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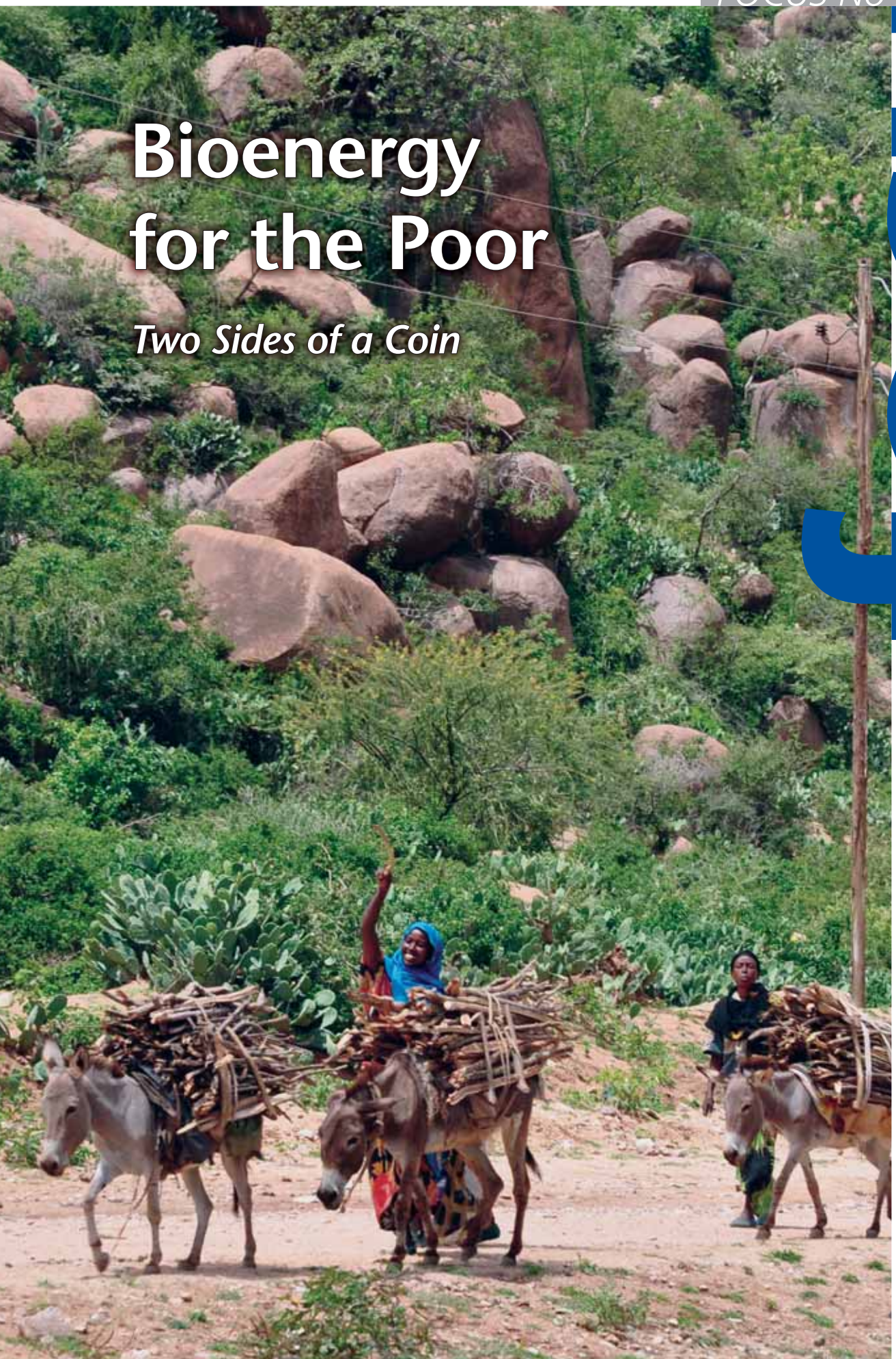
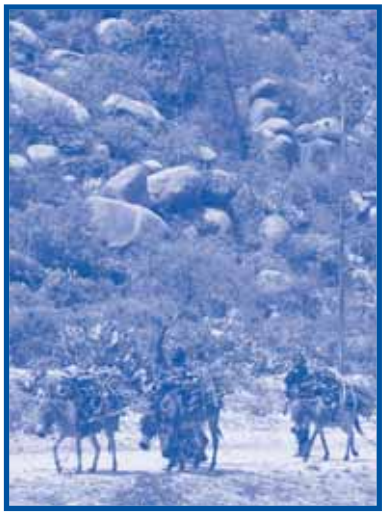
FOCUS No 3/09
focus

Bioenergy for the Poor

Two Sides of a Coin



Contents



Fuelwood is still the main energy source for poor households in rural Ethiopia despite modern energy. Collecting fuelwood is women's work. However, the burden is eased by donkeys, a more gender-neutral animal than other work animals. Valley of Marvels, Eastern Ethiopia. (Photo: Brigitte Portner)

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Bioenergy and development

"Now we don't have to worry about waking up early in the morning or walking for hours to find wood to store for months", explains Sharmila Chaudhary, a woman farmer in Sunsari District Nepal.

Ms. Chaudhary has received guidance from the Biogas Sector Partnership-Nepal to establish a plant that provides her household with biogas for cooking and heating. The NGO has developed biogas plants that, besides gas, also provide slurry which can be used as fertiliser after mixing with solid residues and composting.

Regardless of their success, approaches to implementing biogas plants for individual households have repeatedly been criticised for not reaching the poorest of the poor, as people without access to land and livestock cannot provide sufficient biomass to run a biogas plant.

Biogas Sector Partnership
www.bspnepal.org.np

Despite such appropriate technologies, traditional bioenergy – fuelwood, charcoal and dung – is still the main source of energy for over 2.5 billion people worldwide and indispensable for them to make a living. On the other hand, traditional bioenergy use is often inefficient and depletes natural resources, thereby deteriorating agricultural production and threatening the livelihoods of the poor.

