



RESEARCH ON



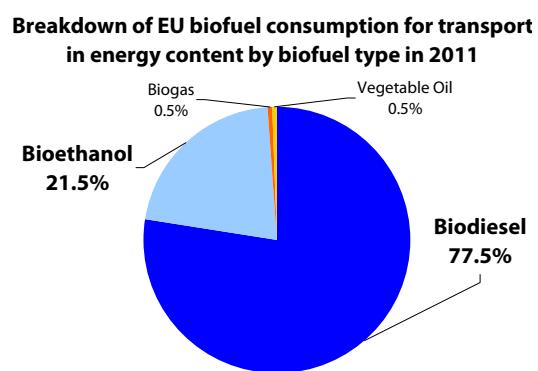
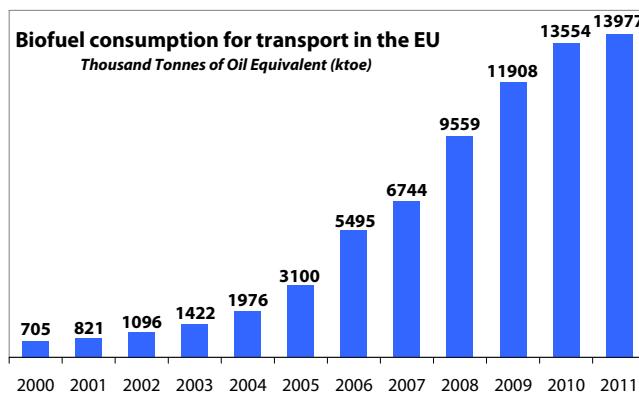
Biofuels

In the past decade, the demand for biofuels has steadily increased, at a global level and in the EU. The main biofuels currently on the market are "**first-generation biofuels**", i.e. derived from agricultural feedstocks. The most widely used biofuels are by far biodiesel and bioethanol. **Biodiesel** is produced from vegetable oils (such as rapeseed, sunflower seed and soybean oils) or animal fats. **Bioethanol** is obtained through the fermentation of sugars into alcohol, using for example sugar beet, maize or wheat. The so-called "**second-generation biofuels**" (i.e. originating from the processing of ligno-cellulosic feedstock such as straw and forest residues) are not yet well developed.

CONTEXT. The growing trend in biofuel use has been supported by **a wide range of policy measures**. In the EU, in particular, the "[Renewable Energy Directive](#)" (2009/28/EC) sets up the compulsory goal of reaching a 10% share of renewable energy in the transport sector in every Member State by 2020. Moreover, the "[Fuel Quality Directive](#)" (2009/30/EC) introduced the mandatory target to achieve by 2020 a 6% reduction in the greenhouse gas intensity of fuels used in road transport. These Directives introduce sustainability criteria and require biofuels to achieve minimum greenhouse gas emission savings compared to fossil fuels.

The greenhouse gas emissions associated with "**indirect land-use change**" are **currently ignored by the EU legislation**. In October 2012, **the European Commission published a proposal** (COM(2012)595, procedure COD(2012)288) to minimise the climate impact of biofuels, by amending the Renewable Energy and the Fuel Quality Directives. The objective of this proposal is to **limit global land conversion for biofuel production**.

STATISTICAL SNAPSHOT. Data Source: EUROBSERV'ER, 2012. Data for 2011 are estimates.



State of Play

For general information on the EU framework for biofuels, see in particular the [Biofuels](#) website of the European Commission and the [European Biofuels Technology Platform](#) website.

[Renewables 2012 : Global Status Report](#) / REN21, 172 p., 2012.

This report provides a comprehensive overview of renewable energy market, industry, investment, and policy developments worldwide. Liquid biofuels provided about 3% of global road transport fuels in 2011, more than any other renewable energy source in the transport sector. The development of



liquid biofuels has been mixed in recent years, with biodiesel production expanding in 2011 and ethanol production stable or down slightly compared with 2010. Several airlines around the world began to operate commercial flights using various biofuels blends, and interest in advanced biofuels continued to increase, although production levels remain relatively low.

[Biofuels Barometer 2012](#) / EUROBSERV'ER, 21 p., 2012.

Between 2010 and 2011 biofuel consumption increased by 3.1% in the EU, which translates into 14 million tonnes of oil equivalent used in 2011 compared to 13.6 million tonnes of oil equivalent in 2010. The EU governments no longer view the rapid increase in biofuel consumption as a priority. The attention has shifted to setting up sustainability systems to verify that the biofuel used in the various countries complies with the Renewable Energy Directive's sustainability criteria. See also the [Interactive Eurobserv'ER Database](#)

[The Current Status of Biofuels in the EU, their Environmental Impacts and Future Prospects](#) / European Academies Science Advisory Council, 47 p., 2012.

A Working Group of academy-nominated experts in energy production and environmental sciences has produced this report. It summarises the scientific evidence about the impacts of biofuels and their environmental sustainability.

Production data in the EU are also available on the [European Biodiesel Board](#) (EBB) website (the EBB, grouping the major EU biodiesel producers, aims to promote the use of biodiesel in the EU) and the [ePURE](#) website (ePURE represents companies that produce renewable ethanol in the EU for all end-uses).

[Renewable Energy. Analysis of the Latest Data on Energy from Renewable Sources](#) / Štúr, European Commission, Eurostat Statistics in Focus N°44/2012, 8 p., 2012.

A section is dedicated to renewable energy (including biofuels) in transport.

[EU Biofuels Annual 2012](#) / Flach et al., United States Department of Agriculture, Foreign Agricultural Service, GAIN Report NL2020, 35 p., 2012.

In 2011, about a fifth of the domestic use of biofuels was imported from outside the EU. Between 2006 and 2008, the EU Member States' mandates for blending and the relative high crude oil prices spurred an increase in the domestic use and production of biofuels, creating a demand for imports. Since 2007, however, competitive imports of both bioethanol and biodiesel have been driving domestic producer margins down.

[Biofuels: Issues and Trends](#) / United States Energy Information Administration, US Department of Energy, 48 p., 2012.

This report presents data on biofuels consumption, production, imports and exports in the United States. It also discusses important developments in biofuels markets.

[Biofuels 2012 Annual Reports for Argentina, Brazil, Canada, China, Colombia, India, Indonesia, Malaysia and Thailand](#) / United States Department of Agriculture, GAIN Reports.

[Les biocarburants de première génération : un bilan mondial mitigé](#) / Persillet, INRA Sciences Sociales N°1/2012, 7 p., version révisée de Juillet 2012.

