Goldman Sachs	US	to invest around \$216 M into Brazil's second largest sugar & ethanol producer, Santelisa Vale
Global Energy Ventures	UK	to construct a 60-M gallon ethanol dehydration plant in Jamaica
BioDiesel Technologies	Austria	started first industrial-size project to use jatropha for biodiesel production in Brazil
Sweden Bioenergy	Sweden	to invest 103 million euros (around \$145 M) to establish a jatropha plantation of 100,000 hectares & set up a biofuel processing plant in Indonesia
Biomaxx Systems	Canada	construction of biodiesel demonstration plant in Thailand
Honda Denki	Japan	to invest up to \$1 B in Bangladesh's biofuels and sugar sectors
D1-BP Fuel Crops (merger of oil giant BP & biofuel firm D1 Oils)	UK	to invest \$160 M over the next 6 years and to cover at least 172,000 hectares of plantations in India, southern Africa, and Southeast Asia for jatropha production
Bronzeoak	UK	launched a program to build bioethanol facilities in the Philippines, Indonesia, Vietnam, Laos, Cambodia, Thailand, and sub-Saharan Africa; to build more than one facility in each country with 250,000 – 750,000 liter a day capacity
Cosmo Oil	Japan	to build a \$100-M bioethanol plant and a \$50-M biodiesel processing facility in the Philippines covering a total of 186,000 hectares and using a variety of feedstock (cassava, sweet potato, & sugar cane)
Sterling Biofuels Intl	Australia	entered into a memorandum of understanding to develop a palm oil mill in Sabah, Malaysia; acquired a 70%-stake in a Malaysian company that has development rights over 10,600 acres (4,289 hectares) of land for oil palm plantation
National Resources Group	UK	signed a \$1.3-B deal with the PNOC-Alternative Fuels Corp. to put up biofuel refineries and plantations in the Philippines; the agreement would cover ethanol plantations with an aggregate capacity of 300,000 MT and jatropha plantations covering at least 1 million hectares

Box 1. Big Oil initiatives on biofuels

Royal Dutch Shell⁴³

- § Invested in Iogen Corporation, a Canadian biotechnology firm whose patented technology uses enzymes to produce ethanol from straw; the resulting ‘cellulose ethanol’ is a fuel with 90% less GHG emissions than conventional petrol on a life cycle basis and no need for extra arable land
- § Working closely with German car giant Volkswagen on innovative fuels as second generation biofuels and synthetic fuels
- § Working with NGOs, governments, suppliers, and industrial consumers on standards for producing energy crops sustainably, for example through the RSPO
- § Acquired a minority stake in German firm Choren Industries GmbH, developer of biomass-to-liquid (BTL) processes; the partnership sets the stage for the construction of a 15,000 ton per-year plant to convert biomass into synthetic biofuel, the world’s first commercial BTL facility⁴⁴

BP⁴⁵

- § Plans to invest US\$500 million over 10 years to create an Energy Biosciences Institute, which will explore the application of bioscience and the production of “new and cleaner technology”
- § Established in 2007 a jatropha demonstration project in India with the Energy Resources Institute and joined the RSPO
- § Working towards producing renewable diesel fuel from tallow and continues to supply ethanol to retailers in Queensland and New South Wales; has a number of projects underway in Australia as part of a move to supply around two-thirds of the Australian government’s 350-million liter annual biofuels target by 2010
- § In the process of establishing Vivergo, a biofuels joint venture company with Associated British Food, a UK-based international food, ingredients, and retail group, and DuPont, an American chemical and health care TNC; the parties plan to build a US\$400 million world-scale bioethanol plant at BP’s existing chemical plants facility in the UK; in August 2007, the European Commission (EC) has approved the proposal⁴⁶

