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WWF Position Paper on Bioenergy – June 2008

"Climate change threatens the basic elements of life for people around the world - access to water, food production, health, and use of land and the environment.[i]"

Content

INTRODUCTION....2

BIOENERGY AND SUSTAINABILITY....3

OPTIONS TO PROMOTE SUSTAINABILITY....5

OPTIONS AT INTERNATIONAL LEVEL....6

GHG Accounting....6

Environmental & Social Production Performances....6

Addressing land-use displacement....7

Research and development (R&D), technology transfer and support for developing countries....8

Multilateral Institutional Work....8

Options at National and Regional level....8

Options at Company, Farm and Forest-level....11

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Introduction

It is now generally accepted by science that in order to avoid dangerous climate change, global warming should stay below a 2°C increase compared to pre-industrial temperatures. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) shows that it may be possible to prevent disastrous climate change if global greenhouse gas (GHG) emissions start to decline before 2015. To keep our climate safe, 50-85 per cent of carbon dioxide (CO_2) emissions will have to be cut by the middle of this century, according to the IPCC Summary for Policy Makers[ii].

This can only be achieved through a variety of ambitious measures and policies on a global scale. WWF's Climate Solutions for 2050[iii] includes as a priority the following measures:

- **energy efficiency (getting more energy services per unit of energy used) is a priority, especially in developed countries;**
- **stopping and reversing loss and degradation of forests (which accounts for approximately 20 per cent of global GHG emissions), particularly in the tropics, is a crucial element of any positive climate-energy scenario;**
- **the rapid and parallel pursuit of the full range of low carbon energy technologies, such as wind, hydro, solar PV & thermal, and bioenergy is crucial, but within a set of environmental and social constraints;**
- **developing flexible fuels, energy storage and new infrastructure;**
- **displacing high-carbon coal with low-carbon natural gas as a "bridging fuel" offers an important opportunity to avoid the long-term lock-in of new coal power stations; and**
- **carbon capture and storage (CCS).**

Therefore, sustainable bioenergy[iv] is one part of WWF's Climate Solutions for 2050. WWF has estimated that by 2050, 110 to 250 EJ[v] of bioenergy could be produced per year whilst taking into account nature conservation interests and food necessities. This represents a range of one quarter to one half of all current global primary energy production and approximately 11 to 29 per cent of the projected final global demand in 2050 (approximately 1000 EJ according to the IPCC SRES A1B scenario) or approximately 1/6 to 1/3 of all energy used in WWF's Climate Solutions for 2050, with ambitious energy conservation measures.

However, climate change is not the only driver of bioenergy development. Security of energy supply, increasing fossil fuel prices and rural development goals all contribute. Currently, bioenergy accounts for more than 10 per cent of the energy consumed worldwide - most of it being consumed in developing countries. Nearly two-thirds of this is estimated to come from wood fuel, accounting for more than half of the global wood consumption[vi]. About three quarters of the bioenergy used presently is characterised by low efficiency combustion, creating environmental and health[vii] problems.

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Bioenergy production for large-scale commercial use is currently growing rapidly. Developed countries have opted for bioenergy production and trade to meet their domestic emissions reduction targets, secure energy supply and farmer incomes. Medium to large developing countries have adopted bioenergy as part of their development strategy to generate export earnings, meet local demand and develop their own bioenergy industries in order to reduce GHG[viii] emissions. Others are turning towards bioenergy crops to meet local energy demands and foster rural development. These goals are not mutually exclusive.

WWF believes that bioenergy can provide diverse sustainable alternatives to fossil fuels, additional incomes for rural communities and contribute to development under the right conditions. For this to be realised, however, bioenergy development must be very carefully planned, implemented, and continually monitored for its environmental and social sustainability. Depending on which crops are produced, where and how, bioenergy developments can cause significant negative environmental and social impacts, including deforestation, biodiversity loss, soil erosion, excessive water use, conflicts over land rights and land use, food shortages and staple food crop price spikes. It is also acknowledged that inappropriately developed bioenergy production can lead to increased poverty and loss of traditional tenure rights, etc.

Bioenergy and sustainability

WWF will only support bioenergy that is environmentally, socially and economically sustainable and considers that effective measures are needed to address the following issues:

1. Bioenergy must deliver large positive energy and GHG balances over fossil fuels
Bioenergy greenhouse gas (GHG) and energy balances vary widely and some crops perform far better than others. However, crop selection, soil and climate are not the only determining factors. Land use change, agricultural practices, use of by-products and low carbon sources of energy, conversion techniques and final energy use, will also affect the lifecycle GHG balance of bioenergy. In addition, any land conversion of carbon-rich vegetation such as primary forests or soils such as peatlands, can cancel out the potential carbon benefits of bioenergy feedstocks.

