

promote measures that ensure that corporations comply with the WHO Code of Conduct on Marketing of Breast-milk Substitutes.

FAO should, in cooperation with the WTO, explore whether rules concerning international trade in agriculture cause any problems for state implementation of the right to food, and should press for changes if such incompatibility can be identified.

FAO should enhance the cooperation with the non-governmental organizations committed to freedom from hunger, and should encourage the International Alliance Against Hunger to take the right to food as a basis for its work.

ETHICAL ISSUES ARISING FROM AGROFUEL PRODUCTION (LIQUID BIOFUEL USED FOR TRANSPORT)

During the last decade, much interest has focused on biomass refined into biofuel (mainly ethanol and biodiesel) and used to power transport vehicles. It has been widely claimed that the use of biofuel for this purpose can contribute to the solution of a range of problems, both environmental and social in nature. In the following, the term “agrofuel” will be used to refer to large-scale, commercial production of liquid biofuel for transport. This is in order to distinguish this production from local usages of biofuel, whether in solid, liquid or gas form, for local use, which have entirely different social and economic consequences than does agrofuel for transport.

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

If such achievements could indeed be realized, there would be a very strong ethical argument in favour of agrofuel production, but most of these claims are not justified. It is necessary to make a realistic assessment of any claims made in favour of agrofuel.

In recent years, grave concerns have emerged and, during the last year, have grown particularly in strength and significance. There are well-documented claims that there can be serious harmful environmental and social consequences of agrofuel production and that these have been grossly underestimated. It also appears that the alleged benefits of agrofuels have been exaggerated. The growing concerns are strikingly reflected in the title of a recent working paper for the Organisation for Economic Co-operation and Development: *Biofuels: is the cure worse than the disease?* (Doornbosch and Steenblik, 2007).

This debate has received increasing attention owing 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 agrofuel, which competes with food production for the use of land and water.

Agrofuel (liquid biofuel produced through agricultural processes) 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 and *Jatropha*.

Brazil pioneered the production of agrofuel well before the Second World War, using parts of its vast sugar-cane plantations for the production of ethanol. The second major producer is the United States of America, starting its production of ethanol from maize in the 1980s. Around the turn of the millennium, the European Union (EU) 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 agrofuel.

The EU and the United States of America consume all of their own agrofuel production internally, but they are far from meeting their own targets of consumption through self-production. Therefore, they will be increasingly dependent on imports from developing countries if they are going to rely heavily on agrofuel. Demand in the EU and the United States of America for agrofuel 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 agrofuel production from *Jatropha* plantations as part of a strategy to meet its own agrofuel needs.

As of today, agrofuel contributes only a tiny part to overall energy supply. In 2007, it provided only 0.36 percent of the total energy consumption in the world. To achieve this very modest fraction of the total energy use, 23 percent of United States coarse grain production was used to produce ethanol and about 47 percent of EU vegetable oil production was used to produce biodiesel (FAO, 2008a). It is estimated that in 2008 the ethanol share of the gasoline fuel market in the United States of America will be about 4.5 percent, with one-quarter of the coarse grain production in the country devoted to agrofuel. The US 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 of America in 2005 had been used for bioethanol production, this would have replaced only 12 percent of the country's gasoline demand and 6 percent of its diesel demand (Muller, Yelden and Schoonover, 2007).

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

Environmental and social consequences of agrofuel production

Environmental harm

Monocultural production of feedstock for agrofuel can harm the environment in a number of ways. With the possible exception of sugar-cane production for ethanol, there is increasing evidence that when the whole life cycle of the production, distribution and use of agrofuel is taken into account, and when direct and indirect effects are counted, agrofuel production actually increases GHG emissions and thereby intensifies rather than mitigates global warming. In an article in *Science*, Fargione *et al.* (2008) presented research conclusions showing that: "Converting rainforests, peatlands, savannas, or grasslands to produce food crop-based biofuels in Brazil, Southeast Asia, and the United States creates

a 'biofuel carbon debt' by releasing 17 to 420 times more CO₂ than the annual greenhouse gas (GHG) reductions that these biofuels would provide by displacing fossil fuels."

The Joint Research Centre of the European Commission is now largely endorsing the view that large-scale agrofuel 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 GHGs that they would negate the savings from EU agrofuels (De Santi, 2008).

Compounding these negative environmental effects of agrofuel production is the claim by critics that monoculture production is harmful to biodiversity, which in turn has considerable consequences for the necessary food diversity required for adequate diets. Furthermore, the production of agrofuel 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 with when it is grown in more fertile land or with more access to water. It is likely that, even with *Jatropha*, the competition for water will be severe if large-scale commercial production is envisaged. Pesticides connected with agrofuel production are also reported to contaminate remaining water resources and give rise to health problems.

Impact on food security

The second issue with large-scale production of agrofuel is the impact on food security. In their paper prepared for the OECD, Doornbosch and Steenblik (2007) have argued that government policies around the world to replace oil with ethanol and other liquid agrofuels 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." It is not only the conversion of traditional agricultural land that may spark the "food-versus-fuel" battle. Following conversion, areas such as 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.

Putting it starkly, the "food-versus-fuel" game makes it possible for a car owner in a developed country to fill a 50-litre tank with agrofuel produced from 200 kg of maize, enough to feed one person for one year (UN, 2007). The purchasing power of the car owner 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.

A major problem arising from extensive agrofuel production is its impact on the soaring food prices, which cause millions more people to suffer from hunger. One of the reasons for the impact on food prices is the price linkage between agrofuel and fossil fuel. This linkage has led to large-scale speculation in the futures market, and also speculation in land investments.

