

## BIOFUEL AND FAIR ENERGY<sup>1</sup>

The analyzes of trends related to alternative fuels and vehicles show that well-protected biofuels producers in the EU and the US received massive investments from the private sector, and production based on food crops has increased rapidly. As a result, food prices have risen, directly impacting urban populations and food-importing countries in the South, questions are being asked about the role biofuels is playing.

The growing need for biofuel is changing the business of agriculture, especially in developing countries, where there is also a push to grow soybeans and corn for use in biofuels. Developing countries have to produce biofuels with a very low price, and often at the expense of the environment. Critics suggest the resulting changes are anything but positive, pointing to stories of small farmers being pushed from their land to make way for big biofuels companies and chemical spraying on crops that is harming citizens. However, this policy is incoherent with EU policies to eradicate poverty and to help enhance sustainable economy in developing countries.

### Background

There are large uncertainties in estimating the future demand for petroleum fuels as well as for that of biofuels. Projected demand for biofuels is estimated based on projections for petroleum oil fuel demand for the transportation sector for 2030, an assumed 10% mass rate of substitution of the petroleum by biofuels, and a diesel to gasoline ratio of 45.5% to 54.5%.

There is uncertainty regarding sustainability of biofuels production in the face of changing climates. According to the projections made by IPCC (2007), agricultural production and food security are under threat due to climate change and variability, and this threat also holds for annual or perennial biofuels crops to be grown to meet the biofuels demands. Thus, there is a need for an improved understanding of all these issues to assess the potential sustainable biofuels production and its environmental and socio-economic implications in developing countries.

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There have been studies that prove the many benefits of substituting fossil fuels (petroleum, etc) with biofuels - converting biomass into liquid fuels, such as biodiesel and ethanol, for transportation. In its simplest sense, biofuels are a perfect replacement for oil products. This is because biofuels are easily renewable and are very inexpensive to produce.

Using biofuels can also help the economy (especially for countries who aren't oil-rich), as it reduces the dependency on imported, foreign oils. This means that a large part of the national budget can be saved by relying on biofuels. It can create numerous jobs.

Biofuels are biodegradable which means they are derived from organic materials and they are naturally renewable. Moreover, these biofuels emit nontoxic and cleaner emissions in comparison to traditional fuels. All types of biofuels are carbon neutral. This means that the amount of carbon dioxide created by the burning of biofuels is equal to the CO<sub>2</sub> absorption capacity of the plants. Hence, no extra CO<sub>2</sub> remains in the atmosphere.

Although many researches show that biofuels are much more environment-friendly than any other known form of fuels and cause much less greenhouse gas (GHG) emissions in comparison to the conventional types of transport fuels and also do not promote global warming, since the carbon they emit is taken back to the environment, a new research has revealed that the burning of materials to produce biofuels emits enough nitrous oxide to create a greenhouse effect.

However, major concerns of wide scale biofuel production are the increased need of growing crops to meet the demand and that **biofuels uses more energy than they can produce**. This leads to some arguments, since it might require extensive land that involve forests, wild habitats and agricultural lands. The environmentalists say that if the use of biofuels is promoted, than more and more land will be used to produce crops to make biofuels. This will result in a loss of habitat for various species of animals and plants.

Some 300 to 500 million farmers in the tropics rely on shifting cultivation and practice a type of 'slash-and-burn' farming. This land-use strategy allows them to grow crops for a few years, after which they have to move on because the nutrient-poor, acidic tropical soils rapidly become depleted. All the while, they contribute to deforestation, out of necessity. This land-use system is a key factor in rural poverty.

A concern that seems valid is that with the increased use of biofuels the farmers may star to grow crops meant for biofuels production rather than the ones that can be used as food. A reduced food production can increase the prices and cause the inflation to rise. The problem is expected to be at its worst in the developing countries, millions of people suffer from the increase in the food prices.





You can drive in tropics many hours and there will be only African palms plantation to the left and right.  
 Photo: Ruta Pels (People to People Estonia).

### US Policies on Biofuels

Alternative fuel and fuel economy legislation in US dates back to the Clean Air Act of 1970 (as amended in 1990), which created initiatives to reduce mobile sources of pollutants. In 1988, federal laws established vehicle manufacturer incentives in the form of Corporate Average Fuel Economy (or CAFE) credits (Alternative Motor Fuels Act). The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the Transportation Equity Act for the 21st Century (TEA-21) of 1998 laid the foundation for highway construction and safety programs.

