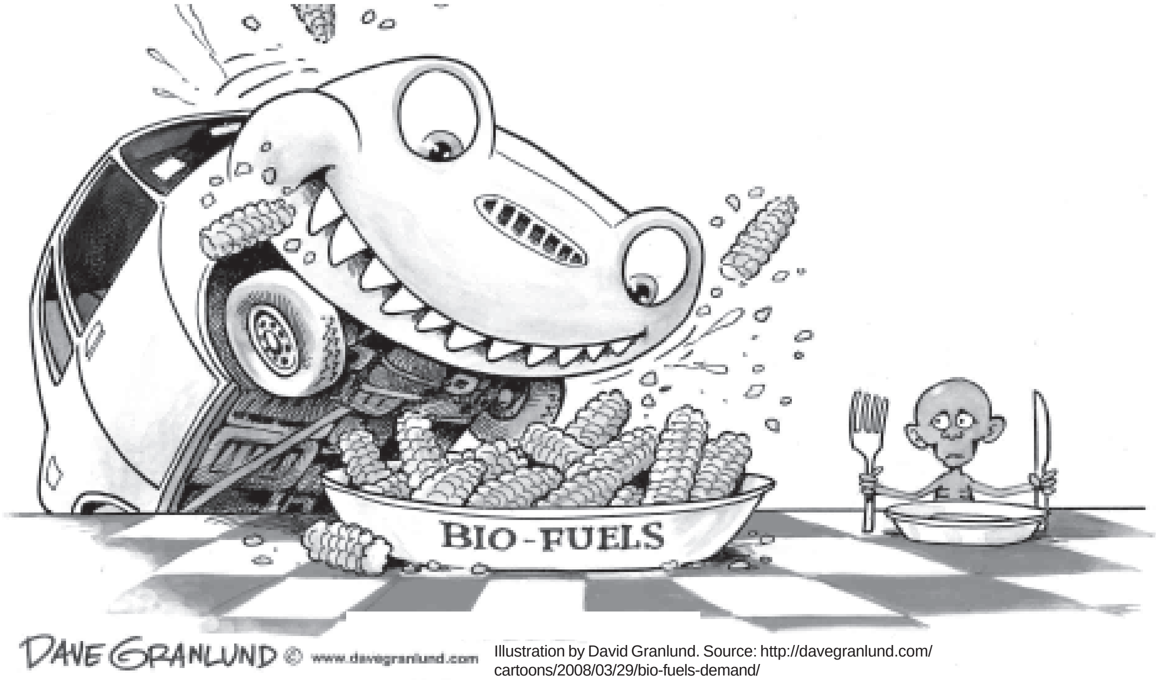


Illustration by David Granlund. Source: http://davegranlund.com/cartoons/2008/03/29/bio-fuels-demand/

Biofuels: False Solution, Disastrous Consequences

by Elenita C. Daño

The food crisis that hit the world in late 2007 up to most of 2008 focused the limelight on a development that the world barely noticed before the crisis: Biofuels.

While they have been promoted and commercialised for years, the world barely noticed the impact of this development until both developed and developing countries collectively felt the pinch from high food prices and scarce food supply.

Prior to the crisis, governments were scrambling to allocate land and adopt policies that provide incentives for production in the midst of worldwide panic over increasing oil prices and climate change. The phenomenal increase in the price of oil resulting from unsteady supply and the global concern to mitigate greenhouse gas emission that bring dangerous climate change, provided the powerful push factors for the biofuel hype.

The biofuel hype

Biofuels are derived from organic matters such as agricultural and forest crops, decaying matters and other biological materials. There are two main types of biofuels, namely, *bio-ethanol* and *bio-diesel*. Bio-ethanol is produced from sugarcane, corn or any starchy crops, while bio-diesel is produced from palm oil, soybean, rapeseed, castor oil or any oil-producing crops like coconut or *Jatropha curcas*. About 60 per cent of global bio-ethanol production comes from sugarcane, while most commercial bio-diesel comes from rapeseed, palm oil and soybeans.

Civil society movements worldwide adopt the term "agrofuel" as more appropriate to describe the nature of biofuels which mainly rely on agricultural crops as feedstock. Research trends point to the viability of using forest biomass and algae as potential sources of feedstock in the future. Thus, the term biofuel broadly conveys all fuels derived from organic or biological materials.