Chevron⁴⁷

- § Has established research alliances with:
 - o The U.S. Department of Energy’s National Renewable Energy Laboratory to research and develop new technologies to convert cellulosic biomass into biofuels
 - o The Georgia Institute of Technology’s Strategic Energy Institute to develop and research commercially viable processes for the production of transportation fuels from renewable resources such as forest and agricultural waste
 - o The University of California, Davis, to pursue next-generation biofuels
- § Launched in June 2006 a biofuels business unit, which will operate within Chevron Technology Ventures (CTV), a corporate subsidiary dedicated to identifying, developing, and commercializing emerging energy technologies; the new business unit will pursue commercial opportunities related to the production and distribution of ethanol and biodiesel in the US⁴⁸; already completed the acquisition of a 22% interest in one of the first large-scale facilities in the US to produce biodiesel

Total⁴⁹

- § Owns or are partners in seven ethyl tertiary butyl ether (ETBE) production facilities in Belgium, France, Germany and Spain
- § Blends fatty acid methyl esters (FAME) in diesel at its refineries and depots in France, Germany and Italy
- § Conducting research, usually in partnership, to confirm the potential of different biofuels options; examples of partnerships established since 2005 include:
 - o synthetic biodiesel (NExBTL): memorandum of understanding with Neste Oil of Finland in July 2005 for the manufacture of a new high-quality biodiesel from vegetable oil and animal fats in one of Total’s European refineries
 - o Biomass To Liquid (BTL): joined three partnerships in Germany
 - o Hydro Thermal Upgrading (HTU): a high-pressure pyrolysis process for upgrading wet biomass to a “bio-crude” suitable for refinery upgrading, an innovative technology being developed with Dutch partners
 - o ethanol-rich gasoline (E85): actively engaged in the formulation and use of gasoline bases with a high ethanol concentration (E85) in modified vehicle engines
 - o new biofuel bases: R&D partnership with Sofiprotéol, the leading French manufacturer of oil seeds and FAME; participation in a project to assess the performance of fatty acid ethyl esters (FAEE) as a diesel fuel base in connection with a partnership funded by AGRICE (a scientific

- o consortium for the promotion of agriculture in chemical and energy applications) and led by the French petroleum institute, IFP
- o participation in the establishment of the ENERBIO research foundation dedicated to exploratory research on bioenergies. Total is also involved in several other projects funded by the French National Research Agency (ANR)

Conoco Phillips

- § Will establish an eight-year, US\$22.5 million research program at Iowa State University dedicated to developing technologies that produce biorenewable fuels; the grant is part its plan to create joint research programs with major universities to produce viable solutions to diversify America's energy sources⁵⁰
- § Launched a project with Tyson Foods in April 2007 to make diesel fuel out of animal by-products at 175 million gallons a year⁵¹

Compiled by IBON Research

ready limited financial resources. At their worst, biofuel programmes can also result in a concentration of ownership that could drive the world's poorest farmers off their land and into deeper poverty". Increasing corporatization of agriculture through biofuels, the UN-Energy notes, means that "still larger companies will enter the rural economy, putting the squeeze on farmers by controlling the price paid to producers and owning the rest of the value train".⁵²

The threat of more landlessness and increased concentration of the means of agricultural production in the Third World is quite real considering that feudal and semi-feudal conditions remain widespread in pre-industrial countries. In Brazil, for instance, two-thirds of all land where food crops can be grown is owned by only 3% of landlords. Efforts to implement a genuine land reform

program has been sidetracked by the aggressive promotion of the Lula government of agribusiness development, in particular ethanol production.⁵³ Recently, billionaire speculator, finance oligarch George Soros invested US\$900 million in Brazil's ethanol industry. In partnership with a colonial-era landlord family, Soros plans to buy sugar cane lands, build ethanol distilleries in western Brazil, and engage in the export market.⁵⁴ As more lands become concentrated in the hands of landlords and their foreign partners, a growing number of farmers become landless and are forced to enter into exploitative and oppressive work arrangements with those who control the plantations. These developments would surely worsen the plight of sugar cane plantation workers Brazil, who at present already endure intolerable slave-like conditions. (See **Box 2**)

Box 2. Cortadores: modern-day slaves⁵⁵

Brazil has become a global reference point in ethanol production. In 2006, sugar and ethanol were its second largest agricultural exports worth US\$8 billion. With growing demand from the US and Europe, producers expect Brazil's sugar cane production to increase by 55% in the next six years. But behind what President Lula calls energy revolution is the pitiful state of the cortadores de cana (sugar cane cutters) who suffer from harsh working conditions and low wages.

