EUROPEAN PARLIAMENT

STUDY

Policy Department
Economic and Scientific Policy

Workshop
Sustainability criteria for Biofuels
Brussels, 4 March 2008

Consolidated texts

IP/A/ENVI/WS/2008-04

PE 404.887

This study was requested by the European Parliament's Committee on the Environment, Public Health and Food Safety. (Ref to contract: IP/A/ENVI/FWC/2006-203/Lot2/C1/SC3)

Only published in English.

Experts invited for the Workshop
Greg Archer (Low Carbon Vehicle Partnership)
Nigel Mortimer (Royal Society, UK)
Bas Eickhout (Netherlands Environmental Assessment Agency)
Berien Elbersen (Wageningen University and Research Centre, NL)
Alan Bond (School of Environmental Sciences, UK)
Neil Judd (ProForest, UK)

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1. Introduction

The rapporteur MEP Ms Corbey and shadow rapporteurs for the Fuel Quality Directive have decided that it is worth the effort to enter into first reading negotiations with the Council. There is, however, one political issue that deserves full attention of the different committees: **sustainability criteria for biofuels**.

Recent scientific evidence suggests that CO_2 efficiency of biofuels is questionable - in particular if land use changes are taken into account. The vote in the Committee on Environment, Public Health and Food Safety (ENVI) approves sustainability criteria, including land use changes. Meanwhile the European Commission has presented its proposal on renewable energies which contains sustainability criteria, although they are less strong than the ones from the ENVI-decision.

The European Parliament ENVI Committee, the TAUW Consulting and Engineering Company together with the EP's ENVI Committee Secretariat and the EP's Policy Department A therefore organise a **workshop** on **Sustainability criteria for biofuels.**

Date: Tuesday 4 March 2008, 14h30 - 18h30

Venue: European Parliament, Brussels, Room Hemicycle

All information will shortly be available on the e-studies website of the European Parliament: http://www.europarl.europa.eu/activities/committees/studies.do?language=EN

2. Workshop - Programme

WORKSHOP
Sustainability criteria for biofuels

European Parliament, Hemicycle Paul-Henri Spaak PHS, Brussels
Tuesday 4 March 2008, 14:30-18:30

PROGRAMME

14:30 Welcome and opening – Rapporteur MEP Ms Dorette CORBEY

Part 1: The Institutional context

14:40 Mr Jos Delbeke, Deputy Director-General DG Environment, European Commission
14:50 Mr Fabrizio Barbaso, Deputy Director-General, DG Energy and Transport, European Commission
15:00 Miran Kresal, Mertens Group, Slovenian Presidency

Part 2: Panel of experts

General introduction - Technical aspects of sustainability criteria

15:10 Greg Archer (LowCVP - Low Carbon Vehicle Partnership)

Criteria related to CO_2 efficiency/saving and land use change

15:20 Nigel Mortimer (Royal Society, UK)
15:30 Bas Eickhout (MNP, Netherlands Environmental Assessment Agency)
15:40 Debate: *Questions and answers session*

Criteria related to biodiversity and water

16:20 Berien Elbersen (Wageningen University and Research Centre, Netherlands)
16:30 Alan Bond (School of Environmental Sciences, University of East Anglia, UK)
16:40 Debate: *Questions and answers session*

Criteria related to social issues

17:10 Neil Judd (ProForest, UK)
17:20 Debate: *Questions and answers session*

Part 3: Conclusions

18:00 Closing remarks – Rapporteur MEP Ms Dorette CORBEY and Shadow Rapporteurs

3. Curriculum vitae of the experts

Greg Archer

(LowCVP - Low Carbon Vehicle Partnership, UK)

Greg Archer is the Managing Director of the Low Carbon Vehicle Partnership (LowCVP) a multi-stakeholder partnership of over 275 organisations established to accelerate the shift to low carbon vehicles and fuels and generate opportunity for UK businesses.

Under Greg's direction since 2004, LowCVP has doubled in size and delivered a impressive array of projects including the introduction of a UK-wide voluntary car-efficiency labelling scheme and managing the establishment of Cenex, a new public-private centre of excellence for low Carbon and fuel-cell technology of which he is also a Director.

His recent work has focused upon leading the Partnership's cutting-edge work on the development of sustainability assurance and reporting systems for biofuels. He led the work for the UK Department for Transport developing carbon and sustainability reporting as part of the Renewable Transport Fuels Obligation (RTFO). He has recently been appointed as a Director of the Office of the Renewable Fuels Agency that will administer RTFO.

Greg is a Chartered Chemist with wide ranging experience in environmental: policy, research, business and programme management. His previous positions have included managing a Government funded programme advising businesses on energy efficiency opportunities; the UK's air pollution research programme and a sustainability consultancy.

Nigel Mortimer

(The Royal Society - North Energy Associates Ltd., UK)

Contact: nigel.mortimer@northenergy.co.uk

Nigel has a BSc in Physics and a PhD in Energy Technology. Nigel formerly held the Chair of Sustainable Energy Development at Sheffield Hallam University where he was the Head of the Resources Research Unit. He has managed and undertaken research and consultancy contract work on a broad range of projects throughout the European Union and elsewhere. His current work involves the evaluation of primary energy inputs and greenhouse gas emissions associated with biomass energy technologies, especially biofuels. Clients for this work include the European Commission, the Department for the Environment, Food and Rural Affairs, the Department of Business, Enterprise and Regulatory Reform, the Environment Agency, and many private companies including British Sugar plc, Biofuels Corporation plc and the Northeast Biofuels Consortium. Nigel is a member of the Royal Society's Biofuels Working Group which recently published "Sustainable Biofuels: Prospects and Challenges".

Nigel Mortimer is one of the founding directors of North Energy Associates Ltd. This consultancy company has been involved in the practical implementation of sustainable energy development since 1991.

Bas Eickhout

(The Netherlands Environmental Assessment Agency, MNP)

Contact: Bas.Eickhout@mnp.nl ; +31 30 274 2924

Work experience

2006 - present Senior policy researcher global sustainability and climate change, Netherlands Environmental Assessment Agency (MNP)

Analysis and modelling of long-term land-use change scenarios, integrated assessment of global sustainable development issues like food security, climate change and biodiversity; project leader. In 2007 responsible for a MNP-overarching project on biomass.

2002 - 2005 Policy researcher integrated assessment modelling, National Institute for Public Health and the Environment (RIVM)

Researcher and responsible for maintenance integrated assessment model IMAGE (Integrated Model to Assess the Global Environment), focus on land-use change scenarios; project leader.

2000 - 2001 Project researcher, National Institute for Public Health and the Environment (RIVM)

Research on atmosphere-ocean system within the IMAGE model

Education

1994 - 2000 MSc Environmental Sciences, Radboud University Nijmegen, Department of Chemistry, Nijmegen, the Netherlands

Global air pollution (tropospheric ozone) and local air quality policies (particulate matters). Analytical chemistry, chemometrics, source identification of aerosol emitters, including a research period at the Clarkson University, Potsdam, New York, USA.

Selected international projects

- Lead Author of the scenario part of the International Assessment of Agricultural Science and Technology Development (Agricultural Assessment).
- Co-chair of the Land-study in context of the 22nd study of the Energy Modelling Forum (EMF-22)
- Contributing Author of IPCC's Fourth Assessment Report.
- Contributing Author of the quantitative analysis and methodology chapters of the scenario part of the Millennium Ecosystem Assessment.
- Co-author of contribution to Global Biodiversity Outlook 2 of the Convention on Biological Diversity (CBD).
- Member of Stanford University based Energy Modelling Forum.

Berien Elbersen

(Alterra, Wageningen University and Research Centre, The Netherlands)

Contact: Berien.elbersen@wur.nl

Dr. Berien Elbersen is a Geographer who obtained her PhD in rural Geography. She is a senior researcher at the Alterra research institute based in Wageningen, The Netherlands. In her present position she has been working as researcher and coordinator in major European projects for more then 15 years, focussing mainly on the relationships between changes in farming and effects on land use, environment and biodiversity. She has a substantial inter-disciplinary knowledge on environmental aspects of land use in general and biomass production in particular.

Over the last 6 years she worked in several research contracts for the European Environment Agency and delivered significant contributions on most of the major bioenergy reports.

Relevant European projects to which she contributed include the most recent study tendered by DG-AGRI on developing the High Nature Value farmland indicators under the Rural Development Programme within the Common Monitoring and Evaluation Framework (CMEF). She also delivered significant contributions for the IRENA study in which 35 agri-environmental indicators were developed for monitoring the integration of environmental concerns into the Common Agricultural Policy. Since then she coordinated the EEA contract study on assessing the potential impact of large-scale biofuel production on agricultural land use, farmland habitats and related biodiversity. At present Dr. Elbersen is coordinating the CCAT study on assessing the impacts of Cross Compliance on farm income, environment, landuse, landscape, biodiversity, public health and animal welfare.

Alan Bond

(School of Environmental Sciences, University of East Anglia, UK)

Alan Bond is Senior Lecturer in Environmental Management at the University of East Anglia, is currently Course Director of a full-time MSc programme on Environmental Assessment and Management and has 15 years experience in Environmental Assessment. Alan sits on the Technical Sub-committee of the Institute of Environmental Management and Assessment (IEMA).

He has undertaken research funded by the European Commission examining appropriate environmental assessment approaches for geological repositories for nuclear waste, and for decommissioning nuclear power plants; other Commission-funded research has identified how best to consider cultural heritage within Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA).

In the UK, Alan has conducted work for the Department for Environment Food and Rural Affairs (Defra) examining the compatibility of the Managing Radioactive Waste Safely programme with both the Strategic Environmental Assessment Directive and Sustainability Appraisal (SA) as applied to spatial plans, and is currently involved in a RELU-funded project using Sustainability Appraisal to examine the environmental, social and economic implications of different biomass planting scenarios in the UK.

Neil Judd

(ProForest, UK)

Qualifications

M.Sc. Forestry and Its Relation to Land Use, University of Oxford
B.A. (Hons) Pure and Applied Biology, University of Oxford

Experience

Neil Judd is a director and co-founder of ProForest and has been working with developing, implementing and auditing standards for responsible natural resource management for nearly 20 years. He has wide experience with a range of certification systems, and has worked throughout the world. His experience has related mainly to certification systems and responsible procurement in the forest sector, but he is now involved in developing and delivering comparable services related to other agricultural commodities. Neil led the successful RSPO processes to develop sustainability criteria and an accompanying certification system. Prior to his present range of responsibilities at ProForest, he spent 7 years working for the largest FSC-accredited certification programme, including 5 years managing the programme. Previous posts also included broad-based project management experience in ecological appraisal and habitat creation, assessment and implementation of environmental management systems, and impact assessment.

Career summary

2002 - present	Director of ProForest.
1997 - 2002	Manager and then Director of the FSC-accredited SGS QUALIFOR Forest Certification Programme.
1995 - 1996	Forestry Services Manager for SGS Malaysia.
1994 - 1995	UK Environmental Manager for Bureau Veritas Quality International (BVQI).
1990 - 1994	Senior Environmental Consultant for P-E International/David Bellamy Associates.
1988 - 1990	Forestry Consultant at the Oxford Forestry Institute (OFI).

Selected publications

Higman, S., Bass, S., Judd, N., Mayers, J. and Nussbaum, R. (1999) The Sustainable Forestry Handbook. Earthscan Publications Limited, UK. 289 pp.

4. Briefings

4.1. General introduction - Technical aspects of sustainability criteria

4.1.1. Delivering a sustainable market for biofuels

by Greg Archer, LowCVP - Low Carbon Vehicle Partnership, UK[1]

Introduction

This paper has been prepared to complement a presentation to a European Parliament workshop addressing sustainability criteria for biofuels. The presentation is based upon work undertaken by the Low Carbon Vehicle Partnership[2] (LowCVP) for the UK Government in the development of carbon and sustainability (C&S) reporting as part of the Renewable Transport Fuels Obligation (RTFO). On a number of points of detail there is presently no consensus amongst LowCVP members. The views expressed do not therefore represent an agreed position of the Partnership. This paper and the presentation to the workshop address:

- The sustainability challenge for biofuels
- Sustainability criteria
- Issues in demonstrating compliance with mandatory criteria:
  - Constraints imposed through World Trade Organisation (WTO) rules
  - The roll of bilateral agreements
  - Chain of custody issues
- Incentivising biofuels with lower carbon intensity
- Managing indirect effects through setting appropriate targets
- Conclusions and the roll of stakeholders.

Silver bullet or pariah fuel?

In the past 3 years the public acceptability of biofuels has significantly declined. In 2005/6 UK non-governmental organisations (NGOs) were campaigning for the introduction of the RTFO to encourage supply of biofuels and industry was proudly proclaiming new investments in production. By summer 2007, the views of many environmental NGOs had switched and a UK campaign generated over 6000 letters urging the Government to "Choose the right biofuel or the orang-utan gets it!" More recently the opposition against biofuels has hardened and an on-going campaign by the Royal Society of the Protection of Birds (RSPB) to stop the introduction of the RTFO has generated over 13,000 emails in a few days.

The reality is that biofuels were never a silver bullet and the right biofuels produced in the right way in the right place and crucially in the right volumes are part of the solution to tackling rising road transport greenhouse gas emissions. Achieving a market of genuinely sustainable biofuels requires intelligent policy design to create incentives that encourage supply of the right biofuels and prevent rewards for unsustainable production. It also requires targets to be set that recognise constraints on land and indirect risks of rapid and unmanaged expansion of biofuel production globally.

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[1] greg.archer@lowcvp.org.uk; 44 (0)207 3407060; www.lowcvp.org.uk

[2] LowCVP is a multi-stakeholder organisation of over 275 organisations established to accelerate a sustainable shift to low carbon vehicles and fuels and thereby create opportunities for UK companies. LowCVPs members include energy and motor industry companies and their supply chains, major fleet operators, academics, consumer and environmental organisations. Amongst LowCVP members there is a consensus that for biofuels to deliver their potential, supply must be linked to strong policies that reward greenhouse gas saving and prevent wider environmental degradation or social inequality.

Sustainability criteria

There is broad agreement regarding the key sustainability criteria for sustainable biofuels. Both the independent Cramer Commission in the Netherlands and the Low Carbon Vehicle Partnership, a multi-stakeholder organisation in the UK, concluded there are 7 principal direct impacts of biofuel feedstock production:

- Conservation of carbon
- Conservation of biodiversity
- Soil conservation
- Sustainable water use
- Protecting air quality
- Workers rights
- Protecting land rights

Other organisations, such as the Round Table on Sustainable Biofuels have reached similar conclusions. In addition to the direct effects there are also important indirect effects of increasing biofuel supply upon land use and food and other commodity prices. Economic benefits arising from feedstock cultivation should also be realised by local community. These indirect effects are beyond the influence or management of individual biofuel suppliers but will become increasingly important to manage as supply of biofuels increases.

The mandatory criteria proposed by the European Commission in the proposed Renewable Energy Directive to exclude fuels produced on areas of high conservation value and high carbon stocks are a good starting point, and focus upon key concerns. However, the proposed Directive only addresses a small proportion of the total direct environmental effects and none of the social issues. Extending the scope of issues addressed by mandatory criteria to cover a wider range of issues, such as soil conservation and sustainable water use is clearly desirable. However, this can only be done if simple, clear indicators can be identified that can be rigorously enforced and meet World Trade Organisation Rules.

Given the limited scope of mandatory requirements, an enhancement to the Directive would be to include a complementary reporting requirement to address wider environmental concerns and social issues that WTO rules do not allow as a basis for exclusion. The UK carbon and sustainability (C&S) reporting requirements as part of the RTFO encourage supply of feedstock that has been produced according to voluntary agri-environmental and social schemes that deliver genuine environmental or social improvements. Each scheme has been benchmarked against a “gold standard” for sustainable biofuel production to determine whether these meet an acceptable level of performance. Public reporting of company performance describe the origin and feedstock, GHG-savings, standards used in cultivation and any resulting land-use change. The publication of reports comparing individual company performance uses corporate responsibility commitments and public-relations risks to encourage companies to source biofuels responsibly. In particular this will help to address social concerns regarding land and employment rights that are otherwise excluded from the Directive.

Enforcement

A key challenge is to robustly demonstrate mandatory requirements or other claims requirements are being met. Principal effects of biofuels arise upstream of their production during cultivation requiring actions at the farm or plantation to deliver sustainable feedstock.

A system to transfer information on the provenance of the feedstock through global supply chains is also required. In markets for food and feed commodities that, to date, have given little attention to demonstrating the environmental performance of feedstock this is a new requirement and was the principal reason the UK Government has phased in its reporting requirements and only proposed to introduce mandatory criteria in 2010/11.

The Renewable Energy Directive proposal to allow voluntary schemes and bilateral agreements to demonstrate compliance with mandatory requirements is flexible and pragmatic and mitigates some of the risk of successful World Trade Organisation (WTO) challenges. However, the European Commission will need to ensure auditing requirements are both robust and consistently implemented. For example, the UK C&S reporting scheme does not assume national laws in supplying countries will be adhered to unless there have been annual independent checks demonstrate this. Similarly, the UK scheme does not assume produce produced under Cross Compliance requirements (that EU farmers must meet to receive EU Farm Support Payments) delivers an acceptable level of environmental performance. This is since Cross Compliance requirements are not consistently implemented between member states and inspection need only occur for 1% of farms (compared to 100% on independent schemes).

