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Biofuels and agro-biodiversity

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One of the great benefits of using biomass for energy production is its potential to reduce the green house gas emissions associated with fossil fuels.[1] The associated risks, however, include potential effects on land use, agricultural production systems, habitats, biodiversity, land, air and water qualities. For this reason, discussions and activities related to bioenergy and biofuels are receiving attention at the environmental, economic and social levels especially with regard to the effects linked to agro-biodiversity, food security and the costs of food production.[2]

The increase in the price of maize, for example, by 60 per cent between 2005 and 2007 in countries such as the United States of America is prompting economists and agriculturalists to assess the impacts of the global surge in biofuel production and distribution policies globally. With 240 kilograms of maize required to produce just 100 litres of ethanol, surely the choice is between producing more food or more fuel. That quantity of maize is equal to the food requirement of one person for one year!

According to a recent World Bank review,[3] the potential environmental benefits of biofuels including their impacts on biodiversity, air, water and soil qualities cannot be generalized and need to be assessed on a case-by-case basis, evaluating cropping and land use patterns as well as the type of crop used for biofuel production. Bioenergy and biofuel production planning and policies require the integration of relevant sectoral policies, such as energy, agriculture, environment, economics and rural development. According to the World Bank reviews, the reduction of green house gases in the United States of America owing to the production of ethanol from maize will be in the range of 10 to 30 per cent, at best, while in Brazil the use of ethanol could reduce green house gas emissions by 90 per cent. According to several studies,[4] although biofuels have the potential to enhance national energy security, the benefits of this technology will remain limited for smallholder farmers. Countries will need sound schemes to ensure smallholder participation catering to local energy demands.

It is widely known that biofuel production in developed countries is backed by high protective tariffs in conjunction with large subsidies paid to biofuel producers. It is still debatable as to whether developing countries can afford such policies in addition to supporting policies that may have to deal with increased grain prices because of the diversion of grain to biofuel production. Challenges will remain until we are able to rely on first generation technologies for biofuel production. Second generation technologies such as production of fuels from microbes, [5] may offer some respite, but not in the immediate future.

The impacts of biofuels on agrobiodiversity

According to a number of recent reports,[6] biofuels have the potential to contribute to an increase food grain prices, increased competition for land and water, as well as deforestation and destruction of agro-biodiversity.[7] Socially and environmentally relevant strategies and policies on biofuels are therefore needed for developing countries. Significant international activity is underway to determine sustainability criteria, including through the Global Bioenergy Partnership and the Roundtable on Sustainable Biofuels. Tools developed by the Food and Agricultural Organisation of the United Nations led consortium such as the 'analytical framework'8 are expected to provide guidance for countries on dealing with the bioenergy industry to respond to energy security in a manner that does not jeopardize the food security of poor farmers.

Biofuels are currently produced using conventional food crops such as maize, wheat, sugar cane, oil palm and oilseed rape. The use of these crops for biofuels on a that too in large scale, will in near future create a direct competition between biofuels and food security as well as eroding agro-biodiversity. Research has shown that perennial rhizomatous grasses such as Arundo donax (native to Asia) and Phalaris arundinacea (reed canary grass native to Europe, Asia and North America) that are currently regarded as biofuel species are in fact invasives. Species such as Miscanthus that are regarded as potential sources of biofuel are again reportedly invasives9. The following policy and research needs may assist in avoiding these difficulties :

Policy and research needs

Existing policy frameworks focus on supply targets rather than on delivery mechanisms and the impacts of production strategies on environmental, social and economic benefits. National strategies on biofuels should consider the cost of technologies, their deployment and use, the short, medium and long term impacts of their use on farmers and biodiversity and assess the economic viability of biofuel technology;

Developing a coherent policy that balances feedstock supply against other uses of land and water would reduce the impacts of biofuel production on agro-biodiversity conservation;

Adequate investments and fiscal and regulatory incentives to develop further technologies that minimize the effects of biofuel feedstock on food crops are needed;10

Continuing the discussion on national food, energy and environmental security in an integrated fashion to assess impacts would improve the development of research and policy options that are balanced towards future food and security needs;

Investing in second generation technologies such as the broadening range of feedstock, including dedicated energy crops, perennial grasses, forestry species that combine the properties of high carbon to nitrogen ratios, higher yields of biomass or oils, easily process able lignocellulosic material, use of organisms such as those from the marine environment (micro-algae)11and direct production of hydrocarbons from plants or microbial systems are critical to reduce the potential impacts of biofuels on agrobiodiversity. Care should be taken, however, that such technologies are managed properly so as not to endanger agriculture and biodiversity.

1 See http://esa.un.org/un-energy/pdf/susdev.Biofuels.FAO.pdf
2 Document UNEP/CBD/COP/9/26
3 World Development Report 2008, World Bank, Washington, United States of America .
4 The Royal Society Policy Document 01/08, 2008, London, United Kingdom of Great Britain and Northern Ireland; Cramer Commission Report, 2006, London, United Kingdom of Great Britain and Northern Ireland; UN Energy, 2007, United Nations, New York, United States of America.
5 http://www.financialexpress.com/news/second -generation-biofuels/271495
6 The Royal Society Policy Document 01/08, 2008, London, UK; Cramer Commission Report, 2006, London, UK; UN Energy, 2007, United Nations, New York, USA.
7 World Development Report, 2008, World Bank, Washington, USA; XXXX; XXXX
8 http://www.fao.org/newsroom/en/news/2008/10000782/index.html
9 Ragu S, et.al. 2006, Science, 313:1742.
10 For additional information see Rosegrant et.al. IFPRI, Focus 14, Brief 3 of 12, 2006.
11 http://www.financialexpress.com/news/second -generation-biofuels/271495