A case in point is Palmares Paulista, a rural town 230 miles from Sao Paulo and the center of a South American energy boom. The farmworkers earn as little as 50p per sugar cane cut and has to endure 12-hour working shifts in scorching heat of over 30 degrees Celsius. They also have to wear thick protective clothes to protect themselves from their sharp machetes. Faced with exhausting work in very high temperatures, some of the farmworkers die. It was reported that 17 cortadores died between 2004 and 2006.

The farmworkers stay in squalid, red-brick tenement buildings where they are crammed into miniscule cubicles, which the workers rent at extortionate prices from landlords. Activists in Brazil say that the cortadores are effectively slaves and the ethanol industry is a shadowy world of middle men and human rights abuses.

Many of the cortadores in Palmares are from the country's arid and impoverished north-east and form part of a destitute migrant workforce of about 200,000 men who risk life and limb to provide the local factories with sugar cane. With increasing foreign investment in the ethanol industry, the number of migrant costadores is expected to grow. In Palmares, 4,000 to 5,000 migrant workers arrive every year to work in sugar cane plantations.

The town's social service chief described the phenomenon: "They arrived here with nothing. They have clothes on their bodies and nothing else. They bring their children with malnutrition, their ill mothers-in-law. It's total exploitation". The migration was triggered by unemployment and poverty and the workers thought that they could find a better life in Palmares because of the ethanol boom. But they are wrong. According to a member of a local Catholic mission that helps the migrant workers: "They think that it rains money in Sao Paulo but they are chasing an illusion. They have no right and they can't complain to anyone – in a certain way they don't exist".

A similar case is the Philippines, where various agrarian reform programmes since the early 1900s under the US colonial rule has ironically intensified land ownership concentration and facilitated different forms of land grabbing. The

country passed a pro-biofuels legislation in January 2007, which was pushed mainly by local sugar land-owning bureaucrats and bourgeois compradors and is now feared to further worsen landlessness in the countryside. (See **Box 3**)

Box 3. Landlord and comprador interest underline the biofuels programme⁵⁶

The Philippines' Biofuels Act of 2006 has been hyped by its supporters as some sort of a silver bullet that could end the country's energy woes and spur development in the countryside. The law intends to maximize the production of sugar cane and coconut in the country to supply feedstock for the required 5%-bioethanol and 1%-biodiesel, respectively.

Among the most ardent supporters of the Biofuels Act in Congress are some of the biggest landlords and bourgeois compradors in the Philippines. Even while the law was still pending in Congress, these politicians had already started to position themselves in the biofuels business. These politicians and their families and/or their landlord/bourgeois comprador patrons are the ones who stand to reap the gains of government's biofuels programme at the expense of farmers and farmworkers.

The principal author of the law, former Congressman (and now Senator) Miguel Zubiri has close sugar connections in the sugar-producing province of Bukidnon that he used to represent in the Congress lower chamber. His father who is the provincial governor used to be the executive vice president of the Bukidnon Sugar Milling Corporation, one of the country's largest sugar companies. The firm has been conducting feasibility studies as early as 2005 for facilities that work both as an ethanol distillery and sugar mill in anticipation of the Biofuels Act.

