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Biofuel, the Environment, and Food Security: A Global Problem Explored Through a Case Study of Indonesia

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*by Nicola Colbran & Asbjørn Eide**

Introduction

This paper examines the environmental and food security controversies over the production and use of biofuel for transportation. During the last decade, tremendous interest has been paid to biomass refined into biofuel (mainly ethanol and biodiesel) and used to power transport vehicles. It is widely claimed that the use of biofuel can contribute to the solution of a range of problems, both environmental and social in nature.

In the face of the growing threat of global warming caused by greenhouse gas ("GHG") emissions, it has been argued that biofuel used for transport can partly or wholly replace gasoline and lead to a significant reduction of such emissions. Another often made claim is that biofuel can provide a renewable, and therefore sustainable, energy source with positive consequences for the environment. Some also claim that production of biofuel can increase the agricultural income for rural poor in developing countries.

If such achievements could indeed be made, there is a very strong ethical argument in favor of liquid biofuel production, but are these claims justified? Do they correspond with reality?

In recent years, grave concerns have emerged and during the last year have particularly grown in strength and significance. There are well documented claims that there can be serious harmful environmental and social consequences of biofuel production and that these have been grossly underestimated. It also appears that the alleged benefits of biofuels have been exaggerated. The growing concerns are strikingly reflected in the title of a recent working paper for the Organization for Economic Co-operation and Development ("OECD"): *Is the cure worse than the disease?*[1]

This debate has received increasing topicality due to the food crisis caused by a steep increase in prices without a corresponding increase in income for the food insecure. One cause of this crisis arises from the production of biofuel which competes with food production for the use of land and water. In this article we examine the situation in one large country which has engaged massively in crops for biofuel production: Indonesia.

Liquid biofuel is primarily produced as ethanol or biodiesel. The feedstocks for ethanol are generally sugar cane and maize, and to a lesser extent wheat, sugar beet, and cassava. The feedstocks for biodiesel are oil-producing crops, such as rapeseed, palm oil,[2] and jatropha.[3]

Brazil pioneered the production of liquid biofuel well before World War II, using parts of its vast sugar cane plantations for the production of ethanol. The second major producer is the United States, starting its production of ethanol from maize in the 1980s. Around the turn of the millennium the European Union became heavily involved, mainly using rapeseed and to a lesser extent soybean and sunflower oil for biodiesel production. In 2006, Indonesia developed its own policy on the production and use of biofuel.

Biofuel production raises rather than reduces GHG emissions.

The United States and the European Union consume the whole of their own biofuel production internally, but they are far from meeting their own targets of consumption through self-production. They will therefore be increasingly dependent on imports from developing countries if they are going to rely heavily on biofuel. The European and American demand for liquid biofuel has motivated substantial production in other countries, particularly in Indonesia and Malaysia, which both engage in biodiesel production from palm oil. Indonesia has also focused on biofuel production from jatropha plantations as part of a strategy to meet its own biofuel needs.

As of today, liquid biofuel has contributed only a tiny part of overall energy consumption. In 2007, it provided only 0.36% of the total energy consumption in the world. To achieve this very modest fraction of the total energy use, twenty-three percent of U.S. coarse grain production was used to produce ethanol and about forty-seven percent of EU vegetable oil production was used to produce biodiesel.[4] It is estimated that in 2008 the ethanol share of the gasoline fuel market in the United States will be about 4.5%, with a quarter of the coarse grain production in the country devoted to biofuel. The U.S. National Academies of Sciences made a calculation, using 2005 as an example, showing that even if all the corn and soybeans produced in the United States in 2005 had been used for bioethanol production,

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this would only replace twelve percent of the country's gasoline demand and six percent of its diesel demand.[5]

If consumption of biofuel were scaled up enough to significantly reduce the need for fossil fuel (gasoline), enormous land areas would be required with serious impacts on the environment and food security.

