Biofuel- A Threat for Food Security and Environment

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Biofuel may play a role in curbing climate change but may create food insecurity and environmental hazards in many developing countries.

In the recent time production and use of biofuel has increased globally due to soaring of fossil fuel price and to secure sustainable energy supply for the future. Biofuels can help reduce global warming by curbing green house gas emission and create employment opportunity and increased income for the rural poor in many developing countries. On the other hand Kyoto Protocol's Clean Development Mechanism (CDM) offers potential for funding biofuels projects in developing countries resulting increasing of biofuel production in these countries. At the same time skeptics argue that benefits may be offset by increased food insecurity for the billions of hungry people in poor country and may create serious environmental problems.

Biofuels, which are made from agricultural crops and other plants e.g. corn (maize), palm oil, sugar cane, *Jathropa* (a biofuel yielding plant), etc. have been seen by many as a cleaner and cheaper way to meet the world's soaring energy needs than with greenhouse gas emitting conventional fossil fuels. The most common use for biofuels is automotive transport. Biofuel can be produced from any biological carbon source. The most common by far is photosynthetic plants that capture solar energy. Many different plants and plant-derived materials are used for biofuel manufacture. In the preparation of biofuel, it is usually grow agricultural crops like sugarcane, sugar beet, maize etc. and then converted it into ethanol by yeast fermentation. It can also done by producing oil yielding plants such as *Jatropha*, *Pongam* seed or rape seed and then oil are heated to reduce their viscosity and they can be directly burn in the diesel engine.

"Conventional fossil fuels still account for more than 95 percent of the global transportation fuel market, biofuel production is gradually increasing 15 percent per year, a rate over ten times that of fossil fuel". Brazil is the world's largest producer of sugar-based ethanol, producing about 16 billion litres a year and US, the world's biggest oil user, is the second-largest biofuel producer after Brazil. Brazil plans to increase biofuels share from 37% to about 60% by 2020. In 2005, the U.S. pledged to nearly double ethanol production by 2012, and the European Community recently announced that biofuels will meet 10 percent of their transportation fuel needs by 2020. According to recent UN-Energy report on "Sustainable Bioenergy", global biofuels production has doubled in the last five years and will likely double again in the next four years. Some of the countries enacted new pro-biofuel policies in recent years are: Australia, Canada, China, India, Indonesia, South Africa, Thailand etc. In China, the government is making E10 (a fuel mixture of 10% ethanol and 90% gasoline) blends mandatory in five provinces that account for 16% of the nation's passenger cars. In Southeast Asia, Thailand has mandated an ambitious 10% ethanol mix in gasoline starting in 2007. India is extending plantations of *Jatropha* and the Indian sugar ethanol program sets a target of 5% bioethanol incorporation into transport fuel.

However, not everyone, particularly the developing country is enthusiastic about the booming of biofuel production. Critics are highlighting the potential environmental and social costs of biofuels, including the consequences of increased food insecurity on the billions of poor of the developing country.

Impacts on food security

World-wide around 852 million people are without enough food to eat on a regular basis and another 2 billion face intermittent food insecurity (SOFI 2004). Progress in reducing poverty and hunger has been limited in many developing countries in recent years despite the development efforts. However, the percentage of hungry people in the world has declined. “Still more people around the world die of hunger than of AIDS, Malaria and Tuberculosis combined”. International Food Policy Research Institute (IFPRI) projections suggest that, the number of food-insecure people in the world would rise by over 16 million for every percentage increase in the real prices of staple foods. That means that 1.2 billion people could be chronically hungry by 2025.
In general, poor people spend a much bigger share of their overall expenditure on food than they do on energy. A recent study by IFPRI revealed that, both the urban and rural poor in a selected number of developing countries spend between about 50% and 70% of their expenditure on food and about 1% to 10% on energy. A country study (Ahmed *et al.* 2007) revealed that, a Bangladeshi five-person household living on one dollar a day per person typically spends its 5 dollars as follows: 3 dollars on food, 50 cents on energy and 1.5 dollars on non-food items. A 20% increase in both food and energy prices would require that they cut or reallocate 70 cents of their expenditures—and doing so from their 1.5 dollars in initial nonfood expenditures would be extremely difficult given the quasi-fixed costs of housing, school fees, transport, and so on (von Braun, J. and Pachauri, R.K. 2006). As a result, cuts will likely be made to food expenditure, exacerbating diet quality and micronutrient malnutrition.