2. Bioenergy feedstocks must be selected on the basis of the most efficient GHG balance, from production through to processing and use
Some conventional crops, such as sugarcane, can provide these benefits if produced and processed sustainably, and are available for use as bioenergy already. However, future investment and research should rather be oriented towards more efficient technologies and towards ligno-cellulosic[ix] crops, or other crops that offer better options to reduce GHG emissions as well as a reduced impact on the environment.

3. Bioenergy policies and programmes must address displacement effects that influence GHG balance, poverty and the environment
Experience shows that when a certain crop replaces an already existing agricultural production capacity, the demand for the initial crop will not disappear (in most of the cases) from the market. As the demand persists,

new production capacity will be set up, in many cases by converting high conservation value areas (HCVAs) into agricultural land. At first sight, the establishment of the new bioenergy capacity on already existing agricultural land is not releasing significant quantities of GHGs into the atmosphere and by its replacement of fossil oil in the transport sector reduces overall emissions. In reality, however, as a result of the displacement effect[x] in carbon and vegetation rich HCVAs, the development will not help to mitigate climate change in the short or medium term. Addressing displacement is a very complicated matter and is closely linked with potentially high risk of competition with food crops leading to impacts on poverty alleviation and development.

4. Bioenergy production areas must not be established through the indiscriminate conversion of natural ecosystems (natural and semi-natural forests, natural floodplains, wet&peatlands) that have high conservation values and/or critical carbon storage functions.

Their destruction can lead to a host of consequences, such as the loss of critical ecosystem representivity, increased habitat fragmentation and decreased resilience, decrease of species diversity (including species extinction in extreme examples), increased conflicts between humans and wildlife resulting in serious threats to human lives and livelihoods as well as decimation of wildlife populations, changes in soil structure and reduced fertility and increased GHG emissions (from peatlands for example). Likewise, growing a bioenergy crop with increased water use requirements could decrease the availability of water for human consumption, industry and downstream freshwater ecosystems, and also result in changed hydrology and growth of soil salination. This must not be done where and when water is, or would be made scarce. WWF considers that the implementation of efficient, multi-stakeholder land-use and water-use planning methods could prevent unwanted development in HCVAs and the over abstraction of water. In some countries, the enforcement capability is not adequate to ensure that HCVAs are not converted to bioenergy crops and this is of serious concern. Additionally, the implemented agricultural and forestry management technologies will have to maintain and/or enhance the carbon storing capacity of the cultivated area.

5. Bioenergy feedstocks must be produced using better management practices (BMPs)

For WWF, conversion of HCVA is not the only environmental concern that needs to be addressed. Unsustainable production practices are contributing to soil, air and water pollution, depletion of water resources and degradation of soil. Energy feedstock production must be planned and carried out using internationally agreed BMPs. As a number of potential bioenergy feedstocks do not have, at the moment, internationally agreed BMPs in place, WWF urges the involved stakeholders to finalise them as soon as possible.

6. Implementation of bioenergy policies must take into account food security and must not threaten the realisation of the right to food

Growing demand for bioenergy is likely to lead to more frequent fluctuations and a general increase in commodity prices. This comes after an unprecedented period of price deflation in agriculture commodity prices, and has implications for all producers, large and small. It is virtually impossible to determine precisely the price scenario of different food and energy crops, but based on WWF's experience, it is believed that perverse subsidies in developed countries will almost certainly amplify the fluctuations.

The volatility on the price and availability of some food crops witnessed in 2007-08 is part of a much larger set of drivers of which bioenergy policies and production are one aspect (others include climate disruptions to growing seasons, the entrance of investment funds into commodity markets, low levels of investment in agriculture R&D, export bans, and increasing demand for western style diets). Bioenergy policies may also have spurred part of the speculation on commodity markets. WWF believes that governments need to consider their strategies for producing bioenergy from crops traditionally grown for food in order that there is no adverse impact upon food policies and priorities.