The Renewable Energy Directive proposal to use a mass balance approach to track produce through the supply chain is sensible. This requires each part of the supply chain to track the amount of feedstock it purchases that meet specified standards and ensure it does not sell more than it has received. It does not require the expensive physical segregation of the product as in a track and trace approach. The scheme should be designed in a way that enables each part of the supply chain to gain value from supply of sustainable feedstock but ensure at no point can a supplier provide more sustainable feedstock than they have received. This will require independent checks of producers and suppliers and are an issue requiring further consideration in the Directive. The European Commission should invite CEN to develop a European Standard that could be operated by companies to demonstrate compliance with chain of custody requirements against which independent annual audits can be conducted.

The UK scheme also uses mass-balance as the basis for the chain of custody, but is flexible in permitting other systems including book and claim schemes – where these can demonstrate a robust system and not lead to double counting. Greenpalm are in the process of establishing a book and claim scheme as part of the Round Table on Sustainable Palm Oil (RSPO) and the European Commission should not wait until 2010 to review whether such schemes are reliable but encourage the development of robust schemes now.

Trade rule constraints

A key concern in implementing mandatory criteria is whether these meet WTO rules. Distinguishing between products on environmental grounds is permissible under trade rules – subject to certain conditions being met. However, rules are complex, case-law very limited and likely outcomes, were a case to be brought, highly uncertain. For example, whether biofuels are classified as an agricultural, industrial or environmental product will influence how the rules are applied.

Under trade rules there is a good basis for a policy to reward low carbon intensity fuels – such as by awarding more certificates or allowances to these fuels. This is since biofuels are intended to reduce GHG-emissions for which there is an international protocol (Kyoto) and international standards for life-cycle assessment. However, establishing a minimum level of GHG-savings is more difficult to justify under trade rules since 35% is a seemingly arbitrary threshold making the approach more open to challenge. The legitimacy of double rewards for specific advanced technologies is also legally questionable.

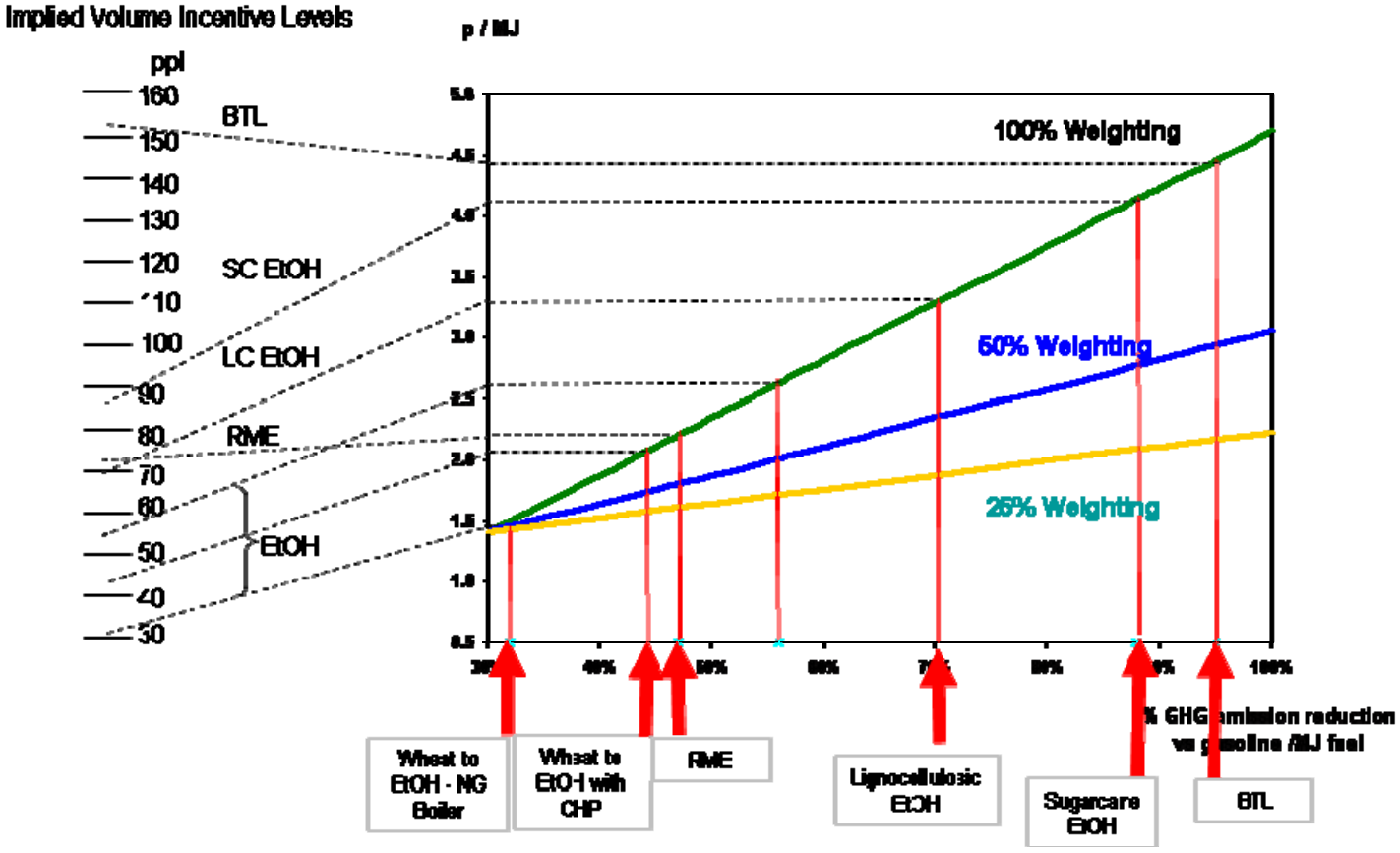
The approach proposed in the Fuel Quality Directive to incentivise production of low carbon intensity fuels is more likely to be acceptable to WTO rules than the threshold approach proposed in the Renewable Energy Directive.

Whether the proposed mandatory criteria in the Renewable Energy Directive are permissible is uncertain. Trade rules do allow distinctions between products based upon how they are produced, but the 2008 cut off date and failure to allow supplying countries time to adapt makes the policy more open to successful challenge. For the proposals to clear the WTO hurdle negotiations should begin urgently with major suppliers and adequate time allowed for exporters to adapt to new requirements. Design of the requirements to comply with WTO is essential since in the highly politicised environment of trade talks over agricultural products challenge is quite likely and will take several years to resolve.

Promoting good GHG-savings

One of the key policy issues for biofuels is how to stimulate supply of low carbon intensity fuels that deliver good GHG-savings. Current European Commission proposals within the Renewable Energy and Fuel Quality Directives are inconsistent.

A minimum threshold is an ineffective mechanism to encourage increased GHG-savings since there is no incentive for fuels to achieve over the threshold. The level of GHG-savings delivered by a biofuel varies widely depending upon how the feedstock has been cultivated, transported and processed. For example LowCVP found production of ethanol from wheat can deliver savings of between 7 and 77%. Policy needs to reward fuels based upon their lifecycle carbon intensity and to not select specific feedstock or technologies for an arbitrary additional reward that can be expected to be challenged at the WTO.



The image shows LowCVP work in progress examining options for linking reward of biofuels to their carbon intensity – as the UK Government has proposed to do from 2010 (subject to agreement at an EU level). The graph illustrates for a range of fuels the implied volume incentive in pence per litre. The figures are dependent upon a range of assumptions but the underlying message is that such a linkage could create appropriate market conditions for advanced fuels and encourage production pathways delivering higher GHG-savings. There are a range of options as to the extent to which additional GHG-savings are rewarded – shown on the slide as a 25, 50 or 100% weighting. LowCVP is currently undertaking a range of sensitivity analysis using the model to examine the optimum design for an obligation scheme that rewards lower carbon intensity fuels.

Indirect effects

Recent concerns regarding biofuels have focused on indirect effects, specifically: how demand for biofuels is creating pressure to deforest and convert permanent pastureland with loss of carbon stocks and biodiversity. Rising food prices have also led to food security concerns. These indirect effects are a risk but the relative contribution of biofuels to these issues presently small. This is since biofuels represent a tiny proportion of grain, oil seed and sugar markets. Increased biofuel demand is adding pressure on land availability but so are increases in global population, in meat consumption and a range of other drivers.

It is erroneous to assume each hectare of biofuel production leads to displacement of a similar area of natural ecosystem – and therefore suggest any level of biofuel production will cause an overall increase in GHG-emissions. This is since yields increase, significant areas of land are presently idle and by-products produced alongside biofuels will displace the need for cultivation of some animal feed. Furthermore, technology advances offer the potential for advanced technologies that use waste products, wood residues or the whole crop with no or reduced demand upon land.

The pressure on land created by increasing production of biofuel feedstock and resulting indirect effects cannot be ignored. In design of the Renewable Energy and Fuel Quality Directives European Institutions must set appropriate targets to manage the risk. For example; research should be commissioned to examine whether incentives for biofuels should be based upon the carbon intensity per hectare to recognise the benefits of feedstocks with lower land demand.

Recent US research, notably by Tim Searchinger[3], has found the effect of increased biofuel demand on land use causes increased GHG-emissions. Other research has critiqued the analysis and questioned some assumptions including projections of future demand and the appropriateness of modeled improvements in yield and production efficiency. The impact of producing a high protein value DDGS (Dark Distilled Grains and Solids) by-product upon land for feed production also requires more detailed consideration. Searchinger has clearly identified a significant risk that indirect land change from increased biofuel production may negate GHG-savings. This risk should be taken into account in EU policy development - particularly future target setting. However, further evaluation of the likely scale of indirect effects of land-use changes requires further detailed consideration to draw definitive conclusions.

[3] Use of US croplands for biofuels increases greenhouse gas emissions through emissions from land use change, (2008), Searchinger et al, Sciencexpress 7th February 2008

The UK Government has recently asked the Renewable Fuels Agency (RFA), to examine indirect effects of increasing demand for biofuels. The terms of reference are presently being developed but will focus upon the extent to which increased biofuel production is leading to deforestation and conversion of permanent pasture and implications of future targets for biofuels. In conducting the review the RFA will ensure stakeholders have ample opportunity to contribute, work closely with European institutions and draw upon expertise globally. Initial findings will be published in the early summer following a trawl of available evidence.

Conclusions

European biofuels policy is presently driven by the competing and conflicting needs to reduce transport GHG-emissions, provide markets for European farmers and address security of supply concerns. This is creating policy distortions undermining the credibility of biofuels. Biofuels are not a silver bullet for reducing transport GHG-emissions but supplied in modest volumes through sustainable production processes that incentivise low carbon intensity fuels they can make a useful contribution.

The security of supply benefits are at best modest and oil consumption in the EU is rising steadily offsetting benefits from increased biofuels consumption. Supply concerns are more effectively addressed by improving vehicle efficiency and encouraging the switch to less carbon intensive modes. The agriculture sector will benefit from increased cultivation of feedstock for biofuels, but policy must be focused upon ensuring this is delivered sustainably and achieves worthwhile climate benefits. An unsustainable market for biofuels discredits the product and will eventually undermine the political support and subsidy upon which the market is (presently) based. This will ultimately reduce benefits for rural economies. A sustainable market for biofuels is achievable but the EU needs to act strongly to create appropriate conditions. Specifically it should:

- Link incentives for biofuels to their lifecycle carbon intensity in a technology neutral manner – as proposed in the Fuel Quality Directive
- Ensure there are rigorous annual audits of farms or plantations to ensure mandatory criteria are being met
- Ask CEN to develop a European Standard for chain of custody arrangements that companies can operate to demonstrate systems are robust
- Encourage sustainable production by encouraging suppliers to join the RSPO and other commodity schemes and allow the use of robust book and claim schemes
- Commence negotiations in the WTO and with key supplying nations to manage the risk of successful challenge to mandatory criteria under trade rules
- Broaden the scope of issues addressed by mandatory criteria by introducing a complementary reporting requirement including other environmental and social concerns.

The Council of Ministers commitment to 10% biofuels by 2020 (based upon energy content) recognised fuels had to be delivered sustainably. Emerging evidence regarding indirect effects suggests it is premature to mandate this level at the current time. European institutions should work with the UK on its review of indirect effects to assess the scale of issues and inform the future level of targets that should be based upon GHG-saving. In the meantime the focus of policy should be on delivering existing targets sustainably using low carbon intensity fuels.

All stakeholders have a responsibility to ensure biofuels realise their potential as a renewable transport fuel:

- Fuel suppliers must source feedstock sustainably and process it using efficient techniques

- Member states must rigorously enforce sustainability criteria
- EU institutions must establish policy and targets that deliver sustainable biofuels
- Some environmental organisations should stop scaremongering and campaign more honestly in their attempts to halt deforestation. If not, they may stop the emerging biofuels industry and opportunities created by advanced technology. This will remove an effective mechanism to reduce GHG-emissions and do nothing to address deforestation.

The right biofuels policy can deliver benefits for all; the wrong policy will ultimately destroy the credibility of the industry and harm the planet.

4.2. Criteria related to CO_2 efficiency/saving and land use change

4.2.1. Criteria related to net greenhouse gas emissions savings

by Nigel Mortimer, The Royal Society - The North Energy Associates Ltd.,UK

The Royal Society report on "Sustainable Biofuels: Prospects and Challenges"[4] concluded that biofuels have a potentially useful role in tackling global climate change and energy security. However, sound and robust policy frameworks are needed to ensure that they can realise this potential. Even so, biofuels must be regarded as only one component of the comprehensive package of measures required to achieve the ultimate goal of sustainable mobility as the real solution to the problems posed by transport. It is necessary to distinguish between different biofuels that are derived from different biomass feedstocks by different processes as these determine actual greenhouse gas (GHG) emissions savings. This is apparent when practical biofuels production by commercial developers is examined in detail. In this regard, not all biofuels are the same and effective policy needs to address this correctly.

Life cycle assessment (LCA) is the well-established technique which is applied to estimate the total GHG emissions associated with the complete process chain involved in producing biofuels. In this context, the most prominent GHG emissions are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). The complete process chain that has to be addressed extends from cultivation and harvesting of a biomass feedstock, transportation, possibly drying and storage, to processing or conversion into the biofuel, and its final distribution. The details of these chains, which depend on the technology choices, affects associated GHG emissions. To assist policy development, net GHG emissions savings are normally calculated which are measured relative to the total GHG emissions associated with the production and combustion of conventional transport fuels such as petrol and diesel.

There are a number of important issues that arise from the LCA of biofuels. One concerns the methodologies adopted to undertake the GHG emissions calculations. Such methodologies affect the systems boundaries (how far the calculations extend), the evaluation of nitrous oxide emissions from cultivated soils (mainly caused by the application of nitrogen fertiliser), reference land use (related to the alternative use of land for biomass feedstock cultivation), and allocation procedures (how GHG emissions are divided between co-products). Unfortunately, there are different methodologies available and these can generate quite different results in terms of net GHG emissions savings, especially as a result of the choice of allocation procedures.

[4] http://royalsociety.org/displaypagedoc.asp?id=28632

There are scientific uncertainties and lack of data associated with the evaluation of soil N_2O emissions. These can have a significant effect on net GHG emissions savings. However, it is expected that these issues will be resolved in the foreseeable future. Concern over reference land use has become a more substantial issue. This relates to the release of very large quantities of CO_2 from land used to grow biomass feedstocks or the food crops which have been displaced by the production of biofuels elsewhere. Cultivation, for any purpose, of land which currently stores large amounts of carbon is a serious problem for global climate change.

The significance for biofuels has been investigated in terms of the carbon burden repayment time which is the number of years required to accumulate sufficient net GHG emissions savings to balance the initial release of carbon from land cleared for cultivation. In the worst cases, carbon repayment times can extend over hundreds of years.

The key points which can be drawn for GHG criteria are that biofuels can deliver real net GHG emissions savings provided that they are produced within an appropriate policy framework with suitable implementation mechanisms. Hence, an agreed and harmonised methodology is required for GHG emissions calculations. Any targets for biofuels utilisation should be driven by proposed GHG emissions reductions rather than arbitrary volume levels of production. Such GHG emissions saving targets should be expected to encourage correct technology choices. Current volume targets are sufficiently high to promote the cultivation of land overseas, either to produce biofuels directly or to grow crops displaced by the production of biofuels elsewhere. Consequently, to prevent unintended contributions to global climate change, it should be a general rule for all development that the destruction of carbon stores should be avoided whenever possible. Practical and effective measures will be needed to achieve this globally.

4.2.2. Sustainability criteria for biofuels: greenhouse gases and land use change

by Bas Eickhout, The Netherlands Environmental Assessment Agency, MNP

Introduction

Biofuels are in the centre of attention, given their questioned sustainability aspects. Most of the discussion focuses on greenhouse gas impacts, biodiversity concerns and concerns for food security (Doornbosch and Steenblik, 2007; Righelato and Spracklen, 2007; Fargione et al., 2008; and Searchinger et al., 2008). Therefore, the issue of sustainability criteria for biofuels has been raised (EP, 2007a; EC, 2008). Here, the discussion is focused on greenhouse gas reductions and land use change.

Greenhouse gas reductions

One of the most important advantages that biofuels have over fossil fuels is their assumed lower greenhouse gas (GHG) emissions in the production chain. In the proposal of the European Commission it is stated that the greenhouse gas reduction due to the use of biofuels, needs to be at least 35% (EC, 2008). The European Parliament has set a reduction target of 50% (EP, 2007), in the amendments to the Fuel Quality Directive of the European Commission (EC, 2007).