This briefing note, only available in French, takes stock of the developments in the biofuels sector at a global level. It also describes the impacts of biofuels on the environment and on the energy sector. Moreover, the note focuses on the public support granted to biofuels, and examines their implications for global food security.

[Contribution of Biofuels to the Global Economy](#) / Urbanchuck, 24 p., 2012.

The purpose of this study is to examine global production trends in ethanol and biodiesel, estimate the global economic footprint of the biofuels industry, and to identify new and emerging production markets such as Africa.

[Energy, Transport and Environment Indicators](#) / Eurostat, 218 p., 2011.

This report includes data for biofuels production capacity, primary production of biofuels and share of biofuels in fuel consumption of transport (pp. 74-79), per Member States and in the EU. For the latest data, check the [Eurostat database](#) [nrg_1073a].



[Bioethanol/Bio-ETBE, Biodiesel and Other Biofuels in Transport, pp.177-206 in Renewable Energy Projections as Published in the National Renewable Energy Action Plans of the EU Member States](#) / Energy Research Centre of the Netherlands and European Environment Agency, 270 p., 2011.

This report presents an overview of all data that have been published in the National Renewable Energy Action Plans. All 27 EU Member States have been covered.

[Biofuels: Markets, Targets and Impacts](#) / Timilsina et al., World Bank, Policy Research Working Paper 5364, 49 p., 2010.

This paper reviews recent developments in biofuel markets and their economic, social and environmental impacts.

[Biofuels: Prospects, Risks and Opportunities](#) / Food and Agriculture Organization of the United Nations, The State of Food and Agriculture, 138 p., 2008.

Biofuel production based on agricultural commodities increased more than threefold from 2000 to 2007. The 2008 edition of the annual flagship FAO publication provides a technical overview of biofuels (i.e. types of biofuels, biofuels life cycles, etc.), a description of their economic and policy drivers, as well as analyses of their impacts on markets, the environment, poverty and food security. To finish it discusses policy challenges raised by biofuels.

Prospective Analyses

The European Parliament has requested a study on the impact of biofuels on the different transport modes and their connection to the agricultural development in Europe. It will be carried out by the Joint Research Centre of the European Commission, and is to be completed by the end of 2013.

[Biofuels \(see particularly pp.98-101 and 506-507\) in Energy Technology Perspectives 2012, Pathways to a Clean Energy System](#) / International Energy Agency, 690 p., 2012.

Only accessible to those with access to the European Parliament's intranet (EP Library).

Total biofuel production needs to double, with advanced biofuel production expanding four-fold over currently announced capacity, to achieve "2DS" objectives in 2020 (the "2DS" describes an energy system consistent with an emissions trajectory that recent climate science research indicates would give an 80% chance of limiting average global temperature increase to 2°C). Key policies priorities should be: setting up policies to support development of advanced biofuels industry; addressing sustainability concerns related to the production and use of biofuels.

[Renewable Energy Outlook. Chapter 7 \(pp.211-240\) in World Energy Outlook 2012](#) / International Energy Agency (IEA), 2012. Only accessible to those with access to the European Parliament's intranet (EP Library).

The World Energy Outlook 2012 presents authoritative projections of energy trends through to 2035 and insights into what they mean for energy security, environmental sustainability and economic development. Biofuels use will more than triple in the New Policies Scenario (IEA's central scenario, assuming only cautious implementation of current commitments and plans), from 1.3 million barrels of oil equivalent per day (mboe/d) in 2010 to 4.5 mboe/d in 2035, driven primarily by blending mandates. Ethanol will remain the dominant biofuel, with supply rising from 1 mboe/d in 2010 to 3.4 mboe/d in 2035. Biofuels will meet 37% of road transport demand in 2035 in Brazil, 19% in the United States and 16% in the EU.

[Biofuels. Chapter 3 \(pp.87-117\) of OECD-FAO Agricultural Outlook 2012](#) / Organisation for Economic Co-operation and Development and Food and Agriculture Organization of the United Nations, 2012.

This chapter provides market projections for biofuels in the world over the 2012-21 period, as well as a detailed description of the US biofuel policy. Global production of bio-ethanol and bio-diesel is projected to almost double by 2021, heavily concentrated in Brazil, the United States, and the EU. Biofuels are based mainly on agricultural feedstocks and are expected to consume a growing share of the global production of sugarcane (34%), vegetable oil (16%), and coarse grains (14%) by 2021. See also page 33 a graph showing the projected country shares for biodiesel and ethanol production in 2021 (figure 1.9).



[EU Transport Greenhouse Gas. Routes to 2050 II. Developing a Better Understanding of the Secondary Impacts and Key Sensitivities for the Decarbonisation of the EU's Transport Sector by 2050](#) / Hill et al., Final project report produced as part of a contract between European Commission Directorate-General Climate Action and AEA Technology plc, 112 p., 2012.

The outputs from this report are intended to help the European Commission in prioritising and developing the key future policy measures that will be critical in ensuring that greenhouse gas emissions from the transport sector can be reduced significantly in future years. Among the main findings regarding biofuels, the report points to significant risks and uncertainties related to the conditions that need to be met if the full potential of greenhouse gas reduction with biofuels is to be realised: the availability of low-carbon biomass and biofuels, the greenhouse gas reduction they actually achieve, their cost and market uptake, biomass demand from other sectors. Policy implementation should focus on effective implementation and improvement of the biofuels greenhouse gas emission reduction and other sustainability criteria. Prevention of negative impacts due to indirect land use change is key in this development. Research into new (second-generation) biofuels production processes and a diverse and reliable supply of biomass that does not cause negative impacts should be promoted.

[Technology Roadmap, Biofuels for Transport](#) / International Energy Agency, 56 p., 2011.

By 2050, biofuels could provide 27% of total transport fuel. The projected use of biofuels could avoid around 2.1 gigatonnes of CO₂ emissions per year when produced sustainably. The roadmap is divided into six sections: current biofuel production and status of different conversion technologies; sustainability issues and recent policy measures to ensure the sustainable production of biofuels; vision for large-scale biofuel deployment and CO₂ abatement; importance of land and biomass resources; economics of production of different biofuels; technology actions and milestones, required policy action and the next steps.

[Biofuels Chapter, in World Agricultural Outlook \(2012-2025\)](#) / Food and Agricultural Policy Research Institute (FAPRI)-Iowa State University (ISU), 2012.

This Outlook is based on data from November 2011 and does not include the 2012 US drought.

[Assessment of Biofuels Potential and Limitations](#) / Mandil et al., International Energy Forum, 59 p., 2010.

