Present and future of biofuels production for sustainability

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PRESENT AND FUTURE OF BIOFUELS PRODUCTION FOR SUSTAINABILITY

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Abstract
This paper provides policy relevant information on the assessment of the environmental and social costs, benefits, the critical developments and the options for a more sustainable use of biomass and measures to increase resource productivity of biofuels. In the 21st century biofuels are considered as economically efficient, socially equitable, and environmentally safe substitute of gasoline. The USA and Brazil produce major portion of the global biofuels. The expansion of biofuels conflicts arise around the food vs. fuel debate and the desirability, feasibility and sustainability of biofuels. At present more than two billion people in the world are suffering from hunger and more are suffering from nutritional deficits. If the production of biofuels be increased continually, more than half of the people of the world will starve around 2020 and most of them will suffer in poorer nations. The paper stresses not to violate human rights in producing biofules.
Key words: Biofuels and biomass, greenhouse gas emissions, sustainability.

INTRODUCTION

Biofuels are combustible materials directly or indirectly derived from biomass, commonly produced from wood, agricultural crops and products, aquatic plants, forestry products, wastes and residues, and animal wastes. Biofuels are part of the bioenergy family which refer to energy produced from biomass products which can be transformed into fuels, notably for transport, stationary use or productive purposes. Biofuels may be solid, liquid or gaseous and include all kinds of biomass and derived products used for energetic purposes. Solid biofuels include wood, charcoal and bagasse (sugar cane after juice extraction). Wood and charcoal are widely used as fuel for domestic purposes such as cooking in the rural areas of most developing countries. Waste bagasse, the fibrous material produced from sugar cane processing, is extensively used for steam and electrical power generation in raw sugar mills. Liquid biofuels include methanol, ethanol, plant oils and the methyl esters produced from these oils commonly referred to as biodiesel.

Gaseous biofuels include methane gas and producer gas. Methane gas is produced from the anaerobic fermentation of animal wastes, wastewater treatment sludge and municipal wastes in landfills. The bioenergy is one of the so-called renewable energies. Besides the traditional use of bioenergy, modern bioenergy comprises biofuels for transport, and processed biomass for heat and electricity production. Traditional biomass means unprocessed biomass, including agricultural waste, forest products waste, collected fuel wood, and animal dung, which is burned in stoves or furnaces to provide heat energy for cooking, heating, and agricultural and industrial processing, typically in rural areas (Bringezu et al. 2009).

Climate change due to global warming and with an increasing demand for energy, volatile oil prices, and energy poverty have led to a search for alternative sources of energy which would be economically efficient, socially equitable, and environmentally sound. One of such type of fuel is biofuels. It provides substantial energy and mitigating climate change so that both government and industry owners in many countries encourage increasing the production of biofuels. The farmers of the poorer countries seek for additional income and production of biomass provides them extra benefit. But it has negative implications of growing biomass for biofuel production. Current biofuels are often made from feedstock crops which also serve as food. Therefore, there is a competition between food and fuel. To produce biofuels, production of food is decreasing and many people are starving due to shortage of food, so that people of poorer countries are suffering from malnutrition and prices of foods are increasing in these countries. To produce biofuels sometimes habitats are destroyed, so that ecosystems are broken and harms high biodiversity and services which are crucial to our economies and human life.

In this paper we provide policy relevant information on the assessment of the environmental and social costs and benefits of biofuels. We describe the critical developments and the options for a more sustainable use of biomass and measures to increase resource productivity. The uncertainty on the overall assessment has been growing to obtain the possible benefits and risks of biofuels. The role of biofuels within the wider climate change agenda to reduce greenhouse gas (GHG) emissions from the transportation sector by means other than biofuels such as fuel efficiency standards for vehicles and the development of hybrids and electric cars. We emphasize on the key problems and perspectives toward sustainable production and use of biofuels. We stressed on enhancing resource productivity, options for more efficient and sustainable production and use of biomass. The modern biomass uses for energetic purposes, such as for generation of heat and power, for the preparation of food and other materials, and liquid biofuels for transport.