The Energy Independence and Security Act of 2007 introduced provisions to increase the supply of renewable fuel sources and raise CAFE standards to reach 35 miles per gallon by 2020. The Emergency Economic Stabilization Act enacted the Energy Improvement and Extension Act of 2008, and the American Recovery and Reinvestment Act of 2009 appropriated nearly \$800 billion towards the creation of jobs, economic growth, tax relief, improvements in education and healthcare, infrastructure modernization, and investments in energy independence and renewable energy technologies. ARRA supports a variety of alternative fuel and advanced vehicle technologies through grant programs, tax credits, research and development, fleet funding, and other measures for Clean Cities portfolio areas (alternative fuels, advanced vehicles, idle reduction, and fuel economy).

On January 2010 US Department of Energy **announces nearly \$80 million investment for advanced biofuels research and fueling infrastructure** that should help support the development of a clean sustainable transportation sector. Two biofuels consortia research



algae-based and other advanced biofuels are part of the Department's continued effort to spur the creation of the domestic bio-industry while creating jobs.

Two cross-functional groups will seek to break down critical barriers to the commercialization of algae-based and other advanced biofuels such as green aviation fuels, diesel, and gasoline that can be transported and sold using today's existing fueling infrastructure. The selected projects consist of leading scientists and engineers from universities, private industry, and government, and will facilitate sharing expertise and technologies.

On July 2011 the US Department of Energy, Office of Energy Efficiency and Renewable Energy's Biomass Program will host its fourth annual conference "Biomass 2011: Replace the Whole Barrel, Supply the Whole Market". This conference will focus on topics surrounding the use of biomass as a replacement for petroleum to supply the energy, products, and power markets. The Biomass 2011 theme will explore the new horizons of bioenergy technologies and deployment strategies, business practices, policies, and partnerships that will help sustainably transform the energy landscape.

Biomass 2011 will use targeted debate topics, plenary sessions, breakout tracks, and technology demonstrations to shape discussion of viable next steps to move the industry forward. The conference will provide a framework to facilitate new collaborations between existing bioindustry and energy companies, technology providers, financiers, federal agencies, and academia, while highlighting the diverse applications of bioenergy and generating the sustained momentum necessary to achieve bioenergy development goals.

### **EU Policies on Biofuels**

On June 2010 European Commission sets up system for certifying sustainable biofuels. The Commission encouraged industry, governments and NGOs to set up certification schemes for all types of biofuels, including those imported into the EU. It laid down what the schemes must do to be recognised by the Commission. This will help implement the EU's requirements that biofuels must deliver substantial reductions in greenhouse gas emissions and should not come from forests, wetlands and nature protection areas. The rules for certification schemes are part of a set of guidelines explaining how the Renewable Energy Directive should be implemented.

Günther Oettinger, EU Commissioner responsible for Energy, said: "In the years to come, biofuels are the main alternative to petrol and diesel used in transport, which produces more than 20% of the greenhouse gas emissions in the European Union. We have to ensure that the biofuels used are also sustainable. Our certification scheme is the most stringent in the world and will make sure that our biofuels meet the highest environmental standards. It will have positive effects also on other regions as it covers imported biofuels."

The package adopted consists of two Communications and a Decision which should help businesses and Member States to implement the Renewable Energy Directive. They focus especially on the sustainability criteria for biofuels and what is to be done in order to control that only sustainable biofuels are used.

On July 2010 European Commission launches public consultation on Indirect Land Use Change (ILUC) and Biofuels. Indirect land use change is a subject of great complexity. The Commission is therefore consulting on a wide basis; seeking advice on both the scale and characteristics of the problem, as well as, if the scale of the problem is significant enough, how it should be addressed. The Commission has issued also several studies on the topic together with the consultation document.

On November 2010 European Commission launches major investment programme (NER300) for innovative low-carbon technologies, including bioenergy. It is first call for proposals for the world's largest programme of investment in low carbon and renewable energy demonstration projects. The initiative, known as NER300, will provide substantial financial support for at least eight projects involving carbon capture and storage (CCS) technologies and at least 34 projects involving innovative renewable energy technologies.

The aim is to drive low carbon economic development in Europe, creating new 'green' jobs and contributing to the achievement of the EU's ambitious climate change goals. The European Investment Bank (EIB) is collaborating with the Commission in the implementation of the programme.

Using revenues from selling of CO<sub>2</sub> allowances, around €4.5 billion will be available for innovative renewable energy technologies and CCS. With project sponsors and Member States contributions this will sum up to €9 billion. This can give a needed boost for keeping EU in the frontrunner position when it comes to climate friendly technologies. Europe has the know-how, the ability and the ambition to lead the world in developing the technologies required to tackle climate change.