Senator Zubiri's co-author, Congressman Herminio Teves, on the other hand, has been pushing for the construction of a projected P2-billion (around US\$44 million) integrated ethanol production complex in Negros Oriental, the province which he represents. The complex would cover 214,116 hectares of land and would be developed by a consortium that includes a company owned by Teves's family. Teves is a big landlord in Negros Oriental and owns a separate sugar milling corporation that is also based in the province.

Instead of rural development and job creation, the biofuels program could intensify rural poverty as more farmers become landless. The Philippine government's bogus Comprehensive Agrarian Reform Program (CARP) allows for numerous exemptions from land reform and for various agribusiness schemes where small farmers lose effective control of the land. Ethanol production is now considered a strategic investment by the Philippine government and as such, due consideration must be given to the supposed economic benefits of ethanol business ventures as against the actual physical distribution of lands to farmer-beneficiaries.

Conclusions

Without a doubt, there is an urgent need to end what the biofuels evangelists call the world's addiction to oil. There is no question about the necessity to develop alternative sources of energy to confront pressing issues such as climate change and high oil prices. But to effectively address these issues, there is a need to radically change the framework that countries use to pursue the development of biofuels and alternative energy sources.

The first step is to recognise and acknowledge that the primary reason for worsening global energy insecurity is the domination of American and European TNCs in the energy sector which has remained unchallenged since the inception of this sector. Thus, efforts to address energy insecurity, most especially in the Third World, must challenge this monopoly control.

This requires a more substantial role for national governments, which in most cases particularly in poor countries, have been reduced to facilitating the entry of foreign capital and technology owned by the TNCs from the First World. Host governments must be the central player in the national exploration, development, and utilization of alternative sources of energy if poor countries are to achieve energy security and independence, and long-term sustainable national economic development. At present, most biofuels programmes in the Third World are designed to rely on foreign capital and technology and external markets. In the process, such programmes simply create more opportunities for foreign companies to exploit and profit from Third World resources.

Ultimately, this approach to biofuels development not only fails to answer the problems of energy insecurity and environmental concerns but creates a host of other problems for the people as well. Because the primary intention of private local and foreign investors is to profit from the massive production of biofuels, the whole biofuels development programme becomes insensitive to domestic food security, the interests of the farmers and farmworkers, and the environment.

Further and careful state-led research and development must be pursued before plunging into the mass production and trade of various biofuel feedstock. Unfortunately, because the whole biofuel industry is deeply controlled by corporate interests and cash-starved Third World governments are in

a rush to outdo each other to corner investment flows, further studies are skipped and the benefits and costs are not properly weighed.

Biofuels may indeed provide some positive environmental effects in the long run but its potential as an environment-friendly energy source can never be fully maximized within the current framework of monopoly control in the production and trade by giant energy and agribusiness companies. Worse, as recent trends show, its large-scale production is even more potentially harmful to nature, outweighing its supposed environmental advantages compared with other energy sources.

All the hype about energy security, rural development, and saving the environment are empty talk because biofuels production and trade, as pushed within the context of corporate interests and driven by narrow profit motivation, in the end only bring to a higher level old problems such as those associated with GMOs and environmental degradation, and the marginalisation and exploitation of direct agricultural producers while strengthening the monopoly control of First World-based TNCs in global agriculture.

Energy independence can only be achieved if energy resources are effectively controlled and managed by the state, and not by private – especially foreign – corporations that have narrow interests. Effective state control and management with genuine participation of people's movements in decision making would prevent the wanton conversion of agricultural lands for biofuels production and ensure that genuine agrarian reform and national food security would not be compromised. It would also ensure sustainability because potential crops that would be used as alternative fuels would be truly developed, including the provision of substantial state support to the direct producers.

But a sustainable and pro-people energy security program, including the production of alternative fuels, can be made possible only by a growing grassroots movement that demand government responsibility and accountability. This requires painstaking organising and education, and coordinated mobilization of farmers, farmworkers, indigenous peoples, consumers, and other vulnerable social sectors that have a direct stake in the biofuels debate. It should build on existing people's campaigns and victories against neoliberal restructuring and imperialist plunder of Third World agriculture, for food sovereignty and for genuine agrarian reform.