Biofuels for transport are generally denoted according to their current or future availability as first, second or third generation biofuels as follows (IEA 2008): First-generation biofuels are commercially produced using conventional technology. The basic feedstocks are seeds, grains, or whole plants from crops such as corn, sugar cane, rapeseed, wheat, sunflower seeds, jatropha curcas, soy or oil palm. These plants were originally selected as food and most are still mainly used to feed people. Biofuels are produced from these feedstocks. The most common first-generation biofuels are bioethanol, biodiesel, and biogas (CH_4 and other hydrocarbons). Biodiesel are obtained from edible oil or from animal oils which are transformed by a chemical process called transesterification. Biodiesel can be blended with fossil fuels without any motor's transformation and also can be used as pure biodiesel. Bioethanol are produced by the fermentation of sugars or starches from sugar cane, cassava, maize, potatoes, sorghum, sugar beet, wheat etc. We also find oilcake, glycerin, fertilizer etc. as by product when prepare first generation biofuels.

Second-generation biofuels can be produced from a variety of non-food sources such as waste biomass, residues, non-food cellulosic (wood) and ligno-cellulosic material (freeing the sugar molecules from cellulose using enzymes), corn stover, the stalks of wheat, and special energy or biomass crops. Second-generation biofuels use biomass to liquid technology, by thermochemical conversion (mainly to produce biodiesel) or fermentation (to produce cellulosic ethanol). Many second-generation biofuels are under development such as biohydrogen, biomethanol, dimethylfuran (DMF), Bio-DME (dimethyl ether), Fischer-Tropsch diesel, biohydrogen diesel, and mixed alcohols.

Algae fuel (oilgae) is a biofuel from algae and denoted as a third-generation biofuel (IEA 2008). Algae are feedstocks from aquatic cultivation for production of triglycerides to produce biodiesel. The processing technology is basically the same as for biodiesel from second-generation feedstocks. Other third-generation biofuels include alcohols like bio-propanol or bio-butanol but because of production difficulties these will not be marketed before 2050, (IEA 2008). Second and third generation biofuels are also called advanced biofuels.

In the developing countries more than 500 million households still use traditional biomass for cooking and heating. But about 25 million households cook and light their homes with biogas and a growing number of small industries, including agricultural processing, obtain process heat and motive power from small-scale biogas plants. Biomass contributed about 1% to the total global electric power capacity of 4,300GW (Giga Watts) in 2006. World ethanol production for transport fuel tripled between 2000 and 2007 from 17 to more than 52BL (billion liters), while biodiesel expanded eleven-fold from less than 1 to almost 11BL. From 2007 to 2008, the share of ethanol in global gasoline type fuel use was estimated to increase from 3.78 to 5.46%, and the share of biodiesel in global diesel type fuel use from 0.93 to 1.5%. The major of transport biofuels producing countries are the USA, Brazil, and the EU. Production in the USA consists mostly of ethanol from corn, in Brazil of ethanol from sugar cane, and in the EU mostly of biodiesel from rapeseed. Other countries producing fuel ethanol include Australia, Canada, China, Colombia, the Dominican Republic, France, Germany, India, Jamaica, Malawi, Poland, South Africa, Spain, Sweden, Thailand, and Zambia. Biodiesel production expanded quickly in Southeast Asia (Malaysia, Indonesia, Singapore and China), Latin America (Argentina and Brazil), and Southeast Europe (Romania and Serbia).

Investment into biofuels production capacity probably exceeded $4 billion worldwide in 2007 and increasing continually rapidly. Industry with government support also invests heavily in the development of advanced biofuels.

THE INCREASE OF DEMAND OF BIOFUELS IN POWER AND HEAT SECTOR

Among developing countries, heat production from agricultural waste is common and small-scale power is increasingly being deployed, for example from rice or coconut husks. The use of bagasse for power and heat production is significant in countries with a large sugar industry. Wood pellets from forest and timber processing residues have become more common, with about 800,000 homes in the US currently using pellets and 6 MT (million tons) consumed in Europe in 2005. The main European countries employing pellets are Austria, Belgium, Denmark, Germany, Italy, the Netherlands, and Sweden. China's national renewable energy target is 15%

of primary energy by 2020, including 30 GW of biomass which is less than 10% of the total renewable target. In 2007 almost 50BLs of ethanol were manufactured while biodiesel supply reached 10BLs. Brazil and the US are the leaders for bioethanol production in the world generating 90% of the total production, with sugarcane in Brazil and mainly corn in the USA. It is estimates that about 90% US ethanol is obtained from maize (Schnepf 2005). The rapidly increasing petroleum prices and uncertainties concerning its availability, growing concern of the environment and the effect of GHGs during the last decades, has revived more and more interests in the use of vegetable oils as a substitute of fossil fuel