Greater awareness of the effects of climate change means that today modern bioenergy solutions, such as biogas plants or biofuels, are seen by many as a way to produce more energy while cutting down greenhouse gas (GHG) emissions and using natural resources more sustainably, thereby providing livelihoods for the poor.

The present *InfoResources Focus* is intended as a reflection on the context of bioenergy production and use, identifying current challenges and presenting certain aspects to be considered in pro-poor policy development and implementation.

Bioenergy is renewable energy from biomass. Fossil fuels are not involved as they are not renewable. Plants absorb solar energy, taking up carbon dioxide as well as water and nutrients, which they store as biomass. Biomass is thus an energy source and a form of carbon storage. Bioenergy may be used directly or indirectly. Bioenergy resources and use can be grouped into three categories:

- *traditional bioenergy that comes directly from woody biomass, such as fuelwood or charcoal, and from livestock dung;*
- *biofuels from energy crops such as sugar cane, oil palm or Jatropha, which are mainly used for transport;*
- *bioenergy that comes indirectly from organic by-products and waste, such as slurry and residues from agriculture or forestry, i.e. straw or sawdust.*

World in Transition – Future Bioenergy and Sustainable Land Use
www.wbgu.de/wbgu_jg2008_engl.html

Bioenergy and climate change

Currently, agriculture, including forestry and land use change, is responsible for about 30% of global anthropogenic GHG emissions. Bioenergy, in most cases stemming from agricultural products, is thus also a source of emissions. GHG emissions resulting from bioenergy production and consumption are not necessarily lower when compared with fossil fuels. Nevertheless, if sustainably managed, i.e. by rehabilitating degraded lands, bioenergy can help to mitigate climate change by enhancing the sequestration of carbon in soils and vegetation and by partly substituting for fossil fuels.

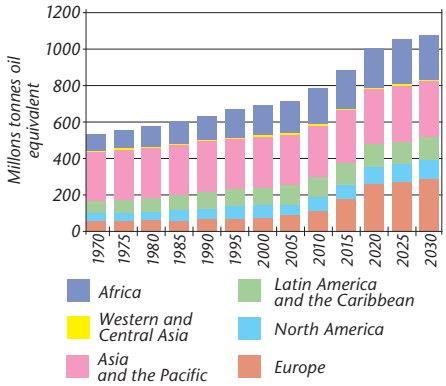
Many different studies looked at the amount of greenhouse gases emitted by agriculture, forestry, and livestock husbandry with almost as many differing results. Internationally, the International Panel on Climate Change (IPCC) report is the most acknowledged.

Fourth Assessment Report of the International Panel on Climate Change
www.ipcc.ch/publications_and_data/publications_and_data_reports.htm

Bioenergy production based on agriculture is simultaneously an energy consumer and an energy provider. Energy produced from biomass requires inputs, like any other agricultural produce. Labour and energy, in the form of fertilisers or machinery, are used during the biofuel production process. In the context of modern industrialised agriculture, bioenergy production is generally input-intensive, and in many cases energy inputs such as fertilisers or petrol are obtained from fossil fuels, which leads to the emission of GHG. In developing countries, GHG emissions result mainly from the combustion of biomass and from clearing of forests and scrublands. Part of the land in these countries is used for the cultivation of biofuel feedstock.

Most of the documents mentioned in the margin are annotated in the list of references.

Global production of energy from biomass



1 tonne of oil equivalent is equal to approximately 4 m^3 of wood. This figure includes the use of black liquor – a by-product from pulping, the separation of woody fibres in paper production – as well as agricultural residues and dung.

State of the World's Forests 2009
www.fao.org/docrep/011/i0350e/i0350e00.HTM

Small-Scale Bioenergy Initiatives: Brief Description and Preliminary Lessons on Livelihood Impacts from Case Studies in Asia, Latin America and Africa
www.fao.org/docrep/011/aj991e/aj991e00.htm

The State of Food and Agriculture 2008. Biofuels: Prospects, Risks and Opportunities
www.fao.org/docrep/011/i0100e/i0100e00.htm

The following global overview of conservation techniques and approaches provides a comprehensive and extensive range of case studies on sustainable land management practices.

Where the Land is Greener
www.wocat.net/en/knowledge-base/documentation-analysis/global-overview-book.html

Besides being a GHG emitter, agriculture itself is affected by climate change. Higher global temperatures, uncertain and shifting precipitation patterns, increased variability, and more extreme events have negative impacts on agricultural production, including cultivation of biomass for energy. Smallholder farmers in the developing world are the most vulnerable and will need institutional support to adapt to changes.

Resource efficiency and sustainable land management

Current energy consumption, with its heavy reliance on fossil fuels, far exceeds the earth's biological capacity. In order to provide more people with renewable energy while also cutting emissions, use of resources and energy in future must be significantly more efficient in order to satisfy needs with less resources and thus less energy. Resource efficiency means getting more from available resources, while energy efficiency means reducing energy demand per unit of activity. To achieve improvements in resource and energy efficiency, innovations related to the institutional setting and to technologies are thus essential for a more sustainable energy system.

To increase resource efficiency, grey energy needs to be reduced; multifunctional use and resource cascading must be envisaged. Grey energy refers to energy used in the production, processing and transport of bioenergy; multifunctional use is defined as using biomass for different applications, while cascading is the use of biomass for subsequent applications, i.e. wood used for timber, then pulp and finally recycled for energy recovery. In Lima, Peru, entrepreneurs have started to buy used edible oil from restaurants and fast food outlets in order to produce biodiesel. The recycled oil is then marketed as fuel to different consumers such as public transport companies and individual consumers.

The rising demand for energy from biomass is putting pressure on natural resources. The easiest and cheapest way to obtain more biomass for energy production is often to expand the land area used for the production of energy crops. In some places energy crops are replacing other crops, pastures, or natural vegetation, which leads to land use changes and competition for resources. Bioenergy production has multiple impacts on soils, water and biodiversity. Large-scale production of energy crops can lead to erosion, to shifts in water regimes or pollution due to agrochemicals. The use of agricultural residues for bioenergy can lead to nutrient depletion and decrease of organic matter. However, if bioenergy is produced in an integrated way, and if principles of sustainable land management are applied, land degradation can be stabilised or even reversed and biodiversity increased.