To calculate this greenhouse gas reduction, several aspects of the production process need to be considered. The following elements might have a significant impact on the results:

- The assumed or actual crop yield.
- Carbon emissions because of land use changes (if relevant).
- N_2O emissions which can be attributed to the production of the biomass crop.
- Emission due to processes in the production chain, especially CO_2 and N_2O emissions in the chemical industry of fertiliser production.
- The use of biomass for process energy in the production chain.
- The allocation method of by-products.

The above-mentioned issues indicate that a target for required greenhouse gas reductions alone is not enough. The impact of some of the different assumptions, as mentioned above, is quite different per production chain. In Figure 1, the greenhouse gas reductions per production chain is given. The first set of assumptions is about the use of bioenergy in the production chain and the best available technology in fertiliser production. In the production chain, energy is needed for transport and processing. In most cases, the input is fossil energy, but also biomass can be used as a resource. For products like sugar cane and wood ethanol or wood based Fischer-Tropsch diesel, bioenergy is already assumed to be normal practice. For others it is not, but it might be a way to increase the greenhouse gas reduction rate. It should be realised that, in these cases, land use will increase.

Another crucial uncertainty is how allocation of by-products is considered. Here, three different steps are considered. Firstly, no allocation of by-products is applied, leading to the lowest greenhouse gas reductions for traditional biofuels. Secondly, allocation of by-products based on the energy value of these products, like glycerine or animal feed, is assumed. This approach is the proposed methodology in Appendix VII-C of the proposal of the European Commission (EC, 2008). Thirdly, substitution of fossil products or animal feed with by-products of biofuels is assumed. For example fossil glycerine is substituted by bioglycerine, and animal feed can be a substitute for soy meal, with corrections for the soy oil. The greenhouse gas reduction rate increases when more by-products can be used.

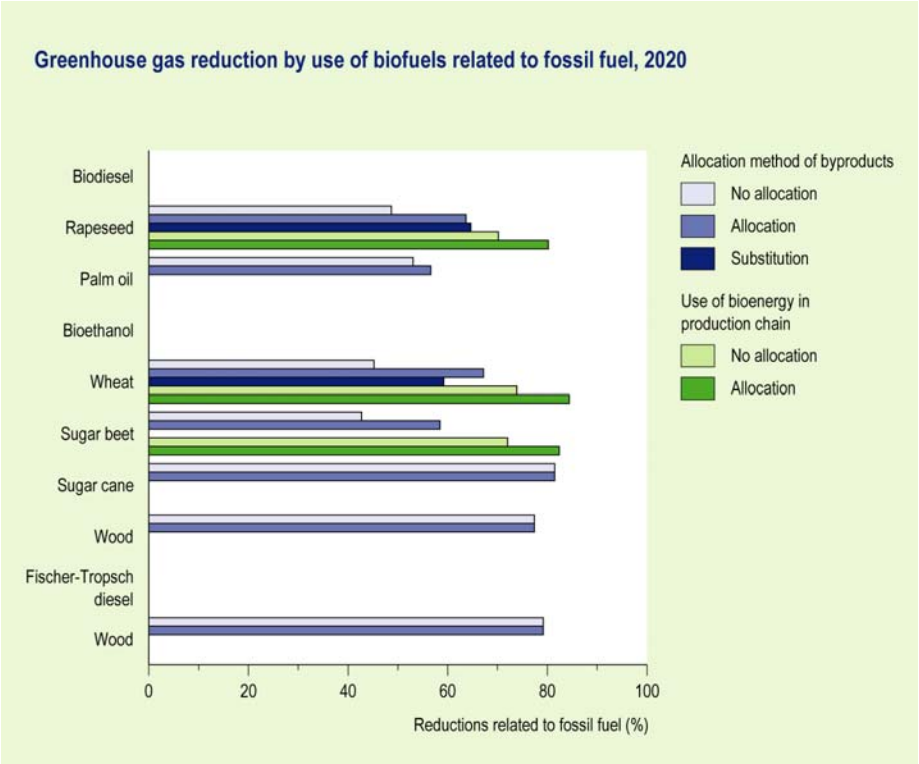


Figure 1: GHG savings according to MNP calculations for different aspects (on the basis of Hamelinck and Hoogwijk, 2007 and Ros and Montfoort, 2006). Use of bioenergy in production chain also refers to best available technology for fertiliser use. Allocation method is energy based as in the Commission's proposal (EC, 2008). Substitution refers to substitution of soy meal as animal feed and fossil glycerine (Eickhout et al., 2008).

Figure 1 shows that the methodology of handling by-products is a crucial step for achieving greenhouse gas reductions. The difference between the energy based allocation method and the substitution method, seems quite acceptable. Clearly, Figure 1, shows that a reduction criterion is very dependent of the chosen calculation methodology.

Fertiliser use

However, the issue of fertiliser use has hardly been mentioned. In the proposed methodology of the European Commission (Appendix VII-C; EC, 2008), fertiliser use should be considered. However, it hardly addresses the issue that fuel production per hectare and farmers income will increase with higher doses of fertiliser. Therefore, a target for biofuels will automatically introduce an incentive for increased use of fertiliser. Moreover, biodiversity concerns are another incentive to minimise the area that is used for biofuels. Clearly, intensification through fertiliser use will be one of the impacts of the Commission's proposal.

Fertiliser use will lead to additional N_2O emissions, decreasing the GHG reductions. Figure 2 shows this trade-off for rapeseed biodiesel: the GHG reductions are declining when high N application rates are applied. When only default values from the proposal are used (36% reduction for rapeseed biodiesel) and farmers use a lot of fertiliser to optimise their income, the 'actual' GHG reductions become very uncertain. For other production chains the results will be different (Smeets et al., 2008) and probably for each production chain an optimal N application rate can be distinguished. This aspect is not considered sufficiently in the Commission's proposal and shows the complexity of the problem that is introduced by the target of 10%.

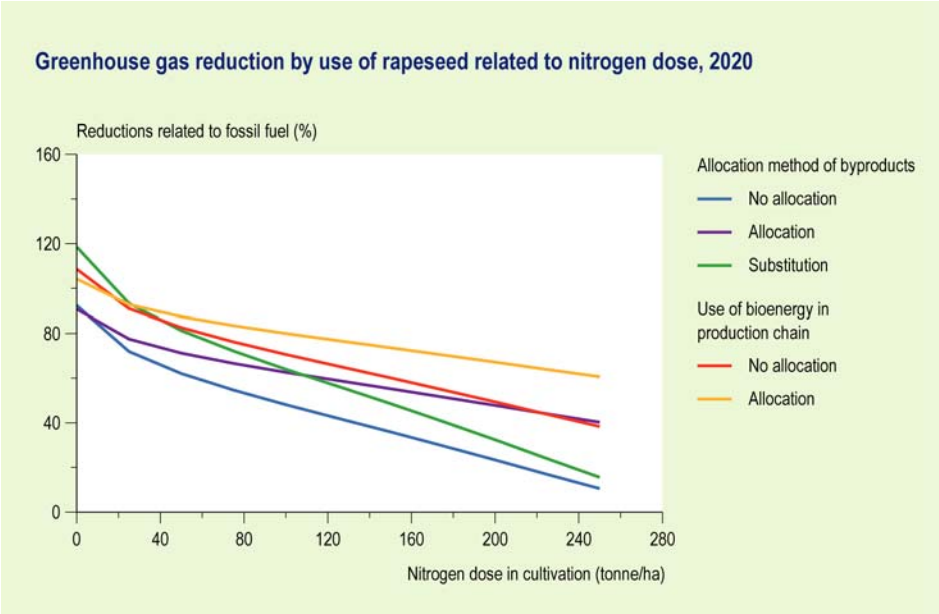


Figure 2 GHG savings for different N application rates, for different allocation rules of by-products in the case of rapeseed (Eickhout et al., 2008).

Land use change

To analyse the impact which the growing demand for biofuels has on land use, the five most important food crops -used for production of first generation biofuels- are selected: wheat, corn, oilseeds (e.g. rapeseed, sunflower and soybean), palm oil and sugar cane. The production of these crops utilise about one third of the total in global arable land area and one eighth of the total in globally utilized as agricultural land (OECD/FAO, 2007).

In 2000, the total global area that these crops took up was around 500 Mha. According to the OECD-FAO Outlook, this area is expected to reach 555 Mha in 2020. Of this total, the area used for biofuels is expected to increase from 4 Mha in 2000 (less than 1% of the total area of wheat, maize, sugar cane and oilseeds) to 35 Mha in 2020 (more than 6%), assuming default developments (OECD/FAO, 2007). This scenario shows that 60% of the land increase between 2000 and 2020 will be due to the demand for biofuels, and that 40% will be due to the demand for food and feed. The development of biofuel areas is visualised in Figure 3 (left panel).

Now, additional biofuel policies are implemented. The United States are aiming at a production of 132.6 billion litres of bioethanol in 2017 (35 billion gallons). The European Union has set a 10%-target in 2020 for the transport sector (EC, 2008). When the United States and EU targets are both considered, the size of the area needed for biofuels increases to around 60 Mha in 2020 (Figure 3; right panel; Eickhout et al., 2008). The additional demand shows that between 2000 and 2020, 70% of the increase in required land is due to the demand for biofuels and 30% is due to the demand for food and feed. The resulting biofuel area constitutes almost 10% of the total area of wheat, maize, sugar cane and oilseeds (581 Mha). With existing technologies (‘first generation’), an area of 20 to 30 million hectares is needed for the production of biofuels for the European target alone (Eickhout et al., 2008).

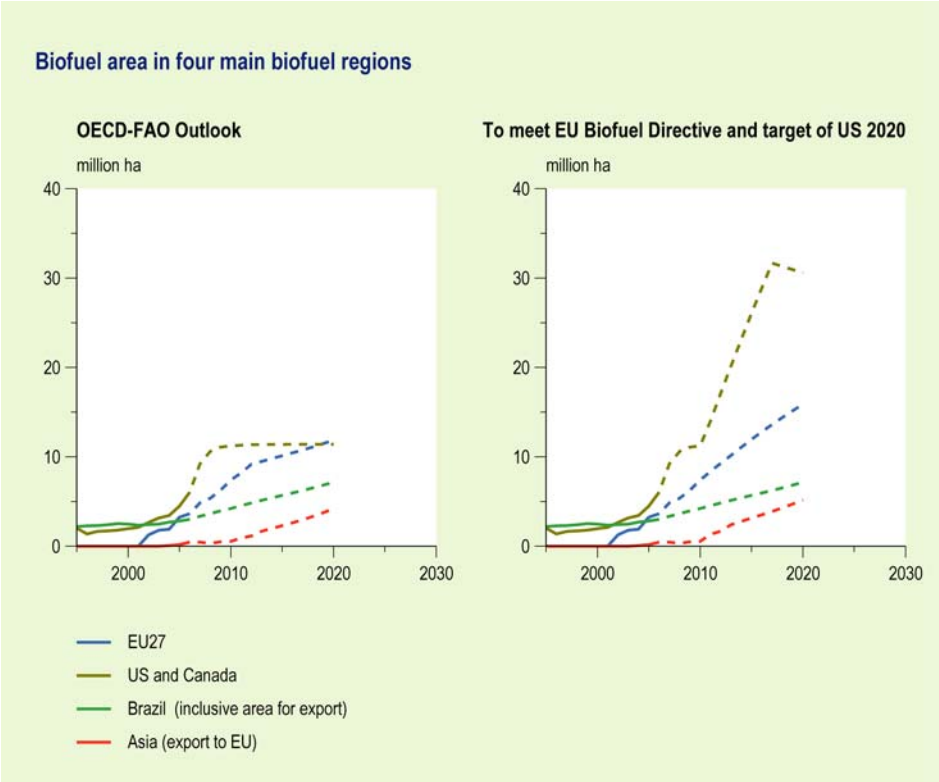


Figure 3: Size of biofuel area in EU, US, Canada, Brazil and Asia, according to OECD/FAO (left panel; 2007) and while meeting the United States and EU targets in their own regions (right panel; Eickhout et al., 2008).

Potential within the EU?

The amount of required land for the biofuel target is not likely to become available within Europe. Studies that do show the availability of large amounts of land, usually assume full liberalisation of European agricultural policies, using a considerable amount of set-aside land and the diverting of existing land use (EEA, 2006; EC, 2007b). However, such a drastic reform of European agriculture is not likely to occur within a short time frame. It is also not likely that land which is best suited for large-scale biofuel production will become available when liberalisation will occur. Diversion of land use will not minimise total land use, globally.

More importantly, when full liberalisation of Europe's agriculture will be applied, it will be almost impossible to steer foreign biofuel production with European policies. Studies that implemented Europe's 10%-target in 2020 in a fully liberalised world (Rienks, 2008; Eickhout and Prins, 2008), concluded that more than 50% of Europe's biofuel demand would be imported. The European Commission assumes lower biofuel imports are needed to meet the 10%-target (EC, 2007b). This uncertainty is of great importance when the effectiveness of the proposed sustainability criteria is assessed. The results may change when new biofuel conversion techniques will enter the market, but large-scale applications before 2020 are unlikely.

Greenhouse gas reduction per hectare

Since global land use is expected to change, the impact of land use emissions are important.

Based on the values of the European Commission, soil emissions of 18 tonnes/ha per year are calculated for the conversion of permanent grassland or lightly forested area into arable land (EC, 2008). Although in actual practice, there will be a large range of values, these soil emissions are very relevant. Therefore, it is important to optimise the emission reduction per hectare of cultivated land. When the results from Figure 1 are translated into avoided greenhouse gas emissions per hectare (Figure 4), it becomes clear that these avoided emissions are very dependent on the allocation method that is used in the calculation methodology.

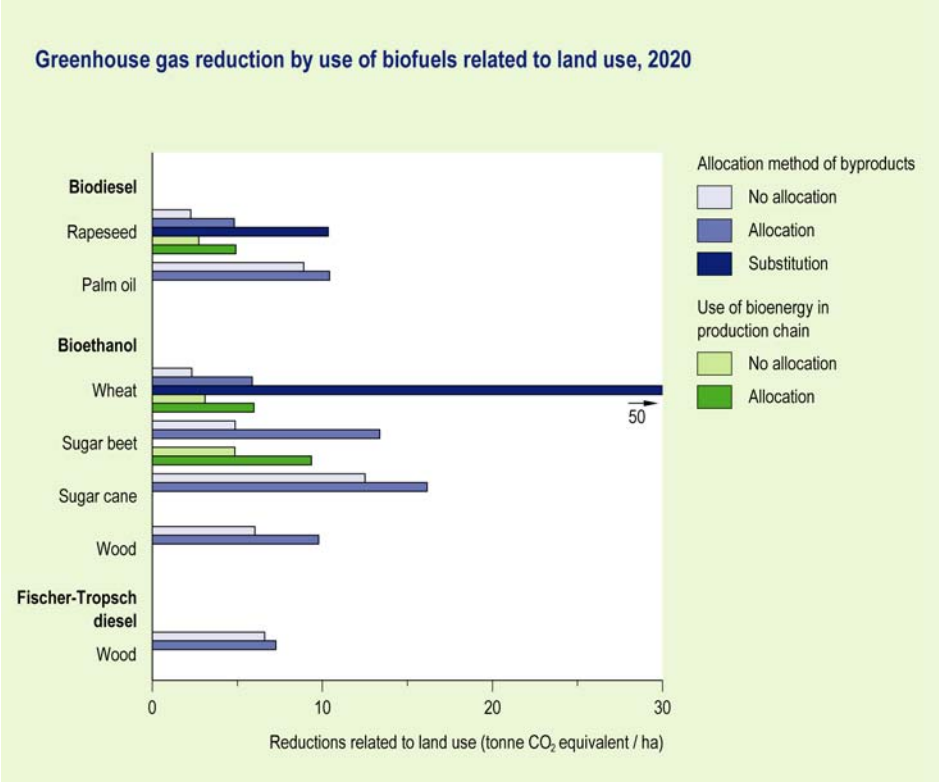


Figure 4: Avoided emissions per hectare for the same production chains and sensitivity settings as in Figure 1 (Eickhout et al., 2008).

Most of the GHG emission reductions are between 5 and 15 tonnes of CO_2-equivalent per hectare per year. Sugar cane and sugar beet are doing relatively well. However, all of these values are lower than the potential soil emission of 18 tonnes/ha per year. With this kind of land conversion, the biofuels could not comply with the criterion of 35% or 50% reduction. To prevent unwanted land use changes, criteria should steer more directly to land that is allowed to be used instead of land that may not be used.

Concluding

A strict target for biofuels on the short term will ask for additional land, probably, to a large extent outside the EU as well. Sustainability criteria can prevent undesired land use changes, but this will not be sufficient to prevent displacement of agriculture. Clear definitions of the greenhouse gas accounting calculations need to be made; otherwise greenhouse gas reductions can vary to a large extent.

Probably, it is better to think of criteria that address the required greenhouse gas reduction per hectare, since such a criterion combines greenhouse gas reductions with land use change.

In total, the most energy efficient route of biomass should be considered. In many cases, this will not result in biomass for transport (as biofuel). For the longer term, other routes for the transport sector are possible, like plug-in cars and hydrogen. Policy targets should aim more at these long-term goals.