Environmental and Social Consequences of Biofuel Production

Environmental Harm

Monocultural production of feedstock for biofuel can cause a number of environmental harms. With the possible exception of sugarcane production for ethanol, there is increasing evidence that when the whole life-cycle of the production, distribution, and use of biofuel is taken into account, and when direct and indirect effects are counted, biofuel production actually increases GHG emissions and thereby intensifies rather than mitigates global warming.[6]

The Joint Research Centre of the European Commission is now largely endorsing the view that biofuel production raises rather than reduces GHG emissions. It has done so partly on the grounds that the GHG effects of the use of nitrogen fertilizers have been underestimated and partly because land use changes could release such quantities of GHG that it would negate the savings from EU agrofuels.[7]

Compounding these negative environmental effects of biofuel production is the claim by critics that monoculture production is harmful to biodiversity, which in turn has considerable consequences for the necessary dietary diversity required for adequate food. Furthermore, the production of biofuel causes both competition for water and the pollution of remaining water resources. Palm oil for biodiesel is heavily dependent on water. The jatropha bush is less dependent on water and can grow in marginal and dry areas, but its yield is low compared to what can be obtained when grown in more fertile land or with more access to water. It is likely that even with jatropha, the competition for water can be severe. Pesticides connected with biofuel production are also reported to contaminate remaining water resources and give rise to health problems.

Impact on Food Security

The second issue with biofuels is the impact on food security. In their paper prepared for the OECD, Doornbusch and Steenblik have argued that government policies around the world to replace oil with ethanol and other liquid biofuels could draw the world into a "food-versus-fuel" battle. They focused in particular on the impact on food prices. "Any diversion of land from food or feed production to production of energy biomass will influence food prices from the start, as both compete for the same inputs."[8] It is not only the conversion of traditional agricultural land that may spark the "food-versus-fuel" battle. Following conversion, areas like forests and marginal land previously used as common property resources, and which are traditional suppliers of food, fodder, fuelwood, building materials, and other locally important resources, are now no longer available to communities. The impact of such conversion on food security is outlined below in the case of Indonesia.

Putting it starkly, the "food-versus-fuel" game makes it possible for a car owner in a developed country to fill a 50 liter tank with biofuel produced from 200 kg of maize, enough to feed one person for one year.[9] The purchasing power of the owner of the car is vastly higher than that of a food insecure person in a developing country; in an unregulated world market there is no doubt who would win this game.

Concentration, eviction, and transformation of the living conditions in rural areas exacerbate the impact of liquid biofuel production on food security. Production of feedstock for biofuel is by its very nature best suited for large tracts of land, and it is a monoculture production, with all its negative implications. Large-scale monoculture production opens the land for foreign and outside investors on an unprecedented scale. Traditional, small-scale agriculture in developing countries is not attractive for investors, but biofuel is—as long as there is a guaranteed market. The implication of this is ominous: it may lead to a process of marginalization or eviction of smallholders to an unprecedented degree, transforming them either into badly paid workers or to the swelling number of urban poor. The long-range consequences can be even more serious than the impact of the soaring food prices. The impact of marginalization of local communities on food security is examined more closely below in the case of Indonesia.

There are many other problems associated with the production of biofuel that are outside the scope of this article. These include the particularly negative effect the process of land concentration, monoculture, and eviction or marginalization are likely to have on women's role in agriculture. In many developing countries, women have the most important role both in production and preparation of food. A recent Food and Agriculture Organization ("FAO") study analyzes the risks that women will face if large-scale production of feedstock for biofuel goes ahead.[10] The authors argue that liquid biofuels production might contribute to the socio-economic marginalization of women and female-headed households in several ways. For example, large-scale plantations for such production require an intensive use of resources and inputs to which smallholder farmers, particularly female farmers, traditionally have limited access.[11]

Returning to the main topic of this article, the impact of biofuel on the environment and food security, we have decided to use Indonesia as a case study to explore these issues in more depth.

The Case Study of Indonesia

Oil palm plantations, and to a lesser extent jatropha plantations, are two of the main sources of bioenergy produced in Indonesia. Oil palm plantations were initially established by the Dutch colonial government between 1870 and 1930.[12] Since then, the development of oil palm plantations has expanded rapidly, and Indonesia is now the largest producer of crude palm oil ("CPO") in the world, producing almost half of the world's palm oil.[13]

In early 2008, Indonesia had 7.3 million hectares of oil palm plantations,[14] with a further 18 million hectares of land cleared for expansion but not yet planted.[15] Regional development plans have allotted an additional 20 million hectares (an area the size of England, the Netherlands, and Switzerland combined) for plantation development mainly in Sumatra, Kalimantan, Sulawesi, and West Papua.[16] One million hectares have been allocated for jatropha plantation and production. By 2009, this area will increase to 10 million hectares.[17]