Negative environmental impacts along the supply, distribution and consumption chain are as important as field-level impacts during the production and processing stages. Leaking chemical containers, lack of wastewater treatment, and transport over long distances based on petroleum consumption also put pressure on natural resources. Proper management along the bioenergy chain, from the field to the end user, is thus necessary to avoid negative impacts and trade-offs with increased bioenergy production.

Bioenergy and the poor

Lack of availability and access to affordable energy makes poverty entrenched. Today, for example, over 1.6 billion people do not have access to electricity. Poor households generally use less energy than wealthier households but due to lack of technologies, their use is not efficient. They spend approximately 15–30% of their income on energy and several hours a day gathering fuelwood and dung. Hence, poor households are disproportionately affected by high and volatile energy prices. Improving access to affordable energy services and efficiency of use free up time and resources. This can help to break cycles of poverty, as basic human needs such as cooking, lightning and heating as well as income-generating activities rely on energy.

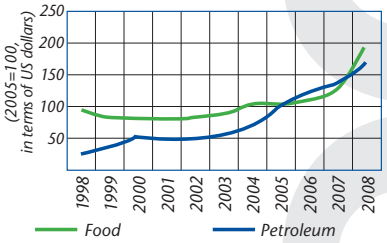
Both the rural and the urban poor are bioenergy consumers and producers: bioenergy solutions such as biogas from agricultural residues or human waste management can ease pressure on natural resources and alleviate poverty. Rural-urban linkages related to energy are very close. The rural poor depend mainly on fuelwood, while the urban poor rely heavily on charcoal produced in rural areas. Bioenergy based on local production and consumption cycles holds great potential for both rural and urban areas.

In most developing countries women and children are responsible for providing energy from traditional sources. Gender relations and physical capacities determine access to resources to some extent as well as vulnerability to poverty. This can have severe consequences on human health and safety. On one hand, without access to energy, even basic human needs such as cooking are hindered. Additionally, burning solid fuels on open fires leads to the death of 1.6 million people annually, women and children in particular. On the other hand, labourers in bioenergy processing plants and in the fields need protection measures and training in how to deal with chemicals and machinery. In addition, alternative farming and processing practices need to be promoted.

Wealthier households might be in a position to choose their energy carrier, but the poorest are not in a position to select from different production and consumption options, as they often lack even the basic necessary resources such as dung from livestock for biogas plants. Bioenergy production can only alleviate poverty if poor people have equitable access to natural resources and technologies for efficient energy use and are involved in related decision-making processes and negotiations. Particularly landless and female-headed households, which in many societies are among the poorest of the poor, often lack access and tenure rights to resources, negotiation skills, and power in their communities.

Low-income food and energy importing countries, where most of the poor spend a great share of their income on food and energy, are most affected by high and volatile prices. The 2008 food price peak was partly caused by augmented biofuel production and high petroleum prices. The figure shows indices of food and fuel prices for 1998 – 2008; the peak is not visible in the figure, as prices subsequently fell.

Indices of Fuel and Food Prices 1998–2008



Food and Energy Crisis: Time to Rethink Development Policy
www.southcentre.org/index.php?option=com_content&task=view&id=849&Itemid=1&lang=en

In 2007, over 45 million tonnes of charcoal were produced in the world, with Africa representing the biggest share at 50%. In the last ten years, global charcoal production has more than doubled, leading in some cases to resource depletion, mainly affecting the rural poor, and to price rises, mainly affecting the urban poor.
Based on ***FAOSTAT*** *2009*
faostat.fao.org

Inforesources Focus 2/06 on ***Sustainable Energy – Rural Poverty Alleviation*** *provides additional information on the linkage between renewable energy and poverty*
www.inforesources.ch/pdf/focus06_2_e.pdf

Challenges

Energy provision for the rural poor

Establishing electricity services in rural communities, thereby connecting remote areas to the grid, unlocks local capital and opens new opportunities for small-scale investments.

Energy Services for the Millennium Development Goals
www.unmillenniumproject.org/documents/MP_Energy_Low_Res.pdf

Without access to energy, poverty will never be eradicated; energy is needed for a broad range of activities such as cooking and heating, transport and communication, to power small enterprises, run water pumps, or provide light to students to do their homework.

The urban as well as the rural poor are energy-poor; unlike the urban poor, however, the rural poor live in remote areas and are spatially dispersed. Providing them with affordable and reliable energy and connecting remote villages to national electric grids are major challenges. Energy planning policies tend to reach these areas only through development of national electric grids and large power plants. It is often forgotten that a significant overall contribution to national energy supply can be made at the local level. Decentralised bioenergy systems can help to reduce energy poverty in remote areas.

Bioenergy in ecosystems

To satisfy increasing food and energy demands, large-scale land acquisitions – or land grabs – are on the rise in developing countries to produce food or biofuels. Justification for most of these land grabs is made by the claim that production takes place on a country's marginal land or a small proportion of its total suitable land. In reality, most such land is already under use, often by local people, and pressure on more valuable land is growing.

Land Grab or Development Opportunity?
www.fao.org/docrep/011/ak241e/ak241e00.htm

Increased biomass production for bioenergy inevitably leads to land use changes. The challenge is to avoid bioenergy production and processing that will negatively impact on the availability and quality of land and water used for food production.

Recently, energy crops like *Jatropha curcas* have raised hopes that marginal areas could be used for biofuel production without competing with food production. But the definition of marginal or idle land is a subject of controversy, as land in this category is often used for fuelwood collection by women or as grazing land by pastoralists. Additionally, the diversion of available water to irrigate energy crops can lead to water shortages elsewhere. Hence, bioenergy planning and policies will not succeed by taking account only of energy aspects. Adopting an ecosystem perspective on bioenergy planning is a major challenge today.

Biofuels and Ecoagriculture: Can Bioenergy Production Enhance Landscape-Scale Ecosystem Conservation and Rural Livelihoods?
www.ecoagriculture.org/documents/files/doc_282.pdf

Bioenergy production as a livelihood strategy

Energy produced from biomass needs to be integrated into the livelihood strategies of the poor. Bioenergy production at the farm and village levels is usually more promising, as local and regional use of bioenergy is economically more attractive than export, and the potential for poverty alleviation is higher.