The aim of this study is to assess the extent to which biofuels could contribute seriously and consistently to meeting a substantial portion of future demand in the transport sector, and to bring some answers to the multitude of questions that have arisen about the viability and sustainability of the various types of biofuels currently in production or under development. Additionally, the study points out any remaining uncertainties or open questions. The study also assesses the current status of various biofuels and attempts to address some of the concerns.

[Prospects for Agricultural Markets and Income in the EU 2010–2020](#) / European Commission, 76p. 2010.

The biofuel scenario assuming a higher crude oil price combined with lower transport fuel demand requires less biofuels to fulfil the EU blending targets and drives prices up, mainly for biofuels and less for feedstock commodities. The results show a shift in favour of biodiesel with respect to ethanol in EU biofuel consumption. The reactions in feedstock markets are more limited and are driven by the higher input costs due to the higher crude oil price.

[The Biofuels Market: Current Situation and Alternative Scenarios](#) / UNCTAD, 118 p., 2009.

The purpose of this volume is to present possible scenarios for the biofuels industry, providing insights on the global economic, energetic, environmental and trade repercussions of specific policy developments. Issues discussed are: the role and implications of biofuels blending targets; Greenhouse gas markets, carbon dioxide credits and biofuels; Commercial viability of second generation biofuel technology; Trade opportunities for developing countries; Advanced biofuels and developing countries: intellectual property scenarios and policy implications; Biodiesel: the potential role of jatropha.

[Global Scenarios for Biofuels: Impacts and Implications](#) / Msangi et al., IFPRI, 16 p., 2008.

This paper examines three alternative scenarios: a conventional scenario, which focuses on rapid global growth in biofuel production under conventional conversion technologies; a second generation



scenario, which incorporates a “softening” of demand on food crops due to second generation, lignocellulosic technologies coming online; and a “second generation plus scenario”, which adds crop productivity improvements to the second generation scenario, which essentially further reduce potentially adverse impacts from expansion of biofuels.

Biofuel Support Policies

[Policy Capacity for the Transition to a Biofuels Economy: a Comparative Study of the EU and USA](#) / Kay et al., Paper prepared for presentation at the 86th Annual Conference of the Agricultural Economics Society, 35 p., 2012.

This paper compares US and EU biofuels policy processes, revealing an intertemporal choice which tests the capacity to account for the future benefits of a low carbon future in current policy processes.

[Cultivating Governance: Cautionary Tales For Biofuel Policy Reformers](#) / Gerasimchuk et al., International Institute for Sustainable Development's Global Subsidies Initiative, 20 p., 2012.

This policy brief analyses the current developments around policies of government support to biofuels internationally. Its objective is to provide policy-makers with a summary of governance lessons that can be learned from the experiences of state support to biofuels.

[Biofuels Subsidies - The State of Play, 2012](#) / Gerasimchuk et al., International Institute for Sustainable Development's Global Subsidies Initiative, 37 p., 2012.

This paper summarizes and discusses policy literature on the state of play of the over US\$ 20 billion in subsidies for biofuel production and consumption. In particular, it examines the influence of three dynamic factors: the “food versus fuel” debate, advanced biofuels developments and the austerity policies necessitated by the financial and economic crisis.

[La politique d'aide aux biocarburants](#) / Cour des comptes, 259 p., 2012.

Prepared by the French Court of auditors, this report provides background data on biofuels, presents stakeholders' positions and analyses the effectiveness and efficiency of the French support policy to biofuels (report available in French).

[Biofuels Incentives: A Summary of Federal Programs](#) / Yacobucci, Congressional Research Service, 2012.

This report outlines federal programs that provide direct or indirect incentives for biofuels. For each program described, the report provides details including administering agency, authorizing statute(s), annual funding and expiration date.

[Biofuels, at What Cost? Government Support for Ethanol and Biodiesel in the EU](#) / Jung et al., International Institute for Sustainable Development's Global Subsidies Initiative, 81 p., 2010.

Biofuels benefit from high levels of financial support in almost all EU Member States. This report aims at quantifying support for biofuels in the EU.

[The Willing, the Unwilling and the Unable - Explaining Implementation of the EU Biofuels Directive](#) / Di Lucia et al., Journal of European Public Policy, 20 p., 2010. Only accessible to those with access to the European Parliament's intranet (EP Library).

This article offers a systematic comparison of the implementation of the EU biofuels policy in 10 Member states (Austria, Denmark, France, Germany, Italy, Latvia, Poland, Slovenia, Spain and Sweden) between 2003 and 2006.

[Evidence Based Policy or Policy Based Evidence Gathering? Biofuels, the EU and the 10% Target](#) / Sharman et al., Environmental Policy and Governance, 20, pp.309–321, 2010. Only accessible to those with access to the European Parliament's intranet (EP Library). Click on IP authentication for full text access.

The 2009 Renewable Energy Directive mandates EU Member States' road transport fuel to comprise a minimum of 10% renewable content by 2020. This target is expected to be met predominantly from biofuels. This paper interrogates the 10% target, critically assessing its political motivations,



use of scientific evidence and the actions of an individual policy entrepreneur who played a central role in its adoption.

[Biofuel Support Policies – An Economic Assessment](#) / OECD, 146 p., 2008. Only accessible to those with access to the European Parliament's intranet (EP Library).

This report, jointly produced by the OECD and the International Energy Agency, analyses the implications of biofuel support from various perspectives. The report shows that the high level of policy support contributes little to reduced greenhouse-gas emissions and other policy objectives, while it adds to a range of factors that raise international prices for food commodities. It concludes that there are alternatives to current support policies for biofuels that would more effectively allow governments to achieve their objectives.

[The Competition Between Food Crops and Non Food Crops for Energy: What are the Effects on Agricultural Structures and on the Use of Land?](#) / Study prepared by Vanini et al., Università di Bologna, at the request of the European Parliament's Committee on Agriculture and Rural Development, Policy Department B, PE 405.402, 118 p., 2008.

This study examines the effects of the EU biofuel policy on European agriculture. The requirements in terms of feedstock and arable land of the EU biofuel targets have been evaluated by assuming scenarios of different price levels for agricultural commodities and the possibility of the EU biofuel industry to be alternatively supplied by European crops or through import. The research has also investigated the technical adaptation of agricultural holdings, the consequences of the prospective changes in the EU's Common agricultural policy, and the impact on the EU food industry and on the environment.