7. Governments must take measures to ensure an equitable playing field for the small producers
WWF considers that rural communities in the producing countries should be able to participate as full partners in new development affecting their community and regions rather than be 'sources of cheap labour'. Increasing agricultural commodity prices will facilitate the incorporation of sustainability criteria into production processes, and importantly should help small farmers by transferring wealth and resources to help create new jobs. In areas where there are functioning distributional and social policies, this trend could lead to the provision of local access to energy, revitalisation of rural areas and the alleviation of poverty. WWF considers that smallholders should fully benefit from the arising economic benefits.

8. Social considerations and indigenous people's rights must be considered as a priority in bioenergy development
WWF believes that the possible negative impacts of bioenergy development on indigenous peoples and local communities need to be recognized and avoided. The increasing involvement of large-scale conglomerates in the bioenergy business has led to fears of displacement and marginalisation of local communities, indigenous peoples and smallholders. There are also concerns about the insecurity of land ownership and tenure rights for rural and indigenous communities who depend upon access to forest, agricultural resources and ecosystem services for all aspects of their lives. There are additionally concerns that bioenergy production will lead to the loss of diverse agricultural systems and agrobiodiversity and the socio-cultural values that accompany them. WWF will therefore only support bioenergy development that respects the rights of indigenous peoples and local communities and contributes to their well-being. Issues of poor working conditions with health and safety risks, forced and/or child labour have been raised particularly under large-scale projects in developing countries. Governments of both developed and developing countries, financial institutions and international agencies have to enable the participation of stakeholders in the decision making process. At a very minimum, any development should 'do no harm'.

Options to promote sustainability

Domestic policies can create incentives for sustainable bioenergy production by giving tariff preferences, procurement preferences and other benefits to sustainably produced bioenergy supplies. For the moment, bioenergy subsidies and tariffs applied especially in the developed countries do not reflect their GHG, environmental and social performance. WWF considers that there is an urgent need to align subsidies and other financial instruments with the environmental and social benefits resulting from the use of bioenergy. It

is unacceptable, however, to use the aforementioned financial instruments as a protectionist tool against imports from developing countries.

In addition, WWF considers that an on-going monitoring and evaluation of the direct and indirect costs and benefits of the bioenergy sector is needed. As the sector grows, investment in functioning land-use planning in key producer regions and the establishment of international funding facilities to invest in adaptation and mitigation programmes for the negative impacts is needed.

WWF recommends and will contribute to the development of the following solutions:

Options at International Level

International bioenergy trade partners, organisations and governments must ensure the sustainability of the bioenergy business. The level of bioenergy use planned by many industrialised countries will mean that achieving their targets will depend on imports. When considering importing bioenergy, industrialised countries must carefully assess the need to support local consumption, technology transfer and climate mitigation in producing countries.

The development of international standards to facilitate trade in bioenergy products is strongly recommended. These production and procurement standards must include social and environmental sustainability criteria. International standards have a special status in the WTO Agreement on Technical Barriers to Trade, where they are presumed to be "necessary". **However, standards should not be used as a protectionist tool to safeguard domestic markets and for creating barriers affecting developing countries.**

Many of the problems associated with bioenergy are existing longstanding issues associated with agriculture, forestry and natural resource management. In order to address these problems, fundamental, structural changes are needed in these sectors and short-term, stop-gap measures focusing on bioenergy alone are insufficient.

GHG Accounting

Bioenergy should not be accounted for as 100 per cent carbon free in national GHG inventories[xi]. Carbon lifecycle[xii] and GHG emissions should be accounted for through a mandatory and internationally accepted full lifecycle accounting system. Such a scheme would help to identify, document and eventually reduce GHG emissions in bioenergy-related processes, such as fertilising, converting carbon-rich lands etc. Over time, such a scheme may help direct governments to only account for the real GHG benefits of bioenergy. Carbon offset projects for bioenergy crops should likewise reflect an accurate accounting of carbon values in their production processes.

Environmental & Social Production Performances

WWF considers that a global approach is needed to agree on the acceptable levels of environmental and social performance in the production of bioenergy among supply chain actors, from growers to end users. Acceptable performance should be defined in terms of principles, criteria and indicators (PCIs) that relate to

the significant and measurable impacts of bioenergy, and adherence to the PCIs within value chains assured by credible verification (certification) and reporting schemes.

In WWF's view, the following environmental principles need to be addressed by any standard as a minimum:

- not damage high conservation value habitats and biodiversity;
- not degrade soil quality;
- not adversely impact the quantity and quality of freshwater resources;
- not lead to damaging releases of toxic compounds into the environment; and
- lead to substantially positive lifecyle GHG balances compared to fossil equivalents.