International Trade in Biofuels: Good for Development? And Good for Environment?
www.iied.org/pubs/pdfs/11068IIED.pdf

Revenues from export commodities generally benefit traders and retailers, while local producers receive comparatively little. Modern small-scale bioenergy production can provide additional income for the poor, improve people's health, and reduce pressure on natural resources. However, without an inclusive institutional setting, the poor will have trouble adopting modern bioenergy production as part of their livelihood strategies.

The international framework

Bioenergy production must comply with climate change policies and pro-poor development policies. High-income countries have a responsibility to provide technical and financial assistance in order to foster low-carbon energy development. Frameworks and regulations at the international and national levels must provide an environment that clearly couples the different interests and opportunities of bioenergy in order to be regulatory but also provide incentive.

World Development Report 2010: Development and Climate Change
www.worldbank.org/wdr2010

Putting agriculture on the agenda

Climate change and the demand for climate-neutral energy have been among the main drivers of international interest in bioenergy. If bioenergy is to contribute to a climate-neutral energy supply, agriculture needs to be integrated into international directives, as mitigation of climate change must first and foremost involve binding targets to reduce GHGs. Despite being major emitters, agriculture, forestry and related land use changes are still not included in international agreements on climate change.

Researchers from the International Food Policy Research Institute recommend three avenues to be pursued by the negotiators at the Climate Change Conference in Copenhagen, 2009:
- *investments in agriculture,*
- *incentives to reduce emissions, and*
- *information and monitoring services.*

Agriculture and Climate Change: An Agenda for Negotiation in Copenhagen
www.ifpri.org/sites/default/files/publications/focus16.pdf

Farmers are the main land managers worldwide. International agreements will have to ensure that agriculture is not just blamed for being a carbon emitter; there is a need to ensure that sustainable land management, including bioenergy production, contributes significantly to climate change mitigation and to investments in rural communities. Agricultural practices that enhance agricultural productivity and support ecosystems and their services, such as carbon sequestration in soils and avoidance of deforestation, i.e. for biofuel crops, need to be included in international climate change mitigation and adaptation policies and programmes.

Compensation for ecosystem services

The increasing attention being given to bioenergy is accompanied by a growing number of markets for ecosystem services, as both are seen as a way to reduce GHG emissions related to agriculture. For many small-scale farmers, these mechanisms could constitute an additional livelihood opportunity. Compensation for services provided by agricultural ecosystems includes direct public and private payments, tax incentives, and certification schemes.

Markets associated with ecosystem services are on the rise. But criticism has been voiced that the poor who provide these services are not the ones who get the financial benefit, as participation in these markets is also linked to power structures. Additionally, there is a general lack of capacity to implement projects consistently, as well as a lack of internationally agreed and legitimate rules and principles. Institutional arrangements for payments for ecosystem services need to be flexible in order to adapt to different socio-ecological systems.

Building Institutions to Trade Ecosystem Services: Marketing Forest Carbon in Mexico
doi:10.1016/j.worlddev.2007.09.010

While most of these tools are applied nationally, certification schemes have also been used internationally, for example for coffee or wood. Certification schemes for biofuels are currently under discussion but are still being elaborated and must be agreed upon at the international level. Additionally, they need to comply with World Trade Organization (WTO) regulations as well as sustainability standards, including labour rights for agricultural workers and environmental criteria such as biodiversity conservation. Sustainability standards and certification schemes must also include trade-offs between sectors, and the methodologies applied need to be comparative, credible and affordable in order to be implemented and followed.

The Roundtable on Sustainable Biofuels is currently developing principles and criteria for sustainable biofuels. It is an international initiative bringing together farmers, companies, non-governmental organizations, experts, governments, and inter-governmental agencies concerned with ensuring the sustainability of biofuels production and processing.

Roundtable on Sustainable Biofuels
http://cgse.epfl.ch/page65660-en.html

Today, international trade in bioenergy is in its initial stage. Most biomass traded is currently non-bioenergy products. The most internationally traded bioenergy products are: vegetable oils (62% of palm oil is traded, 15% of rapeseed oil), wood pellets (25%), ethanol (8.5% of world production is traded), charcoal (2.2%) and fuelwood (0.2%).

Risk Governance Guidelines for Bioenergy Policies
www.irgc.org/IMG/pdf/IRGC_PB_Bioenergy_WEB-2.pdf

Trade constraints

Bioenergy trade volume will increase in future despite negative environmental impacts due to GHG emissions from transportation. Favouring domestic markets over international markets thus has a double benefit: reduced environmental impact during transport, and bioenergy production and trade that are more likely to be pro-poor. Consequently, efforts to promote bioenergy trade ideally centre on local and regional remedies.

Today, market distortions disproportionately affect developing countries and are even reinforced by the emergence of biofuels, as they are mainly produced in the South. Currently, the global North subsidises agriculture with approximately USD 300 billion per year. International organisations, such as the WTO and the United Nations Conference on Trade and Development (UNCTAD), have no common policy for dealing with bioenergy flows, subsidies, taxes, import barriers and investment. Trade policies on bioenergy have to be harmonised, be pro-poor, and ensure that production, processing, trade and consumption of bioenergy are sustainable.

The national level

Cross-sectoral bioenergy policies and land-use planning

The development of effective, sustainable and efficient policies requires the consideration of many different issues and trade-offs. Bioenergy strategies have to be linked to agriculture, energy, rural development, environment and food strategies. Careful resource and land use planning is necessary and must adopt a consultative approach involving all concerned stakeholders. Besides current policies that aim to replace fossil fuel with biofuels for transport, governments must focus on production and consumption patterns, as these are also potential fossil fuel consumers.

Policy and decision-makers need to understand the interactions between the various policy domains and levels related to bioenergy. They need to assure that food security considerations are given priority. Trade in energy and agriculture, in particular, is marked by wide disparities. In the case of energy, for example, a relatively small number of countries dominate exports, while most countries import most – and, in some cases, all – of the fuels they consume. Diversified energy portfolios would thus also have benefits at the national level and ideally also contribute to sustainable development.