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4.3. Criteria related to biodiversity and water

4.3.1. Biomass cropping and risks for biodiversity loss.

by Berien Elbersen,Alterra, Wageningen University and Research Centre

The wider, qualitative relationship between several farming practices such as the use of pesticides, herbicides, nutrient inputs, tillage, irrigation, changes in landscape structure on soil organisms, invertebrates, birds, plants and mammals have systematically been described in several publications and have shown to have caused major declines in farmland biodiversity[5]. This increased food production generally went together with a loss of very large areas of permanent grassland, dry steppe grasslands and wetlands which were replaced by arable agriculture with a huge loss of biodiversity[6]. The process of polarisation in which iIntensification shows a heavy impact on farmland biodiversity but also abandonment of agricultural land use has an adverse effect, especially in semi-natural areas created by extensive livestock farming (EAA, 1999 and 2005).

The substantial rise in the use of biomass from agriculture for producing transport fuels and energy can put an additional pressure on farmland biodiversity in the same way as the increased demand for food and feed crops did as described in the beginning of this paper. In the following the main principles will be explained to understand in which way farmland biodiversity may be adversely affected by an increased demand for agricultural biomass feedstock.

Generally, the production of biomass for bio-energy from arable farming is not fundamentally different from the production of food and feed especially if it concerns rotational arable crops used for starch (e.g. cereals, maize), sugar (e.g. sugar beet, sweet sorghum) and oil crops (e.g. oil seed rape, sunflower). If it concerns a conversion to perennial ligno-cellulose biomass crops (e.g. miscanthus, switchgrass, short rotation coppice willow or poplar) the net-effect will more often include positive benefits for biodiversity[7].

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[5] e.g. Buckwell & Armstrong-Brown 2004; Wadsworth *et al.* 2003; Boatman et al., 1999; MAFF, 1998; Pretty, 1998; EPA, 1999; Campbell and Cooke, 1997

[6] Carey (2005) refers to serious declines in some species associated with arable farmland in the late 20th century of which evidence is shown in many studies based on national monitoring and long-term studies of birds, butterflies, beneficial invertebrates and annual arable flowers (Birdlife International, 2004; Vickery et al., 2004; Asher *et al.*, 2001; Baillie *et al.*, 2001; Donald *et al.* 2001, 2002; Aebischer, 1991; Donald, 1998; Sotherton, 1998 etc.).

[7] The biodiversity effects of perennials is fundamentally different from arable crops. 1) they can be regarded as permanent crops with a rotation time of at least 15 years; harvest of the biomass will only start after 2 to 5 years. 2) input use and machinery requirements are much more limited than with arable crops. This is generally also the case with respect to water use, especially for the Miscanthus and Switchgrass. 3) From an erosion risk perspective, these crops provide good soil protection. Some of the varieties of these crops were even developed for this purpose (e.g. Switchgrass). The effects of these crops on landscape structure can be significant, as they become rather tall (2-5 meters). However, when grown as strips, they may have a positive effect on landscape diversity and may create valuable (shelter) habitats for certain mammals and bird species.

If biomass production is going to have an effect on biodiversity it will come where extra land is needed above what is required for food production and where there is therefore a change in land use. To describe the potential effects on biodiversity a distinction needs to be made between shifts from extensive land use categories to arable land and shifts within arable land and also between types of biomass crops to which they can be converted:

1. Conversion of **extensive land use categories to arable land**. For example:

- *Permanent grass converted to arable land*. Effects on biodiversity are especially negative if this involves loss of extensive permanent grass (rough grassland or grassland with very low fertiliser input), potentially together with increased drainage and irrigation.
- *Fallow and set-aside land converted to arable land*. The effect on biodiversity will be especially large if there is a loss of long-term fallow or set aside, or a tightening of rotation that leads to generally increased use of crop protection and fertiliser.
- *Permanent crops converted to arable land*. The effects on biodiversity are especially negative if extensive permanent crops such as extensive olives and almonds and Dehesa or Montado types[8] of culture are lost and it is even worse if this land also becomes irrigated. However, if it includes the shift of intensive permanent crops (e.g. fruit trees, citrus, intensive olives and vineyards) to arable or perennial crops used for biomass purposes it could have a neutral to positive effect on biodiversity.
- *Abandoned farmland converted to perennial biomass crops (perennial grasses or short rotation coppice) or grassland*. The effect on biodiversity would be neutral if this maintains the diversity in the landscape and a low input approach is used.

2. **Shifts within arable land**. For example:

- *Increased growth of 'intensive' crops for bioenergy purposes that need greater inputs of crop protection chemicals and fertilizer*. Examples would be changes from spring to winter cereals, from cereals and oil seed crops to root crops. If cereals are replaced by oilseed rape, higher inputs can be expected, resulting in negative impacts on the affected land. Biodiversity would also be affected, both on the arable land itself and possibly on adjacent land if runoffs are strong due to bio-physical conditions. Growing maize instead of other crops usually increases erosion rates on arable land, with side-effects on associated flora and fauna. Another relevant aspect is crop rotation. There are substantive differences in terms of biodiversity between varied crop rotations and mono-cropping practices, tendencies towards less frequent rotations when shifts in bioenergy cropping are made have to be avoided.

[8] Dehesa and Montado are Spanish and Portuguese terms respectively to refer to open forests of evergreen oak species (Quercus suber and/or Q. rotundifolia) in combination with cereal growing and/or pasture (Pinto-Correia 1993). Because of the alternating tree densities, due to natural regeneration, in combination with an extensive use of the understorey, the system is highly diversified and therefore supports high levels of (often rare) species and habitat diversity (Ojeda et al. 1995).

- *Increased growth of 'extensive' crops that need lower inputs of crop protection chemicals and fertilizer*. Examples include shifts from root crops to cereals and oil seed crops, or arable crops to short rotation coppice (SRC) and perennial biomass grasses are usually beneficial to environmental resource protection. However, for biodiversity aspects a wide arable rotation and increased overall crop diversity will be potentially better than large scale SRC or energy grass plantations and will depend on scale and management.
- *A change from dryland to irrigated farmland, or from wetland to drained farmland*. Examples of the first would be a shift from cereal cropping to irrigated maize. This would put extra pressure on water resources which would have adverse effects on biodiversity in regions where water is a scarce recourse. This is certainly the case in most parts of the Mediterranean, but also in Eastern Europe, where water abstraction by agriculture is already a problem (see EEA (2005), IRENA Indicator 34 and EEA, 2004). Effects of increased water abstraction have caused salinisation and contamination of water problems, loss of wetlands and disappearance of habitats by the creation of dams and reservoirs. In general there is an important competition for (sweet) water between agriculture, urban land uses and nature in several more arid parts of Europe. The draining of wetlands for conversion into biomass crops would be even more disastrous for biodiversity as wetlands are scarce habitats of large importance for many species, especially birds.
- *A change from irrigated farmland to dry land agriculture.* This type of conversion would generally be positive as it decreases the demand for sweet water for irrigation.

Beside land use changes which may occur in Europe and which have direct and indirect effects on biodiversity we should also mention the impacts outside Europe that are occurring because of indirect land use changes. Domestic biomass cropping induces additional land requirements in other countries. These induced land use or land use changes might happen under unsustainable conditions, affecting biodiversity by habitat destruction or intensification of agriculture but also lead to an increased Green House Gas emission (e.g. Fargione et al., 2008 and Searchinger et al., 2008).

Conclusions and recommendations

It is clear that competition for land should be avoided as much as possible to prevent farmland biodiversity loss inside and outside Europe but also to come to a more efficient mitigation of GHG emissions. This can be done firstly by promoting the use of by- and waste biomass feedstock before crops and by the fast introduction of second generation biofuels needed. There are also significant potentials for bioenergy feedstocks production to occur without land use changes (use of grassland/ hedge etc. cuttings, organic waste, more efficient use of land available, using breeds achieving higher yields etc.), which in turn may even ensure further maintenance of protected habitats if done in a extensive manner.

If biomass cropping is needed try to grow it as much as possible on freed land and according to the following principles:

- Try to introduce a mix of biomass crops in order to maintain and/or increase landscape diversity and prevent a further tightening of the crop rotation.
- Try to introduce innovative low input-high yielding farming practices such as mulch systems, double cropping, mixed cropping, strip cropping.
- Aim for reduction in mechanization intensity, such as less tillage and ploughing.
- Identify drought resistant-high yielding crops for arid zones that suit existing farming systems.

Acknowledgements

This report is largely based on material extracted from published and un-published EEA reports and consultancy reports for the EEA. The main reports used are:

- Schlegel, S; Elbersen, B & Kaphengst, T (2007), Input to DG TREN consultation on "Biofuel issues in the new legislation on the promotion of renewable energy". How to avoid major biodiversity loss from land use change induced by biomass production for bioenergy?
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4.3.2. RELU-Biomass, Sustainability Appraisal and the implications for sustainability criteria in the Fuel Quality Directive

by Alan Bond, School of Environmental Sciences, University of East Anglia, UK
on behalf of RELU-Biomass

Background to RELU-Biomass

The future form of the UK rural economy and associated land uses has been the subject of considerable discussion (e.g. Policy Commission on the Future of Farming and Food, 2002; Countryside Agency, 2003) reflecting a range of pressures. A combination of agricultural and energy drivers has stimulated interest in the scope for growing and processing biomass crops as a source of renewable energy based on recent reviews or policy documents confirming the potential of biomass as an energy source (e.g. RCEP, 2004; DTI and Carbon Trust, 2004).

There are two types of energy crops currently envisaged for UK farmland, coppiced trees or grasses. The most common in terms of planting (e.g. Bauen A, *et al*., 2004; CSL, 2003) are short-rotation coppice (SRC) willow (*Salix* spp) and elephant grass (*Miscanthus x giganteus*), which the RELU-Biomass project is focussing on. These crops are physically different to current rural land uses; they are in place for 7-25 years; harvesting cycles can be long (e.g. 1-4 years), harvest is normally early spring and they are tall (3-4 m) and dense (DTI, 1999; RCEP, 2004). These factors have potential implications for visual appearance, tourist income, farm income, hydrology and biodiversity.

With respect to the other potential impacts, very little research has been carried out in the UK, or elsewhere in Europe, on wildlife use of miscanthus (RCEP, 2004). For SRC, several studies have been undertaken. Early non-commercial plantings in the UK were found to provide new habitat opportunities for a variety of wildlife. Plant diversity consisted of a mixture of pre-existing and colonising plants (Sage, 1998; Cunningham, *et al*., 2004). Although some research has been directed at ground-dwelling species (Coates & Say, 1999), invertebrate studies have mostly focussed on the crop canopy, where a variety of invertebrates have been recorded including some pests (Sage and Tucker, 1997). For birds, assessments suggest SRC supports some species not normally found in intensively managed arable crops and others that are (Sage and Robertson, 1996).

Growing energy crops may also have implications for water resources. Howes *et al*. (2002) concluded that the effects of energy crop production on water quality were likely to be beneficial (with the possible exception of sewage sludge application to SRC) due to the reduced requirement for inputs. However, there is serious concern about amounts of water needed by energy crops and the possible implications for stream flow and groundwater recharge.

With the introduction of the Water Framework Directive (European Parliament and the Council of the European Union, 2000) this concern relates not only to the direct impacts on resource availability, but also to the implications of lower flows for the ecology of water courses. There have been two major studies into the potential hydrological impacts of energy crops in the UK, both carried out by the Centre for Ecology and Hydrology (CEH). In the most recent, Finch *et al.* (2004) concluded that there was no simple answer since the balance of impacts depended on the type of energy crop, the land cover replaced, soil characteristics and climatic variables. Moreover, these studies were based on limited numbers of measurements, particularly for miscanthus, so there were significant uncertainties in the predictions that could be generated for different rainfall scenarios.

RELU-Biomass approach

A Sustainability Appraisal (SA) approach is being used to provide an integrated assessment of the implications of greater energy crop planting. SA is an environmental assessment methodology that systematically examines the extent to which the implementation of a plan or strategy would achieve sustainable development (Countryside Council for Wales, English Nature, Environment Agency & RSPB, 2004). Under the Planning and Compulsory Purchase Act (United Kingdom Parliament, 2004) SAs are mandatory for several types of land use plans (e.g. Regional Spatial Strategies) in the UK. The ODPM (2005) has issued a consultation document which outlines how SAs can be conducted to meet the requirements of both the EU SEA Directive (European Parliament and the Council of the European Union, 2001) and the 2004 Act. The SA approach has been chosen here because it: (i) encompasses social, economic and environmental objectives (ii) is suitable for landscape scale evaluations (iii) can be adapted to compare the implications of different planting scenarios (iv) is currently being used in a range of regional and local planning frameworks (v) utilises much existing work on sustainability indicators (e.g. see http://www.sustainable-development.gov.uk) but permits some flexibility in the measures employed.

What happens in a Sustainability Appraisal?

Sustainability Appraisal is known as 'objectives-led' appraisal in that sustainability objectives are set which provide the framework for the appraisal exercise. Just setting objectives on their own is clearly not enough as they have to be pro-actively used in an assessment of the plan or programme being appraised. In our case, the plan to be appraised comprises different planting (i.e., different areas of planting, planting patterns, headland area, crop management, etc.) and end use (i.e. use in large power stations or small community heat and electricity generation systems) scenarios for short rotation coppice and *miscanthus*.

A sustainability appraisal framework comprises the sustainability objectives for a defined geographical area. These objectives should be set by appropriate stakeholders with local knowledge so that the framework will be appropriate to its geographical context. Having identified the objectives, the next step is to identify indicators and targets such that performance of the different planting and end use scenarios can be identified. Inevitably, this will lead to a situation in which it is clear that some scenarios perform well in relation to some objectives, but not others, and some trade offs will need to be made which ultimately relies on the value judgement of the decision makers. No scenarios are likely to have beneficial impacts only.

The RELU-Biomass project has focussed on two out of nine regions in England: the South West and East Midlands, as these are very different, but have some examples of biomass planting to study and the potential to develop an industry.

In both regions, stakeholder meetings have been held involving representatives of the statutory consultees in the Strategic Environmental Assessment process (Environment Agency, Natural England, English Heritage), farmers, landowner associations, Non Governmental Associations, National Farmers Union, amongst others. Together, these stakeholders have debated the key sustainability objectives against which scenarios can be tested. The ultimate aim is to be able to inform policy development in relation to biomass planting in England with a clear knowledge if the implications of the policy choices.

Table 1 indicates the sustainability objectives identified for the South West region of England. Table 2 sets out the initial views on appropriate indicators (agreed by the same stakeholders). Typically, the indicators used in sustainability appraisal are informed (or even copied) from existing sources, such as, the guidance on sustainability appraisal written by the Government which gives examples of sustainability indicators (ODPM, 2005) and the "Sustainability Indicators in your pocket" setting out the key indicators for the UK published by the Department for Environment, Food and Rural Affairs (Department for Environment Food and Rural Affairs, 2007). These indicators can reflect existing data sets rather than the most appropriate date for testing the objectives derived in sustainability appraisal.

Table 1 South West Region of England: objectives identified by stakeholders

SAFEGUARD THE HISTORIC ENVIRONMENT
PROTECT AND ENHANCE BIODIVERSITY
REDUCE GREENHOUSE GAS EMISSIONS
IMPROVE PUBLIC CONNECTION WITH THE COUNTRYSIDE
ENHANCE RURAL EMPLOYMENT
INCREASE AMOUNT OF ENERGY PRODUCED AND USED LOCALLY
REDUCE ENERGY COSTS
ENHANCE LOCAL LANDSCAPE CHARACTER
ENHANCE RURAL QUALITY OF LIFE
IMPROVE WATER QUALITY
MAINTAIN WATER AVAILABILITY
PROTECT AND IMPROVE SOIL RESOURCES
IMPROVE AIR QUALITY
MINIMISE ADDITIONAL VEHICLE MOVEMENTS
MAXIMISE WASTE MANAGEMENT OPPORTUNITIES
INCREASE THE VIABILITY OF LOCAL ECONOMIES
ENHANCE VIABILITY OF FARMING
MAINTAIN TOURISM RESOURCE

Table 2 South West Region of England: objectives and indicators relevant to the Fuel Quality Directive

SUSTAINABILITY OBJECTIVE	POTENTIAL INDICATORS
PROTECT AND ENHANCE BIODIVERSITY	Bird population indices (a) farmland Changes in BAP species in the local landscape Change in local (native) populations of characteristic plant and invertebrate species/groups Priority species and habitat status
IMPROVE WATER QUALITY	Percentage of main rivers and canals as good or fair quality Rivers of good (a) biological (b) chemical quality
MAINTAIN WATER AVAILABILITY	Abstractions by purpose (provide for sustainable sources of water supply indicator) Minimum ecological flows Flood return periods Change in water demand

A particular issue in developing a sustainability appraisal framework is the fact that the greater the number of objectives and indicators, the greater the number of predictions which need to be made. In the example given in table 1, there are 18 sustainability objectives. If, on average, there were 4 indicators used to assess performance against the indicator, this gives 72 indicators in total which need assessing against the existing situation and each scenario. If only 4 scenarios are tested, this leads to 360 predictions – each requiring a significant amount of data collection. This is another reason why many indicators are based on measurements which are already made, or are easily made, rather than those which would be the most appropriate.