The bulk of biofuels produced in any country is consumed domestically. Brazil, the world's largest exporter of the most efficient bio-ethanol, produces more than 40 per cent of the country's gasoline consumption annually. But this is barely 10 per cent of its total domestic production. Biofuels are projected to contribute around 20 to 30 per cent of the global energy demand by 2030.

The glowing projections on the demand for biofuel are triggered by major push and pull factors. The push comes from the growing recognition that the glory days of cheap oil have ended. The price of oil that peaked in mid-2008 and began plummeting since then has not dissuaded the most optimistic of petroleum fanatics, but merely emphasised the serious threats posed by supply and price volatility to global economy and stability. One irrefutable message that the recent oil crisis has taught the world is the imperative of reducing our dependence on fossil fuel.

Another strong push comes from the global pressure to address climate change by drastically reducing greenhouse gas emission, in which the energy, transport and industrial sectors are major contributors.

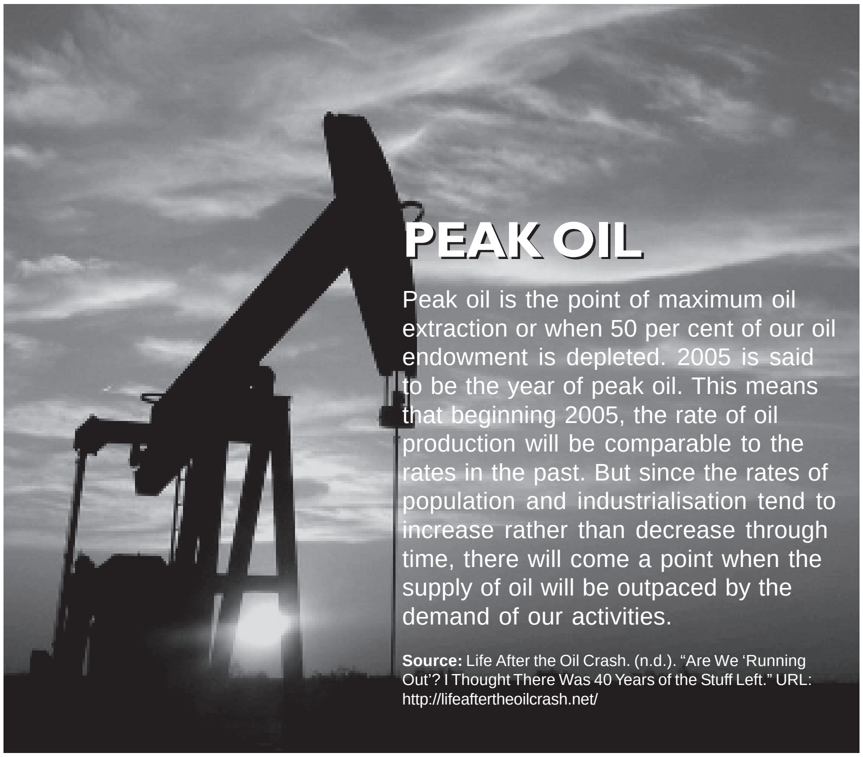
Unlike fossil fuels that are derived from non-renewable oil deposits in certain parts of the world, many of which are perennially wrought with political and military conflicts, biofuels can be produced from agricultural crops that can be cultivated, harvested and processed in countries that need them. Unlike fossil fuel and coal that emit greenhouse gases that have largely caused global warming since the industrial revolution, biofuel is derived from organic matters that are considered "carbon-neutral" when burned.

An attractive pull factor is the increasing demand for fuel in general and biofuel particularly in developed countries and by the growing elite in some developing countries. With the unabated consumption of oil in countries like the United States (US) reaching up to 400 gallons per capita annually, which has become the unfortunate benchmark of how developed countries produce and consume, the market for biofuel is very promising. The reality of "peak oil" that hit the world hard in 2008, provided the grand stage for the biofuel hype.