Sustainable Bioenergy: A Framework for Decision Makers
http://esa.un.org/un-energy/pdf/susdev.Biofuels.FAO.pdf

Diversifying the energy portfolio

Investments in agriculture, energy and infrastructure such as irrigation, extension services, and research, as well as in innovative approaches and technologies, can significantly improve energy and resource efficiency. National energy diversification, away from fossil fuels and towards renewable energy sources such as bioenergy, increases a country's energy independence. Stakeholders need access to information and clear incentives to limit emissions and to invest in bioenergy solutions. Diversifying the energy portfolio reduces overall risk and increases opportunities for private investment. In addition, approaches that produce surplus energy which can be fed into the national grid should be given priority.

Support for small-scale farmers and agricultural labourers

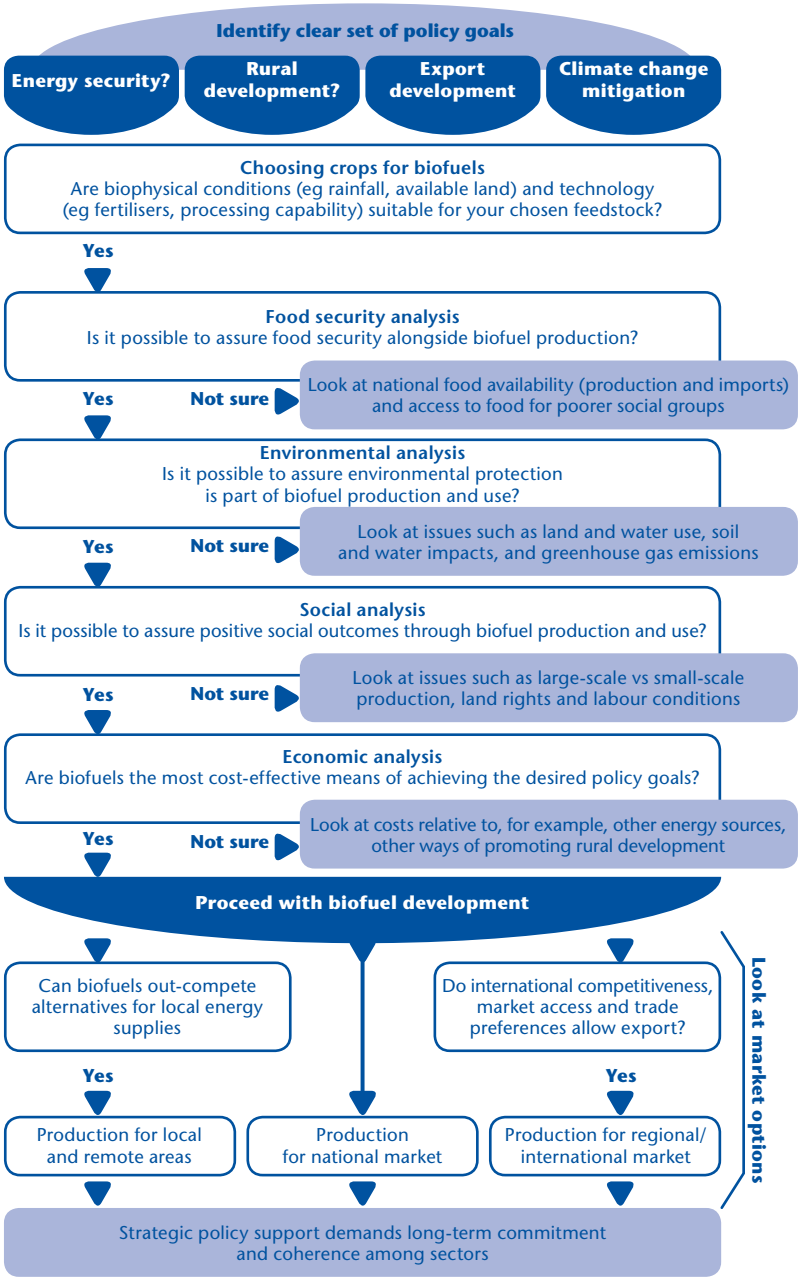
Pro-poor bioenergy markets need to pay specific attention to institutional arrangements: small-scale farmers and agricultural labourers must not be disadvantaged by the international value chain or by contracts with bioenergy plants. Bioenergy producers and consumers need to have access to energy markets and fair tariffs. Along with linking of sectoral strategies, coordination and coupling between the different institutions and organisations involved enhances the effectiveness of bioenergy systems in relation to poverty reduction, energy, and resource efficiency. Strengthened institutional capacities, investment in research and properly defined tasks among involved stakeholders will contribute to knowledge exchange and appropriate implementation of technologies.

Land titles and community rights to self-determination can enable farmers to earn an equitable share of revenues from biofuel production. Whenever a bioenergy project is proposed, informed decision-making and local participation is crucial. For this to happen, however, small-scale farmers need technical assistance, access to credit, fair contracts, and support to establish cooperatives. A favourable institutional setting must be provided by national policy.

Biofuels and Ecoagriculture: Can Bioenergy Production Enhance Landscape-Scale Ecosystem Conservation and Rural Livelihoods?
www.ecoagriculture.org/documents/files/doc_282.pdf

Strategic national choices on biofuel development: a decision tree

Decisions related to the implementation of bioenergy projects require consideration of different impacts and trade-offs by decision-makers. The decision tree below can guide the processes needed on the way to making final choices about national biofuel development.



Source of figure: ***Biofuels: Making Tough Choices***
www.iied.org/pubs/pdfs/17032IIED.pdf

Regional rural development and local solutions

There is not a single solution to the three challenges mentioned on page 6. All of them, however, are concerned with meeting local place-based needs and considering the context. Bioenergy production must provide poor people with affordable and accessible low-carbon energy – over the long run and in sufficient quantities and quality without degrading ecosystems and undermining food security. But providing bioenergy alone will not solve the problem of poverty; development activities will not take place if communities can light only one bulb per shelter.