Land Use Change Associated With Biofuels

[Impact Assessment Accompanying the Proposal for a Directive of the European Parliament and of the Council amending Directive 98/70/EC Relating to the Quality of Petrol and Diesel Fuels and Amending Directive 2009/28/EC on the Promotion of the Use of Energy from Renewable Sources](#) / SWD(2012)343, 129 p., 2012.

This Impact Assessment relies mainly on the work of the International Food Policy Institute (IFPRI). The key issue addressed is whether indirect land use change should be addressed and if so in which way.

[Revue critique des études évaluant l'effet des changements d'affectation des sols sur les bilans environnementaux des biocarburants](#) / De Cara et al., Institut national de la recherche agronomique (INRA) pour l'Agence de l'Environnement et de la Maîtrise de l'Energie (Ademe), 96 p., 2012.

Available lifecycle analyses usually show that biofuels may contribute to the mitigation of greenhouse gas emissions through the substitution of fossil fuel by recycled biomass-based carbon. However, standard lifecycle analyses overlook the implications of the development of biofuels on land use change and their consequences on carbon stocks and greenhouse gas emissions. This study, only available in French (however the Executive Summary is available in English), carries out a literature review on the potential impact of the development of biofuels on land use change and greenhouse gas emissions.

[Assessing the Land Use Change Consequences of European Biofuel Policies](#) / International Food Policy Research Institute, Laborde, 111 p., 2011.

This study was requested by the European Commission to examine land use change effects of biofuels. It contains several improvements compared to the Al-Riffai and al. report (2010, see below).

[Biofuel and Climate Change Mitigation – A Computable General Equilibrium Analysis Incorporating Land Use Change](#) / Timilsina et al., World Bank, Policy Research Working Paper 5672, p.29, 2011.

The question of whether biofuels help mitigate climate change has attracted much debate in the literature. Using a global computable general equilibrium model that explicitly represents land-use change impacts due to the expansion of biofuels, this study attempts to shed some light on this question.



[Indirect Land Use Change and Biofuels](#) / Study prepared by Fritsche et al., Oeko Institut, at the request of the European Parliament's Committee on Environment, Public Health and Food Safety, Policy Department A, PE 451.495, 63 p., 2011.

This study discusses the impact of indirect land use change on greenhouse gas emissions from biofuels by evaluating the scale of indirect land use change linked with the EU biofuels targets. For that, studies carried out for the Commission are critically reviewed and analysed, and a short evaluation of the Commission Report on indirect land use change is included also. The study assesses also possible cumulative effects of the biofuels target and use of biomass for energy as projected in National Renewable Action Plans, and draws conclusions on the appropriate level of an indirect land use change factor.

[Report from the European Commission on Indirect Land Use Change Related to Biofuels and Bioliquids](#) / COM(2011)811, 15 p.

The report acknowledges that indirect land use change can reduce greenhouse gas emissions savings associated with biofuels, but also identifies a number of uncertainties associated with the available models.

[Global trade and environmental impact of the EU biofuels mandate](#) / Al-Riffai et al., International Food Policy Research Institute, 125 p., 2010. See also: [Annex I - Detailed Results, Core scenario](#), [Annex II - Details Baseline, Central Scenario](#).

The objective of this study is to analyse the impact of possible changes in EU biofuels trade policies on global agricultural production and the environmental performance of the EU biofuel policy. The study pays particular attention to the indirect land-use change effects, and the associated emissions, of the main feedstocks used for first-generation biofuels production.

[Biofuels: a New Methodology to Estimate Greenhouse Gas Emissions from Global Land Use Change](#) / Hiederer et al., European Commission, Joint Research Centre, 150 p., 2010.

This study implements a new methodology developed by the Joint Research Centre Institute for Environment and Sustainability and Institute for Energy for estimating changes in greenhouse gas emissions from soil, and above- and belowground biomass resulting from global land use changes caused by the production of biofuels.

[Indirect Land Use Change from Increased Biofuels Demand: Comparison of Models and Results for Marginal Biofuels Production from Different Feedstocks](#) / Edwards et al., European Commission, Joint Research Centre, 150 p., 2010.

This study was performed in support to the preparation of the policy proposal on the assessment of the effects of indirect land use change and to the Commission's internal debate on how to address indirect land-use change emissions in legislation. It compares the indirect land use change results produced by different economic models for marginal increases in biofuel production from different feedstocks.

[Impacts of the EU Biofuel Target on Agricultural Markets and Land Use: A Comparative Modelling Assessment](#) / Fonseca et al., European Commission, Joint Research Centre, 130 p., 2010.

This report presents the results of an agro-economic impact analysis prepared by the Institute for Prospective Technological Studies for DG Agriculture and Rural Development of the European Commission, with the aim of analysing the impacts of EU biofuel policies on agricultural production, trade and land use within and outside the EU, up to the year 2020.

[The Global Impacts of Biofuel Mandates](#) / Hertel et al., The Energy Journal, Vol. 31, No. 1, pp. 75-100, 2010.

The rise in world oil prices, coupled with heightened interest in the abatement of greenhouse gas emissions, led to a sharp increase in biofuels production around the world. Previous authors have devoted considerable attention to the impacts of these policies on a country-by-country basis. However, there are also strong interactions among these programs, as they compete in world markets for feedstocks and ultimately for a limited supply of global land. This paper offers a global assessment of biofuel programs – focusing particularly on the EU and US.

[Modelling the Global Trade and Environmental Impacts of Biofuel Policies](#) / Bouët et al., IFPRI Discussion Paper, 56 p., 2010.



There is rising skepticism about the potential positive environmental impacts of first generation biofuels. Growing biofuel crops could induce diversion of other crops dedicated to food and feed needs. The relocation of production could increase deforestation and bring significant new volumes of carbon into the atmosphere. This paper develops a methodology for assessing the indirect land use change effects related to biofuel policies in a computable general equilibrium framework.

[Use of US Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land Use Change](#) / Searchinger et al., Science, pp.1238-1240, 2008.

This seminal article sparked the debate on indirect land use change related to biofuels. Most prior studies had found that substituting biofuels for gasoline would reduce greenhouse gases because biofuels sequestered carbon through the growth of the feedstock. These analyses had failed to count the carbon emissions that occur as farmers worldwide respond to higher prices and convert forest and grassland to new cropland to replace the grain (or cropland) diverted to biofuels.

Biofuels and Food Security

[Biofuels and Food Security \(Draft v0 Version\)](#) / High Level Panel of Experts, Committee on World Food Security, 2013. The final version is to be published in June 2013 [on this webpage](#).