Implications for the Sustainability Criteria in the Fuel Quality Directive

The RELU-Biomass project is still collecting results and it is too early to release preliminary findings. However, a number of points can be made:

1. The full range of issues affected by planting of biofuel crops is much broader than those listed in the current sustainability criteria text of the Fuel Quality Directive (see Table 1). If the focus is too narrow, there is a greater likelihood of negative impacts in areas not covered by the listed sustainability criteria.
2. Biodiversity indicators pose a particular problem. There is no agreed definition of "biodiversity", but it is argued to cover ecosystem components, structure and functions (Grumbine (1993). It is not possible to measure everything and using some indicators is a surrogate which necessarily has flaws. For example, if the focus is on farmland birds and diversity indices – it may be easy to demonstrate no significant negative impact through the use of appropriate management practices. However, what about numbers of arthropods, bees, butterflies, lichens, mosses, etc.? The RELU-Biomass study is making many measurements which are not currently reflected in indicator sets and are finding changes in the species numbers with different crops which would not be detected by those indicators. Without an agreed definition of biodiversity and appropriate measures, there will always be scope for third parties to carry out limited research to demonstrate some negative impacts on biodiversity. This risks stopping all planting.

3. Any land use change will have biodiversity and water impacts as different crops are in place with different ecosystems associated with them, different water needs, etc. If biodiversity or water impacts are assessed and found to result in some negative impacts and therefore a biofuel crop is not planted – what is to stop a food crop being planted instead with worse impacts?
4. Climate change will cause biodiversity change and changes in water availability. There seems to be a presumption that change is bad – particularly in terms of biodiversity. But as change will happen in any case, how is this factored into the sustainability criteria?

In summary, the suggested criteria are vague and leave the way open for court challenges in order to clarify what is meant by terms like "biodiversity" and which kind of indicators are appropriate to use. There is potential scope for third parties to use the criteria to prevent support for biofuel crop payments even if, overall, they are a more sustainable option than other feasible alternatives.

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4.4. Criteria related to social issues

by Neil Judd, ProForest, UK

4.4.1. Introduction

This briefing paper has been prepared to accompany a presentation at the European Parliament Workshop on sustainability criteria for biofuels. This paper specifically considers criteria related to social issues. The scope of the paper is limited to the production of biofuels feedstocks, and does not seek to address any other elements of the supply chain.

4.4.2. Background relating to social issues

The main types of social issues arising from the production of biofuels feedstocks can be identified as the following:

- Competition with food production
- Competition with other land uses
- Land tenure conflicts
- Consultation and consent
- Social impacts of production
    - Workforce
    - Local communities

These social issues can be broadly categorised as either *direct* or *indirect.* Direct issues are those that derive specifically from the production of the actual feedstock from a defined unit of land. These include:

- Workforce issues, and
- Impacts on communities locally affected by production

Conversely, indirect issues that are related to the sector as a whole, and concern impacts that arise from the expanding production of, and demand for, feedstocks, for example. These include:

- Competition with food production
- Competition with other land uses

The appropriate policy and practical responses to direct and indirect issues are complementary, but necessarily different. Direct issues, relating to social impacts at the location of production, can be addressed through approaches such as certification or sustainability reporting. However, indirect issues must be dealt with at a wider scale, through measures such as:

- Reducing energy use and increasing efficiency
- Local, regional (and global?) land-use planning
- Strategies to address food security

A general desire to address indirect measures has been reflected in initiatives by EU member state governments, although little progress has been made to date on how to achieve this in practice.

4.4.3. Scope of social criteria covered by existing initiatives

Three examples of existing initiatives concerning the development of sustainability criteria for biofuel feedstocks have been selected, in order to identify the scope of the social criteria that is included by each initiative.

The three initiatives vary in their scope and objectives of application, and are as follows:

- Global multistakeholder process for generic sustainability criteria
  - Roundtable on Sustainable Biofuels
- Statutory generic sustainability reporting initiative
  - UK RTFO Sustainable Biofuel Metastandard
- Global multistakeholder process for a specific feedstock
  - Roundtable on Sustainable Palm Oil (RSPO) Principles and Criteria

The range of social criteria included by each is summarised below:

Issue	**RSB Principles**	**RTFO Metastandard**	**RSPO P&C**
Consultation	✓	✓ Principle 7	✓ Principles 1, 6 and 7
Human and labour rights	✓	✓ Principle 6	✓ Principle 6
Socio-economic development (including land rights)	✓	Land rights only Principle 7	✓ Principles 2, 6 and 7
Food security	✓	x	x

The issue headings in the table above are consistent with the range of issues noted in section 2, above, and are reproduced from the RSB principles. It is worth noting that the RSB Principles are explicitly aspirational, and are stated as representing an ideal scenario for biofuels feedstocks production. They are not necessarily wholly transferable to practical application, for example in certification standards. The inclusion of food security as a principle reflects this aspirational approach.

The RTFO metastandard addresses all of the requirements, with the exception of broader issues relating to socio-economic development, and includes particular detail on workforce issues.

The RSPO Principles and Criteria includes considerable detail in each of the three main requirements, and also includes specific criteria for existing and new planted areas.

4.4.4. Addressing proposed Annex VIb criteria

Proposals for amendments to the European Commission's communication (2007, 18) on amending Directive 98/70/EC have been made, including specific details relating to social criteria for biofuels feedstocks in a proposed new Annex VIb. The three proposed requirements for social criteria are noted in the table below, together with the most appropriate level of addressing each of these:

Reporting on consequences for food prices and food security	• Broader scale initiatives, at national or regional level
Consent by local communities	• Certification and/or sustainability reporting
Public access to information and participation	• Certification and/or sustainability reporting

It is relevant to note that there is some uncertainty relating to the inclusion of social criteria in public procurement requirements, in terms of their compliance with EU procurement rules. For example, the inclusion of social criteria in public procurement requirements for timber products is currently approached differently by member states, and the European Commission is now considering this issue.

5. Proceedings of the workshop: summary of the findings and the debate

by TAUW Consulting Company

5.1. Opening of the workshop

MEP Ms Dorette CORBEY (NL, PSE) - Rapporteur on the Fuel Quality Directive for the Committee of the Environment, Public Health and Food Safety - introduces the workshop.

Ms Dorette Corbey MEP referred to the increasing concern about biofuels. At first biofuels were seen as a solution to the problem of green house gas emissions, now they are presented as part of the problem by several NGO's. At this moment the European Commission (EC) and the European Parliament (EP) are working on a package of directives to reduce green house gas emissions. Two proposals for directives in that package are dealing with issues related to biofuels. The proposal for the Renewables Directive states that 10% of the fuels for transport have to be replaced by biofuels in 2020. The proposal for the revision of the Fuel Quality Directive includes a reduction of green house gases of 1% per year in the well-to-wheel emissions. Although this is not a direct requirement for the use of biofuels, the reduction of green house gases will most likely also lead to increased use of biofuels.

The European Commission did not include sustainability criteria in the proposal for the Fuel Quality Directive. As the requirement for reduction of green house gases will most likely lead to an increase in the use of biofuels the EP proposes that sustainability criteria for biofuels shall be included. The three institutions of the European Union are presently working together on formulating sustainability criteria that can be used in the Fuel Quality Directive as well as in the Renewables Directive.

5.2. The institutional context

5.2.1. View of the European Commission

Mr Fabrizio Barbaso, Deputy Director-General of DG Energy and Transport, European Commission, presented the view of the European Commission on biofuels. Three subjects were explained: The role of the sustainability criteria in the legislative framework, the sustainability scheme itself and how it will be put in practice.

The sustainability criteria will have to be met before a Member State can count the biofuels to meet the requirements of the Renewables directive. Also state aids will only be given to those biofuels that meet the criteria, so producing companies will have to comply before they can count the amount of biofuel they produce for the required amount. A scheme of sustainability criteria has to be developed for biofuels in transport, heating as well as for the production of electricity. The EC is working on sustainability schemes for other sources as well and will report in 2010 on these sustainability schemes.

On the sustainability scheme itself Mr Barbaso stated: The sustainability scheme to be developed has two parts: The criteria itself and the monitoring and reviewing by the European Commission. Three main aspects of the criteria are: GHG savings, land use change and environmental requirements for agriculture.

To deliver substantial savings the greenhouse gas savings should be at least 35% compared to conventional fuel based on full life cycle analyses. These life cycle analyses should also take into account land use change because of the production of biomass. The Renewables Directive includes requirements for crops grown on different types of land.

The environmental requirements for agriculture will cover all the crops grown for biofuels within the EU. Now only the supported crops need to comply. Presently no environmental requirements for agriculture in third countries exist that can be used in legislation.

When the sustainability criteria are laid down the work is not done. The EC proposes that the implementation and verification should be done by the Member States. Existing certification schemes as developed by authorities, NGO's and industry should be used if they ensure that the criteria as set in the directive are met. If the commission recognises a certification scheme all Member States will have to accept that scheme as proof that the criteria have been met. Member States will not have the right to make additional criteria as this could result in 27 different schemes. The EC proposes the "Mass balance" method because this method will ensure sufficient control and is tough enough to lead to changes in behaviour. The EC does not think comitology procedures are needed. Their view is that all the criteria should be present in the directive itself.

5.2.2. Policy context

Mr Jos Delbeke, Deputy Director-General of DG Environment, European Commission explained the policy context of the sustainability criteria. In 2007 the EC adopted a package on climate and energy. It included a green house gas emissions reduction of 20%, 20% renewable energy and 10% biofuels in transport by 2020. This was complementary to the already adopted 20% improvement of energy efficiency. In January 2007 the EC presented a package on cars and fuels. This is an integrated approach including enhancement of fuels and improving the energy efficiency of cars. The Fuel Quality Directive discussed in this meeting includes the requirement for producers to reduce 1% of their Greenhouse Gas emissions per year between 2010 and 2020. Transport is targeted specifically in both packages because transport is the only sector that still has growing greenhouse gas emissions. Both packages try to lower the risk in security of supply of energy, especially for transport. The reduction of greenhouse gases by fuel suppliers and improving the energy security can be done in several ways but biofuels will probably play an important role.

The use of biofuels can bring along negative aspects. Therefore criteria have been set down in the Renewables Directive. The details for these criteria were not yet present when the EC proposed the revision of the Fuel Quality Directive. The view of the EC as well as the Presidency is that criteria in both directives should be the same. The Council has set up an ad-hoc working group on this subject and the Parliament is working on criteria as well. The proposal for the Renewables Directive will be the starting point for the much appreciated work of the other institutions.

5.2.3. The ad-hoc working group of the Council

Mr Miran Kresal, chair of the ad-hoc working group on sustainability criteria, on behalf of the Slovenian Presidency, explained the work of the ad-hoc working group. The problem is that the sustainability criteria on biofuels have to be used in two directives. On one side there is the Fuel Quality Directive which is very advanced in its legislative process. On the other side is the Renewables Directive which is not so far advanced in that process. By the time the discussion is finished for the Renewables Directive it might be too late for the Fuel Quality Directive. The ad-hoc working group was set up to deal with this problem.

As it is an independent group it can also create a balance between environment and energy. The first is mainly dealt with in the Fuel Quality Directive; the second is primarily dealt with in the Renewables Directive.

The ad-hoc commission has a strict time limit and a limited scope. Only the relevant parts of the Renewables Directive will be taken and modified so they can be put into the Fuel Quality Directive. This has to be done within a few months. The work will be finished at the beginning of May. The first harmonised solutions will hopefully be available then.

The ad-hoc group hopes to work together with the Parliament as it is cooperating with the EC on this subject and hopes that the Fuel Quality Directive can be concluded within the Slovenian presidency.

5.3. Expert panel - Session I

5.3.1. Introduction

Mr Greg Archer of LowCVP gave a short introduction into sustainability criteria for biofuels. The first reporting scheme for biofuels, developed by LowCVP, will be going live in April in UK. The following presentation gives Mr Archer's personal point of view as not all the parties involved in LowCVP agree on all points.

The criteria that will be proposed need to have a high robustness. They need to be WTO-proof and they have to give the public the confidence that the biofuels bought by them are good.

At present "good" and "bad" biofuels are being produced. The legislation should give an incentive to the "good" biofuels and should stop the "bad" ones. It should be kept in mind however that all biofuels when grown the right way could contribute to reduce green house gas emissions without environmental and social problems. The criteria that will be set in the directives will have to work under the restrictions of the WTO. Putting forward too many criteria will give problems under the WTO rules. No difference should be made between production within the European Union and production outside the Union.

There is a high consensus on which criteria are important. The criteria relate to social and environmental issues. The values set in the criteria are still under debate but they should be set based on scientific measures. A division can be made between direct and indirect issues. Direct issues can be dealt with relatively easy in legislation or certification; indirect issues are much more difficult. If targets like the 10% obligation are set care has to be taken not to enhance bad indirect effects.

In order to check compliance, different systems can be adopted: Track and trace is not very practical and expensive. Mass balance as the EC is adopting is more practical. The procedures should be clear for companies and they should be the same everywhere. Robust book and claim schemes will also work as is being proved at this moment by the Round table on Sustainable Palm Oil (RSPO). The EC should give thought to allowing this scheme as well.

Producers of biofuel should be encouraged to aim for ever higher greenhouse gas savings. A threshold will not do that. An incentive for higher greenhouse gas savings will encourage fuel producers to go further beyond the threshold. This reward should be linked to carbon intensity and not to volume or energy density.

There are indirect risks related to the production of biofuels. The indirect issues are not fully understood yet; therefore further scientific work is needed. If targets are set they should be reviewed regularly as information is released from science. This review should be set in the directive.

5.3.2. First presentation greenhouse gas savings and land use change

Mr Nigel Mortimer of the Royal Society in the UK gave an explanation about the calculation of greenhouse gas emissions during the production of biofuels. There are big differences between biofuels, however in general there are potential benefits for global climate change mitigation. It should be stressed though that there are other ways to arrange sustainable mobility than by using biofuels.

It is important to take into account all the green house gas emissions in the calculations. Important aspects to take into account are emissions from soil, displacement effects and how to allocate the greenhouse gases between the biofuel and co-products. Mr Mortimer's presentation gave figures that showed the big differences in the calculated greenhouse gas savings depending on the choices made in calculation method.

Carbon stores in the ground can be released when land is made ready to produce energy crops. This creates a carbon burden that can take up to hundreds of years to pay off. The criteria should define where land shall not be used for agriculture at all to make sure this phenomenon doesn't happen.

It is not clear yet how N_2O-emision from soil works, but it is clear that it is not insignificant. It is undoable to measure the N_2O-emissions field by field. Models based on measurements and science should be used to predict the N_2O-emissions. Not all the science needed for these models is present at this moment.

Also the choices made in the technology used for growing and processing have a large impact. The net greenhouse gas saving of one way of growing and converting oilseed rape into bio-diesel can be twice as high as from another way. This underscored the message that biofuels can be grown in a good or a bad way.

It is not clear yet what the land use displacement effects are. The land use displacement effects are usually based on assumptions. Displacement impacts are difficult to measure, where do the crops move to if they are not grown here?

Allocation of greenhouse gases to the biofuel or to the co-products can be done in more than one way. Allocating according to substitution, price, mass or energy content gives big differences in greenhouse gas savings.

A target of 10% biofuels means importing bio mass or fuels into the EU. Targets should be set in terms of green house gas savings and not as a volume target.

5.3.3. Second presentation greenhouse gas savings and land use change

Mr Bas Eickhout of the Dutch Environmental Assessment Agency MNP, started his presentation by concluding that there is no black and white in biofuels, it is grey all over. The problem is to formulate the criteria to get the right crop at the right place at the right volume.

All the biofuels can meet the requirement of 35% greenhouse gas saving. To reach 50% greenhouse gas saving it will be a bit more difficult but it will depend a lot on the calculation methodology. The EC did a good job formulating the methodology but their method uses default values which introduce risks. For example the demand for biofuels will increase the use of fertiliser as this gives a higher yield per hectare. This will result in an increase of nitrous oxide from the soil. This increase lowers the greenhouse gas savings dramatically. The real greenhouse gas savings as a result will be much lower than the greenhouse gas savings calculated with the default values.

Even without a 10% target for biofuels there will be a growth in the production of biomass because of a higher demand as a result of increased wealth in Asia. This will result in increased land use. The land use for the production of biofuels for the European market will be on top of this increase. And it should be kept in mind that the biofuel demand of the US will probably rise considerably in the near future since a target will also be set there. If the demand for biomass increases too, it will have negative consequences.

Within the European Union there will not be enough land to produce biomass for a 10% substitution of our fuels. Set aside land within the European Union can be used but this also raises biodiversity issues. The most efficient way to increase the land use for agriculture within Europe is liberalisation of the agricultural policy. However in a fully liberalised agricultural policy food will be grown outside of the EU. In a free market about 50% of the biofuels will be imported.

The production of bio-mass for biofuels on land now used for the production of food will result in land displacement effects. This might lead to an increase of greenhouse gas emissions. In order to incorporate the displacement effect MNP proposes to use an indicator that is expressed as the greenhouse gas reduction per ha of land. The relation between greenhouse gas emissions and land use can also be seen when the second generation biofuels are compared with the first generation. The greenhouse gas savings from the second generation will be higher but the land use will also be higher because the by-products can not be used for animal feed.

At this moment the proposal uses volume demands for biofuels. This stimulates biofuels but does not necessarily stimulate the best option for reducing greenhouse gases. For the longer term using biomass to generate electricity for a plug-in car or producing hydrogen for transport might be much more energy efficient but is not stimulated in the current proposal. Policy targets should aim more at these long term goals.

5.3.4. Discussion

The questions were collected before answers were given by the panel of experts. For convenience the answers directly follow the questions in this report.