Biofuel is not a novel source of energy. Many communities across the world have used it in the past, albeit at a small-scale often household-based level. Many rural communities in Southeast Asia with no access to kerosene during World War II used oil extracted from *Jatropha curcas*, coconut and castor beans for lighting and cooking. Many communities across the Pacific such as in the Marshall Islands and the Bougainville, have been using coconut oil to fuel vehicles. *Jatropha curcas* has been widely promoted in Mali since the 1980s as a local source of fuel for cooking and lighting, as well as a viable livelihood for rural women (Henning, 1998).

But the biofuel hype is far from providing an affordable and accessible energy for the poor. In order to meet the unquenchable demand for energy to fuel the industrial world's unsustainable production and consumption patterns, biofuel needs to be produced in an industrial-scale that integrates efficient processing based on the economies-of-scale model.

Mainly due to the high production costs in converting engines and machines to pure biofuel, commercial biofuel is generally blended with fossil fuel counterparts.



PEAK OIL

Peak oil is the point of maximum oil extraction or when 50 per cent of our oil endowment is depleted. 2005 is said to be the year of peak oil. This means that beginning 2005, the rate of oil production will be comparable to the rates in the past. But since the rates of population and industrialisation tend to increase rather than decrease through time, there will come a point when the supply of oil will be outpaced by the demand of our activities.

Source: Life After the Oil Crash. (n.d.). "Are We 'Running Out'? I Thought There Was 40 Years of the Stuff Left." URL: http://lifeaftertheoilcrash.net/

Rather than a solution to replace fossil fuel, such biofuel is generally presented as an alternative or complement to fossil fuel (Duffey, 2006).

Reality Check: Impacts on the Environment and Communities

Biofuel accounts for less than five per cent of the total fuel consumption worldwide. Currently, only a small amount of the biofuel produced are traded internationally, with the bulk consumed domestically. However, trade in biofuels is expected to expand rapidly, as many countries, largely because of limited land and agricultural resources, do not have the capacity to supply their internal markets (Duffey, 2006).

The potentials of earning from the biofuel trade and the promise of energy security have inspired many developing countries to adopt policies to promote biofuels; allocate land for biofuel production; and provide incentives for biofuel production and commercialisation.

Big developing countries like India and China, and smaller ones like the Philippines and Bangladesh have legislated the promotion of biofuels; have aggressively moved to allocate agricultural lands for biofuel production; and have provided incentives for the shift to biofuel use especially in the transport sector. Unfortunately, the potential and actual impacts of biofuels production on the environment and communities are often downplayed in the quest to realise these potentials and promises.

Competition for land: fuel or food?

Large-scale cultivation of crops for biofuel increases competition for agricultural resources, mainly for land and water, between food production and biofuel production. More agricultural lands would have to be set aside for biofuel production to meet the increasing demand of a world that continues to produce and consume unsustainably.

Even with the strategy to focus more on non-grain oil crops such as jatropha, which can even grow in marginal lands, large-scale production would require agricultural lands. As it is, the world already has limited land to spare for growing food, let alone for biofuel crops.

Satellite data reveal that 40 per cent of the earth's land is already used up for agriculture. In order to raise its share in global consumption of transport fuels to 10 per cent, more than a third of all agricultural lands would need to be converted for biofuel production (cited in Jhamtani and Daño, 2007).

Experts estimate that if the current number of vehicles running on bio-ethanol blend increase by four per cent annually, the world will need to plant the entire area of the US, except for cities, with corn by 2048 (Dias De Oliveria cited in Mendoza, 2007). Currently, the US' entire corn harvest when converted into ethanol can only provide 12 per cent of the country's gasoline needs while the entire soybean harvest can only provide six per cent of their diesel fuel requirements.

Beyond the theoretical computations on the serious competition for land between food and biofuel production, the recent food crisis has shown how the figures translate to ugly realities. In 2008, the World Bank estimates that biofuels are directly responsible for the recent explosion in grain and food prices worldwide, forcing "food prices up by 75 per cent" (Chakrabortty, 2008).

Proponents claim that improved extraction of biofuel from crops, increased yields, and more efficient production can address concerns on competition with food production. However, increasing productivity in a large-scale farm context would require more water, fertilisers and other chemical inputs, even the use of genetically modified crops that are designed to have higher cellulose or oil content.