This report includes chapters on biofuel policies in the world; biofuels and the technology frontier; food prices, hunger and poverty; biofuels and land and social implications of biofuels. The High Level Panel of Experts on food security and nutrition has been created as part of the reform of the international governance of food security to advise the Committee on World Food Security, which is the foremost intergovernmental and international platform dealing with food security and nutrition.

[Biofuels, Environment, and Food: the story gets more complicated, Chapter 5 in "2011 Global Food Policy Report"](#) / Laborde et al., International Food Policy Research Institute (IFPRI), pp.49-54, 2012.

Originally promoted as a way of decreasing dependence on fossil fuels and avoiding the carbon emissions generated by them, biofuel production has now been widely recognized to have strong links to agricultural markets and even land-use patterns. The first-generation biofuels currently in commercial use have the strongest links to agricultural markets and land use, although there are important by-products that can be used as feed in order to offset these effects. Given the areas of scientific uncertainty that still remain over the impact of biofuels on food security and the environment, decision making has become complex and, in some cases, contentious.

[Should We be Concerned About Competition Between Food and Fuel? Analysis of biofuel consumption mandates in the EU and the United States](#) / Charles, Global Subsidies initiative of the International Institute for Sustainable Development, 8 p., 2012.

This policy brief discusses the impact of EU and United States consumption targets on food commodity prices and provides a number of recommendations to help reduce competition between already constrained agricultural markets and increasing biofuel production.

[Global Strategic Framework For Food Security And Nutrition](#) / Committee on World Food Security, CFS 2012/39/5 Add.1, 46 p., 2012.

This document provides an overarching framework and a single reference document with practical guidance on core recommendations for food security and nutrition strategies, policies and actions validated by the Committee on World Food Security. It is not a legally binding instrument but rather offers guidelines and recommendations. States, international and regional organizations, and all other appropriate stakeholders are recommended to review biofuels policies (where applicable and if necessary) according to balanced science-based assessments of the opportunities and challenges they may present for food security, so that biofuels can be produced where it is socially, economically and environmentally feasible to do so.

[Can Biofuels Policy Work For Food Security ?](#) / Durham et al., Defra, 29 p., 2012.

According to this paper, grains and oilseeds produced for use in biofuels could be allowed to flow into animal feed or human food markets during temporary spikes in the price of agricultural commodities. Currently this is strongly discouraged from happening by legal requirements to blend biofuels with conventional transport fuel (often called biofuels mandates or blending obligations).



[The Hunger Grains. The fight is on. Time to scrap EU biofuel mandates.](#) / Kelly, Oxfam International, 33 p., 2012.

This paper shows how concerns about land and food rights around the world are closely linked to EU biofuel mandates.

[Food not Fuel: Agrofuels, Food Prices and Hunger](#) / Friends of the Earth International, 6 p., 2012.

This briefing gives a summary of how agrofuels impact food prices and what this means for the world's poorest people.

[Addressing the Biofuels Problem: Food Security Options for Agricultural Feedstocks, Chapter 23 in Safeguarding Food Security in Volatile Global Markets](#) / Wright, FAO, 2011.

This chapter is part of a four-part volume gathering the latest thinking on the issues and controversies surrounding price volatility in global food markets. Drawing from theory, empiricism and heuristic evidence, the book contributes to the debate on the causes, consequences, and challenges of food price volatility.

[Biofuels and Food Security: Time to Consider Safety Valves?](#) / Wright, IPC Policy Focus, 6 p., 2011.

The rapid increase of biofuel production from agricultural feedstocks has driven grain prices higher and is keeping aggregate cereal stocks low, making the market unusually vulnerable to supply and demand shocks. The establishment of call options on grains and oilseeds that governments can purchase from biofuel producers, would allow the diversion of agricultural feedstocks from biofuel production into the food chain in times of acute need. Such options are advisable in developing countries pursuing or contemplating ambitious biofuels programs.

[Biofuels, Food Security, and Africa](#) / Molony, African Affairs, 10 p., 2010. Only accessible to those with access to the European Parliament's intranet (EP Library).

This briefing discusses the relationship between biofuels and food security in Africa, and brings in related issues concerning land ownership and livelihoods. As more and more African countries devote land to the cultivation of biofuels, the numerous questions and potential conflicts that are addressed here are of crucial relevance to many vulnerable populations, environments, and states across the continent.

[The Impacts of Biofuels on the Environment and on Food Security in Brazil](#) / Peskett, Overseas Development Institute for the European Parliament, Policy Departments A and B, PE 405.380, 14 p., 2008.

This note analyses the impacts of biofuels on the environment and on food security in Brazil. The Brazilian biofuels industry is a world leader. Since 1990 over 42 million hectares of Brazilian forest have been lost but it cannot be on account of biofuel. In other hand, there is little evidence that biofuels cause hunger: prices of most food in Brazil have been falling compared to the general price since 1994.

[Striving for Biofuels: Impacts on Land Use and Food Security](#) / Study prepared by Eickhout, Netherlands Environmental Assessment Agency at the request of the European Parliament's Committee on Agriculture and Rural Development, Policy Departments A and B, PE 405.379, 14 p., 2008.

This paper provides a brief overview of the relation of biofuels with land use changes and impacts on food security.

Biofuels and Agri-Food / Fuel Prices

[EU Biofuel Use and Agricultural Commodity Prices: a Review of the Evidence Base](#) / Kretschmer et al., Institute for European Environmental Policy, 75 p., 2012.

This report provides a review of the evidence base on the link between policy-driven EU biofuels demand and global agricultural prices – in particular through reviewing a selection of modelling based studies. The 10% target for the use of renewable energy in transport set in the EU Renewable Energy Directive is anticipated to lead to a tripling of biofuel use in the EU in 2020 compared to 2008



levels, according to the National Renewable Energy Action Plans that all Member States have been required to produce.

[Relationship Between Prices of Food, Fuel and Biofuel](#) / Kristoufek et al., Paper prepared for presentation at the 131st European Association of Agricultural Economists Seminar, 19 p., 2012.

This paper analyses the relationships between the prices of biodiesel, ethanol and related fuels and agricultural commodities. It is shown that in short-term, both ethanol and biodiesel are very weakly connected with the other commodities. In medium-term, the biofuels network becomes more structured. The system splits into two well separated branches – a fuels part and a food part. Biodiesel tends to the fuels branch and ethanol to the food branch.

[Price Volatility in Food and Agricultural Markets: Policy Responses](#) / Policy report including contributions by FAO, IFAD, IMF, OECD, UNCTAD, WFP, the World Bank, the WTO, IFPRI and UN HLTF, 68p., 2011.