BIOFUELS IN TRANSPORTATION SECTOR

Drinking alcohol in a glass of wine, beer, or liquor is ethanol. Fuel ethanol is “denatured” by the addition of 2-5% gasoline, which makes it undrinkable. In the U.S. today fuel ethanol is mostly made from the starch in corn kernels; in Brazil it is made from the juice in sugar cane (FAO 2007). World ethanol production for transport fuel tripled between 2000 and 2007 from 17 to more than 52BL, while biodiesel expanded eleven-fold from less than 1 to almost 11BL. These fuels together provided 1.8% of the world’s transport fuel by energy value (Organization for Economic Co-operation and Development, OECD 2008). In Europe there has been a continuing increase in the use of biofuels in road transport over the past decade from 0.1% in 1997 to 2.6% in 2007 (European Environment Agency, EEA 2008 a,b). Current use of biofuels for transport on the global scale is dominated by bioethanol and biodiesel. Commercial investment in second-generation biofuel plants is beginning in Canada, Germany, Finland, Japan, the Netherlands, Sweden, and the USA (EEA 2008a,b).

OECD (2008) estimated that 64.5BL ethanol and 11.8BL biodiesel are using for transportation in 2008 which is 22% increases from 2007. From 2005-2007 to 2008, the share of ethanol in global gasoline type fuel use has increased from 3.78 to 5.46%, the share of biodiesel in global diesel type fuel use has increased from 0.93% to 1.5% (OECD 2008). The main producing countries for transport biofuels are the USA (ethanol from corn), Brazil (ethanol from sugar cane), and the EU (biodiesel from rapeseed). The USA became the leading fuel ethanol producer in 2006 and was producing over 18BL. Unfortunately US ethanol imports increased six-fold because of local increased demand of energy. US ethanol production is expected to further increase and reaches to 38BL in 2008, which is 43% up from 2007, but representing more than half (58%) of global production (OECD 2008). Brazilian ethanol production increased to 22.5BL in 2008, which is 29% of the world’s total (OECD 2008). Malaysia’s ambition is to capture 10% of the global biodiesel market by 2010 based on its palm oil plantations. Indonesia also planned to expand its palm oil plantations by 1.5Mha (Mega hectares) by 2008, to reach 7Mha totals, as part of a biofuels expansion program that includes $100 million in subsidies for palm oil and other biofuels from soy and maize.

New biodiesel capacity has developed throughout Europe which is about 7BL/a at the end of 2006. Plans for new biodiesel plants and increased palm oil and Jatropha plantations were announced in several countries during 2006/2007. Serious commercial investment in second-generation biofuels began during 2006/2007 in many countries, like Canada, the USA, Japan and the EU (REN21 2008). The world's first commercial wood-to-ethanol plant run by BioEthanol Japan Kansai Co. began operation in Osaka in 2007, with a capacity of 1.4ML/a. In the USA, the first commercial cellulosic ethanol facility to convert waste wood materials into a renewable fuel went into production near Upton, Wyoming in 2008, run by KL Process Design Group. In Europe, the Dutch firm Royal Nedalco was building a $200M plant that would produce 200ML/a from wheat chaff and other wastes by late 2008 (OECD 2008). Global trade in fuel ethanol is estimated to have been about 3BL/a over 2006/07.

Brazil has been the world leader in mandated blending of biofuels for 30 years under its ProAlcool program. The blending shares are adjusted occasionally, but have remained in the range of 20–25%. A new US renewable fuels standard implies that 20% of gasoline for road transport would be blend of biofuels by 2022. In 2007, the German government proposed a national total biofuels target of 17% of energy consumption for road transport by 2020. The EU has adopted a new EU-wide binding target of 10% of transport energy from renewable sources by 2020 (EU 2009).

FUTURE TARGET OF BIOFUELS PRODUCTION

To increase the production of biofuels depends on the availability of fertile land appropriate for producing the various feedstocks and efficient technologies. There are a number of uncertainties which can affect biomass availability as follows (Bringezu et al. 2009):

- Irrigation may be necessary for economically viable outputs in countries where water is already scarce.
- Improved farm management and higher productivity usually imply increasing use of fertilizers and appropriate pest control. This may lead to increased pollution from nutrients and biocides.
- More intensive farming to produce energy crops may require less extension of land than extensive cropping of lower yield feedstocks, but with opposite effects on field biodiversity. More intensive cattle-raising would also be necessary to free up grassland currently used for grazing.
- If the total demands increases faster than yields, agriculture could drive up land and food prices, and contribute to further land use changes.
- In particular with regard to further yield increases and the hazard of extreme weather vents and this may lead to regional and local yield shocks.