Driving the Demand—Domestic and International

Domestic and international demand for biofuel is one incentive for plantation expansion. At the international level, as discussed above, the EU and United States promote biofuel as an alternative energy source for transport and for use in power stations.[18] In 2006, Malaysia and Indonesia announced their intention to supply twenty percent of the market in Europe and declared that they would set aside forty percent of their palm oil output for biodiesel.[19] This commitment requires about 12 million tons of CPO and plantation acreage of around 4 million hectares.[20] China is also considering palm oil from Southeast Asia as a main source of alternative energy and has made large investments in oil palm development.[21]

At the domestic level, in 2006 the Indonesian government announced an ambitious policy targeting the development of renewable energy as a priority, especially the production of biofuel, with the production of biofuel having two equally important stated benefits: the alleviation of poverty and the creation of employment.[22] To support its policy, the government has passed legislation for the production and promotion of biofuel;[23] established a National Team for Biofuel Development;[24] provided financial incentives; and made efforts to simplify licensing procedures for biofuel plantation and production. Since the policy was announced in 2006, twenty-two companies have been set up to produce biofuels.[25]

While biofuel provides an incentive to develop and expand plantations, it is only one of a number of potential uses for palm oil. The oil is used in a variety of non-biofuel products,[26] and demand for these products is sky-rocketing. Since the 1990s, economic growth in China and India alone has meant that one quarter of the world's population depends on palm oil as its preferred vegetable oil.[27] Demand for palm oil in the United States has also increased as food manufacturers try to reduce transfats associated with soy oil (U.S. palm oil imports have quadrupled in two years).[28] Global demand is expected to double by 2020 with four percent annual rate of increase per year.[29] This means that irrespective of the level of demand for biofuel, any consequences on the environment and food security of such crops are likely to continue.

The EU, China, and Indonesia have embraced biofuel as a clean, reliable alternative energy source. But are these claims justified? Do they correspond with what happens in reality? Does biofuel fulfil the claims of environmental benefits once factors like land use change, air pollution, the use of agrochemicals, water course diversion, and pollution are taken into account? Does it cause food insecurity as feared by many?[30]

The Environmental Effects of Biofuel Production

Land Use Change Through Deforestation

Indonesia has 120.35 million hectares of forest, which is the largest forest area in Southeast Asia and the world's third largest after the Amazon and Congo Basins.[31] Its forests are home to around 10% of all species of flowering plants, 17% of all bird species, 12% of all mammal species, 16% of all reptile species, and 16% of all amphibian species.[32] In large part owing to its rainforests, Indonesia is among the world's ten most mega diverse countries. Importantly for food security, which is discussed later, its forests are also a source of food or the means to procure it for an estimated 60-90 million people.[33]

However, in 2008 Indonesia became "the country which pursues the world's highest annual rate of deforestation" with 1.8 million hectares of forest cleared each year between 2000 and 2005.[34] Today, oil palm plantations are a primary cause of deforestation, as Indonesia acknowledged itself in its Third Implementation Report on the Convention on Biological Diversity ("CBD").[35]

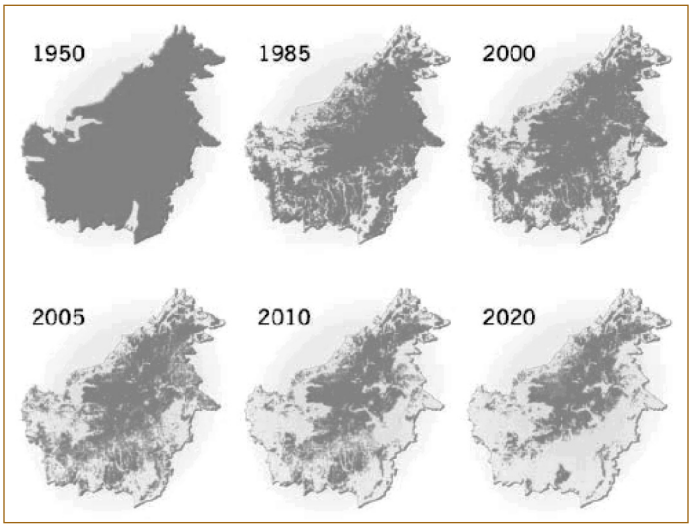


Figure 1: The Extent of Deforestation in Kalimantan 1950-2005, and Projection Towards 2020[36]