This report was requested by the G20 leaders at their summit meeting in November 2010. During the 2007-2009 period biofuels accounted for a significant share of global use of several crops: 20% for sugar cane, 9% for vegetable oil and coarse grains and 4% for sugar beet. Projections encompass a broad range of possible effects but all suggest that biofuel production will exert considerable upward pressure on prices in the future. For example, according to one study international prices for wheat, coarse grains, oilseeds and vegetable oil could be increased by 8%, 13%, 7% and 35% respectively. Moreover, as long as governments impose mandates, biofuel production will aggravate the price inelasticity of demand that contributes to volatility in agricultural prices.

[The Impact of US Biofuel Policies on Agricultural Price Levels and Volatility](#) / Babcock, Center for Agricultural and Rural Development, Iowa State University, Issue No. 35, 38 p., 2011.

Changes in developed country biofuel policy are some of the key recommendations of an intergovernmental organization report to the G20, a group of leading economies. However, in-depth analysis on the relationship between biofuel policy in the US and the food price volatility has been missing. This paper bridges that gap.

[World Oil Price and Biofuels - A General Equilibrium Analysis](#) / Timilsina et al., World Bank, Policy Research Working Paper 5673, 29 p., 2011.

The price of oil could play a significant role in influencing the expansion of biofuels. However, this issue has not been fully investigated yet in the literature. Using a global computable general equilibrium model, this study analyses the impact of oil price on biofuel expansion, and subsequently, on food supply. The study shows that a 65% increase in oil price in 2020 from the 2009 level would increase the global biofuel penetration to 5.4% in 2020 from 2.4% in 2009. A doubling of oil price in 2020 from its baseline level, or a 230% increase from the 2009 level, would increase the global biofuel penetration in 2020 to 12.6%. The penetration of biofuels is highly sensitive to the substitution possibility between biofuels and fossil fuel.

[Domestic Policies in a Globalised World: What you Do is What I Get](#) / Laborde, 7 p., 2011. This paper assesses the consequences of biofuel mandates for global agricultural price stability. It also puts forward some recommendations for policymakers.

[The Impact of Ethanol and Ethanol Subsidies on Corn Prices: Revisiting History](#) / Babcock et al., CARD Policy Brief 11-PB 5, 12 p., 2011.

The rapid rise in corn prices that began in the fall of 2006 coincided with exponential growth in US corn ethanol production. At about the same time, new ethanol consumption mandates were added to existing ethanol import tariffs and price subsidies. This troika of subsidies leads critics to view the ethanol industry as being beholden to subsidies, which then leads to the conclusion that ethanol subsidies lead to high corn prices. But droughts, floods, a severe US recession, and two general commodity price surges have also occurred since 2006.

[The Integration of Energy and Agricultural Markets](#) / Tyner, Agricultural Economics, Vol. 41, pp. 193-201, 2010. Only accessible to those with access to the European Parliament's intranet (EP Library).



This article addresses the evolving links between energy and agricultural markets (based on the case of biofuels production in the United States).

[A Note on Rising Food Prices](#) / Mitchell, World Bank, Policy Research Working Paper 4682, 21 p., 2008.

The rapid rise in food prices has been a burden on the poor in developing countries, who spend roughly half of their household incomes on food. This paper examines the factors behind the rapid increase in internationally traded food prices since 2002 and estimates the contribution of various factors such as the increased production of biofuels from food grains and oilseeds, the weak dollar, and the increase in food production costs due to higher energy prices. It concludes that the most important factor was the large increase in biofuels production in the US and the EU.

[The 2007/08 Agricultural Price Spikes: Causes and Policy Implications](#) / HM Government, 123 p., 2010.

The purpose of this report is to analyse the causes of the spikes, and examine policy options to reduce the severity and frequency of agricultural price spikes in the future.

[Will EU Biofuel Policies Affect Global Agricultural Markets?](#) / Martin et al., European Review of Agricultural Economics, Vol. 35, N° 2, pp. 117-41, 2008. Only accessible to those with access to the European Parliament's intranet (EP Library).

This article assesses the implications of the EU Biofuels Directive (BFD) using a computable general equilibrium framework with endogenous land supply. The results show that, without policy intervention to stimulate the use of biofuel crops, the targets of the BFD will not be met. With the BFD, the enhanced demand for biofuel crops has a strong impact on agriculture globally and within Europe, leading to an increase in land use. On the other hand, the long-term declining trend in real agricultural prices may slow down or even reverse.

[The Impacts of Biofuel Production on Food Prices: A review](#) / Zentrum für Entwicklungsforschung (ZEF), Discussion Papers on Development Policy N°127, 25 p., 2008.

This discussion paper reviews evidence, projections and opinions about the impacts of biofuel production on commodity and food prices. It also summarizes the different discourses on the various "non-biofuel" causes of the recent soar of food and commodity prices. It compares all results and highlights their differences and the causes of these differences.

More References on Biofuels in Developing Countries

[Biofuels and The Poor](#) / Stanford University; International Food Policy Research Institute; Chinese Academy of Sciences; Center for Energy Sciences Research; Bill and Melinda Gates Foundation, 2013.

This project, funded by a grant from the Bill & Melinda Gates Foundation, aims at shedding light on how biofuels could impact the lives of poor smallholder farmers in South Asia and Sub-Saharan Africa and analyze the feasibility of investing in biofuels systems in the developing world. Several reports were produced in its framework.

[Fuel for Thought. Addressing the Social Impacts of EU Biofuels Policies](#), Anders Dahlbeck, ActionAid, 2012

Globally, it is estimated that biofuels have been involved in at least 50 million hectares being grabbed from rural communities, and participated significantly in the 2008 food crisis.

[Data Set with Over 400 Global Land Grabs](#) / GRAIN, 62 p., 2012.

GRAIN is making available a data set documenting 416 recent, large-scale land grabs by foreign investors for the production of food crops, some of them for the production of biofuels. The cases cover nearly 35 million hectares of land in 66 countries.

[Africa: Up for Grabs, The Scale and Impact of Land Grabbing for Agrofuels](#) / Friends of the Earth International, 37 p., 2010.

This report discusses the scale and impact of land grabbing for agrofuels.



[The Changing North-South and South-South Political Economy of Biofuels](#) / Dauvergne, et al., Third World Quarterly; 2009. Only accessible to those with access to the European Parliament's intranet (EP Library).