Mr Claude Turmes MEP

Question to Mr Archer: Where is the trade off between the fuels and more energy efficient cars?

Answers by Mr Archer: If you need to make a trade off almost certainly making cars more efficient is the best option. If you use biofuels now it is a quick way to lower emissions of all cars. There is no real trade off as the directives are complementary.

Answer by Mr Delwege: It is important to see the complementarities between the different directives. You need to work on both sides to make it honest and balanced. There is synergy between the Fuel Quality Directive and the Renewables Directive.

Question to Mr Mortimer: Is it the most important issue to agree on the methodology? How do we trade off between being precise now and allowing information that will be available in the future to influence the future criteria?

Answer by Mr Mortimer: The issues discussed today are crucial. If we fail this test we fail coming generations. Practical criteria can be set in place as we can very quickly harmonise the methodology. The differences between the methodologies put forward by different organisations have been identified and can be overcome. However we have to learn fast about the nitrogen cycle. We can put mechanisms in place until we know more. It is important to be very transparent in our choices, but that does not make the methodology easy to understand. Even though the methodology is difficult to understand we have to make sure users and policymakers of biofuels have confidence as the suppliers need a stable framework for investments. The policy should give confidence and at the same time be flexible to incorporate new information.

Questions to Mr Eickhout: You presented figures about future arable land use. Do we also have to take the climate change into account when estimating the amount of arable land? Do you have information on this?

Answer by Mr Bas Eickhout: Yes we should take into account climate change. Climate change does not necessarily lead to a decrease of arable land on a global scale. Cynically enough, the US and EU may have a bigger arable land area in the future.

Question to Mr Eickhout: Do you think that we should use biomass to make electricity in a combined heat and power plant to get a much higher efficiency in stead of using biomass to produce biofuels in an inefficient way?

Answer by Mr Eickhout: Biomass is used more efficiently in the electricity sector than in fuels. The EC has put forward packages to integrate these issues with different directives. I would like to put the question on the table if we need an extra obligation for fuels alone.

Answer by Mrs Dorette Corbey: That is an interesting question but it is not the subject of this workshop. Therefore we will not discuss it further.

Mrs Caroline Lucas MEP

Question to Mr Archer: Are all the carefully build up criteria compatible with a 10%vol target or will the target undermine the criteria?

Answer by Mr Archer: The 10% target leads to indirect issues which we can not yet quantify at this moment. I would not set a minimum threshold. Reward the producers of fuel to lower the GHG emissions.

Question to Mr Eickhout: Will higher oil prices lead to higher land use at a lower intensity resulting in conflicts over land?

Answer by Mr Eickhout: I think higher oil prices will probably not increase the land use intensification. An oil shortage is not foreseen as we could use tar sands and other not so easily usable types of oil. As a result the intensive agriculture will only cost more.

Mrs Pilar Ayuso MEP

I agree with sustainability criteria and I like to see them implemented in the directives within this decade. Putting the criteria into both directives at the same time might slow down this process. The question is who is going to verify these criteria in third countries. Can you give us clear and concise criteria, standards and robust measures to arrange the accreditation?

Answer by Mr Greg Archer: Based on my experience with the UK scheme of the last three years I can say that appropriate criteria can be set and the right procedures can be put in place to make sure the criteria are actually being met. This can be a combination of mandatory audits like in cross compliance, voluntary audits as being done for the RSPO or audits by companies themselves to make sure they buy the right biomass.

Mr Vittorio Prodi MEP

Question: It is a complicated system. Should we wait until we know more about this system and meanwhile focus on residues until we have better technology to produce biofuels such as the second generation biofuels?

Answer by Mr Delbeke: Why are the criteria so complicated? Because there are big differences within Europe. We need to consider all differences when making the criteria. The threshold of 35% is put forward as the net carbon balance should be clear and significant.

Mrs Anja Weisberger MEP

Question: How high, 30/40/50%, should the threshold be? Would 50% ban al the first generation fuels? We should not make the production of biofuels in Europe impossible by setting a too high threshold.

Answer by Mr Archer: We should not set a threshold. This would mean that any fuel that does not meet the threshold does not count for a producer and therefore it will not be made. It is better to stimulate greenhouse gas savings more if they are higher.

Question: How could a certification system work for in EU and outside the EU?

In Europe already regulations exist such as cross compliance. There should not be higher burdens for producers especially in Europe. How can we make sure that in Europe the farmers should not be required to comply with stricter measures than farmers in other countries?

Answer by Mr Greg Archer: The environmental or sustainable footprint for the production of biofuels in Europe is not necessarily better than in third countries. It is important do set the same criteria and accreditation schemes for products from within and from outside Europe. You can give benefits for greenhouse gas savings to all biofuels whether they are imported or home grown.

Answer by Mr Bas Eickhout: You ask of us a clear and robust methodology and at the same time you want no more bureaucracy. There is a tension between them. The EC has set a very clear and detailed methodology in their directive. But to make it easy to use and lower bureaucracy they have also given default values. These values are debatable so it diminishes the clarity of the method. I can not answer your question what is the better method.

Mr Neil Parish MEP

We should not make it too difficult or nobody will be able to grow the crops for biofuels. From first generation 70% of the maize is left as a by-product. The by product is used as feed for cattle or poultry. The land used to produce biofuels therefore is not lost to feed production.

We need criteria that could be understood by the people who have to work with it.

The market is going to regulate some things such as the trade-off between food and fuels. No farmer is going to grow fuel crops if they can produce food. If there is too much food it will be used for biofuels.

Answer by Mr Bas Eickhout: The by-products are crucial, therefore you can not say that first generation is bad and second generation is good. It all depends on the way they are grown and processed and which by-products are made.

Question: Should we look to genetically modified crops for the production of energy?

Answer by Mr Eickhout: Genetic modification will probably increase the energy output of crops. At this moment these genetically modified energy crops are not there yet. As a market for high energy crops will develop it is likely that genetic research will be done on that subject.

Mrs Dorette Corbey, MEP

Question: Unfortunately I have not yet heard how to incorporate indirect land use change. How can we incorporate the greenhouse gas emissions from land use change into the criteria?

Answer by Mr Bas Eickhout: It is impossible for us to give a value for a land use penalty at this moment. If there is a displacement effect you can also give incentives to use certain types of land instead of excluding certain types of land.

Questions from the audience:

Question: If we are looking at 35% or 50% reduction of greenhouse gas saving *and* put stringent criteria are you not blocking the fuels that have a high greenhouse gas saving by setting these criteria? How do we balance between the biodiversity and sustainability criteria and the green house gas savings?

Answer by Mr Bas Eickhout: I would like to stress that criteria as done by the EC are very balanced between lowering greenhouse gas emissions, biodiversity and social issues. Unlike some comments I have heard today I do not think that the criteria of the EC are against the greenhouse gas savings.

Question: Wouldn't it be better to use default values for land use change now and make revisions when more information is known, even though we do not know exactly how big these values in reality are right now than setting no value at all?

Answer by Mr Greg Archer: We simply do not know what the results of land use change are, so we do not know the greenhouse gas penalty of the land use change. We only know that at this moment biofuels are not the biggest drivers for land use change. In the future it might be a big driver; therefore we need reviews in the directive to adapt to emerging science. I invite all of you to contribute to the science needed.

Further Expert Comments

Mr Nigel Mortimer

I agree with Greg Archer that biofuels are at this moment not the biggest problem. In the Renewables Directive some criteria are given that state that destroying carbon stocks should be avoided. So it is possible to put in place rules to stop land use displacement issues. This should not be done for biofuels alone but for all products. This can not be done however by the European Union alone. This has to be done globally.

5.4. Expert panel - Session II

5.4.1. First presentation on biodiversity and water use

Mrs Berien Elbersen from Wageningen University and Research Centre informed the audience about biomass cropping and risks of biodiversity loss. Biodiversity impacts depend on many factors: how much land is needed, type of biomass crops, type of land use conversion, the different types of organisms, effect on water and soil quality, landscape diversity, and habitat fragmentation.

Three groups of biomass crops can be identified. 1. Sugar/starch such as potatoes, 2. Oil-starch such as cereals and 3. Ligno-cellulose crops such as willow and Switchgrass. The effects of these three groups on biodiversity are different. The first two groups are similar to conventional (food) crops. The third is different from what is grown now. The input use is much lower, though water usage may be high, there is less mechanisation and it has an important structural impact as the crops are much higher than most of the presently grown crops.

The effects of land use change depend on the starting and end points of the change. As there is a big diversity in land use within Europe the effects of land use change differ within Europe as well. In general more intensive agriculture, using more pesticides and fertiliser, clearing abandoned land, draining land or bring it under irrigation, enlarging plots by removing hedges and tree lines and more tillage of the land will have a negative impact on biodiversity whereas rotation widening and lower inputs have a positive impact on biodiversity.

In order to protect the biodiversity it is good to introduce a mix of biomass crops and aim for reduction in mechanization intensity. The ploughing up of permanent grassland, olive groves and agro-forestry areas should be prevented as much as possible.

Win-win situations should be explored for the production of biomass crops with enhancement of biodiversity. Especially using current arable land in the production of perennial crops has a positive impact on biodiversity.

5.4.2. Second presentation on biodiversity and water use

Mr Alan Bond from the University of East Anglia presented information about a biomass project currently underway in the UK. In this project sustainable criteria were established by the stakeholders. For these criteria (among others) hydrology and biodiversity of two areas are investigated so a prediction can be made for land use change to biomass cropping.

The measurement of water use by a crop depends on many different factors. Equipment to measure all these factors is quite costly and measurements are time consuming. A value can be distilled from all these parameters though. With biodiversity this is different. Many types of organisms are counted, but even more species are not counted. The values resulting from these investigations are not easily interpreted. Besides the impacts of the planting of the biofuel crop there are changes in climate which influence species, but also changes in the weather and changes in species influence other species. It is not easy to clearly define which change is a result of change in crops and which is a result of other changes in the environment.

Besides there is a moral judgement: Is biodiversity influenced positively or negatively if there are more birds and fewer bees? What is biodiversity and can it be measured in an objective way?

Any change in land use will lead to biodiversity change. And biodiversity will change by itself all the time. No negative impact on any species is impossible as any land use change will always have a (small) negative impact on species. It is therefore important to design criteria in such a way that not everybody can block the planting of bio-crops because it will result in the reduction of a single species.

5.4.3. Presentation on social criteria

Neil Judd from ProForest gives a presentation on social issues related to the production of biomass for biofuels. Five issues are considered: Competition with food, competition with other land uses, land tenure conflicts, consultation and consent and social impacts of production like the impacts on workforce.

Social issues can also be divided in direct and indirect issues. Direct issues can be addressed by certification. Indirect issues are not so easily addressed by certification; they should be addressed on a global scale. There is a general desire to address these issues but little progress is being made.

There are already initiatives for biofuel feedstock such as the Roundtable on Sustainable Biofuels, Renewable Transport Fuel Obligation (RTFO) in the UK, and the Roundtable on Sustainable Palm oil. There are differences between these initiatives. Some are for all biomass and some for one crop, some are statutory and some are voluntary. The initiatives do not always include the same issues.

Social issues are not as scientific as for example greenhouse gas emissions. Therefore it is more difficult to define these criteria. The wording should be very clear as they have to be used in practice.

5.4.4. Discussion

The questions were collected before the experts gave answer to all the questions at once. For convenience the answers directly follow the questions in this report.

Mr Claude Turmes MEP

Question to Neil Judd: What could the European Union do in a proactive way to smoothen the issue of big companies displacing local farmers? How important is the problem of people displacement and how can we address it proactively in this directive and how can we address it in other ways?

Answer by Mr Neil Judd: It would be a good idea if the European Union was to play a role in anticipating what is going to happen through multi stakeholder discussions. This is especially necessary if there are new feed stocks such as Jatropha.

Mrs Pilar Ayuso MEP

All the sustainability criteria have to be used by farmers. So the rules should be clear and workable.

We need criteria as soon as possible. Companies need legal security.

We have spoken about sustainability criteria but we should not forget the discussion about the ethanol waiver and the deleting of annex 6.

Answer by Mr Alan Bond: Rules need to be clear as quickly as possible. The wording has to be clear and not vague to make sure as little court cases as possible will arise. We can learn from other directives like the strategic environmental assessment directive or the habitat directive. There is already experience with these directives in all the Member States. This might be a better way to start than new texts that might be too vague.

Questions from the audience:

Question: How can you be sure about the social issues if there is a conflict between a biofuel producer and a local community? When do you penalise? If the case is taken before the court it takes time. If the case is settled before the court, how can the penalty on the biofuel producer be retracted?

Answer by Mr Neil Judd: Issues should be addressed in court. The law is the basis for any certification standard like the RSPO.

Question: Will including social criteria block the smallholders from complying with the criteria in the directives.

Answer by Mr Neil Judd: Smallholders are certainly in danger of being marginalized. In RSPO this danger is recognised. The RSPO has set up a task force to look how principles and criteria can be adopted for smallholders.

Question: Could we use idle land to grow biofuel crops? There is already in south Asia a lot of idle land. Maybe carbon stock could be built up in the idle lands again?

Answer by Mrs Berien Elbersen: Using idle land could be a good option. The consequences should be investigated further. There are some doubts about this. It is very expensive to use idle lands again. In order to give an answer to the question if using idle land could bring back the stock of carbon into the soil more research is needed. The build up of carbon could be much greater if the land is left to nature.

Further Expert Comments

Mr Neil Judd

Certification can help with proving production is done in the right way and with eliminating social problems. This can be done for example by using RTFO-based audits.

Mr Greg Archer

I would like to point out that there are already many sets of criteria. Do not invent the wheel again. Auditing can be much easier installed in this way. We should build upon what already exists such as RSPO or audits that are already in place in the land of production.

5.5. Concluding remarks

Final remarks by Ms Corbey MEP.

6. Annex: Workshop presentations

Delivering a sustainable biofuels market

European Parliament Workshop
4th March 2008
European Parliament, Brussels

Greg Archer
Director, Low Carbon Vehicle Partnership, UK

LowCVP

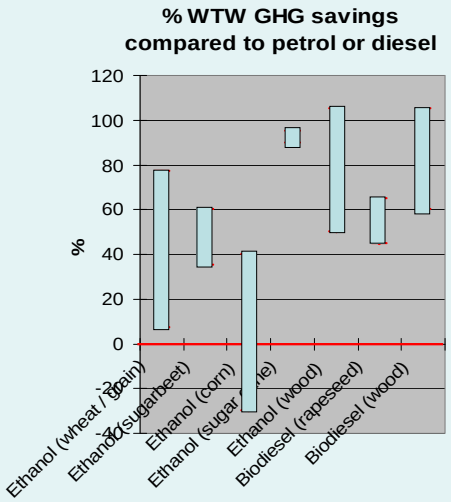
Biofuels – silver bullet or pariah fuel?

2006

2007

LowCVP

There are good and bad biofuels – assurance schemes can distinguish



Derived from Concawe 2006

There is considerable consensus regarding the key sustainability criteria for biofuels

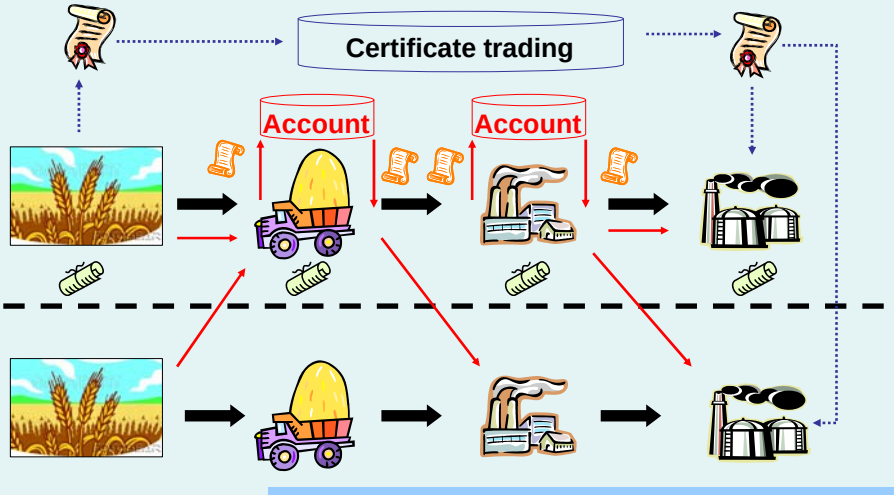
	Direct	Indirect
❑ Conservation of carbon	✓	✓
❑ Conservation of biodiversity	✓	✓
❑ Soil conservation	✓	
❑ Sustainable water use	✓	
❑ Protecting air quality	✓	
❑ Workers rights	✓	
❑ Land rights	✓	
❑ Competition for food		✓
❑ Welfare benefits		✓

If WTO rules prevent legislating on all criteria then reporting on the wider issues should be required

Mandatory	Reporting Obligation
Conservation of carbon	Soil conservation
Conservation of biodiversity	Sustainable water use
Minimum GHG saving	Air quality
	Land rights
	Workers rights

LowC VP

All chain of custody options can be implemented robustly – but require independent annual audits