Equally important, the following social principles must also be addressed as a minimum[xiii]:

- the principle of full and effective participation of potentially-affected communities, including Free Prior Informed Consent whenever development affects indigenous lands, territories and resources
- the principle of 'do no harm' (any development should not contribute to poverty)
- respect of traditional rights to land and resource use and access
- respect for workers (health, safety and labour rights)

WWF supports a global "roundtable" approach involving representatives of producers, supply chain and retail companies and NGOs, as a feasible way of agreeing a system for assuring acceptable performance of bioenergy. Governments and market players can ensure in an appropriate way that the players operating from or on their territory adhere and participate actively to the scheme. Existing schemes for wood, palm oil, soy and sugarcane, and their PCI, provide the starting point for such a global approach, while recognising the need to complement these processes with specific GHG criteria and measurable indicators specific to the bioenergy feedstock.

Addressing land-use displacement

WWF recognises that one of the most challenging tasks in ensuring that bioenergy feedstock production is sustainable is tackling displacement. Bioenergy feedstocks production can displace food crops or drive conversion of carbon-rich ecosystems as a secondary impact, cancelling in some cases the potential GHG benefits of bioenergy use and leading to serious social impacts. Addressing displacement is a complicated matter. As most of the commodities are produced and traded on a global market, displacement will act across borders but also across crops.

WWF strongly recommends the prevention of displacement to avoid unwanted impacts through the following measures:

- use idle land[xiv] and in particular already eroded, overgrazed and less fertile land only to establish new bioenergy production capacity;
- increase productivity in the already existing plantations for example better management practices can significantly increase productivity in oil palm plantations;
- promote the use of waste and by-products as a source of bioenergy; and

- establish functional and coherent land use, agriculture and rural development and energy policies that secure land allocation for food and fuel crops and reduce price fluctuations.

WWF fully supports the wide use of existing credible, independent certification schemes as an effective tool to promote sustainable production, noting however that these schemes will not prevent displacement and secondary impacts. Law enforcement and land-use planning are equally important.

Research and development (R&D), technology transfer and support for developing countries

R&D should be promoted and technology expertise made available to countries to promote a much more inclusive uptake of bioenergy for reducing global dependency on fossil fuels in developing countries. Research and development work should lead to reduced production costs, higher energy conversion efficiency and greater cost-effectiveness of bioenergy. Financial and technical support must be provided to developing countries for the development of their own renewable energy supply strategies. Such strategies should address technical standards, infrastructure and other economic, social and environmental aspects. WWF strongly supports cost-effective technology development and early deployment of appropriate technology that would benefit landless farmers. National and regional markets should be developed for bioenergy taking into account community needs and management capabilities. This would increase incomes for local producers and liberate resources for other uses.

Multilateral Institutional Work

International institutions, including the International Labour Organisation (ILO), UN Food and Agriculture Organisation (FAO), UN Conference on Trade and Development (UNCTAD), UN Environment Programme (UNEP) and UN Development Programme (UNDP), should conduct specific country-based assessments to help governments determine their strategy and engagement with bioenergy production, encourage sharing of experiences on small producers' involvement. This would enable small producers to fully benefit from bioenergy production and help developing countries improve their capacity and competency to adapt existing technologies to local conditions and adjust to more sophisticated and likely, proprietary technologies. Members of the Organisation for Economic Cooperation and Development (OECD) should also provide substantial additional (financial and technical) assistance to developing countries in order to strengthen land-use planning and control for bioenergy expansion and to support bioenergy growers to apply better management practices (BMPs) in crop production.

WWF considers that research and monitoring the effects of increasing bioenergy use on food production, access by poor people to land and water resources, and on land use change and its environmental impacts are essential, and that the knowledge gained must be used to adjust policy or take other corrective actions.

Options at National and Regional level

Governments of the key developed and developing countries should ensure the sustainable production and use of bioenergy, and take into account the impacts their bioenergy policies may have on other countries. A comprehensive set of measures is needed to make bioenergy GHG positive, to ensure positive

natural resources and land use, and to protect the more fragile communities that are affected by bioenergy developments. This requires a solid framework with policy coherence amongst agriculture, forestry and energy sectors in order to address the risk of conflict between competing land uses and to adopt the most appropriate forms of sustainable energy.