The destruction of primary and secondary forests on such a scale places enormous pressure on biodiversity and species such as the Sumatran tiger and orangutan found in the forests of Kalimantan. In the last decade their habitat has declined while the plantation area in Sumatra and Kalimantan has increased rapidly.[37] An oil palm plantation can only support up to twenty percent of the mammals, reptiles, and birds that a primary rainforest supported prior to its conversion. To survive, wildlife (especially mammals) must share the same environment as humans. Plantation workers and local communities encounter orangutans, tigers and other wildlife for some time after deforestation, leading to often serious and sometimes fatal consequences.[38] According to Greenpeace, 1,600 orangutans were killed on oil palm plantations during 2006.[39]

The loss of natural forests around the world each year contributes more GHG emissions to the atmosphere than the global transport sector.[40] Indonesia's primary (old growth) forests are estimated to store around 230 tons of carbon per hectare,[41] while secondary (re-growth) forests store around 176 tons of carbon.[42] By contrast, oil palm plantations only store around 91 tons of carbon per hectare, meaning there is a large deficit of carbon when primary and secondary forests are converted to oil palm plantations.[43]

Although the Indonesian Environment Minister has publicly promised that "we are not going to sacrifice any trees for biofuels,"[44] a substantial part of Indonesia's planned oil palm expansion continues to be in forest areas. This is not surprising given Presidential Instruction No.1/2006 concerning the Supply and Utilisation of Biofuel as an Alternative Fuel directs the Ministry of Forestry to make "unproductive" forests available for conversion to plantations, and requires the Ministry of Home Affairs, provincial governors, regents, and mayors to encourage communities to turn land over to biofuel development. It is further complicated by conflicts of interest within the government. In Aceh, fourteen of the twenty-three district Heads of the Department of Forestry, who implement the mandate of the forestry department to protect forests from illegal loggers and plantation companies, are also the Heads of the Department of Plantations, whose priority it is to develop plantations.[45]

Land Use Change Through the Draining of Peatlands

In addition to its vast forests, Indonesia has 22.5 million hectares of peatlands,[46] which is most of the 27.1 million hectares of peatlands in the Southeast Asian region.[47] Peatlands act as a natural carbon store, but release carbon when drying out or oxidizing. According to Wetlands International, about a quarter of palm oil originates from drained peatlands[48] and over fifty percent of new oil palm plantations are allocated on peatlands.[49] Conservative estimates indicate that each year around 660 million tons of carbon is released from peatlands that are drying out and oxidizing.[50] Over ninety percent of these emissions originate from Indonesia. Recently calculated GHG emissions place Indonesia as the world's third largest emitter,[51] although some oil palm companies and members of the government dispute the figures.[52] Adding to this bleak picture is a study by Wetlands International which has shown that palm oil produced on tropical peatlands contributed more CO_2 to the atmosphere than the use of fossil fuels.[53] When peatlands in Indonesia are converted into oil palm plantations, studies estimate it takes 423 years to pay off the carbon debt.[54]

In 2007, the Indonesian Agriculture Minister ordered provincial governors to stop awarding new permits to palm oil companies in peatlands, but according to Greenpeace, there have been no changes since the Minister's order.[55] Palm oil companies oppose any moratorium on forest and peatland conversions, arguing that it will negatively impact on the industry and on Indonesia's economy, causing job losses and increased poverty.[56]

Land Use Change Through Fires

Forest fires to clear land for plantations are a regular source of haze in Southeast Asia, posing serious health problems, traffic disturbance, and substantial economic costs. Fires are a quick and cheap land clearing technique that save almost twenty percent of the cost of establishing an oil palm plantation once the land has been clear felled.[57]