The IFPRI, project that given continued high oil prices, the rapid increase in global biofuel production will push global corn prices up by 20 percent by 2010 and 41 percent by 2020. “The prices of oilseeds, including soybeans, rapeseeds, and sunflower seeds, are projected to rise by 26 percent by 2010 and 76 percent by 2020, and wheat prices by 11 percent by 2010 and 30 percent by 2020”. In the poorest parts of sub-Saharan Africa, Asia, and Latin America, where cassava is a staple food, its price is expected to increase by 33 percent by 2010 and 135 percent by 2020. The projected price increases may be mitigated if crop yields increase substantially or ethanol production based on other raw materials (such as trees and grasses) becomes commercially viable. But unless biofuel policies change significantly, neither development is likely. The production of cassava-based ethanol may pose an especially grave threat to the food security of the world's poor. Year 2007 began with tortilla riots in Mexico and ended with grain riots in China due to high energy prices and ethanol production drove up corn and grain prices. Several studies by economists at the World Bank and elsewhere suggest that caloric consumption among the world's poor declines by about half of one percent whenever the average prices of all major staples food increase by one percent. When one staple food becomes more expensive, people try to replace it with a cheaper one, but if the prices of nearly all staples go up, they are left with no alternative.

Many of the crops currently used for producing biofuel require high-quality agricultural land and significant inputs of fertilisers, pesticides and water. In most cases, biofuels crops are grown on the food crop land. A study by the International Energy Agency (IEA) assessed the impact on cropland if the US and EU expand biofuel production according to current plans. The results show that up to

43% of cropland would be needed for biofuel production. "*Jatropha*" is being pushed as one of the new smart crops for African small farmers to produce fuel, and the impact is already being felt around the continent. In Tanzania, thousands of farmers growing rice and maize are already being evicted from fertile areas of land with good access to water, for biofuel sugar cane and *Jatropha* plantations on newly privatised land. This topic is internationally controversial, with good-and-valid arguments on both sides of the ongoing debate. Prices on a number of food types used for biofuel have doubled in the last couple of years. If the use of food crops for biofuels (corn) increases, commodity prices will increase, making these crops less accessible to the poor. There are those that say biofuel is not the main cause. Some say the problem is a result of government actions to support biofuels. Others say it is just due to oil price increases. Whatever may be the cause, the impact of food price increases is greatest on poorer countries. There are other challenges as well. Like any innovation, increased production of energy crops has the potential to exacerbate socioeconomic inequalities by concentrating benefits on the well-off.

Without technologies to improve productivity, the prices changes would adversely affect poor, net-food-purchasing households and would probably exceed the possible income gains by many small farm households. In general, biofuels that use food sources are costly to the poor and raise prices on the basic foods that already represent a large share of poor people's household spending. Therefore, the crop subsidies that encourage the production of biofuels from certain food sources have a welfare burden on the poor, as well as on producers of those crops in other countries.

Impacts on environment

One of the arguments in favor of biofuels is that they could positively affect net carbon emissions as an alternative to fossil fuels. However, the rapid growth of biofuel industry have unintended impacts on the environment e.g. it can lead to deforestation, a loss of biodiversity, and excessive use of fertilizers and pesticides, thereby degrading the land and water that poor people depend on.

Large-scale biofuels production can threaten ecosystem, as seen recently with palm oil plantations in Indonesia that are encroaching on forests and edging out the endangered orangutan population. In Brazil, the Cerrado, a vast forest with rich biodiversity, just south of the Amazon, is coming under pressure as sugar cane cultivation expands.