Context-specific technologies and stakeholder involvement

On the Pacific Islands the coconut tree plays a vital role in local communities. Removing and drying the coconut kernel to make "copra" has been a primary source of income for generations. As a response to highly volatile prices for copra and coconut oil and the high dependence on imported petroleum, the islanders started to search for alternatives such as production diversification and the transfer of processing units to production sites. In Vanuatu, coconut farmers and copra producers work together in cooperation to find feasible and sustainable opportunities to use coconut oil to run vehicles and generators.

Biofuel Energy from Coconut in the Pacific Island
www.riaed.net/IMG/pdf/Thesis_Copra_Biofuel.pdf

Before implementing bioenergy projects, the current status of energy supply has to be assessed and understood. It is of crucial importance for the project design to know local energy needs: who uses energy and what type of energy is in use; how energy is produced and delivered to the users and how much they pay; and how much they would and could pay for a dependable bioenergy service. The best technology is the one that is selected according to the needs of the local population, and the availability and type of bioenergy.

Implementing Sustainable Bioenergy Production. A Compilation of Tools and Approaches
http://data.iucn.org/dbtw-wpd/edocs/2008-057.pdf

It is not always the newest technology that is best suited, and many large-scale applications might be too expensive for rural households. Nevertheless, financial considerations have to take account of the lifespan of a technology – in some cases investment costs might be relatively high, but will be repaid after a number of years. For poor households to afford bioenergy, micro-credits and other financial incentives will have to be considered.

Community involvement is thus central to successful implementation of small-scale bioenergy projects, as technologies such as biogas combustion using agricultural residues, or farming practices that explicitly include energy production besides food and feed, generally face barriers when introduced. Particular attention must be given to women, as they are most often responsible for a household's energy provision. Additionally, transparency in negotiations must be ensured in order to benefit stakeholders and communities equally and to ensure that existing land and property rights are respected.

A gender perspective in planning bioenergy projects ensures that the concerns and needs of women and men are taken into account. Women's involvement is of particular importance, as women spend three times as much time transporting fuel and water as men and regularly carry four times as much as men in volume. In some cases biogas systems have increased women's workload because of the additional biomass and water that has to be carried.

Gender and Bioenergy
www.genderandenvironment.org/admin/admin_biblioteca/documentos/Factsheet%20BioEnergy.pdf

Multifunctional solutions

In the Tanga Region, on the coast of Tanzania, Sisal is the most important cash crop for small-scale farmers. Farmers intercrop sisal mainly in outgrower schemes, and the products, such as ropes, carpets or clothing, are sold on national and the international markets. Since planting and harvesting takes place all year, there is little vulnerability to environmental shocks, giving farmers financial security. However, with current production methods only 4% of the plant can be used as fibre. Sisal companies have thus started to use the residues for biogas production. The biogas is used to run electricity generators in production plants and excess electricity is supplied to farmers' homes, schools and hospitals.

Small-Scale Bioenergy Initiatives: Brief Description and Preliminary Lessons on Livelihood Impacts from Case Studies in Asia, Latin America and Africa
ftp://ftp.fao.org/docrep/fao/011/aj991e/aj991e.pdf

Bioenergy production that acknowledges the multiple uses, functions and services of ecosystems offers a number of opportunities, including improved livelihoods and reduced land degradation. Bioenergy production based on the use of agricultural residues or organic waste is an option that does not necessarily require a change in the production system but integrates food, feed, fibre and fuel with sustainable land management practices.

Agroforestry and inter-cropping, for example, are sustainable land management options for diversifying the agricultural production system without competing with food supplies. Many of these integrated approaches result in by-products, as shown example above. Additionally, food-energy systems are a very low-cost climate change mitigation option: perennial plants with deep root systems and cultivation systems that leave agricultural residues reduce water use and store carbon in the soils and the biomass.

Ensuring long-term viability

Energy plants require maintenance in order to provide energy continuously. On the one hand, people have to be trained to maintain bioenergy service over the long run at a sustained quality and quantity. On the other hand, consumers have to agree to pay a fair price for this service. Depending on the amount and type of energy produced, surplus might be fed into a regional or national grid (i.e. electricity), or a marketing concept for by-products may need to be elaborated, for example for clothing made of sisal.

However, for bioenergy production to be competitive, economies of scale and stable energy prices are required. The former requires cooperation at the local level: producer organisations, smallholder cooperatives or outgrower schemes can facilitate market access by small-scale farmers. The latter calls for a credible international commitment to reduce fossil fuel consumption and to invest in renewable energies.

"Outgrower scheme" is a commonly used term for contract farming. It implies the availability of credit, timely supply of inputs, knowledge transfer, provision of extension services and access to a ready market. The same principles can also be applied to non-farm bioenergy production such as human waste management.

The State of Food and Agriculture 2008. Biofuels: Prospects, Risks and Opportunities
ftp://ftp.fao.org/docrep/fao/011/i0100e/i0100e.pdf

If rights and duties along the bioenergy value chain have been agreed on, bioenergy production has the potential to lead to the development of a private sector, stimulate job creation, and offer new climate-neutral energy opportunities without depleting natural resources or putting people's livelihoods in danger.

Recommended reading

The following list features a documented and targeted selection of print documents and Internet sites of relevance to "Bioenergy for the Poor: Two Sides of a Coin". The documents are listed by title in alphabetical order. All are available online (accessed on 2 November 2009).

International Food Policy Research Institute. 2009

Policy

Agriculture and Climate Change: An Agenda for Negotiation in Copenhagen

2020 Focus 16. www.ifpri.org/sites/default/files/focus16_01_0.pdf

A set of policy briefs by various contributors, who share their views on key points concerning why agriculture has to be carefully included in the international climate change negotiations. The brief provides science and technology options, concluding with a strong plea for agriculture and for ongoing negotiations to address climate change, which will provide a unique opportunity to combine low-cost mitigation and essential adaptation outcomes with poverty reduction.