The NER300 initiative will act as a catalyst for the demonstration of new low carbon technologies on a commercial scale. These and other green technologies are an increasingly important source of future economic growth and jobs. They will also help us meet our ambitious climate targets for 2020 and beyond."

NER300 funding can be combined with financing from other EU instruments, including the Structural and Cohesion Funds and the European Energy Programme for Recovery (EEPR). Under the NER300 decision, the EIB is responsible for selling the 300 million allowances and managing and disbursing the proceeds. While details, including the starting date of the sales, are not fixed yet, it is expected that all NER300 allowances will be sold before the start of the third trading period of the EU ETS in January 2013.

### **Biofuels and developing countries**

Biofuels have been supported in the EU and US as a replacement for oil, with the result of displacing food production and pushing up food prices. Many biofuels and carbon offsetting schemes deprive people of land, water and food and this is incoherent with efforts the EU has taken to eradicate poverty.

Biofuels production opportunities in developing countries are being fuelled by the apparent relative availability of land to grow the feedstock crops; however, a biofuels boom in these countries raises concerns about potential added social and environmental pressures. Possible impacts include increases in food prices and reduced food security in low income societies and environmental consequences resulting from land-use and land-cover change (e.g. greenhouse gas emissions and loss of biodiversity). These impacts depend on the premise that biofuels production can be sustained at a reasonable level, and with transparent and fair market prices to allow appropriate investment.

Recent years have seen various "solutions" proposed to the problems of climate change and new fuels. Unfortunately, many of them have impacted negatively on the poor, particularly women and indigenous people, whilst allowing the current economic system to continue. The Food and Agriculture Organization has found that women in particular are adversely affected by large-scale biofuels production, because of the competition for marginal land, which is often used by women for household food production; high water consumption of biofuels crops, which compete directly with household needs and increase women's workload; and

exploitation of female biofuels plantation workers. Other projects are designed to offset the emissions produced by consumers or businesses in the developed world, by reducing or sequestering carbon emissions. Initiatives such as forestry projects that enclose previously communal land tend to affect women most because they are often dependent on natural resources for their livelihoods.

About one billion people in the world are hungry or malnourished, with over half of them living in rural areas in South Asia and Sub-Saharan Africa (SSA) and dependent on agriculture for food and livelihoods. In South Asia there is sufficient per capita food production to feed the population but unequal distribution of food, resulting in pockets of hungry people; whereas in Sub-Saharan Africa there is insufficient per capita food production to feed the population as a whole. There is potential to increase yields in both areas. South Asia realizes about 75% the global average yields of major food crops, while Sub-Saharan Africa realizes less than 30%.

Countries are following a decision process in order to fit the biofuels industry within their development strategies and available resources (physical, monetary and institutional). First, countries define their overall objectives, as well as the policies needed to support those goals, which may be guided by the potential benefits identified.

From other side, there are voices that the development of biofuels will bring direct opportunities to developing countries because their production will create many local jobs in the value chain - from growing raw materials to their manufacture. Furthermore, the local production of biofuels in developing countries will help to decrease the dependency on costly fossil fuel imports.

Local production of biofuels for internal consumption could have substantial economic benefit in terms of foreign exchange savings. Brazil and most Sub-Saharan countries also view biofuels as potential options for creating rural employment.

The biofuels policies of developed countries - EU and USA are partly driving and defining biofuels programs in the developing world, particularly Africa. The biofuel programs in many countries such as Ethiopia, Kenya, Madagascar, Mozambique, and Tanzania are in part export driven and prompted by investment from external agencies such as European companies (BP in Ethiopia, D1, Sun Biofuels, Sekab, to name but a few). Both developed and developing countries, have already set targets for substituting or supplementing diesel and gasoline by biofuels, with proportions ranging from 5 to 20% to be met at various times within the period 2010-2030. Both developing and developed countries are in the process of formulating



biofuels policies to meet these targets, along with associated incentives, regulations and standards.

It is likely that many of these biofuels programs and projects are being launched without considering and enacting long-term policies. Yet, these policies will shape biofuels programs and the associated impacts (e.g. land use change, employment, land tenure, ecosystem and human health, air quality) in the years and decades to come.

### **Biofuels' perspectives**

Energy supplies need to be secure and sustainable as well as affordable. To reduce the reliance on fossil fuel, conservation is still the primary strategy. There is no instant weaning on conventional petroleum diesel. It is quite impossible to totally replace it but instead the consumption must be decreased. Other sources of energy such as solar, wind, etc. are still needed. But this does not mean that biofuels have no future. As a matter of fact, it has a very promising potential. As an alternative to this “traditional” diesel or gasoline fuel, it is expected to yield significant energy security and environmental advantage to its consumers.