The worst forest fires in Indonesia to date were those in 1997-98, which affected at least six percent of the country's total landmass, causing smog to cover large parts of Indonesia, Malaysia, Brunei and Singapore for at least three months.[58] Indonesia's Third Implementation report on the CBD states that large-scale land conversion was the largest cause of the 1997-98 fires, which burned nearly 5 million hectares of forest and caused approximately $8 billion in economic losses in Indonesia alone.[59] Of the larger 1997-98 fires, 46-80% occurred in plantation concessions, around three-quarters of which were oil palm plantations. Although it is difficult to prove, most fires were likely lit by company staff or locals paid by the company. Arson as a result of conflicts between local communities and plantation companies was apparently another cause of the fires.[60]

Water Pollution, Soil Erosion, and Pesticides and Fertilizers

Biofuel plantation establishment and management also effects the environment in ways felt most acutely by the local communities whose land is converted into plantations.

The establishment of plantations diverts water from local communities, disturbs stream flows, and pollutes water resources. This also impacts water resources as a source of food for local communities. As oil palm is a monoculture crop, the land must be cleared of all vegetation. Roads and drainage canals are constructed using heavy machinery.[61] This reduces the permeability of the land, causes a loss of soil faunal activity, and compacts the land, all of which increases top soil runoff and causes soil erosion. Sediment loads in rivers and streams increase significantly. Flooding escalates in the rainy season, while there are water shortages in the dry season due to interrupted or reduced water flows.[62]

Oil palm plantations also cause the deterioration of water quality. The cultivation of oil palms requires pesticides and fertilizers for optimum production, which often leach into rivers, contaminating the water.[63] In the oil palm plantation sector, around twenty-five different pesticides are used, but monitoring their usage is difficult as it is reportedly not controlled or documented.[64] The most commonly used weed killer is paraquat dichloride, which is very toxic and accumulates in the soil with repeated applications.[65] Its toxicity and accumulation in the soil negatively affect the ability to use the land as a source of food and income.

Water quality is worsened by the overflow or dumping of untreated palm oil mill effluent ("POME") into waterways, which threatens community health and reduces aquatic diversity. POME is a mixture of water, crushed shells, and fat residue. Most CPO mills have outdoor waste tanks to store and detoxify

POME by adding oxygen, but the tanks can overflow in heavy rain or during intensive production periods. Some companies also allow the effluent to flow directly into the rivers.[66] A mill with a capacity of sixty tons of fresh fruit bunches ("FFB") per hour can produce 1,200 cubic meters of liquid waste per day, equivalent to the sewage produced by a city of 75,000 people.[67] As FFB needs to be processed within twenty-four to forty-eight hours of harvest, one palm oil mill is usually built for about every 4,000-5,000 hectares of plantation.[68] There are 7.3 million hectares of oil palm plantations in Indonesia.

Jatropha is also dependent on water. Although in principle it can grow in marginal and dry areas, the yield is low compared to what can be obtained when grown in more fertile land with access to increased water. In areas such as Sumba in East Nusa Tenggara, where extensive jatropha plantations are planned, there is no precedent for water management on the scale required for productive and profitable large-scale jatropha plantations.[69]

Contributing to potential environmental issues is that no jatropha species have been properly domesticated and, as a result, the long-term impact of its large-scale use on soil quality and the environment is unknown.[70] Jatropha has been banned in the Australian state of Western Australia, as it is claimed to be an invasive plant that is highly toxic to livestock.[71]

Without change in the way biofuel crops are planted and managed in Indonesia, there are no sufficient ethical justifications for biofuel use that override its harmful environmental implications. We are still far from the situation where all alternative energy sources are exhausted. There are other more efficient ways of using energy, and there are better ways to address the reduction of GHG emissions and urban pollution than by way of biofuel production.

The Impact of Biofuel Production on Food Security

On May 2, 2008, in his background note calling upon the UN Human Rights Council to convene a special session on the current world food crisis,[72] the Special Rapporteur on the Right to Food pointed to the demand for biofuels as one determining factor in the crisis. An increased production of crops for biofuel has contributed to higher prices as less food is produced in order to fill gas tanks. This has caused evictions and marginalization, thereby undermining the livelihood of the most vulnerable groups. The result is that many individuals, either alone or in community with others, no longer enjoy physical and economic access to adequate food or the means for its procurement.[73]