Since the 2007 food crisis, controversy has engulfed biofuels. An analysis of the expanding global biofuel industry reveals the increasing environmental consequences of economic and political relations among developing countries.

[Production and Use of Biofuels in Developing Countries](#) / Study prepared by Wiggins et al., Overseas Development Institute and ProForest, at the request of the European Parliament's Committee on Development, Policy Department External Policies, PE 388.966, 42 p., 2009.

This study examines some of the key issues surrounding biofuels and developing countries and makes recommendations for EU policy to prevent or limit damage from biofuel development, and to take advantage of opportunities.

[Focus on "Biofuels: the Promise and the Risks" in World Bank 2008 Development Report](#) / World Bank, pp. 70-71, 2007.

The report argues that biofuels offer a potential source of renewable energy and possible large new markets for agricultural producers. However few current biofuels programs are economically viable, and most have social and environmental costs: upward pressure on food prices, intensified competition for land and water, and possibly, deforestation. National biofuel strategies need to be based on a thorough assessment of these opportunities and costs.

Biofuels, Trade and the World Trade Organisation (WTO)

[Dispute Settlement: Dispute DS443: Argentina vs. EU and Spain — Certain Measures Concerning the Importation of Biodiesels](#) / WTO. Ongoing since August 2012.

On 17 August 2012, Argentina requested consultations with the EU and Spain concerning certain measures affecting the importation of biodiesels for accounting purposes with regard to the compliance with the mandatory targets for biofuels. The key measure challenged by Argentina is the Spanish Ministerial Order regulating allocation of quantities of biodiesel needed to achieve the mandatory target of renewable energy. This measure is the national implementation of the EU regulatory framework for energy from renewable sources.

[Biofuels, Sustainability, and Trade-Related Regulatory Chill](#) / Lydgate, Journal of International Economic Law, Volume 15, N°1, pp.157–180, 2012.

Recent EU sustainability criteria for biofuels provide an opportunity to understand more precisely the relationship between national sustainable development policies and WTO law. A desire to avoid WTO conflict was one reason for the omission of stronger criteria addressing negative social and environmental impacts of increased biofuels production. This article documents potential reasons for a WTO regulatory chill effect on the sustainability criteria. It then outlines challenges that the regulatory concept poses to trade law

[The Compatibility of EU Biofuel Policies with Global Sustainability and the WTO](#) / Burrell et al., The World Economy, pp.784-797, 2012. Only accessible to those with access to the European Parliament's intranet (EP Library).

This paper reports the simulated impacts of EU biofuel policies on biofuel trade and land used for cereals, oilseeds and sugar in 2020, both with the current EU biofuel tariffs in place and assuming zero EU biofuel tariffs. The results show that EU biofuel policies increase the global area devoted to these crops. When EU biofuel tariffs are removed, their global area increases less but a larger share of the increase in area owing to EU biofuel policies falls outside the EU, and a disproportionately large share of the increase in global area is situated in Brazil.

[Impact of Multinational Biofuel Mandates on Agri-food Trade](#) / Banse et al., 23 p., 2012.

This paper shows the consequences of enhanced biofuel production in the regions and countries of the world that have implemented biofuel policies. With multinational biofuel policies at global level agricultural trade significantly increases, especially for those products which are processed to biodiesel and ethanol, which are cereals, oilseeds and sugar.



[EU Biofuels Policy Raising the Question of WTO Compatibility](#) / Switzer et al, International and Comparative Law Quarterly, Vol. 60, N°3, pp.713-736, 2011. Only accessible to those with access to the European Parliament's intranet (EP Library).

This paper examines the extent to which the EU's Biofuels Policy may be constrained by and treated under current WTO disciplines. The discussion starts by examining the current EU policy regarding the promotion of biofuels as an alternative to fossil fuels before turning to the question of how the rules of the WTO interplay with this policy. In this regard, particular emphasis is placed on the WTO rules on subsidies and non-discrimination.

[Biofuel and Biomass Subsidies in the US, the EU and Brazil: Towards a Transparent System of Notification](#) / Josling et al., International Policy Council Position Paper, 48 p., 2010.

This paper is intended to examine the way in which information on biofuels support is reported in the US, the EU and Brazil: the three major players in the biofuels market. It explores the relationship between these subsidies and the WTO monitoring of support under the Agreement on Agriculture and the Agreement on Subsidies and Countervailing Measures.

[Biofuel Subsidies and Standards: WTO Considerations](#) / WTO, Report on Session 35, Sub-Theme 2 of the WTO Public Forum on New Forces Shaping World Trade, § p., 2010.

This report discusses subsidies and sustainability standards concerning biofuels. The following questions are dealt with: How are subsidies being notified to the WTO? Can biofuel subsidies be considered agricultural subsidies, therefore falling under the Agreement on Agriculture's domestic support pillar? How does the OECD's Producer Support Estimate approach biofuel support? How can greater transparency on levels of subsidies be achieved? What trade issues are raised by the incorporation of lifecycle analyses in sustainability standards?

[Sustainability Criteria in the EU Renewable Energy Directive; Consistent with WTO Rules?](#) / Lendle et al., ICTSD Information Note N°2, 2010.

The paper analyses the consistency of the EU Renewable Energy Directive 2009/28/EC with WTO Rules. There has been wide criticism surrounding the issue as it is argued that the Directive is not compatible with WTO discipline. The information note provides sound and comprehensive legal analysis on this issue and can thus hopefully inform any emerging dispute and the relating decision making process.

[Biofuels Subsidies and the Law of the WTO](#) / Harmer, ICTSD Programme on Agricultural Trade and Sustainable Development, Issue Paper No. 20, 50 p., 2009.

This paper reviews biofuel measures that are commonly used in major producing countries against WTO subsidies disciplines. These measures are found in a range of laws and policies relating to energy, the environment and agriculture. There is little evidence that domestic policymakers have taken into account WTO disciplines when crafting these measures. This paper identifies a number of issues for policymakers to consider.

Other Environmental Issues

[Global Economic And Environmental Aspects of Biofuels](#) / Pimentel et al., e-book, 449 p., 2012. Only accessible to those with access to the European Parliament's intranet (EP Library).

This book focuses on key ecological and economic issues associated with the production of ethanol as a fuel from corn, sugarcane, crop residues and other organic materials.

[Uncertainties About the Greenhouse Gas Emissions Saving of Rapeseed Biodiesel](#) / Pehnelt et al., Jena Economic Research Papers, 35 p., 2012.