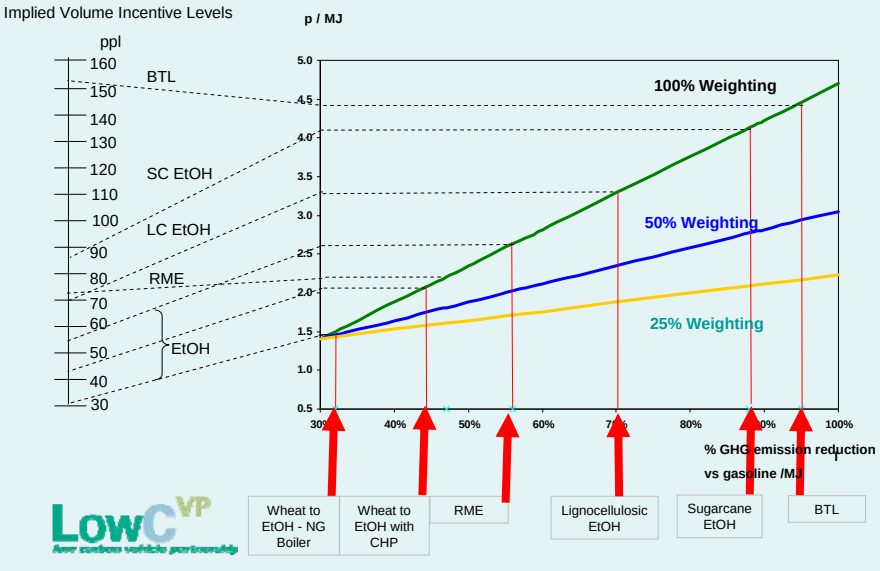
LowC VP

Sustainability criteria for biofuels will be constrained by trade rules

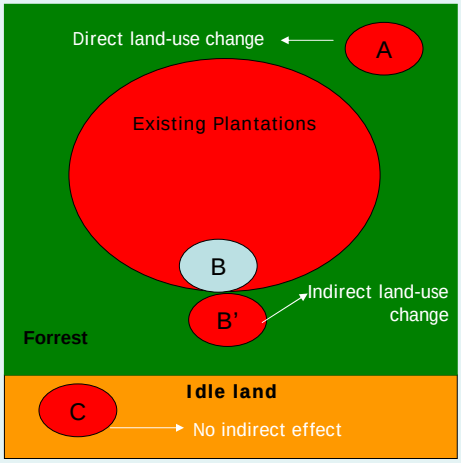
- Key trade issues are whether:
  - Biofuels "like-product"
  - Biofuels are agricultural products, environmental products or industrial goods!
  - The scheme objectives and design are appropriate

- To maximise effectiveness and minimise the risk of successful challenge criteria should:
  - Ideally be based upon Internationally agreed standards
  - Also apply to indigenous producers
  - Allow flexibility in how to comply
  - Be based on robust science
- In addition:
  - There should bi and multi-lateral discussions
  - Time should be allowed for adaptation
  - Appropriate due process should be followed

Rewarding fuels based upon their carbon intensity could incentivise advanced technology – but overcompensate some fuels



Indirect effects on land use and food prices have emerged as a key concern and future influence on biofuel targets



The right policy can deliver benefits for all; the wrong policy will destroy the credibility of the industry and harm the planet

- Conflicting policy objectives are creating an unsustainable market
- EU policy should:
  - Link incentives for biofuels to their lifecycle carbon intensity in a technology neutral manner – as proposed in the Fuel Quality Directive
  - Ensure there is rigorous enforcement and a European Standard for operating the chain of custody
  - Encourage participation in voluntary agri-environmental and social schemes
  - Commence negotiations in the WTO and with key supplying nations and design policy to reduce the risk of successful challenge
  - Broaden the scope of addressed issues through complementary mandatory reporting
- Future targets should be based on GHG-savings and take account of indirect effects
- All stakeholders have a responsibility to deliver a sustainable market

Any Questions?

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secretariat@lowcvp.org.uk

www.lowcvp.org.uk

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Criteria Related to Net Greenhouse Gas Emissions Savings

Dr Nigel Mortimer

twenty ten and beyond | 350 years of excellence in science

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Context

- Royal Society Report on Sustainable Biofuels: Prospects and Challenges:
  - Potential benefits for global climate change mitigation
  - All biofuels are not the same
  - Policies and measures to realise benefits
  - Biofuels only part of solution to sustainable mobility
- Life cycle assessment of biofuels:
  - Policy-makers
  - Commercial developers

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Life Cycle Assessment

- Greenhouse gas emissions:
  - carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O)
- Full life cycle:
  - cultivation, harvesting, transportation, processing, conversion, distribution, etc
- Net greenhouse gas emissions savings:
  - relative to conventional transport fuels

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Accounting Methodology

- Systems boundaries:
  - extent of accounting
- Soil nitrous oxide emissions:
  - scientific understanding and data
- Reference land use:
  - Displacement impacts
- Allocation procedures:
  - co-products

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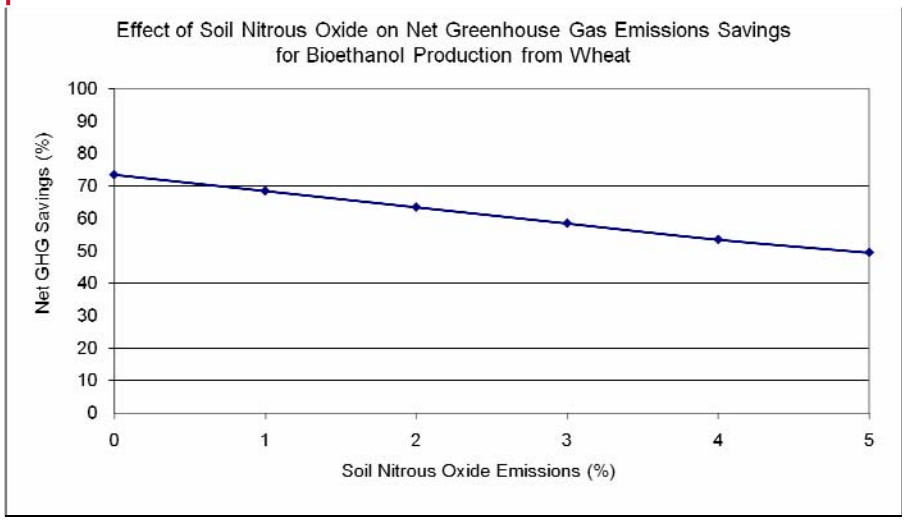
Effect of Nitrous Oxide Emissions from Soil



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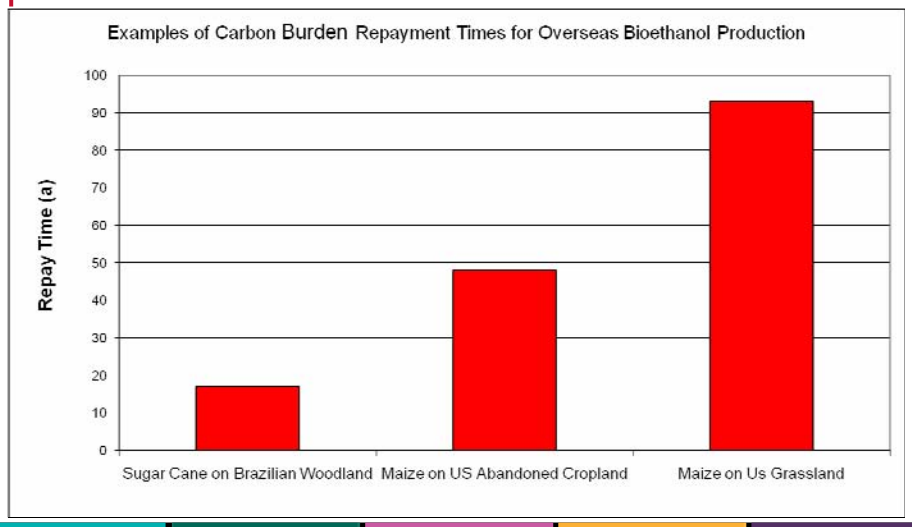
Effect of Carbon Burdens – Overseas Bioethanol



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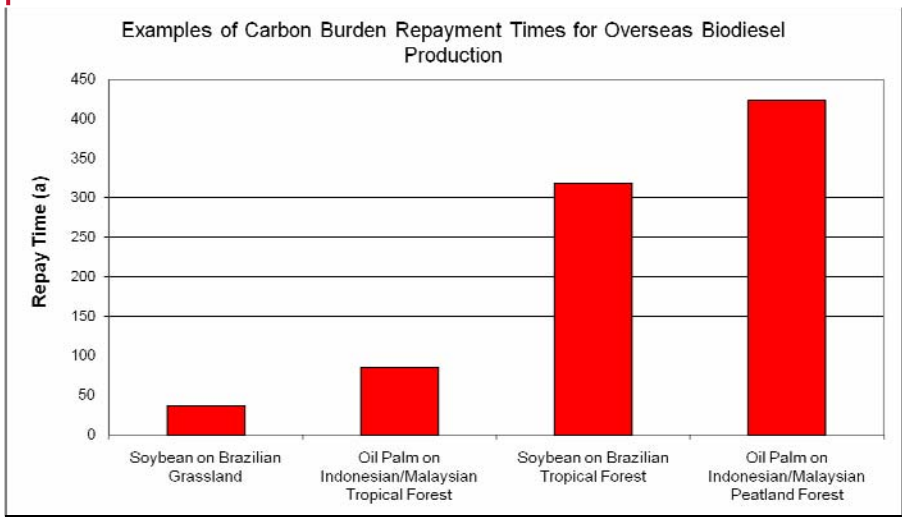
Effect of Carbon Burdens – Overseas Biodiesel



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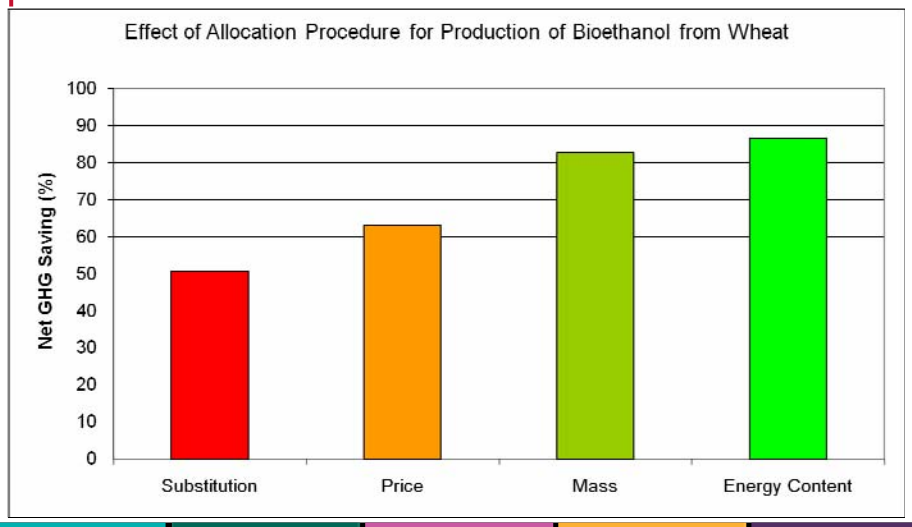
Effect of Co-Product Allocation Procedures



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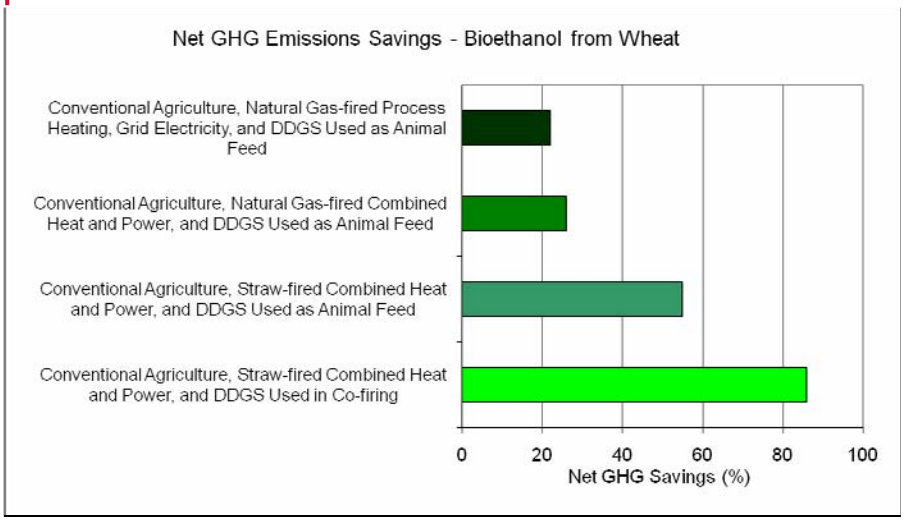
Effect of Technology Choices - Bioethanol



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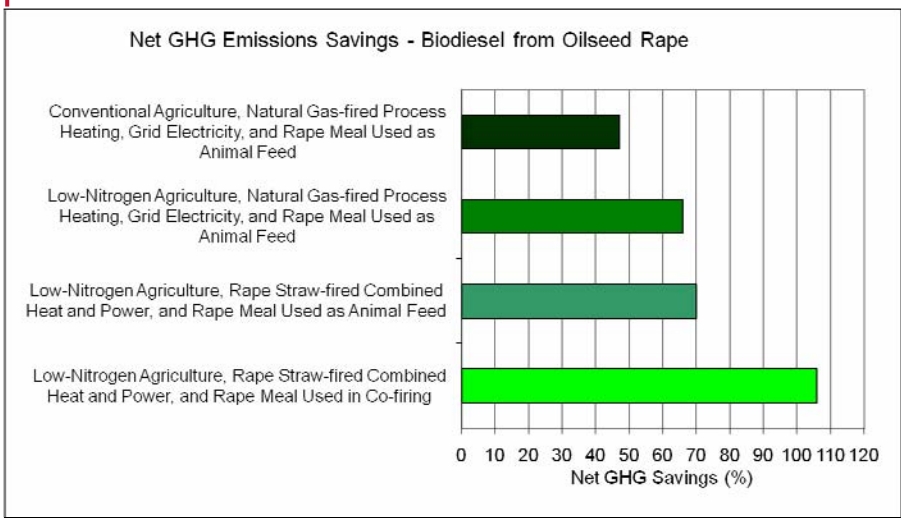
Effect of Technology Choice – Biodiesel



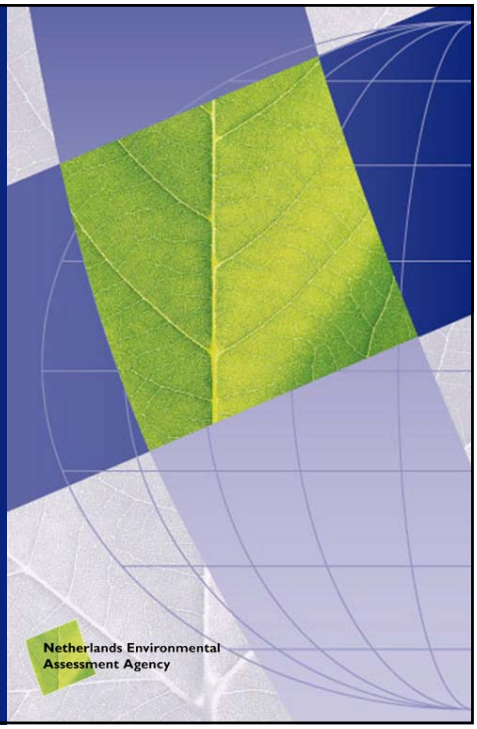
Key Points

- Biofuels can realise real greenhouse gas savings
- Limits to biofuel production in European Union
- Overseas biofuels production needed for targets
- Real greenhouse gas savings if:
  - Harmonised methodology
  - Correct technology chosen
  - Destruction of carbon sinks avoided
  - Food displacement avoided

Bas Eickhout

Sustainability criteria: greenhouse gas emissions and land use change

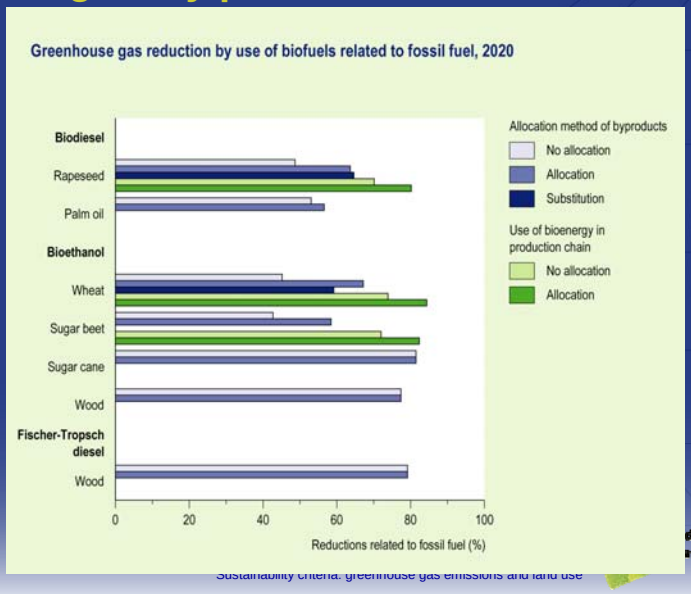
Brussels, March 4, 2008



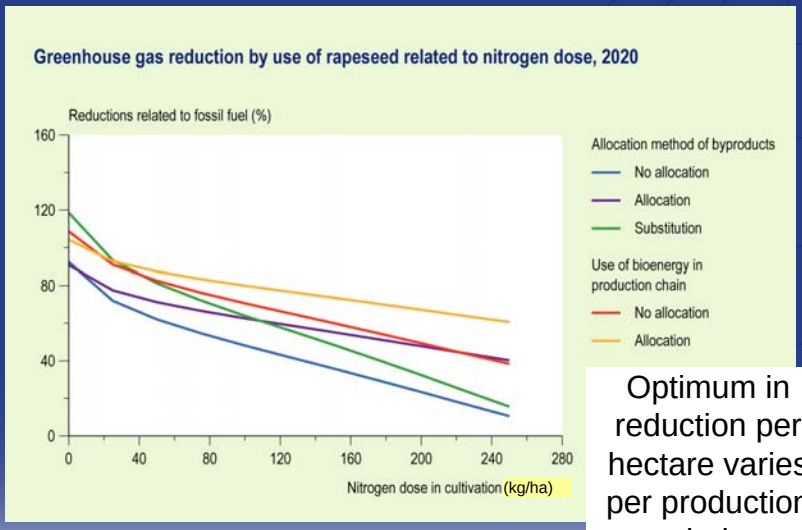
How to calculate well to wheel

- Allocation method of by-products
  - No allocation
  - Allocation on basis of energy content
  - Allocation by substitution of by-products (here, substitution of soy bean is considered)
- Use of biomass in production chain; and optimal fertiliser use