In October 2007, Nobel Laureate Paul Crutzen published findings that the release of Nitrous Oxide (N_2O) from rapeseed oil, and corn (maize), contribute more to global warming than the fossil fuels they replace. However, the Crutzen paper goes on to say that crops with less nitrogen demand, such as grasses and woody coppicing will have positive but lower climate impacts. In February 2008, two articles were published in *Science* concluding that clearing land for biofuel production produces twice as much greenhouse gas than the IPCC had previously estimated.

In some locations such as Indonesia and Malaysia, deforestation for Palm Oil plantations is leading to displacement of Indigenous peoples. Also, extensive use of pesticide for biofuel crops is reducing clean water supplies.

In terms of economic impact, global biofuel expansion will affect prices, crop and energy markets, labor and land markets. If it moved into a larger production scale, macro-economic variables, including exchange rates will be affected.

A policy alternative

Still the issue of producing biofuel in the developing country is a sensitive issue where land is very scarce and poor spend their lion share income for purchasing food. Before go for commercial production of biofuel, the socio-economic and environmental issue should be taken into consideration including food security issue. Besides these, there are other concerns regarding efficiency. First, biofuels must be produced in a way that results in an output of energy greater than the amount of energy used to produce them—that is, they should have a highly positive energy balance. Second, biofuel production must be managed in a way that substantially reduces greenhouse gases compared with petroleum. Biofuel crop production can be a suitable alternative if designed in a participatory manner with those whose livelihoods will be affected.

There is recent advancement in the production of biofuel. Second-generation technologies can solve the food security issues as ethanol is produced from residues such as stalks and leaves. Third generation bio-fuel is also promising as it produces from Algae which will not threat to food crop production. The development of cellulosic ethanol could dispel some of these concerns, but additional research and investment are needed to make this technology commercially viable and environmentally sustainable. Cellulose conversion technologies will open up enormous potential for broadening the kinds of feedstocks that can be used for biofuel to include trees and grasses that produce large amounts of usable biomass per hectare and that can be grown in areas where biofuel crop is less likely to compete with agricultural production for food and feed supplies. These technologies will enable greater use of existing agricultural waste and crop by-products and will also encourage growth of dedicated feedstock plantations, including tall grasses like switch grass and *Miscanthus*, and plants rich in non-edible oils like *Jatropha curcas* and *Pongamia pinnata* (Karoch) that grow in low-rainfall areas and on poor soils. *Ponagamia pinnata* is a common tree abundantly grown in *haor* areas of greater Sylhet districts. *Pongamia* and *Jatropha* are non food crops and can be also grown in marginal, degraded or unproductive land of the country. These two plants can be potential biofuel for Bangladesh as it does not compete with food crops. The degraded land most likely held considerably less carbon than the plantation, even in the soil and other below-ground biomass. In this case, the change in land use will offer not only benefits resulting from displacing fossil fuels, but also carbon benefits and other ecosystem benefits. In Brazil, for example, environmental regulations now require 25 percent of the plantation area to be left in natural vegetation to help preserve biodiversity and provide other ecosystem services.

In addition, in many low-income developing countries, farmers are unaware of the opportunities presented by biofuel production and thus risk missing out on the potential benefits. Public-private partnerships could help raise awareness of these opportunities among farmers in low-income countries.

The future of biofuels is uncertain, depending largely on the price of oil, agriculture and energy policies, and technological developments. The potential social and environmental risks associated with biofuels must be carefully weighed when deciding how much to produce, what types of land will be used and in what types of feedstocks to invest. One can be certain that ethanol and biodiesel cannot solve all of the economic and environmental problems associated with fossil fuels. In that case we can explore and adopt improved technology and invest more for CNG transport, LPG vehicle, battery-electric car, hydrogen fuel cell buses, etc. to meet energy balance for automobile. Measures that reduce overall demand for energy, such as increasing the fuel economy of automobiles and expanding mass transit options in cities, will also be necessary.

Without a holistic policy framework, biofuels opportunity can go terribly wrong for the poor in the country. Only in the presence of appropriate *agricultural, economic, trade, energy and social policies* will biofuels contribute to energy security without jeopardising food security of the poor. In the conclusion a framework will be required for policy and action needed to achieve win–win outcomes in terms of economic development, energy security, and food security for the billions of poor.

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