Transforming Traditional Agricultural Land into Plantations

In Indonesia, both traditional agricultural land and forests have been converted into plantations. This denies individuals the possibility of feeding themselves directly from productive land or other natural resources.[74] In regards to traditional agricultural land, between 1993 and 2003 there was a decline in the number of staple crop farmers in Sumatra (3,140,000 to 3,080,000) but a steep increase in plantation smallholders (1,766,000 to 2,831,000).[75]

Land conversion impacts productive agricultural land by increasing flooding and landslides. In Aceh Tamiang in eastern Aceh, oil palm plantations were identified as a main reason for flooding in recent years, as a result of which "at least 128,028 hectares of farmland will become swampy when the rainy season arrives, and during the dry season will suffer drought."[76]

The Impact on Food Security of Plantation-Style Monocropping

Communities dependent on forests as a source of food are well-off in terms of food security, sovereignty over production, and management and stability in supply and income. Such communities create secure livelihoods through a range of strategies, including planting a variety of annual food crops as well as perennial cash crops. In addition, community economies are supported by ecosystem goods and services and common pool resources—a source of monetary and non-monetary income.[77]

Land made available for biofuel production through deforestation transforms areas that once supported forest-dependent communities into areas dominated by monocropping. Once monocropping is introduced, there is a loss of biodiversity, and a loss of ecosystem goods and services, as well as common pool resources. It also introduces a new crop requiring intensive management through permanent cultivation, which many local communities are unfamiliar with.[78] Traditional rotational farming is no longer possible because there is no natural forest left to fertilize the poor rainforest soils, which are needed for the planting of crops.

As the transformation destroys indigenous peoples' traditional food sources, it leads to food insecurity, and endangers the dietary diversity of local communities. Such a transformation of biologically diverse areas takes away the local community's sovereignty over production and management, as well as stability in supply and income. Dependence on a single crop commodity may also increase the vulnerability of those working in the palm oil industry. For example, CPO prices on the international market fluctuate widely. In May 2007, CPO prices were $400 per ton, but in May 2008 were $1,150 per ton.[79] In August 2008, they had fallen back to below $800 per ton.[80]

Communities also find that their overall cost of living increases once monoculture has been introduced. This increase affects the ability of local communities to procure adequate food. They need more cash to survive as communities can no longer harvest food and products from the forest and do not have land to grow their own crops. To meet this need for cash, they can either become smallholders, laborers, or part of the swelling number of urban poor.

The effect on food security caused by oil palm plantations could be even more serious in regard to jatropha, which is to be planted in the eastern regions of Indonesia (West Nusa Tenggara, East Nusa Tenggara, Sulawesi, and Papua).[81] Jatropha has been promoted as a good solution to the impact of biofuel production on food security as it is a non-food crop that can be grown on "marginal lands" not normally suitable for foodcrops.[82] The eastern regions of Indonesia are often considered marginal as

they are deemed to have limited food production ability and are prone to drought. In these regions there is an abundance of land not permanently cultivated, which is considered ideal for biofuel plantation development. However, if so-called marginal land is converted into biofuel plantations, the land can no longer be used as common property resources, which have traditionally supplied food, fodder, fuelwood, building materials, and other locally important resources.

The introduction of large-scale jatropha plantations will also increase the need for cash as workers and farmers have less time to feed themselves directly from productive land or other natural resources. Jatropha is quite labor intensive with calculations indicating one hectare of jatropha will require 108 working days per year (from land preparation to post-harvest), with each worker being annually paid Rp.1.7 million ($187).[83] For farmers themselves, the price they receive for jatropha seeds is low, at less than one dollar per kilo, and in some cases less than six cents.[84] This is a very small amount of money and there is little time remaining for workers to either tend to their own land for food production or to carry out other income generating activities to procure food.

An important aspect of the right to food is the ability to procure adequate food without compromising the satisfaction of other basic needs.[85] Like many countries, Indonesia is experiencing steep increases in food prices, particularly staple foods. The price of palm-oil-based cooking oil experienced the steepest rise; from Rp.9,000 per kilo in August 2007,[86] to Rp.14,000 per kilo by March 2008.[87] This price is prohibitively expensive for many Indonesians given that forty-two percent of Indonesians (nearly 100 million people) live on less than Rp.9,000 to 18,000 per day.[88] One of the causes of this increase is that Indonesian palm oil producers are more interested in selling CPO to the international market, drawn by the possibility of higher prices.[89] The shortage of cooking oil has meant many families are using recycled cooking oil, bought from vendors at a reduced price.