The Scientific Council on Global Environmental Change of the German Government estimated the economically viable and sustainable potential for global bioenergy (energy crops and waste) to amount to 40 to 85EJ/a (exajoule (10^{18} joules) per annum) by the middle of the 21st century (Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen, WBGU 2008). The IEA (2007a) expects a rather moderate development for biomass and waste to contribute 56EJ/a in 2015 and 68EJ/a in 2030 (table-1).

Table 1: Bioenergy Accounting to IEA (2007a). Source: Bringezu et al. (2009).

	2005	2015	2030	2005-2015	2005-2030
Total primary energy supply-TPES (EJ)	479	601	742	26%	55%
Biomass and waste (EJ)	48	56	68	16%	41%
Share of biomass of TPES	10.10%	9.30%	9.10%	-8%	-9%
Total energy consumption-TEC (EJ)	324	404	497	25%	53%
Biouels for transport (EJ)	0.8	2.4	4.3	200%	437%
Share of biomass of TEC	0.20%	0.60%	0.90%	140%	250%

The FAO (2008) expects that the global use of bioethanol and biodiesel to nearly double from 2005- 2007 to 2017. Most of this increase will be due to biofuels use in the US, the EU, Brazil and China. Indonesia, India, Australia, Canada, Thailand, the Philippines and Japan are all likely important producers and consumers in the foreseeable future. The total biofuels feedstocks for the global production would increase from 50MT in 2005 to 193MT in 2017.

In 2003, total EU biomass use for energy purposes was 69MT and total biomass use for energy would be 130MT in 2010. Biomass Action Plan and an EU Strategy for Biofuels expressed that the measures in the action plan could lead to an increase in biomass use to about 150MT in 2010 or soon after. It is estimated that the amount of global energy could be supplied by biomass in 2050 range from 40 to more than 1,000EJ. The estimates of biomass from all sources by 2050, including trees and forest wastes, range up to 1.3BT (Perlack et al. 2005).

IMPORTANCE AND OPPORTUNITIES OF BIOFUELS

In the 21st century the use of biofuels are increased due to global warming and climate change for the dependence on fossil fuels only. Biodiesel is a renewable fuel and presents advantages of producing approximately 80% less carbon dioxide emissions, and almost 100% less sulfur dioxide. The development of biofuels projects can help to reduce urban pollution and promote rural development dealing with poverty alleviation challenges. The renewed interest in biofuels is increased mainly to the rising and volatile price of oil, the fight against climate change and also ongoing efforts to revitalize the agricultural sector facing low commodity prices.

To produce biofuels we can use agricultural residues, forest products waste, and municipal waste, so that GHG emissions must reduce. The main opportunities of biofuels are as follows:

- increased the production of safe and sustainable energy services in rural areas,
- increased energy supply security as a substitution of oil,
- increased agricultural productivity because of the use of agricultural residues and waste in productive processes,
- reduced national oil import expenditures,

- increased employment opportunities in agriculture, industry, infrastructure and research in both rural and urban areas,
- new investment and trade opportunities creates in the international markets,
- increased income for farmers due to better market access for biofuel feedstocks and investments in infrastructure, and
- reduced emission of pollutants, including GHGs which provide both local and global environmental benefits.

The EU road transport sector accounts for more than 30% of the total energy consumption in the Community. In EU internal combustion engines will continue to be the dominant transport technology available in 2030, using mostly liquid fuels produced from both fossil and renewable sources. Biofuels provide the best option to replace a significant share of these fossil fuels.

By cultivating biofuels, most countries will be able to grow one or more types of crops in which they possess a comparative advantage and use them to meet either domestic or foreign demand or both. This increased demand for agriculture is expected to increase farm income and raise income for farmers, and reduce the need for subsidies for income support. These countries can produce their own fuel, and reduce their dependence on foreign sources for energy (Hazell and Pachauri 2006). Biofuels can reduce carbon emissions and can create new jobs for the farmers and labors.