Filling up a 25-gallon tank of sports utility vehicles (SUV) with pure ethanol consumes about 204 kilograms of corn which is enough to feed 30 persons in a year.

More intensive biofuel production would require intensified use of fertilisers which are derived from the by-products of petroleum. Massive use of fertilisers has resulted to serious soil degradation in many parts of the world where intensive agricultural cultivation has been introduced through such vehicles as the Green Revolution.

Competition for Water in the Era of Global Warming

Increased production of biofuel in commercial scale and expansion of agricultural areas will substantially increase the demand for water. Depending on the feedstock source, one liter of ethanol consumes about 2,000-10,000 liters of water. Corn generally consumes 4,000 tonnes of water per tonne of grain produced and another 15 to 16 tonnes of water per tonne of processed ethanol, or an equivalent of 10,000 liters of water per liter of ethanol produced (Mendoza, 2007).

Furthermore, biofuel production involves processing of feedstock that brings voluminous liquid wastes as by-products that pollute surface and ground water, adversely affecting the supply of clean and potable water.

Already, agriculture consumes 93 per cent of the world's available fresh water supply and benefits from 66 per cent of the world's total water withdrawals (World Water Council). The amount of water required for food production is projected to increase from 60 to 90 per cent in the next 50 years, especially if there is no improvement in water productivity, a tough task in the era of global warming when many areas around the world are threatened by perennial drought (IWMI, 2006).

"Green Energy," Expensive Food

As the world experienced in the recent food crisis, the growing demand for biofuel significantly contributed to the rising price of food crops, aggravated by limited supply of commodities in the world market. Sugar prices have doubled (driven in part by Brazil's use of sugar cane for fuel), world corn and wheat prices soared by one-third in 2007.

By 2020, the increasing demand for biofuels at current rates of expansion is expected to push the price of wheat to as much as 30 per cent, corn, 41 per cent and oilseeds, 76 per cent (von Braun and Pachauri, 2006). Notably, caloric consumption suffers from high food prices, declining as price rises by a ratio of 1:2 (cited in Jhamtani and Daño, 2007).

The world witnessed the translation of these grim projections into reality in last year's food crisis. In Mexico, the expanding cropland planted with yellow corn for ethanol exported to the US reduced the supply of white corn for tortillas, thus pushing prices of white corn and tortillas up, causing social unrests in 2007 (Altieri and Holt-Gimenez, 2007; Crenson, 2007).

For the world's poorest people, many of whom spend as much as three-fourths of their income to buy food, rising food prices is a serious threat to survival. Higher food prices will further marginalise the world's poor whose fundamental access to food is often threatened by fluctuations in food supply, demand and prices. High costs of feedstock drive small livestock and poultry raisers out of business, depriving millions of poor families of their livelihood sources.

Simple calculations of how biofuels deprive people of food to ensure survival are scandalous. Filling up a 25-gallon tank of sports utility vehicles (SUV) with pure ethanol consumes about 204 kilograms of corn which is enough to feed 30 persons in a year (cited in Mendoza, 2007). In the name of providing clean energy for the luxury cars of consumers in rich countries, it is simply immoral to divert the protein and carbohydrate sources of the poor in developing countries for transport use.

Clean Energy, Dirty Production

The production of "clean fuel" from crops such as corn and ethanol involves dirty processes. Ethanol from sugarcane is produced with the generation of huge liquid wastes called distillery slops that come out at 12 to 18 liters for every liter of ethanol produced (Madrid et al 1982, Manalili et al 2003 cited in Mendoza, 2007).

On the other hand, corn ethanol plants generate 13 liters of wastewater for every liter of ethanol produced (Pimentel and Patzek, 2005). Ethanol wastes are highly acidic and foul-smelling, that they could be highly pollutive if not treated and disposed properly.