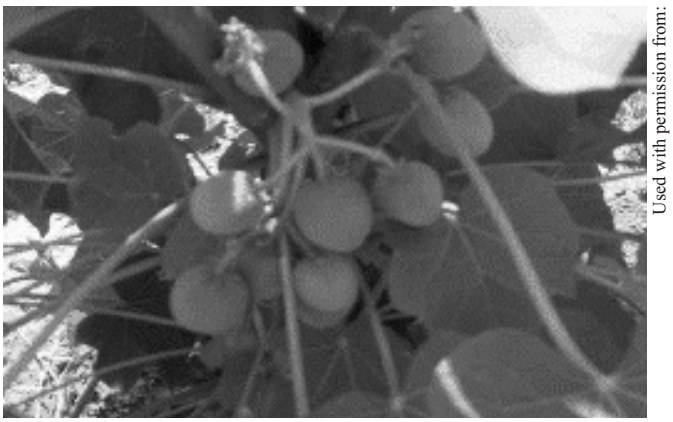
Indonesia is not immune to the recent world food crisis. Many Indonesians do not have regular access to, or means for the procurement of, sufficient, nutritionally adequate, and culturally acceptable food for an active, healthy life.[90] In pursuing the plantation and production of biofuel, Indonesia needs to address the possible consequences that not managing biofuel sustainably may have on food security. Failure to do so may seriously weaken the availability of food in quantity and quality sufficient to satisfy the dietary needs of individuals and the accessibility of such food.

The question then is whether Indonesia is likely to address the possible consequences of not managing biofuel sustainably. One challenge is that Indonesia has simply not publicly acknowledged the social and environmental problems associated with unsustainable biofuel production. For example, in September 2008, the Indonesian Minister for Agricultre lobbied the EU over concerns that the EU was planning a policy that would limit imports of palm oil for biofuel from Indonesia. The Minister claimed "the EU was influenced by negative campaigns from non-governmental organizations ("NGOs"). We feel it's not about environmental issues, it's about trade."[91] He emphasised the Indonesian government's belief that biofuel is a solution to poverty through employment creation by stating that the palm oil sector currently employs more than 5 million people. He added that "we should choose between human interests or those of the monkeys."[92] However, sustainable biofuel production does not require such a choice.

At the international level, there is an increasing awareness of the dangers inherent in unregulated palm oil and biofuel production. Voluntary guidelines relating to certain crops used for biofuel production have been developed, such as as the Roundtable on Sustainable Palm Oil ("RSPO") Principles and Criteria for Sustainable Palm Oil Production.[93] These Principles were finalized in November 2007, although they will be reviewed again within five years. According to these Principles, "sustainable palm oil production is comprised of legal, economically viable, environmentally appropriate and socially beneficial management and operations."[94] On the positive side, these Principles represent a potentially useful tool for civil society groups to evaluate companies' social and environmental practices and to hold them accountable. The grievance panel of the RSPO has already been used by communities in West Kalimantan as part of a suite of measures to challenge the environmentally and socially unsustainable practices of the Wilmar Group operating in the region.[95] Wilmar International (and the International Finance Corporation) has since withdrawn its claims of sustainable palm oil production, and Wilmar claims to have set up procedures to ensure that the RSPO Principles will be adhered to.[96]

In 2008 Indonesia became "the country which pursues the world's highest annual rate of deforestation."

However, there are also challenges in relation to the Principles. The Principles are voluntary and may only be truly enforced through market forces where there is higher consumer awareness about sustainability. There is also the question of who will ultimately bear the time and financial burden of proving that the palm oil produced is sustainable: will it be small plantation holder producers, who in many cases produce oil palm fruit for the companies that control their lands and debts? An additional problem with the Principles was outlined by Unilever, the world's largest consumer of palm oil, when it admitted to Greenpeace that it is not possible to trace the origin of palm oil once it is on the international market.[97]



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Jatropha seeds and fruit

Finally, it is important to consider whether domestic legal systems that regulate biofuel production facilitate compliance with the Principles. If the legal systems do not, and in fact are contrary to the Principles, it will be impossible for companies that have already established plantations in compliance with domestic law to produce sustainable biofuel.