Governments should ensure adherence to international efforts towards making bioenergy sustainable, as well as support compliance by private sector players to these standards. As a start, WWF considers that governments should require bioenergy companies (refiners, fuel retailers) to publish annual reports on a representative set of key performance indicators (based on international norms as set out above and agreed through stakeholder consultations) for the main environmental and social issues associated with bioenergy crop growing, processing/refining and transport. This reporting would include GHG balances and should serve as the basis for an international sustainability assurance scheme. Additionally, the exporting countries must be required to develop domestic capacity to implement and enforce the standards and policies on sustainable bioenergy production.

For example, WWF supports the initiatives taken by the UK and Netherlands governments to develop framework standards for environmental and social bioenergy criteria that are partially based on existing credible commodity roundtables and certification schemes. WWF considers that a similar approach is required at EU level and in other major bioenergy importing countries. These initiatives are needed in the context of ambitious bioenergy targets combined with the absence of international bioenergy sustainability standards. These schemes must move as soon as possible to setting minimum acceptable sustainability standards and to link support for best performing (GHG balance, environmental and social) bioenergy production patterns.

Some specific measures would help steer regional and national efforts

Land-use planning and protection of local communities and smallholders

Land use for the production of bioenergy feedstock is largely unplanned. Only some national policies are beginning to identify suitable areas and resources for biomass cultivation and harvesting purposes.

WWF recommends:

- Strategic economic and environmental assessment and planning for bioenergy industry development at an appropriate jurisdictional scale (national, state/province, regional) and with public participation, e.g. suitability mapping that includes the social and environmental availability of water as well as land, sustainable financing mechanisms and Payment for Environmental Services (PES).
- Mapping of the raw material sources at a regional/landscape/catchment level. These will include existing forest resources, short rotation coppice, dedicated agricultural crops, and residues from existing forest and agricultural operations.
- Strengthening and improvement of mapping systems for HCVAs[xv] and other ecologically sensitive, biologically important areas such as habitats of priority species, corridors and buffer zones. This should especially be the case when bioenergy development is likely to cause or exacerbate conflicts

between wildlife and people, which can severely threaten the lives and livelihoods of local people (in some cases leading to human injury or death), as well as decimating wildlife populations. This will normally be the case when bioenergy developments are placed in or near habitats of megafauna species such as elephants, tigers, jaguars or bears.

- Effective policy mechanisms should be defined to protect these high priority areas from bioenergy development, and adequate resources should be deployed to ensure effective implementation and enforcement of those policies.
- Mechanisms to ensure that small producers benefit from bioenergy production and markets. This could include creating specific institutional arrangements to ensure participation by small producers and rural communities in decentralised production and processing through contract farming arrangements or cooperatives.
- Enforcement of the ILO core labour standards for adoption and implementation at all levels of production.
- Develop national guidelines and monitoring system for bioenergy cultivation and harvesting.
- Enforcement of zero burning policy (with recognition of the need for transitional measures and alternative employment opportunities where zero burning and the accompanying need for mechanised harvesting is likely to result in large and rapid increases in unemployment, as is the case in parts of the Brazilian cane industry) and other environmental legislation.

Bioenergy development should not harm and should contribute to the well being of small holders and communities in rural areas, particularly indigenous peoples.
Because indigenous peoples are often discriminated against and politically marginalised, special efforts should be made to respect, protect, and comply with their collective and individual rights, including customary as well as resource rights. Indigenous peoples have the rights to the lands, territories, and resources that they have traditionally owned or otherwise occupied or used, and that those rights must be recognized and effectively protected, as laid out in the ILO Convention 169 and the UN Declaration on the Rights of Indigenous Peoples. Therefore special efforts should be made to establish stakeholder mechanisms in order to ensure that indigenous peoples likely to be affected by bioenergy development can give their prior informed consent to that development, secure relevant land and resource rights, and share in the benefits.

Support for sustainable bioenergy production, distribution and consumption:
WWF recommends policy and market mechanisms including renewable fuel obligations, tax exemptions, investment subsidies, public procurement and demonstration projects for establishing sustainable bioenergy use and production. Such instruments should, in no circumstances, take the form of open-ended income transfers, act as means for protecting national markets or affect the security of global food supplies. In the medium to long term, bioenergy production will have to become economically viable without subsidies. It is unlikely that developing country governments will have sufficient funds to support the development, up-take and establishment of bioenergy on par with fossil fuels. It is therefore recommended to significantly reduce the subsidies provided to carbon-intensive energy options (e.g. coal, oil and gas) and to price carbon in favour of non-polluting alternatives like sustainable bioenergy.

