UNEP-WCMC submission on the development and application of tools relevant to the sustainable production and use of biofuels

The production of liquid biofuels is rapidly increasing. Governments are setting targets to increase the proportion of biofuels in their energy mix for the purposes of climate change mitigation, energy security and rural development. Most research to date has focused on the role of biofuels in reducing carbon emissions, and questions have been raised over their actual performance in this respect (Fargione *et al.* 2008; Gibbs *et al.* 2008; Searchinger *et al.* 2008). Far less attention has been paid to the potential impacts of biofuels on biodiversity, although it is clear that these impacts can be significant (Fitzherbert *et al.* 2008; Koh & Wilcove 2007; Royal Society 2008).

Each of the many different biofuel crops has different land requirements and environmental impacts, so the biodiversity outcomes of increasing biofuel cultivation will be context specific. In general, there are three main ways in which cultivation of biofuel crops can have negative impacts upon biodiversity:

1. Through direct conversion of land from natural and semi-natural ecosystems to biofuel cropland
2. Through indirect conversion of land from natural and semi-natural ecosystems as a result of displaced agricultural production and improved access and infrastructure
3. Through agricultural intensification and the associated 'off farm' impacts, including soil erosion and pollution due to agrochemical run-off and pesticide drift.

Some of these impacts have already been observed, particularly in Indonesia and Malaysia where it is estimated that 55-59% of oil palm expansion has occurred at the expense of tropical forest (Koh & Wilcove 2007), but also in the Brazilian cerrado and in conservation set-aside lands in the USA and the EU.

However, where appropriate biofuel crops are grown on appropriate land, they can be beneficial for biodiversity. Mixtures of native biofuel crop species can support native biodiversity, and good agricultural practice can help to rehabilitate degraded land, through soil conservation and improvement. By providing improved livelihoods for local people, some biofuel production can help to alleviate pressures on native ecosystems.

The production of 'next generation' biofuels is expected to have fewer adverse biodiversity impacts, to the extent that native species mixtures can be grown on degraded land, and waste residues used. However, these technologies are not yet economically viable for large scale production, and are associated with other biodiversity impacts resulting from removing residues, as well as with the potential risks of invasiveness, particularly if crops are genetically modified.

Projections suggest that biofuel production will continue to increase in the future, and that total land requirements for biofuel and biomass production (including second generation biofuels) could be as much as to the total current area of cropland (Field *et al.* 2008; Gurgel *et al.* 2008).

Given the likelihood of increasing biofuel production, the options for limiting the adverse impacts of biofuel production on biodiversity need to be examined. There is an urgent need to develop criteria and tools to guide decisions on areas in which biofuels can be grown and incentivise appropriate crop selection along with good management practices.

Biodiversity-related standards for biofuel crop production

Several initiatives have developed or are developing 'sustainability' standards and criteria for biofuel production. These standards, which can be either regulatory or voluntary, typically include criteria designed to limit adverse impacts on biodiversity. The European Commission (EC), for example has developed in its Renewable Energy Directive (RED) a regulatory standard for biofuel feedstocks grown in and imported to the EU. Initiatives such as the Roundtable on Sustainable Biofuels (RSB), the Better Sugar Cane Initiative and the Roundtable on Sustainable Palm Oil (RSPO) are developing voluntary standards.

To limit adverse biodiversity impacts standards typically specify that there should be no conversion of land for biofuel production in existing protected areas. They also recommend that conversion should be avoided in areas of high biodiversity importance, but are variable in the degree to which they specify what those might be. It is generally recommended that conversion of primary natural forest and wetlands including peatlands be avoided, principally on the grounds that greenhouse gas emissions from conversion would outweigh any emissions reductions from biofuel use. In some cases standards recommend that cultivation of biofuels should be confined to 'marginal and degraded lands' as a way of limiting adverse impacts on food production. As yet, none of these standards currently addresses the issue of indirect land use change in relation to biofuel cultivation.

In order for sustainability standards to become operational, clear definitions are urgently needed for such terms as 'areas of high biodiversity importance' and 'marginal and degraded lands', as well as terms specific to individual standards such as 'highly biodiverse', 'natural', 'non natural' and 'grasslands', as well as 'primary forests without clearly visible human disturbance', all used in the European RED.

To determine the potential effectiveness of sustainability standards in limiting the adverse impacts of biofuel development on biodiversity, analyses are needed to clarify which areas are covered by the existing definitions within each standard. For example, many areas classified as degraded, such as logged forest and 'abandoned' agricultural and grassland areas, will still support levels of high biodiversity. The analyses will need to incorporate consideration of what fraction of biofuels production the standards are likely to be applied to, and should help to identify where biodiversity is potentially still at risk from biofuel expansion. While global or regional analyses will provide useful perspectives on these issues, decisions regarding biofuel development will need to be supported by assessments of potential biodiversity impacts at national and local scales and by full life cycle analyses of the potential impacts of biofuel production (e.g. Fargione *et al.* 2008, Searchinger *et al.* 2008). UNEP-WCMC is undertaking work on the implications of definitions used in the sustainability standards, and on the spatial analyses that can help in operationalising them.

Tools for operationalising the standards

The tools available for identifying areas of importance for biodiversity include the World Database on Protected Areas (http://www.wdpa.org/). Land cover databases including Globcover (http://www.esa.int/due/ionia/globcover) and national land cover data sets can help to identify areas of current forest cover and locations of wetlands and peatlands. Other tools for identifying areas important for biodiversity include Key Biodiversity Areas, which identify important biodiversity areas at a national scale based upon international criteria relating to species conservation. For finer scale assessments, the process for identifying High Conservation Value (HCV) areas (http://www.hcvnetwork.org/practical-support/the-hcv-toolkit-global-home), takes into account the views of local and national stakeholders and a broader range of potential values. Spatial analyses (e.g. Kapos *et al.* 2008) can be used to identify areas where multiple values, including high carbon storage, high biodiversity importance and importance for other ecosystem services coincide, which should be avoided in the development of biofuel cultivation.

Voluntary initiatives such as the RSB will need to engage biofuel crop producers on a large scale in order to operationalise the sustainability criteria. Regulatory standards are likely to be a more powerful tool in reducing biodiversity impact, and the degree to which voluntary standards will play a complementary role is as yet unclear. Lessons could be learnt from voluntary forestry schemes such as the FSC in this respect. However, voluntary standards will be important for fostering sustainable biofuel production in the many areas not covered by a regulatory framework. The parallel development of many standards risks confusion among producers as well as distributors and may cause difficulties in implementation.

Conclusions

Further development of biofuels will certainly occur and will have a mixture of positive and negative impacts on biodiversity depending on the feedstocks, sites and agricultural practices involved. To ensure that adverse impacts are minimised, it will be important for the biodiversity community to work actively to develop tools for supporting decisions about biofuel development. Thorough analyses of potential impacts throughout the life cycle of each biofuel will be needed to support decision making at national and local scales. Sustainability standards are required to help reduce adverse impacts on biodiversity. Consistency in the approaches to biodiversity across the different sustainability standards is likely to increase their effectiveness in this respect.

At the national level it will be important for agencies and authorities with responsibility for biodiversity to engage with their counterparts responsible for biofuel feedstock development, in order to ensure that biodiversity issues are adequately addressed.

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