Irrespective of the efficacy of such Principles, the formulation and implementation of national strategies for the production of biofuel requires full compliance with principles of good governance: adequate and representative legislative capacity which can link the human rights principles to the concrete situations and needs of the country concerned, people's participation, accountability, transparency, rule of law, and an independent judiciary, well versed with human rights.

Conclusion

In this article, we have presented the general environmental and food security issues relating to biofuel production and its use for transportation and have explored the real impact on the ground through a case study of biofuel plantation and production in Indonesia.

Two key lessons stand out from the environmental harm described above and from the soaring food prices, which are having a devastating impact on vulnerable people. The first is that food availability is becoming an increasingly serious problem and has to be met by increased production. Future intensification of agricultural production or expansion to formerly uncultivated land should focus on food production, not on fuel production, and particularly not on liquid fuel production. The second lesson should be based on the awareness that prices will remain high for a long time, even though somewhat reduced from the present level. Taking into account that hundreds of millions of people in developing countries will not be able to buy their necessary food on the market at such high prices, alternatives must be found. This can take two directions, both of which must be pursued.

The first step is to ensure adequate land and protect the assets of small farmers and peasants so that they may produce the necessary food for themselves, their families, and the local market with low input costs. The possibilities for small-scale and more organic farmers should be significantly expanded and given support, nationally and internationally. The second step, which supplements the first, is to establish a functioning safety net for those who cannot gain access to the necessary assets. Safety nets must be established through national and international cooperation. They should not be restricted to the minimum food or cash required to survive, but should facilitate empowerment of the recipient by helping them move from dependency to self-reliance, whether through agricultural activity or other means. The safety net should not be merely an emergency device but a tool for sustainable development.

Recommendation: The Need for International Guidelines

To avoid the harmful environmental and human consequences and maximize the possible benefits from biofuels, international guidelines must be urgently developed for biofuels production. The exact form of the guidelines is a matter to be explored through international negotiations. This is of increasing urgency as a result of the food crisis. Existing guidelines on crops that can be used to produce biofuel and their associated strengths and weaknesses should serve as models. All guidelines should complement, not contradict, each other and should not impose an unnecessary burden on those who produce biofuel in a socially and environmentally satisfactory way.

In regard to the content of international guidelines for biofuel production, the following concerns should be taken into account:

- Avoid production of biofuel in ways which lead to increased greenhouse gas emissions, when direct and indirect impact is taken into account, or which divert water from existing users and prevents previously existing access to water for drinking and sanitation, which degrade the soil or pollute water or the local air conditions (e.g. by burning).
- Avoid introducing non-native species which carry risks of invasion before appropriate safeguards are adopted—full application of precautionary principle is required.
- Abstain from measures which evict previous users of the land without negotiation and acceptable alternatives for the previous users, whether they had recognized tenure or not. Abstain from production of biofuel in ways which undermine previously existing opportunities for women to

produce food or have access to woodfuel, unless other alternatives are made available prior to the initiation of the biofuel project.

- Establish legally binding certification schemes and a reliable monitoring system to ensure that the international certification is effective and enforced.
- Give priority to projects based on small-scale farming, possibly through cooperative arrangements, with a combination of biofuel and food production for local consumption, and projects that ensure stable and healthy working conditions, which ensure adequate dignity and independence of the worker.
- Choose feedstock that has the potential, in its production, transport, distribution, and use, to reduce GHG emissions compared to the use of fossil fuel, and which avoids diverting water from established and necessary uses, and avoids soil degradation or pollution.

Endnotes: Biofuel, the Environment, and Food Security

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[8] OECD, *supra* note 1, at 4.

[9] The Secretary General, *Note of the Secretary-General on the Right to Food*, ¶ 21, *delivered to the U.N. General Assembly,* U.N. A/62/289 (Aug. 22, 2007) (Quoting G.Gendron, Radio Canada, Aug. 12, 2007).

[10] *See* Andrea Rossi & Yianna Lambrou, Food and Agriculture Organization of the United Nations, Gender and Equity Issues in Liquid Biofuels Production: Minimizing the Risks to Maximize the Opportunities 50 (2008).

[11] *Id.*

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