Aurélie Leplus. 2003

Case studies

Biofuel Energy from Coconut in the Pacific Island

The Lory cooperative pilot project. MSc Thesis. Wageningen: Wageningen Agricultural University.
www.riaed.net/IMG/pdf/Thesis_Copra_Biofuel.pdf

The coconut is an abundant and valuable source in the Pacific region and its products and by-products have an important role in the islands' economies. The study analyses coconut oil production at the Lory cooperative pilot project in Vanuatu for fuel use and its potential as a sustainable energy carrier at the village level. Coconut fuel has the potential to offset imported petroleum and to improve revenues for the local population.

Jeffrey C. Milder, Jeffrey A. McNeely, Seth A. Shames and Sara J. Scherr. 2008

Policy

Biofuels and Ecoagriculture: Can Bioenergy Production Enhance Landscape-Scale Ecosystem Conservation and Rural Livelihoods?

International Journal of Agricultural Sustainability 6(2):105–121. doi:10.3763/ijas.2008.0344
www.ecoagriculture.org/documents/files/doc_282.pdf

Ecoagriculture, an approach with the threefold aim of biodiversity and ecosystem services conservation, sustainable agriculture production and viable local livelihoods, is used as a framework for evaluation of the effects of biofuel production on multiple landscape variables. The recommendations include i.a. the incorporation of biofuels into multifunctional agricultural landscapes in the context of smallholder production for local use, as well as the need for well-designed national biofuel programmes and further research.

Sonja Vermeulen, Annie Dufey and Bill Vorley. 2008

Policy

Biofuels: Making Tough Choices

Sustainable Development Opinion. London: International Institute for Environment and Development
www.iied.org/pubs/pdfs/17032IIED.pdf

National biofuel policies may strive for different goals, such as export or rural development, energy security or climate mitigation. At the same time, their design is unavoidably linked to negotiations between governments and other interest groups and requires trade-offs. This short publication introduces the "decision tree" as a tool to support the complex process of decision-making.

Case studies
Overview

Biogas Sector Partnership Nepal

www.bspnepal.org.np

Operating as the implementing agency for the Biogas Support Programme Nepal (BSP), the Biogas Sector Partnership specializes in the development and dissemination of biogas plants as a means of protecting the environment while improving livelihoods and addressing social and sustainability issues. Its activities include technical and capacity development as well as the development of partnerships and fundraising, while keeping an eye on socio-economic and gender questions. In its website, the BSP, provides ample information about the project itself as well as technical information, success stories and a list of publications.

Esteve Corbera and Katrina Brown. 2008

Case studies

Building Institutions to Trade Ecosystem Services: Marketing Forest Carbon in Mexico

World Development 36(10): 1956–1979. doi:10.1016/j.worlddev.2007.09.010

This case study from Mexico analyses the development of markets for forest carbon in the context of the Clean Development Mechanism (CDM) of the Kyoto Protocol. It concludes that several challenges lie ahead and identifies a lack of support for adequate institutional arrangements, insufficient capacities for the implementation of such projects, and lack of integration between the institutions concerned as the main problems.

Sijay Modi, Susan McDade, Dominique Lallement and Jamal Saghir. 2006

Policy

Overview

Energy Services for the Millennium Development Goals

UN Millennium Project, UNDP, Energy Sector Management Assistance Programme, and the World Bank

www.unmillenniumproject.org/documents/MP_Energy_Low_Res.pdf

There is no MDG explicitly related to energy, but greater access to sustainable and affordable energy services is a condition sine qua non for the achievement of all the MDGs. This publication firstly highlights the linkages between energy services and each Goal, keeping an eye on the different roles and needs of men and women and on different conditions in urban and rural areas. It provides insight into the main operational challenges in provision of these services.

South Centre. 2008

Policy

Food and Energy Crisis: Time to Rethink Development Policy

Reflections from the High Level North-South Dialogue on Food and Energy Security

www.southcentre.org/index2.php?option=com_docman&task=doc_view&gid=1062&Itemid=69

Aiming to raise awareness about linkages between food security, energy security and climate change, and to promote discussions about possible solutions, the South Centre and the Permanent Mission of Indonesia in Geneva organised, on 17 June 2008, a High Level Dialogue on Food Security and Energy Security. The publication particularly emphasises a Southern perspective and summarises the discussion of the Dialogue and contains reflections regarding the key messages that emerged from it.

Intergovernmental Panel on Climate Change. 2007

Policy

Overview

Fourth Assessment Report: Climate Change 2007 (AR4)

www.ipcc.ch/publications_and_data/publications_and_data_reports.htm

The Intergovernmental Panel on Climate Change (IPCC) was jointly established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), with a mandate to assess scientific information related to climate change, to evaluate the environmental and socio-economic consequences of climate change, and to formulate realistic response strategies. Since its establishment, the IPCC has produced a series of Assessment Reports.

Ariana Araujo and Andrea Quesada-Aguilar in collaboration with Lorena Aguilar, Andrea Athanas and Nadine McCormick. 2007

Policy

Gender and Bioenergy

www.genderandenvironment.org/admin/admin_biblioteca/documentos/Factsheet%20BioEnergy.pdf

This fact sheet illustrates the differences in men's and women's energy needs, as they arise from different social, cultural and economic situations. As a result, inappropriate policies can increase women's vulnerability and poverty for them and their families. The paper provides concrete recommendations for the inclusion of a gender perspective into bioenergy policies and practices. These include, among other things, women's access to information, to training programmes, and to credit and to carbon fund markets.

International Union for Conservation of Nature. 2009

Instruments

Implementing Sustainable Bioenergy Production: A Compilation of Tools and Approaches

http://data.iucn.org/dbtw-wpd/edocs/2008-057.pdf

Sustainable production is a prerequisite for bioenergy to achieve positive results in terms of environmental management and livelihood development. The authors provide examples of existing principles, frameworks, tools and approaches as well as key recommendations for reducing and managing risks related to inappropriate policies.

Annie Dufey. 2007

Policy

International Trade in Biofuels: Good for Development? And Good for Environment?

www.iied.org/pubs/pdfs/11068IIED.pdf

International production and trade in biofuels is expanding rapidly and may quadruple in the next twenty years. But many of the policies related to biofuels are not adequate to deal with the complexity of the issue and to ensure the

sustainable development of biofuel production and markets. The positive impacts expected by this expansion may therefore be accompanied by important negative side-effects such as increased poverty, environmental damage, and food shortages. The author highlights the trends in international biofuel trade and explains the linkages between biofuels and sustainable development in terms of environmental conservation and social development.