Bioenergy targets need to be put into political context

Bioenergy targets should be part of a broader sustainable transport policy, including energy efficiency, modal shift, shift to other types of energy, such as electrification of transport. It should be noted that the more sustainable alternative options to fossil transport fuels, such as sustainable hydrogen, biofuels or electric transport, will all require the use of biomass.

Given the current pressure on food supply, which remains the priority, countries should be consistent when setting long term bioenergy targets. Setting interim targets followed by the assessment of the social, economic and environmental impacts once these targets are attained, would allow stakeholders to make better informed decisions on long term targets. Any bioenergy production or consumption target should be linked to sustainability safeguards including certification of bioenergy, with ambitious GHG reductions. Such certification would incentivise farmers and companies to move away to the better options for bioenergy production

Options at Company, Farm and Forest-level

In the absence of strong political agreements on bioenergy production, market-based mechanisms, such as the Forest Stewardship Council (FSC), Roundtable on Sustainable Palm Oil (RSPO), Roundtable on Responsible Soy (RTRS), Better Sugarcane Initiative (BSI), and Roundtable on Sustainable Biofuels (RSB), can deliver the level of sustainability needed in bioenergy feedstock production. However, some of these initiatives need to be amended so that they cover the whole lifecycle of feedstocks through processing into bioenergies and to ensure that they establish standards for GHG performance.

Better management practices and environmental standards must ultimately be tailored to specific crops and production sites. In some of the sectors, like forestry, such standards exist at several levels: international, regional and national, established through different processes: governmental negotiations, FSC national standard development etc. Bioenergy procurement policies and sustainability schemes should be based on existing, credible systems.

WWF recommends that all farmers producing bioenergy crops use such a farm/forest management system, together with an appropriate verification system with assurances against fraud and in favour of environmental stewardship.

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[i] ExecutiveExecutive Summary of : The Stern Review (http://www.hm-treasury.gov.uk/media/8AC/F7/Executive_Summary.pdf)

[ii] IPCC 4th Assessment WGIII – Summary for Policy Makers, May 2007. Page 23

[iii]Climate Solutions : WWF's Vision for 2050, May 2007. Download: (http://assets.panda.org/downloads/climatesolutionweb.pdf)

[iv] Bioenergy is a renewable energy source derived from combustible biomass in the form of liquid biofuels (processed usually from energy-rich crops), wastes (including renewable municipal waste), solid biomass (wood, charcoal and other biomass material), or gases (derived from biomass decomposition).Biomass is the totality of plants in the terrestrial and marine biosphere which use CO2, water and solar energy to produce organic material; it also includes animals, and agents of decomposition such as bacteria and fungi whose activity releases CO2 into the atmosphere.

[v] Exajoules

[vi] Best et al, 2008, A Sustainable Biofuels Consensus, Rockefeller Foundation, Bellagio Study and Conference Center, based upon IEA 2006, World Energy Outlook 2006, OECD/IEA, Paris, France and World Energy Assessment and FAO, 2004 (http://www.fao.org/forestry/site/28679/en/)

[vii] WHO, 2000 (http://www.who.int/inf-pr-2000/en/pr2000-56.html)

[viii] Greenhouse gases (GHG) are components of the atmosphere that contribute to the greenhouse effect. Some greenhouse gases occur naturally in the atmosphere, while others result from human activities such as burning of fossil fuels such as coal. Greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, and ozone.

[ix] Ligno-cellulosic biomass is biomass composed primarily by lignin and cellulose. Examples of ligno-cellulosic biomass are: all types of trees, grasses, agricultural residues such as corn stover, sugarcane bagasse, straw, etc.

[x] Displacement effects can occur when the production of biomass displaces certain activities to other areas where they may cause negative land use changes, such as deforestation.

[xi] Signatory parties to the UNFCCC are required to submit regularly an inventory of their GHG emissions. The IPCC has provided guidance on how to estimate and report on anthropogenic GHG emissions and removals, using a standardized tabular reporting format for six major sectors: energy; industrial processes; solvents and other product use; agriculture; land-use change and forestry; and waste.

[xii] Carbon life cycle assessment is the assessment of the carbon fluxes related to the production of certain crops.

[xiii] These principles are in accordance with WWF's Code of Ethics and Statement of Principles on Indigenous Peoples and Conservation.

[xiv] Several authors have indicated the large potential of energy crops on degraded land (Dehue 2006, Diemont 2001, Hoogwijk 2004, Lal 2006). The challenge with realising production on idle land is that there is no internationally agreed definition of "idle land".

[xv] For more information visit http://hcvnetwork.org