The aim of this paper is to analyse the greenhouse gas emissions saving potential of rapeseed biodiesel, but is not able to reproduce the greenhouse gas emissions saving values published in the annex of the Renewable Energy Directive. Therefore, the greenhouse gas emissions saving values of rapeseed biodiesel stated by the EU are more than questionable.



[Recognised Voluntary Schemes](#) / European Commission, 2013.

Voluntary schemes are control systems that certify sustainability of biofuels. Companies importing or producing biofuels have to demonstrate that their biofuels are produced in a sustainable way. They can do so by asking a scheme to do all the necessary audits to prove that. The EU Commission does not run these schemes itself but opened up the opportunity for private companies and for institutions to play this part.

[Environmental Authorities and Biofuel Controversies](#) / Mol, Environmental politics, Vol. 19, N°1, pp. 61-79, 2010. Only accessible to those with access to the European Parliament's intranet (EP Library).

The current generation of crop-based biofuels is heavily contested for its negative consequences for the environment and the poor. Hence, the current biofuel system needs to be transformed in the direction of what can be labelled "fair fuels": (bio)fuels that are environmentally and socially sustainable. Private market environmental authorities, moral environmental authorities and all kinds of hybrid authorities in biofuel regulation are emerging.

[Nitrogen and Biofuels: an Overview of The Current State of Knowledge](#) / Erisman et al., Nutrient Cycling in Agroecosystems, Vol. 86, Issue 2, pp 211-223, 2010.

There is much discussion on the availability of different biomass sources for bioenergy application and on the reduction of greenhouse gas emissions compared to conventional fossil fuels. There is much less discussion on the other effects of biomass such as the acceleration of the nitrogen cycle through increased fertilizer use resulting in losses to the environment and additional emissions of oxidized nitrogen.

[Towards Sustainable Production and Use of Resources: Assessing Biofuels](#) / Bringezu et al., United Nations Environment Programme, 120 p., 2009.

A sophisticated approach needs to be taken when developing biofuels as an environmentally-friendly energy option, this report concludes. Governments should fit biofuels into an overall energy, climate, land use, water and agricultural strategy if their deployment is to benefit society, the economy and the environment as a whole.

[Biofuels: Environmental Consequences and Interactions with Changing Land Use](#) / Proceedings of the Scientific Committee on Problems of the Environment, International Biofuels Project Rapid Assessment, Germany, 2009.

Includes chapters on: Biofuels and the Environment in the 21st Century; Government Policies and Drivers of World Biofuels, Sustainability Criteria, Certification Proposals and their Limitations; Biomass Conversion to Fuels and Electric Power; Crops for Biofuel: Current Status and Prospects for the Future; Energy Balance & Greenhouse Gas Emissions of Biofuels from a Life-Greenhouse Gas Implications of Land Use Change and Land Conversion; Biodiversity Consequences of Increased Biofuel Production; Biofuels and Water; Impact of Ethanol Production on Nutrient Cycles and Water Quality; Air Quality Issues Associated with Biofuel Production and Use; Biofuels: Economic and Public Policy Considerations; Social and Distributional Impacts of Biofuel Production; Future Feedstocks for Biofuel Systems; Quantifying the Environmental Impacts of Biofuel Production: Knowns and Unknowns; Biofuels and Developing Countries; What are the Final Land Limits; Mitigation Strategies: Biofuel Development Considerations to Minimize Impacts on the Socio-Environmental System.

[Linking an Economic Model for European Agriculture With a Mechanistic Model to Estimate Nitrogen and Carbon Losses from Arable Soils in Europe](#) / Leip et al., Biogeosciences, Vol. 5, pp.73-94, 2008.

This paper shows the first results of the nitrogen budget in croplands in fourteen countries of the EU and discuss possibilities to improve the detailed assessment of nitrogen and carbon fluxes from European arable soils.

[Certification Schemes for Biofuels – Focus on Brazil](#) / Study prepared by ProForest at the request of the European Parliament's Committee on Agriculture and Rural Development, Policy Departments A and B, PE 405.381, 9 p., 2008.



This note provides some sustainability criteria in order to develop certification schemes of biofuels: e.g. social and environmental criteria at the production stage; accreditation and certification process requirements; and supply chain mechanisms (traceability).

[Making Certification Work for Sustainable Development: The Case of Biofuels](#) / Zarrilli et al., United Nations Conference on Trade and Development, 2008.

In parallel with fast-growing biofuels use and trade, concerns are being voiced about the sustainability of biofuels and feedstock production, and interests in mechanisms to ensure it are intensifying. Discussions are ongoing on developing frameworks for certification schemes that encourage sustainable production. The numerous public and private initiatives being undertaken are in various stages of development ranging from the discussion phase to full implementation.

Second-Generation Biofuels

[Mobilising Cereal Straw In The EU To Feed Advanced Biofuel Production](#) / Kretschmer et al., Institute for European Environmental Policy, 61 p., 2012.

This report considers the use of one particular agricultural residue, straw, for the production of cellulosic ethanol and considers ways in which it can be mobilised more effectively for this purpose.

[From First to Second-Generation Biofuel Technologies](#) / International Energy Agency, 124 p., 2010.

The debate over biofuels produced from food crops has pinned a lot of hope on "second-generation biofuels" produced from crop and forest residues and from non-food energy crops. This report examines the current state-of-the-art and the challenges for second generation biofuel technologies. It evaluates their costs and considers policies to support their development and deployment.

[Sustainable Production of Second-Generation Biofuels](#) / International Energy Agency, 221 p., 2010.

This study aims to identify opportunities and constraints related to the potential future production of second-generation biofuels in major economies and developing countries, and to examine under which conditions the new fuels could be produced sustainably in these countries.



Author Guillaume RAGONNAUD, with the support of Filipa AZEVEDO, Policy Department B.

Disclaimer This document is provided to Members of the European Parliament and their staff in support of their parliamentary duties and does not necessarily represent the views of the author or the European Parliament. It should not be considered as being exhaustive.

Feedback If you wish to give us your feedback please e-mail to Poldep-Cohesion Secretariat.

Policy Department B Within the European Parliament's Directorate-General for Internal Policies, Policy Department B is the research unit which supplies technical expertise to the following five parliamentary Committees: Agriculture and Rural Development; Culture and Education; Fisheries; Regional Development; Transport and Tourism. Expertise is produced either in-house or externally. You can access our studies from this [webpage](#).

RESEARCH ON is organised around a concise, scene-setting introduction and statistical snapshot, followed by an annotated list of relevant sources, classified in thematic sections.

PE 495.839



Expertise for Better Law Making

AGRI

JANUARY 2013