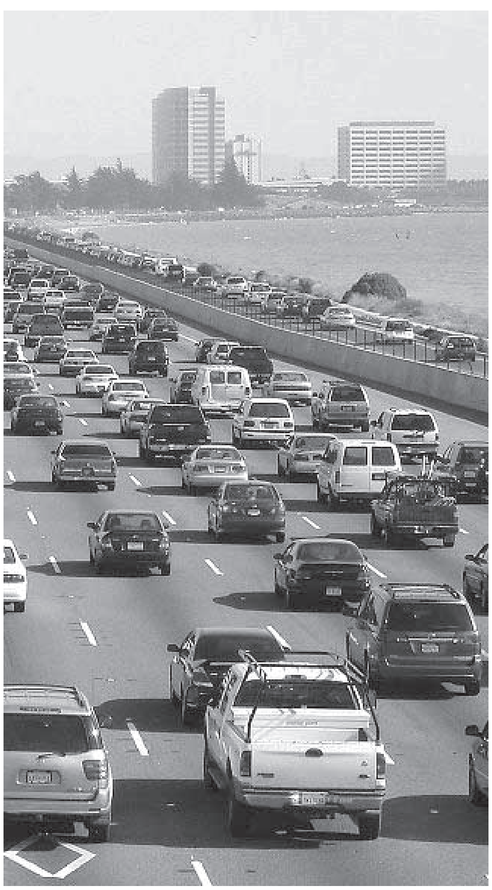
Waste from bio-diesel is three times more pollutive than ethanol waste, producing nine to 15 liters of slop waste equivalent per liter of bio-diesel produced. While wastes and by-products can be treated and re-used for various purposes such as fertilisers, the treatment is expensive and beyond the reach of small-scale biofuel producers.

Free from fossil fuel, at last?

Ironically, commercial production of biofuel based on intensive, industrial monoculture systems increases the use of fossil fuel-based agricultural inputs such as inorganic fertilisers and chemical pesticides. Industrial corn, for instance, requires high levels of chemical nitrogen fertilisers and herbicides. Soybeans require massive amounts of non-selective herbicide that upsets soil ecology and produces "superweeds." Intensive production and monocultures result to massive topsoil erosion and surface and groundwater pollution from pesticides and fertiliser runoff.

While biofuels have been promoted as "clean energy" source, its energy balance—the amount of fossil energy needed to produce crop biomass compared to that coming out—is a controversial issue. Some researchers see serious negative energy balances with biofuels, with ethanol production from corn consuming 25 per cent more energy (Pimentel and Patzek, 2005). At best, other researchers found that the energy balance from corn ethanol is between 1.2 to 1.8, with jatropha yielding the highest energy balance among all biofuels.

Energy balance varies widely across biofuel types, taking into account the entire fuel cycle, from feedstock production to final consumption, and depending on the type of feedstock used, methods of cultivation and conversion technology (Duffey, 2006).



Fuel Consumption at Top Speed. *The United States is still the world's top consumer of oil, with nearly 21 million barrels per day and the world's greatest carbon emmiter. Together with China and the European Union, the US accounts for half of all fuel consumption.*

Sources: Damassa, Thomas.(12 November 2006). "Fossil Fuel Consumption and its Implications." URL:http://www.wri.org/stories/2006/11/fossil-fuel-consumption-and-its-implications and the Central Intelligence Agency. (9 February 2009). Factbook. URL: https://www.cia.gov/library/publications/the-world-factbook/geos/us.html

Photo from Wikimedia Commons

Does it help mitigate climate change?

Agriculture and land use change contributes a total of 32 per cent in the total greenhouse gas emission worldwide. A closer look at the biofuel production process, however, raises some serious questions on its supposed contribution to mitigate climate change. Burning of sugarcane fields prior to harvest to reduce labor costs is a common practice in developing countries that considerably increases greenhouse gas emission, pollution and health risks in surrounding communities. Thousands of hectares of forests and peatlands are burned every year in Indonesia to give way to expansion of oil palm plantations.

Greater use of fertilisers particularly nitrogen releases more nitrous oxide and carbon dioxide into the atmosphere from the manufacturing process of nitrogen fertilisers. When applied to soil, nitrogen oxide escapes from the soil as a very potent greenhouse gas. The energy requirement in nitrogen fertiliser production, including transportation and storage, ranges from 1.8 to 2.04 liters of oil per kilogram of nitrogen (Heller 2000, cited in Mendoza 2007).

In the final analysis, industrial-scale production of biofuels depend on fossil fuel to keep the feedstock production and processing plants working and to keep the trucks and tankers running to transport the end products to the market. In the most pessimistic projection, reduction in greenhouse gas emission resulting from the shift to biofuels may even be offset by the increased use of fossil fuel for industrial-scale biofuel production.