BIOFUELS PRODUCTION FROM FEEDSTOCKS

The feedstocks which can be used for the production of biofuels may be classified into three groups as follows: (i) cellulosic biomass, (ii) sugar and starchy crops, and (iii) oil-producing plants.

Cellulosic biomass is the type of feedstock that it is made up of very complex sugar polymers which are not usually used as a source of human food. Cellulosic biomass includes a wide range of heterogeneous solid materials such as (Uriarte 2010);

- agricultural residues comprising leftover material from crops such as rice straw, coconut coir, the stalks, leaves and husks of corn plants,
- forestry wastes such as chips and sawdust from lumber mills, dead trees, and tree branches,
- municipal solid wastes such as paper products,
- food processing and other industrial wastes such as slops from alcohol distilleries and black liquor from pulp and paper manufacturing, and
- energy crops grown for fuel purposes such as fast growing trees and grasses.

Sugar and starchy crops are plants such as sugar cane and sugar beets that can store through photosynthesis the energy from the sun by converting it into simple sugars. There are plants such as corn, cassava and sweet potato which store the energy as complex sugars or starches. Carbohydrates, on the other hand, are a group of organic compounds that include sugars, starches, celluloses and gums. They provide a major source of energy in the diet of humans and animals. These compounds are produced through photosynthesis by plants and contain only molecules of carbon, hydrogen and oxygen. These biomass products are mainly used as human or animal food. Unfortunately because of the need to find alternative sources of energy other than fossil fuels, these products are increasingly being used for the production of biofuels, particularly ethanol as gasoline substitute or blend (Uriarte 2010).

The oil-producing plants are a large number of plants that produce oils, in particular fixed oils, which can be processed to produce biofuels that can be used as diesel substitute or blend. Most of these oils such as soybean oil, coconut oil and palm oil have been used mainly for human or animal food or the production of various types of cosmetics and pharmaceuticals but increasing amounts are now being processed for the production of biodiesel (Uriarte 2010).

In 2003 India, as an emerging economy with increasing energy requirements (IEA 2007), launched a Biodiesel National Mission that aims to blend biodiesel with petroleum diesel, at a proportion of 20% in 2012, through a massive cultivation of Jatropha curcas (GOI 2003).

Ethanol can be produced by the fermentation of carbohydrates from various feedstocks. Fermentation is a series of chemical reactions that convert sugars to ethanol in the presence of suitable strain of yeast, which feed on the sugars. Ethanol and carbon dioxide are produced as the sugar is consumed. The simplified fermentation reaction for a 6-carbon sugar, glucose, is as follows:

$$C_6H_{12}O_6 = 2CH_3CH_2OH + 2CO_2.$$

To make ethanol fully miscible with gasoline, it is necessary to further remove the residual water to produce anhydrous ethanol with a concentration of at least 99.5%. To attain this concentration, the hydrous ethanol has to undergo a suitable dehydration process.

BARRIERS TO DEVELOPMENT OF BIOFUELS IN DEVELOPING COUNTRIES

The spreading of biofuels in developing countries faces several barriers and some of them are as follows:

- lack of information on options and opportunities,
- lack of conducive legal, policy and regulatory frameworks,
- absence of institutions that would support the promotion of such technologies,
- low income and lack of access to financing services in the rural areas,
- lack of capacity to operate and maintain technologies related to biofuels, and
- difficulty in managing land is a major problem for developing biofuel feedstock cultivation in some developing countries.

Indian government takes steps to product Jatropha curcas commercially in Tamil Nadu. About 4kg of Jatropha curcas seeds are needed to get 1L of biodiesel, the maximum production is 75L of biodiesel. But the farmers face losses in the cultivations of Jatropha curcas and they are trying to cultivate other crops (Government of Tamil Nadu 2004).

THE EFFECTS OF BIOFUELS PRODUCTION

In 2006, the US consumed about 5 billion gallons (BGs) of ethanol for transportation fuel which is very low as compared to over 140BGs of gasoline. In 2006, corn for ethanol showed a production spike of 50% over the previous year, to a level which surpassed corn exports (USDA 2007). In 2005, the US Energy Policy Act (EPA) has the goal of production of 12BGs of ethanol by 2012 but President W. Bush has called for the annual production of

35BGs of renewable fuel by 2017. By the end of 2006 there were 110 ethanol plants in the USA, many of which are now being expanded, and 73 were under construction. An additional 200 such plants are in the planning stage. Some environmental groups hold out the promise that all of the US's gasoline could be replaced by biofuels by 2050 (Barbara 2007).