There is a greater variety of highly productive biofuels feedstocks that can be grown in tropical developing countries compared to those that can be grown in temperate, developed countries. For ethanol, these include sugarcane, a variety of starchy crops such as cassava, and grain crops such as maize, and sweet sorghum. A wide variety of oilseed crops, traditionally viewed as foodstuffs, (e.g. groundnuts, sesame and soybean) and several cooking oil production crops (e.g. cotton seed, oil palm, and sunflower) can be used for biodiesel production. In many areas where food production should be given a priority over biofuels production to meet national food security requirements, inedible crops and a variety of non-food crops are already being used or explored for their biofuels potential.

Scientists note several potential perennial cellulosic and nonedible oil crops including trees and shrubs such as jatropha, several palms and indigenous Amazonian trees. The potential biomass/oil yields and quality of many trees and non-edible oil crops from the woodlands and arid lands of Africa are beginning to be investigated through various projects (e.g. the World Agroforestry Centre in collaboration with a European Commission INCO project “Competence Platform on Energy Crop and Agroforestry Systems for Arid and Semi-arid Ecosystems – Africa).



The trees *Pappea capensis* and *Ximenia caffra* are potential oilseed sources and indigenous to Southern Africa.

The Mission of the European Biofuels Technology Platform is to contribute to the development of cost-competitive world-class biofuels value chains, to the creation of a healthy biofuels industry, and to accelerate the sustainable deployment of biofuels in the EU through a process of guidance, prioritisation and promotion of research, technology development and demonstration. Although biomass is a renewable energy source, the development of biofuels raises important issues of Food vs Fuel, Land Availability and Environmental Impact, Indirect Effects and a need for measures (e.g. certification, GHG savings standards and cultivation criteria) to be put in place to ensure sustainability.

The sustainability of biofuels is covered by the EC Joint Research Centre (JRC) project Quality and Performance of Biofuels (BioF) and projects such as BioGrace.

The EU funded project BioGrace aims to harmonise calculations of biofuel greenhouse gas emissions and thus supports the implementation of the Renewable Energy Directive (RED, 2009/28/EC) and Fuel Quality Directive (FQD, 2009/30/EC) into national laws.

BioGrace will be holding a series of public workshops on biofuels GHG calculations focusing on all EU Member States. The workshops will be held between February and June 2011 in Utrecht, Netherlands, Heidelberg, Germany, Paris, France, Athens, Greece, Stockholm, Sweden and Madrid, Spain.

## Conclusion

The process of biofuels production has been termed as non-sustainable. Most of the biofuels when produced tend to create a negative effect on food production. Also, no method of biofuels production has been discovered that does not cause any environmental problems.

For biomass fuels, the most common feedstocks used today are corn grain (for ethanol) and soybeans (for biodiesel). In the near future agricultural residues such as corn stover (the stalks, leaves, and husks of the plant) and wheat straw will also be used. Long-term plans include growing and using dedicated energy crops, such as fast-growing trees and grasses, and algae. These feedstocks can grow sustainably on land that will not support intensive food crops.

Biodiesel production from a range of crops could be grown cooperatively by smallholder farmers. The choice of feedstock must consider and assure food security, environmental protection, social equity and national/rural development. This choice must be informed by



market options; local, national, international or a combination of any of these. When a decision is made that the biofuels industry is appropriate, implementation mechanisms must be put in place to address investments in inter-sectoral research and technology access, provision of incentives at all value-chain stages and policy coherence over time.

The recent experiences of high fuel prices and the mismatch between global demand and supply present optimism about the potential of biofuels. Export opportunities (feedstock and finished products) for many of the developing countries with comparative advantages of available land for low cost feedstock production now appear real.

However, some areas will struggle with addressing biophysical and infrastructure hurdles mentioned in this chapter (e.g. lack of roads, low soil fertility, access to water etc.) to make the ventures profitable. It is also important to emphasize that the success of biofuels export from developing countries to developed countries will depend on the future policies of countries such as the US and EU, which subsidize domestic, but inefficient, biofuels agro-industries resulting in trade barriers.

### Recommendations

- :: The EU should stimulate productive second-generation biofuels.
- :: To make researches about Non-food crops have potential, though they still need research on their domestication and conversion into biofuels.
- :: An innovative new approach could turn this situation around. It is based on biochar - a carbon-rich product obtained from the pyrolysis of biomass.
- :: To develop technologies, including hydrogen, and an enhanced geothermal power generating system using geothermal fluids stored in submarine volcanic rocks.
- :: To use renewable energy - biomass power, geothermal power, solar power, wind energy. Renewable energy technologies can help contribute to a clean and secure energy future for nations and the world.

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