Fuel feasting on forests

To meet growing demands, forests are cleared and burned in many developing countries for expansion of biofuel production. Large-scale monoculture soybean plantations have damaged over 91 million acres of forests and grasslands in Brazil, Argentina, Paraguay and Bolivia (Altierri and Holt-Gimenez, 2007). More oil palms are planted in Indonesia by clearing the forests and drying or burning peatlands, making it the third highest emitter of greenhouse gases in the world. Forest clearing for oil palm cultivation is the underlying cause of perennial forest fires that hit Indonesia's densest forest areas, resulting in a damaging haze that affect most of Southeast Asia.

Any reduction of greenhouse gases is defeated when carbon-capturing forests are felled to make way for biofuel crops and will add to the impacts of deforestation in tropical countries, such as floods and soil erosion due to longer dry periods (Altierri and Holt-Gimenez, 2007). Burning forests emit more carbon dioxide into the atmosphere and leaves no more sinks to absorb carbon (Hartmut Michel as cited in Burgonio, 2008). This trend throws serious doubts on the purpose of biofuel in providing a cleaner and more environmentally sustainable alternative to fossil fuel.

Land for Fuel Without People

Deforestation continues to threaten the survival of indigenous peoples, forest dwellers and the rural poor who depend on forests for their food, livelihood and cultural identity. Indigenous communities have been displaced in Indonesia and Malaysia in the course of clearing forests to give way to oil palm plantations.

Indigenous cultures, dependent on community interaction with biological resources in the forests, have been severely eroded by the displacement of communities and the integration of indigenous peoples to monoculture production. Communities have been deprived of their traditional sources of food, nutrition and medicines. The burning of forests has reduced biodiversity which is the very foundation of agriculture and potential source of natural compounds for treating diseases.

In the competition between food and fuel, the poor who have limited access to and control over land and other productive resources are bound to loose. While biofuel production can potentially create jobs in impoverished rural areas where the bulk of the world's poor and hungry live, efficient production of biofuels favours large-scale production, pushing small-scale producers to the margins.

Many of the potential social benefits from biofuels may only be realised if opportunities for small-scale production and community-based processing of feedstocks are present. The current reality that favours large-scale production and centralised processing to ensure efficiency are no reasons for optimism.

Subsidising Destruction

Taking the same path as fossil fuel, biofuel production is heavily subsidised especially in industrialised countries where the current demand is mostly concentrated. In the US, for example, estimates show that more than 200 support measures amount to US$0.45 to US$0.57 per liter for bio-diesel and US$0.38 to US$0.49 per liter for ethanol (cited in Jhamtani and Daño, 2007). Without such subsidies, biofuels would not be able to compete with the heavily-subsidised and well-entrenched cartel distribution of fossil fuels.

With biofuels already heavily subsidised in the US and the European Union (EU), producers in developing countries are also demanding for subsidies from their governments. Subsidy is also demanded based on the supposedly "environmentally friendly" nature of biofuels.

Second Generation Biofuel: Will it be better?

The harsh realities confronting biofuels from agricultural crops have pushed proponents to divert attention to the promises of the so-called second generation biofuels which involve the conversion of cellulosic biomass to bio-energy. Technologies in advanced development use genetically modified organisms or processes in synthetic biology that efficiently converts cellulosic materials from forests and agricultural wastes to energy sources.

Already, various researches have begun to cast doubts on the promises of biomass-based fuel. Current technologies are anchored on harvesting and processing of so-called agriculture and forest wastes, as if such biomass has no function in the natural ecosystem where they are found.

Agricultural and forest biomass play a very important role as a primary source of energy for soil microbial activities and in trapping carbon that would have otherwise been released into the atmosphere. Basic soil biology dictates that crop residues are essential for soil nutrition, water retention and soil carbon, and that yields are reduced when residues are removed from the soil (Mendoza, 2007).

Biofuels for the poor?