A gallon of ethanol contains only about two-thirds of the energy in a gallon of gasoline, so that we have to produce more ethanol to replace fix amount of gasoline. The expansion of biofuels conflicts arise around the food vs. fuel debate and the desirability, feasibility and sustainability of biofuels. At present more than two billion people in the world are suffering from hunger and more are suffering from nutritional deficits. On the other hand developed countries like the USA are using the food grains to produce biofuels. If the production of ethanol be increased continually, more than half of the people of the world will starve around 2020 and most of them will suffer in poorer nations. The developed nations must be conscious that biofuel production shall not impair food security and take steps to avoid negative impacts on biodiversity and ecosystems. They must be strict that the cultivators of biomass should not face violation of land rights, human rights or labor rights.

About two-thirds of global water uses for agriculture and as a result, water labels are dropping significantly in some of the most productive areas of US farmland. To product 1 gallon of ethanol requires 1,700 gallons of freshwater both for corn production and for the fermentation processing of ethanol. Much of US farm land drains into the Mississippi River and eventually into the Gulf of Mexico. The water runoff from these farm lands already causes eutrophication in the Gulf, and the size of this dead zone is expanding. The dead zone has averaged about 4,800 square miles since 1990; the record of 8,500 square miles occurred in 2002 (Patzek 2006). The Gallagher Review (2008) has estimated that there is sufficient land available to satisfy demand for food, feed and fuel to 2020, but this needs to be confirmed in a local and regional context before global supply of bioenergy increases significantly. Again to product these crops usually require more fertilizers and pesticides than traditional ones.

Due to increase of biofuels production the prices all food commodities increased and stock depleted globally. From early 2007 to mid 2008 wheat prices have increased by over 40%, rice prices jumped by more than 60% and soybean prices also rose by 40% (UNCTAD 2008). Palm oil went up 200% between January 2005 and June 2008, soybean oil followed with an increase of 192% over the same period. The International Monetary Fund's (IMF's) index of internationally traded food commodities prices rose 130% between January 2002 and June 2008 and 56% between January 2007 and June 2008 (Mitchell 2008).

Only 35% of global arable land is free from degradation. Studies estimate that approximately 40% of the world's agricultural land is seriously degraded, with significant impacts on the productivity of about 16% of agroecosystems. During the last decade, per capita available cropland decreased 20% (Brown 1997, Wood et al. 2000).

Corn production in particular is associated with high rates of soil erosion; with rates as much as 100-2500 times greater than for pasture grasses. Continued erosion at the current pace will result in the loss of over 30% of the global soil inventory by the year 2050 (Barbara 2007).

The growing corn reduces carbon from the atmosphere but corn products as combustible fuel releases this carbon back into the air. So there is no net benefit in terms of GHG emissions. The fossil energy is used in planting and harvesting the corn, and the industrial processing of the corn into ethanol increases greenhouse gas emissions. In addition, most ethanol plants are powered by coal, which has the highest amount of GHG emissions of all the fossil fuels (Barbara 2007).

To satisfy just 10% of US fuel consumption using corn ethanol, the equivalent CO_2 emissions would be an additional 127 MMT (million metric tons)/year. This is roughly equivalent to gasoline emissions from 20 million vehicles (Patzek 2006). The use of biofuels could even increase greenhouse gas emissions if land would be converted from forests, wetland and reserves for conservation to grow more corn or soy beans.

CONCLUDING REMARKS

In this paper we have discussed the necessity of biofuels. In the 21st century biofuels are considering substitution of gasoline due to shortage of fossil fuels, volatile of oil prices and increase of the demand of global energy. Production of biofuels provides substantial energy and decreases GHG emissions, and increases income of the farmers and labors. Biofuels are produced from food grains, sugar cane and edible oils. We have shown that if biofules production increases continually then about half of the populations of the world will starve around 2020. Drinking water is used for cultivation of biomasses, so that people will suffer from the shortage of pure drinking water in future if the global supply of bioenergy increases significantly. To produce biofuels sometimes habitats are destroyed, so that ecosystems are broken and harms high biodiversity and services which are crucial to our economies and human life. We have discussed the benefits and disadvantages of the production of biomass in some details.

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