International Institute for Environment and Development and Food and Agriculture Organization of the United Nations. 2009

Overview
Policy

Land Grab or Development Opportunity? Agricultural Investment and International Land Deals in Africa

www.fao.org/docrep/011/ak241e/ak241e00.htm

Independent of the reasons that lead to land grabs, they are a constantly increasing phenomenon that contains both risks and development opportunities for rural populations in recipient countries. The present publication draws preliminary conclusions about the possible impacts of land grabs and provides recommendations for recipient governments as well as investors and international development agencies.

International Risk Governance Council. 2008

Policy
Overview

Risk Governance Guidelines for Bioenergy Policies

Geneva: International Risk Governance Council. www.irgc.org/IMG/pdf/IRGC_PB_Bioenergy_WEB-2.pdf

The Council's policy brief provides the reader with information about recent bioenergy developments and policies and shows up risks and opportunities related to economic, social, structural and environmental issues. Among its recommendations, the Council suggests the use of Life-Cycle and Environmental Impact Assessments (LCAs and EIAs) in order to ensure an adequately broad scope for policy-making. For developing countries, it recommends the production and use of bioenergy, primarily at the local level.

Instruments

Roundtable on Sustainable Biofuels

http://cgse.epfl.ch/page65660.html

The Roundtable on Sustainable Biofuels (RSB) is an international initiative bringing together stakeholders from various sectors and institutions concerned with ensuring the sustainability of biofuels production and processing. By means of a large concertation process among partners and networks, it has established a list of principles and criteria for sustainable biofuels and is actually working on the creation of standards. The RSB also organizes meetings, teleconferences and online discussions.

Food and Agriculture Organization and Policy Innovation Systems for Clean Energy Security. 2009

Case studies

Small-Scale Bioenergy Initiatives: Brief Description and Preliminary Lessons on Livelihood Impacts from Case Studies in Asia, Latin America and Africa

ftp://ftp.fao.org/docrep/fao/011/aj991e/aj991e.pdf

15 case studies from 12 countries in Latin America, Africa and Asia illustrate the way diverse local bioenergy initiatives can affect rural livelihoods in various contexts. The studies were conducted using a market systems perspective, which takes account of the enabling environment, market chain actors, and linkages and supporting services. The publication analyses and compares the case studies, and provides lessons and conclusions as well as recommendations for further work.

Food and Agriculture Organization of the United Nations. 2009

Overview

State of the World's Forests

www.fao.org/docrep/011/i0350e/i0350e00.HTM

This year's Outlook considers the forest and forestry prospects at the sub-regional, regional and global levels. It foresees that the global demand for wood and wood products will rise, requiring a balance between production and the maintenance of environmental services such as clean air and water, climate change mitigation and landscape conservation. Forest sector institutions, whose role and interactions are undergoing important changes, will have to consolidate and avoid fragmentation, while the science and technology sectors will have to keep pace with rapid change.

UN-Energy. 2007

Policy

Sustainable Bioenergy: A Framework for Decision Makers

http://esa.un.org/un-energy/pdf/susdev.Biofuels.FAO.pdf

Bioenergy production can be an efficient remedy for mitigating environmental degradation and climate change, as well as dependence on an increasingly unstable world oil market. However, to fulfill those goals, its production must be ecologically, socially and economically sustainable. With a special focus on liquid biofuels, this publication presents

nine key sustainability issues and explains potential benefits and trade-offs at both the national and international levels. Furthermore, it assists policy and decision-makers by putting at their disposal a brief framework for action.

Food and Agriculture Organization of the United Nations. 2008

Policy

The State of Food and Agriculture 2008: Biofuels: Prospects, Risks and Opportunities

www.fao.org/docrep/011/i0100e/i0100e00.htm

FAO's 2008 report on the state of food and agriculture focuses on the current debate on biofuels. It examines current policies as well as those that will be necessary to address the potentially fateful impacts that unsustainable production and use of biofuels can have on the environment, food security and the poor. In its key messages it concludes, among other things, that the impacts of biofuel development will be felt by all countries through their agricultural markets, and that criteria for sustainable production, without being an absolute panacea, can help to improve the environmental footprint of biofuels.

Hanspeter Liniger and William Critchley (editors). 2007

Instruments

Where the Land is Greener

Case studies and analysis of soil and water conservation initiatives worldwide. World Overview of Conservation Approaches and Technologies (WOCAT). www.wocat.net/en/knowledge-base/documentation-analysis/global-overview-book.html

The World Overview of Conservation Approaches and Technologies (WOCAT) is a network of soil and water conservation specialists from all over the world. 'Where the Land is Greener' synthesises the experience they have gained since WOCAT was initiated in 1992. The book is a stimulus to apply sustainable land management on all farmland, pastoral areas, and forestland. It proposes a broad range of technologies and approaches for areas where the land is not yet 'green enough'.

The World Bank, 2009

Policy

Overview

World Development Report. 2010: Development and Climate Change

www.worldbank.org/wdr2010

The authors of the World Development Report 2010 argue that a climate-smart world is within reach if we act now to tackle the substantial inertia in the climate, in infrastructure, and in behaviour and institutions; if we act together to reconcile needed growth with prudent and affordable development choices; and if we act differently by investing in the needed energy revolution and taking the steps required to adapt to a rapidly changing planet.

German Advisory Council on Global Change (WBGU). 2009

Policy

World in Transition – Future Bioenergy and Sustainable Land Use

www.wbgu.de/wbgu_jg2008_en.pdf

Bioenergy policy is designed within a difficult context, characterized by the complexity of the issue, scientific uncertainty, and multiplicity of interests. Yet the right policy can generate positive and sustainable results. The WGBU analysis presents strategies showing how bioenergy can become part of sustainable energy systems in industrialised, newly industrialising, and developing countries. It proposes a global regulatory framework for sustainable policies that aim to help mitigate climate change and overcome energy poverty while minimising risks such as loss of biodiversity.

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