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Annexes

Annex I

Two generations of biofuels

I. First generation biofuels

First-generation biofuels refer to biofuels made from sugar, starch, vegetable oil, or animal fats using conventional technology". The most common first generation biofuels include:

1. *Bioethanol*: Bioethanol is the most common biofuel worldwide. It is an alcohol fuel produced by fermentation of sugars derived from wheat, corn, sugar beet and sugar cane. The production methods used are enzymatic digestion (to release sugars from stored starches e.g. from wheat and corn), fermentation of the sugars, distillation and drying. Ethanol can be used in petrol engines as a replacement for gasoline; it can be mixed with gasoline to any percentage, see common ethanol fuel mixtures for information on ethanol. All petrol engines can run on blends of up to 15% bioethanol with petroleum/gasoline. For higher percentage blends, engine modifications are needed. Many car manufacturers are now producing flex-fuel vehicles, which can run on any combination of bioethanol and petrol, up to 100% bioethanol.
2. *Biodiesel*: Biodiesel is the most common biofuel in Europe. It is produced from oils or fats using transesterification and is a liquid similar in composition to mineral diesel. Its chemical name is fatty acid methyl (or ethyl) ester (FAME). Oils are mixed with sodium hydroxide and methanol (or ethanol) and the chemical reaction produces biodiesel (FAME) and glycerol. 1 part glycerol is produced for every 10 parts biodiesel. Biodiesel can be used in any diesel engine when mixed with mineral diesel. In some countries manufacturers cover their diesel engines under warranty for 100% biodiesel use. However, the majority of vehicle manufacturers limit their recommendations to 15% biodiesel blended with mineral diesel. In many European countries, a 5% biodiesel blend is widely used and is available at thousands of gas stations.
3. *Vegetable oil*: Vegetable oil can be used for either food or fuel; the quality of the oil may be lower for fuel use. Vegetable oil can be used in many older diesel engines (equipped with indirect injection systems), but only in warm climates. In most cases, vegetable oil is used to manufacture biodiesel, which is compatible with most diesel engines when blended with conventional diesel fuel. No engine manufacturer explicitly states that straight vegetable oil can be used in their engines. Used vegetable oil (e.g. from deep fat fryers) can be filtered and processed into biodiesel.
4. *Butanol*: Butanol is often claimed to provide a direct replacement for gasoline. It is not in widespread production, and engine manufacturers have not made statements about its use. While on paper (and a few lab tests) it appears that butanol has sufficiently similar characteristics with gasoline such that it should work without problem in any gasoline engine, no widespread experience exists. Butanol is formed by ABE fermentation (acetone, butanol, and ethanol) and experimental modifications of the process show potentially high net energy gains with butanol as the only liquid product. Butanol will produce more energy and allegedly can be burned "straight" in existing gasoline engines (without modification to the engine or car), and is less corrosive and less water soluble than ethanol, and could be distributed via existing infrastructures.
5. *Alcohol fuels*: Biologically produced alcohols, most commonly ethanol and less commonly propanol and butanol, are produced by the action of microorganisms and enzymes through fermentation.
6. *Methanol*: Methanol is currently produced from natural gas, a fossil fuel. It can also be produced from biomass. The methanol economy is an interesting alternative to the hydrogen economy.
7. *Biogas*: Biogas is produced by the process of anaerobic digestion of organic material by anaerobes. It can be produced either from biodegradable waste materials or by the use of

energy crops fed into anaerobic digesters to supplement gas yields. The solid byproduct, digestate, can be used as a biofuel or a fertilizer. Biogas contains methane and can be recovered from industrial anaerobic digesters and mechanical biological treatment systems. Landfill gas is a less clean form of biogas which is produced in landfills through naturally occurring anaerobic digestion. If it escapes into the atmosphere it is a potent greenhouse gas.

