Indirect effects of bioenergy – Effects on landscapes and livelihoods

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IUCN, the International Union for Conservation of Nature, is the world's oldest and largest global environmental network - a democratic membership union with more than 1,000 government and NGO member organizations, and almost 11,000 volunteer scientists in more than 160 countries. IUCN helps the world find pragmatic solutions to our most pressing environment and development challenges. It supports scientific research, manages field projects all over the world and brings governments, non-government organizations, United Nations agencies, companies and local communities together to develop and implement policy, laws and best practice.

Ecosystems and Human Well-being

Human well-being is highly dependent on ecosystems and the services they provide. Ecosystem services are the multiple benefits provided by ecosystems to humans.
- provisioning services (food, water and genetic resources)
- regulating services (regulation of climate, flood protection, and water quality)
- cultural services (recreational and spiritual benefits)
- supporting services (soil formation, pollination, and nutrient cycling)

Many of these services are also the basic services provided by ecosystems that are needed for productive bio-energy systems.

In 2005 the Millennium Ecosystem Assessment showed that over the past 50 years ecosystems have been changing more rapidly than ever before. Approximately 60 percent of the ecosystem services examined in the Assessment are being degraded or used unsustainably. Only 4 ecosystem services have enhanced over the past 50 years, 3 of which involve food production (crop, livestock and aquaculture).

Human activity has caused between 50 and 1000 times more extinctions in the last 100 years than would have happened due to natural processes. IUCN Red List (2008) shows that currently almost 17.000 species are threatened with extinction, whereas only 785 are known to have become extinct in the past 100 years.

The main reasons for the decline in ecosystems and ecosystem services are:
- habitat conversion
- pollution
- overexploitation of natural resources
- climate change
- invasive species

Many people are dependent *directly* on ecosystems for their subsistence and livelihoods, though the exact number of people depending is difficult to estimate. Lipton (2004)[i] estimated that 75% of the world population that lives below the poverty line (i.e. 1.2 billion people living on less that 1 US$ a day) depends directly on ecosystems services for subsistence.

Furthermore, 2.6 billion people are dependent on traditional forms of biomass (e.g. fuel wood, charcoal) for heating and cooking[ii]. This in fact provides a huge opportunity for bio-energy or

other sustainable energy solutions. Access to modern energy services could help alleviate poverty and more energy-efficient use of the traditional biomass could provide opportunities to decrease pressure on the resource base of traditional forms of bio energy, from tropical forest to drylands.

The rush for land and how to define 'idle', 'marginal' and 'degraded' land.

There is ample evidence that the extra demand for bio energy cannot be met with intensification of yields alone. The demand for bio-energy, together with the increasing demands for food, feed and fibre will lead to an expansion of arable land. Estimations of how much additional arable land for bio energy is needed differ a lot. IEA estimates that land requirements under IEA Alternative Policy scenario will amount to 52.8 million ha in 2030 (compared to 13.8 million ha of arable land in 2004)[iii]. Other studies, based on economic model scenarios, estimate the land requirements for bio energy in 2050 as high as 1500 million ha.[iv] So the amount of additional land that is required to meet the demands for bio energy is unsure, but a significant expansion of the current arable land area is to be expected.

The question is, where will the expansion of arable land most likely take place. To avoid food conflicts and forest conversion, many policies promote the use of 'degraded' or 'idle' land (i.e. the European Directive for the promoti

Higher land values in turn have an effect on land tenure and land use. Land *use* indicates *what* crop is grown on the land and land *tenure* is defined as *who* has access to the land. As land use changes from subsistence farming to cash crop (i.e. for biofuel) the tenure aspects change as well.

Likewise, with higher land and crop values, changes in land access from small holder farming to large scale biofuel plantations might take place. Local communities who haven't formalized their land tenure and land rights aspects are particu

Other socio economic indirect effects of biofuels