For economic reasons, poor farmers may be pressured to grow crops for biofuels than for food while not having access to energy. This situation would merely echo countless stories of large-scale hydropower plants

Fueling the future or pumping towards perdition? *Although touted as the most environmentally friendly fuel, doubts remain on the sustainability of biofuels, especially if it can eat up humankind's sources of food and expel wastes into the land, water and the atmopsphere.*

Photo taken from URL: http://www.ecofriend.org/contact-us.php?q=general

displacing communities for the sake of providing energy to industries and cities while leaving nearby poor villages without electricity.

While biofuels ventures have been cited as absorbing employment, they would not automatically improve the working and living conditions of workers in mono-cropping plantations. Worse, in a highly centralised and distorted energy production and distribution system, developing countries may even end up subsidising the energy needs of their industrial elite at the expense of the poor's welfare.

There is a glaring inequity in energy distribution, where the rich in the North and the South consume and waste more energy while the multitude of the poor do not have access to energy. Adopting biofuels as a technology fix would definitely not make the poor less marginalised and disempowered. A meaningful shift to biofuels or for any renewable energy source for that matter, would take a paradigm shift in energy and in the mode of production and the consumption pattern. ■

Elenita C. Daño *is an Associate of Third World Network, based in Davao City, Philippines. She has extensive experience in policy advocacy and research on wide-ranging issues in agriculture and biodiversity in developing countries, particularly in Southeast Asia*

References:

Altieri, Miguel A. and Holt-Gimenez Eric. (6 February 2007). "UC's Biotech Benefactors: The Power of Big Finance and Bad Ideas." URL: http://www.foodfirst.org/node/1621

Brown, Lester. (17 August 2006). "Ethanol could leave the world hungry." URL: http://money.cnn.com/magazines/fortune/fortune_archive/2006/08/21/8383659/index.htm

Burgonio,TJ. (14 January 2008). "Rethink biofuel, says Nobel laureate." URL: http://newsinfo.inquirer.net/inquirerheadlines/nation/view/20080114-112152/Rethink-biofuel-says-Nobel-laureate

Chakrabortty, Aditya. (3 July 2008). "Secret Report: Biofuel Caused Food Crisis; Internal World Bank study delivers blow to plant energy drive." URL: http://www.guardian.co.uk/environment/2008/jul/03/biofuels.renewableenergy

Crenson, Matt (12 March 2007). "Biofuels Boom Raises Tough Questions." URL:http://theseep.wordpress.com/2007/03/12/biofuels-boom-raises-tough-questions-ap-report/

Duffey, Annie. (2006). Biofuels Production, Trade and Sustainable Development: Emerging Issues. London: International Institute for Environment and Development (IIED).

Henning, Reinhard. (1998). "Use of Jatropha curgas L.*: A Household Perspective and Its Contribution to Rural Employment Creation; Experiences of the* Jatropha *Project in Mali, West Africa, 1987-1997" (copytext)*

International Center for Research in the Semi-Arid Tropics (ICRISAT). (2007). "Pro-Poor Biofuels Outlook for Asia and Africa: ICRISAT's Perspective". (copytext)

International Water Management Institute (IWMI) Comprehensive Assessment Secretariat. (2006). "Insights from the Comprehensive Assessment of Water Management in Agriculture, Stockholm World Water Week." (copytext)

Jhamtani, Hira and Elenita Daño (2007). "Biofuels: Access to Energy or Market Fundamentalism?" In Third World Resurgence

Koplow, Doug. 2006. "Biofuels - At What Cost? Government Support for Ethanol and Biodiesel in the United States.": Geneva: Global Subsidies Initiatives of the International Institute for Sustainable Development Report

Mendoza, Teodoro C. (2007). "Are Biofuels Really Beneficial for Humanity?" in Philippine Journal of Crop Science (PJCS) *Issue 32, No.3: pp. 83-98.*

Pimentel, David and Patzek, Tad. (2005). "Ethanol Production Using Corn, Switchgrass, and Wood; Biodiesel Producting Using Soybean and Sunflower.": Natural Resources Research*, Vol. 14, No. 1.*

Von Braun, Joachim and R.K. Pachauri. (2006). "The Promises and Challenges of Biofuels for the Poor in Developing Countries.": IFPRI 2005-2006 Annual Report. *Washington, DC: International Food and Policy Research Institute (IFPRI)*

World Water Council. (nd). "Water at a Glance." URL: http://www.worldwatercouncil.org/index.php