II. Second generation biofuels

Second generation biofuels use biomass to liquid technology. But unlike bioethanol and biodiesel, which are already in large-scale commercial production, these biofuels are still under development. They include:

1. ***Biohydrogen***: Biohydrogen is the same as hydrogen except it is produced from a biomass feedstock. This is done using gasification of the biomass and then reforming the methane produced. BioHydrogen can be used in fuel cells to produce electricity.
2. ***DMF***: DMF or dimethylfuran production from fructose and glucose using catalytic biomass-to-liquid process
3. ***Bio-DME***: Bio-DME (dimethyl ether) is the same as DME but it is produced from bio-sources. It can be produced from biomethanol using catalytic dehydration or from syngas using DME synthesis. DME can be used in the compression ignition engine.
4. ***Biomethanol***: Biomethanol is the same as methanol but it is produced from biomass. Biomethanol can be blended with petrol up to 10-20% without any infrastructure changes.
5. ***HTU diesel***: HTU diesel is produced from wet biomass. It can be mixed with fossil diesel in any percentage without need for infrastructure.
6. ***Fischer-Tropsch diesel***: (FT) diesel is produced using gas-to-liquids technology. FT diesel can be mixed with fossil diesel at any percentage without need for infrastructure change.
7. ***Mixed alcohols***: Mixed alcohols are produced from syngas with catalysts similar to those used for methanol. Most R&D in this area is concentrated in producing mostly ethanol. However, some fuels are marketed as mixed alcohols. Mixed alcohols are superior to pure methanol or ethanol, in that the higher alcohols have higher energy content. Also, when blending, the higher alcohols increase compatibility of gasoline and ethanol, which increases water tolerance and decreases evaporative emissions. In addition, higher alcohols have also lower heat of vaporization than ethanol, which is important for cold starts.
8. ***Wood diesel***: A new biofuel was developed by the University of Georgia from wood chips. The oil is extracted and then added to unmodified diesel engines. Either new plants are used or planted to replace the old plants. The charcoal byproduct is put back into the soil as a fertilizer.

Source: "Biofuel" from Wikipedia, The Free Encyclopedia accessible online at <http://en.wikipedia.org/wiki/Biofuels>

Recent national developments in the biofuel industry

North America

1. ***United States***: In 2005, the Renewable Fuels Standard (RFS) was passed. It requires the use of 28.4 billion liters (7.5 billion gallons) of biofuels for transportation by 2012. Under new guidelines implementing the Energy Policy Act of 1992, many government fleet vehicles that run on diesel fuel are now required to use B20 (20% biodiesel) blends.
2. ***Canada***: The government aims for 45% of the country's gasoline consumption to contain 10% ethanol by 2010. Ontario will be the center of the ethanol program, where the government expects all fuel to be a 5 percent blend of ethanol by 2007.

Latin America

1. ***Brazil***: The government plans to expand the production of biodiesel. All diesel fuel must contain 2 percent biodiesel by 2008, increasing to 5% by 2013, and the government hopes

to ensure that poor farmers in the north and northeast receive a fair share of the economic benefits of biodiesel production.

2. Colombia: Beginning in early 2006, the government required the use of 10% ethanol in all gasoline sold in cities with populations exceeding 500,000.
3. Venezuela: The state oil company is supporting the construction of 15 sugar cane distilleries over the next five years, as the government phases in a national E10 (10% ethanol) blending mandate.
4. Bolivia: 15 distilleries are being constructed, and the government is considering authorizing blends of E25.
5. Costa Rica and Guatemala are also in the trial stages for expanding production of sugar cane fuel ethanol. Argentina, Mexico, Paraguay, and Peru are all considering biofuel programs as well. Many of these countries have learned from the experience of Brazil, the world leader in fuel ethanol.