Concentration, eviction and the transformation of living conditions in rural areas are among the results of liquid agrofuel production and these have serious consequences for food security. Production of feedstock for agrofuel 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 agrofuel 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, either transforming them into badly paid workers or adding them to the swelling number of urban poor. The long-term 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 agrofuel. These include the particularly negative effect that the process of land concentration, monoculture and eviction or marginalization is likely to have on women's role in agriculture. In many developing countries, women have the most important role in both the production and preparation of food. An FAO study has analysed the risks that women will face if large-scale production of feedstock for agrofuel goes ahead (FAO, 2008b). The study argues that agrofuel 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.

The above analysis should not be construed to imply that biofuel production is always harmful. It has only addressed large-scale agrofuel (liquid biofuel production for transport), where the main threats are land grabbing, concentration of land and competition with food production. Liquid biofuel produced for other purposes can have clearly positive consequences under certain specified conditions. It can provide improved access to modern forms of energy (electricity and other forms) in rural areas, and have positive impacts on food security (e.g. fewer health problems through reducing the use of fuelwood, access to water through bioenergy-propelled water pumps, and simple drying devices that reduce crop losses). Very encouraging examples are reviewed in a recent study (FAO–PISCES, 2009).

It is also not excluded that larger agrofuel projects can have a beneficial impact when organized in a proper way and provide safeguards to protect the poor and food-insecure, avoid harmful displacement of water resources, and ensure environmental sustainability by avoiding pollution and net increases in GHG emissions.

When more integrated food and energy systems (IFESs) are used, this can be an efficient means to reduce risks and promote opportunities related to liquid biofuel development. Integrated food energy systems are designed to integrate, intensify and thus increase the simultaneous production of food and energy in two ways:

- *By combining the production of food and fuel feedstock on the same land through mixed cropping and/or agrosilvipastoral systems. One example is the agropastoral system*

proposed by a public–private consortium project aimed at developing palm oil plantations in savannahs in Brazzaville (Congo). It involves integrating food crops between rows of oil-palm trees during the first years of the plantation, and switching to livestock grazing under the shade of the plantation at a later stage. A combination with the second type of IFES mentioned below, through the use of cattle manure to supply energy to the biodiesel processing plant, could even be envisaged.

- *By transforming the by-products of one system into the feedstocks for the other.* In this case, the major goal of the IFES is to maximize synergies between food crops, livestock, fish production and sources of renewable energy (e.g. biodigestion of by-products or waste). This is achieved by the adoption of agro-industrial technologies that allow maximum utilization of by-products, diversification of raw materials, waste production on a smaller scale, and encouraging recycling and economic utilization of residues, for harmonization of energy and food production.

Such systems can be fairly simple, such as the production of biogas at the farm level, or rather sophisticated, with recycling of waste as both energy feedstock and animal food, using residues for the production of biofuels. There are examples where leftovers from corn used to produce ethanol are afterwards used to feed the livestock, whose dung in turn is used to produce biogas, which generates electricity used in the ethanol plant and also for milk production.

Conclusion

Two key lessons stand out from the harmful environmental effects described above and from the soaring food prices that are having a devastating impact on vulnerable people. The first is that food availability is becoming an increasingly serious problem caused by land diversion to agrofuel production and by changing food habits in more affluent societies. Increased production will be necessary, but it will not address the problems of those who have no access to land and cannot afford the food on the market. Future intensification of agricultural production or expansion to formerly uncultivated land should focus on food production, not on agrofuel production, unless it can be combined with food 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 the fact that hundreds of millions of people in developing countries will not be able to buy the food they need at such high prices, alternatives must be found. Initiatives should focus on two aims.

The first aim 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 second is to ensure that possibilities for small-scale and organic farmers are expanded significantly and receive national and international support.

For this purpose, certain forms of biofuel might turn out to be highly useful and should be welcomed. Efforts are now being made in some countries such as Indonesia to develop energy-sufficient local villages, where *Jatropha* production on a small scale is used to produce biofuel to power small electric generators providing local electricity. There are

other developments of a similar nature in other developing countries. These are indeed highly welcome developments because they contribute to an all-round local social and cultural development, and do not have the destructive consequences of large-scale plantations for commercial agrofuel.

Recommendations

To avoid the harmful environmental and human consequences and maximize the possible benefits from biofuels, international guidelines should be urgently developed for agrofuel 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 special crops that can be used to produce agrofuel should be assessed for their strengths and weaknesses. All guidelines should complement, not contradict, one another and should not impose an unnecessary burden on those who produce biofuel in a socially and environmentally satisfactory way, particularly for purposes other than agrofuel.

With regard to the content of international guidelines for agrofuel production, FAO should encourage the following courses of action:

- 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.
- Avoid production of agrofuel in ways that lead to increased GHG emissions, when direct and indirect impact is taken into account, and/or production that diverts water from existing users and prevents previously existing access to water for drinking and sanitation, and/or which degrades the soil or pollute water or the local air conditions (e.g. by burning).
- Avoid introducing non-native species that carry risks of invasion before appropriate safeguards are adopted – full application of the precautionary principle is required.
- Abstain from measures that evict users of the land without negotiation and acceptable alternatives for the users, whether they have recognized tenure or not.
- Abstain from production of agrofuel wherever it can undermine previously existing opportunities for women to produce food or have access to fuelwood. Should agrofuel production be introduced in a given locality, alternatives must be established in advance that safeguard access for the local population to land for food production and to fuelwood or other means of cooking and heating to at least the same extent as before the introduction of agrofuel production.
- Establish legally binding certification schemes to ensure that the above requirements have been fulfilled and implement a reliable monitoring system to ensure that the international certification is effective and enforced.
- Develop adequate international regulation of financial markets to prevent the negative consequences of speculation associated with hedge funds and futures markets caused by the price link between agrofuel and fossil fuel.