Europe

1. A European Union directive has set the goal of obtaining 5.75 percent of transportation fuel needs from biofuels by 2010 in all member states.
2. In February 2006, the EU adopted an ambitious Strategy for Biofuels with a range of potential market-based, legislative, and research measures to increase the production and use of biofuels.
3. Germany and France have announced plans to rapidly expand both ethanol and biodiesel production, with the aim of reaching the EU targets before the deadline.

Asia

1. Japan: The government has permitted low-level ethanol blends in preparation for a possible blending mandate, with the long-term intention of replacing 20% of the nation's oil demand with biofuels or gas-to-liquid (GTL) fuels by 2030.
2. Thailand: The government has mandated an ambitious 10% ethanol mix in gasoline starting in 2007 to reduce the cost of oil imports while supporting domestic sugar and cassava growers.
3. Philippines: In January 2007, the government passed the Biofuels Act of 2006 that mandates blends of 1% biodiesel and 5% bioethanol
4. The palm oil industry plans to supply an increasing portion of national diesel fuel requirements in Malaysia and Indonesia.
5. India: A rejuvenated sugar ethanol program calls for E5 blends throughout most of the country; the government plans soon, depending on ethanol availability, to raise this requirement to E10 and then E20.
6. China: The government is making E10 blends mandatory in five provinces that account for 16% of the nation's passenger cars.

Africa

1. Efforts to expand biofuels production and use are being initiated or are under way in numerous countries, including Benin, Ethiopia, Ghana, Guinea Bissau, Kenya, Malawi, Mozambique, Nigeria, Senegal, South Africa, and Zimbabwe.

Annex II**Summary of major arguments against genetic engineering (GE) and genetically modified organisms (GMOs)**

1. As a new scientific technology, great caution must be used in utilizing GE. It must include carefully controlled long-term tests to assess the impact of GMOs on human health and the environment.
2. GE uses artificial laboratory techniques that breach natural reproductive barriers and combine genes from distant species in ways that could never occur in nature. It alters genetic patterns that have developed over millions of years thus greatly increasing the likelihood of unanticipated side effects.
3. While the choice of which gene to insert is precise, the insertion of this gene into a living cell is highly imprecise, with no control over where the DNA of the new gene is inserted. This unnatural process can disrupt the natural genetic information encoded in the DNA, as well as the regulation of gene expression, in ways that are uncontrolled and unpredictable.
4. While companies claim that all genetically engineered foods have been thoroughly tested before and demonstrated to be safe before they are released to the market, such testing is conducted only on rats and other animals. In addition, such testing are conducted only by the companies that want to market the GMO and very little of this research has been reviewed by independent scientists and published in scientific journals.
5. The unpredictable disruptions in normal DNA functioning caused by GE can produce unanticipated and unknown side effects for human health, including unknown and unpredictable toxins and allergens.
6. There is no evidence that genetically modified foods are safe for human health. There is no objective way to determine if any of these foods have long-term effects that negatively impact human health. Food crops genetically modified to produce their own Bt, a pesticide that protects crops from insects, such as corn and potatoes are like asking people to eat pesticides. Yet when Bt is sold as pesticide (i.e. in the US), people are warned not to swallow it, breathe it, or get it in cuts.
7. There is little evidence that GE increases crop yield or reduces herbicide or pesticide use. Research has shown that genes for resistance to herbicides will outcross with the natural ecosystem, creating 'superweeds' and plants modified to produce their own pesticide will create resistant insect pests. These inflict irreversible damages to the environment.
8. Purely scientific assessment of GE ignores the fact that for many people, food has cultural, ethical, and religious dimensions that must also be considered.
9. Historically, farmers have created the world's crop varieties through natural breeding. To allow large TNCs to use small genetic changes to take control of these collectively produced resources, as well as the evolutionary process itself, is to risk that these corporations would monopolise agricultural output worldwide.
10. If a few giant TNCs in the First World are allowed to control the seed used around the world, serious questions will arise on the national patrimony and sovereignty of many poor countries.