Savings vary per calculation method

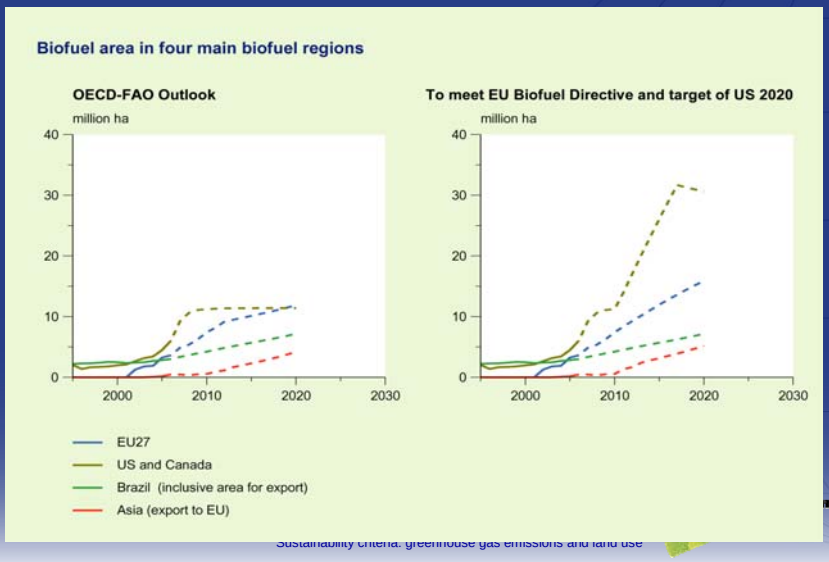


Intensification leads to N_2O emissions

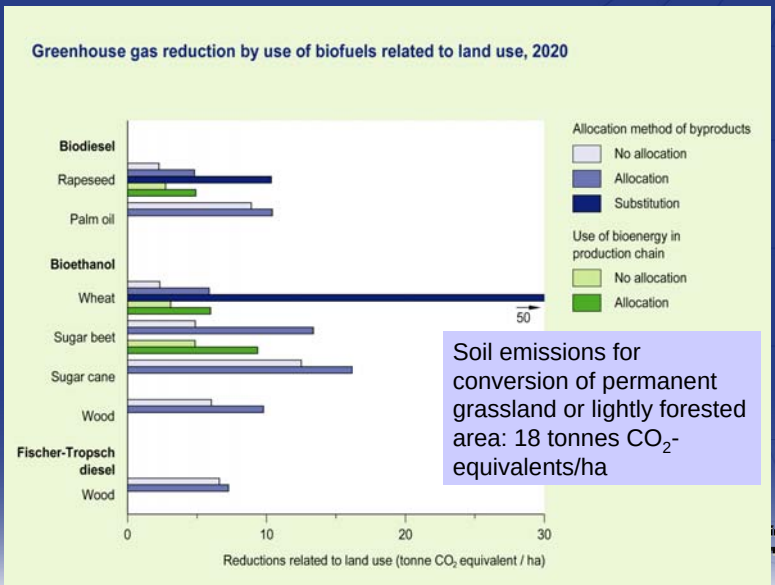


Optimum in reduction per hectare varies per production chain

Land use will increase globally

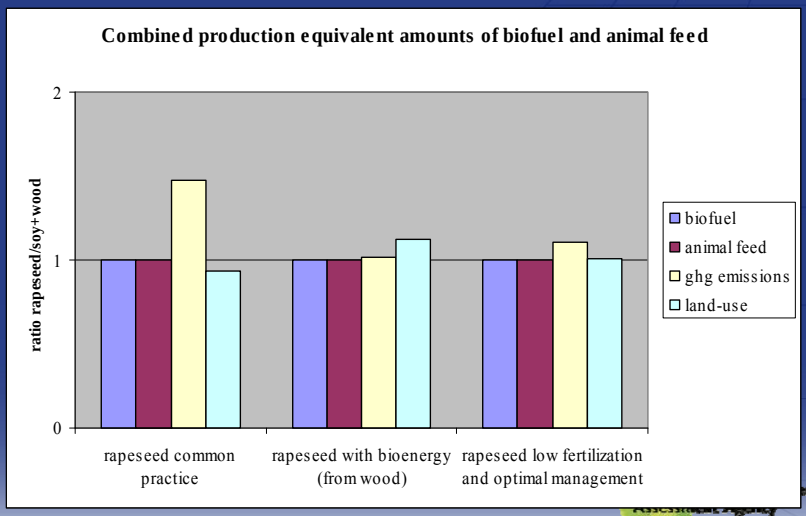


Therefore: emission reductions per hectare



Soil emissions for conversion of permanent grassland or lightly forested area: 18 tonnes CO_2-equivalents/ha

Second generation not always better: depends on by-products



Sustainability criteria: greenhouse gas emissions and land use 7

Looking for the optimal use of the available biomass

EC-p

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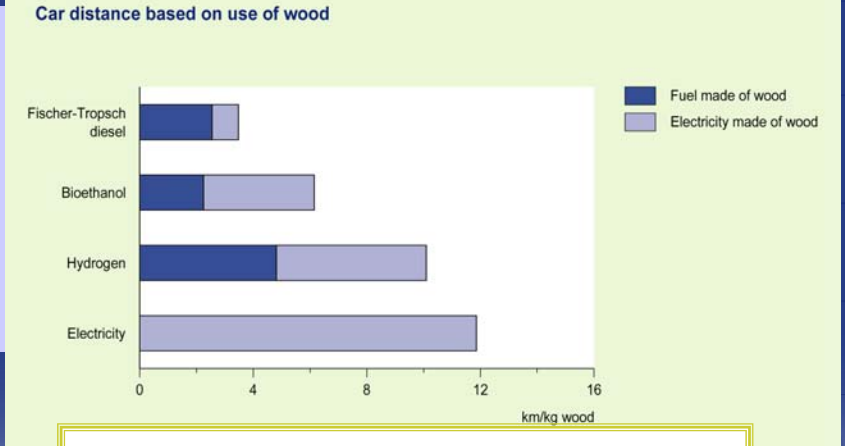


Looking for options for sustainable transport

8

Thank you for your attention

www.mnp.nl/en

Biomass cropping and risks for biodiversity loss

Berien Elbersen
Alterra, Wageningen, The Netherlands

Workshop for the European Parliament on Sustainability criteria for biofuels
Brussels, March 5, 2008

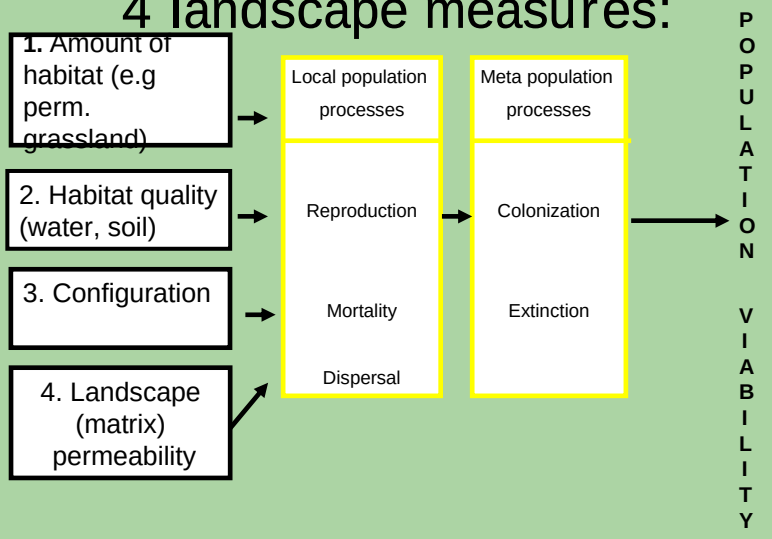
Bioenergy at WAGENINGEN UR

ALTERRA

Biodiversity impacts depend on:

- Extend of land use requirements?
- Types of biomass crops?
- Types of land use conversions?
- Effects on types of biodiversity (Soil organisms, birds, mammals, invertebrates and plants)
- Effects on water and soil quality (habitat quality)
- Effects on landscape diversity and habitat fragmentation (Landscape structure, habitat configuration)

Population viability depends on 4 landscape measures:



Three groups of biomass crops

Biofuel energy crops:

1) Sugar/starch: sugar beet and potatoes

2) Oil-starch: sun-flower, Rape, cereals, sorghum

Ligno-cellulose crops:

3) Short Rotation Coppice and perennial biomass grasses (myscanthus, Switchgrass, Reed Canary grass)

Effects of these 3 groups of biomass crops on biodiversity are different!

Three groups of biomass crops

Biofuel energy crops:

1) Sugar/starch: sugar beet and potatoes, fodder maize — Similar to conventional crops: high input use

2) Oil-starch: sun-flower, Rape, cereals, sorghum, corn maize — Similar to conventional crops: medium-high input use

Ligno-cellulose crops:

3) Short Rotation Coppice and perennial biomass grasses (myscanthus, Switchgrass, Reed Canary grass, etc.) — Low input use, low mechanisation, important landscape structural impacts

Type of land use conversion possible

Types of land use conversions most likely to affect biodiversity in either positive or negative way

- Conversion of extensive land use categories to arable land. e.g.
  - Fallow/set-aside → arable
  - Permanent grass → arable
  - Dehesa/montado → arable
  - Abandoned land → arable
  - Wetland → Drained arable land
- Changes within arable land e.g.
  - Intensive crops → extensive biomass crops (SRC)
  - Extensive crops (spring cereals) → intensive biomass crop (e.g. root crops)
  - Intensive crops → intensive crops
  - Decreased/increased crop diversity

Drivers:	*Pressures:*	Water	Soil	Soil organism	Birds	Mammals	Inverts	Plants
rotation widening/ less pesticides/ less fertilisers	**extensification**	**+**	+	+	+	+	+	+
clearing abandoned land	**Re-using abandoned land, increase landscape diversity**	-	-	-	+	+/-	+/-	+/-
drain land/ bring land under irrigation	**Drainage/ irrigation**	-	-	-	-	-	-	-
enlarging plots/ remove hedges, tree lines etc	**Habitat fragmentation**	**0**	0	0	-	-	-	-
more tillage/ploughing removal biomass	**Erosion/ disturbance**	-	-	-	-	-	-	-
More N-application	**Eutrophication, Acidification**	-	-	-	+/-	0	-	-
More pesticides	**pollution**	-	-	-	-	-	-	-
Ploughing-up of perm. grassland/Dehesas	**Habitat destruction**	-	-	-	-	-	-	-

Types of land use conversions most likely to affect environment and biodiversity

- Conversion of extensive land use categories to arable land. e.g.
  - Fallow/set-aside → arable
  - Permanent grass → arable
  - Dehesa/montado → arable
  - Abandoned land → arable
  - Wetland → Drained arable land

- Changes within arable land e.g.
  - Intensive crops → extensive biomass crops (SRC)
  - Extensive crops (spring cereals) → intensive biomass crop (e.g. root crops)
  - Intensive crops → intensive crops
  - Decreased/increased crop diversity

Potential land use conversions and farming practices and pressures on biodiversity

Drivers:	*Pressures:*	**Water**	**Air/ Climate**	**Soil**	**Soil organism**	**Birds**	**Mammals**	**Inverts**	**Plants**
rotation widening/ less inputs	**extensification**	+	+	+	+	+	+	+	+
Clearing abandoned land	**Re-using abandoned land, increase landscape diversity**	-	-	-	-	+	+/-	+/-	+/-
Drain land/ bring land under irrigation	**Drainage/ irrigation**	-	-	-	-	-	-	-	-
Enlarging plots/ remove hedges, tree lines etc	**Habitat fragmentation**	**0**	-	0	0	-	-	-	-
More tillage/ploughing removal biomass	**Erosion/ Soil disturbance**	-	-	-	-	-	-	-	-
More N-application	**Eutrophication, Acidification**	-	-	-	-	+/-	0	-	-
More pesticides	**pollution**	-	-	-	-	-	-	-	-
Ploughing-up of perm. grassland/Dehesas	**Habitat destruction**	-	-	-	-	-	-	-	-

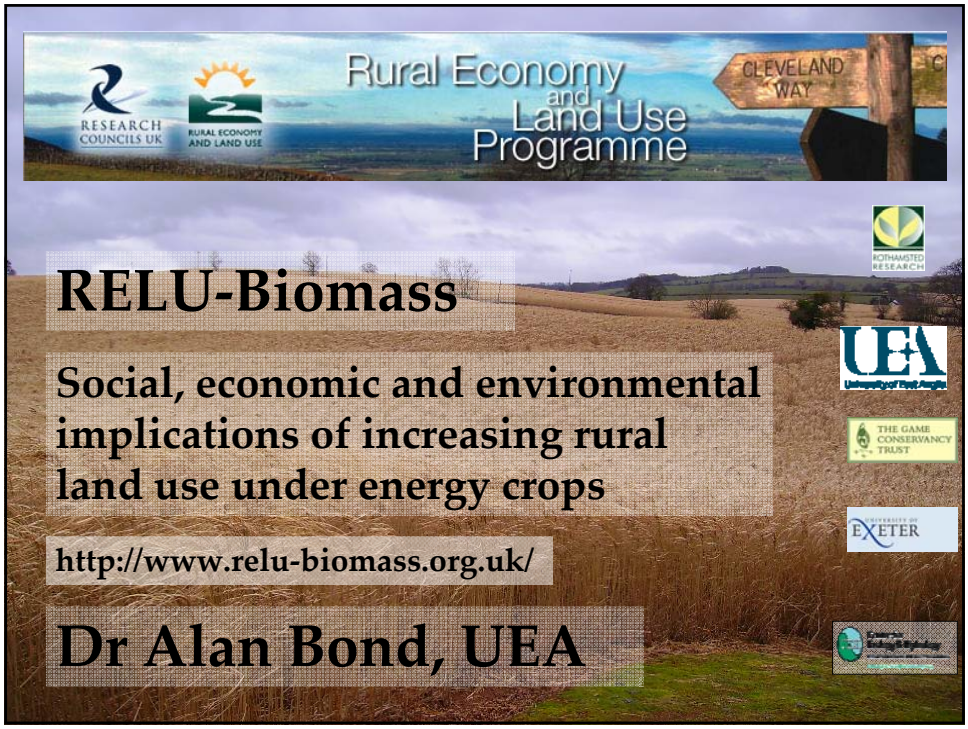
Conclusions

- Increased competition for land should be avoided
- Use of by- and waste products first
- Agrofuels bring the largest risks for adverse effects on biodiversity
- Bad performance on biodiversity usually goes together with bad GHG balance
- Fast introduction of second generation biofuels needed

Recommendations

On free(d) land:

- Try to introduce a mix of biomass crops in order to maintain and/or increase landscape diversity and prevent a further tightening of the crop rotation.
- Aim for reduction in mechanization intensity, such as less tillage and ploughing.
- Prevent the ploughing up of permanent grassland, olive-groves and agro-forestry areas
- Explore win-win solutions for biomass cropping in which biomass is produced while e.g. farmland biodiversity is enhanced, land use is extensified, environmental problems prevented (e.g. soil erosion and fire risk). This can involve currently non-productive lands if the biomass use supports habitat management and avoids negative impacts.



Our RELU-Biomass project will:

- Environmental Impact Assessments
- Strategic Environmental Assessments

Hydrology

Time series measurements:

- Downward global solar radiation
- Net radiation
- Intercepted solar radiation
- Latent heat flux (evaporation)
- Sensible heat flux
- CO2 flux
- Soil water contents and potentials at a number of depths
- Soil temperature and heat flux
- Rainfall
- Throughfall
- Crop canopy height and leaf area index

Biomass Study Sites

- Plants – quadrats
- Seeds – seed traps
- Seedbank – soil cores & germination
- Ground active arthropods – pitfall traps
- Ground & plant active arthropods – vortis suction samples
- Bees & butterflies – transect walks
- Aerial/canopy inverts – sticky traps
- Moths – light traps

Sustainability Appraisal

Objectives identified:

Safeguard archaeological remains; **enhance biodiversity**; reduce greenhouse gas emissions; improve public enjoyment of the countryside; enhance rural employment; increase amount of energy produced locally; reduce energy costs; maintain local landscape character; enhance rural quality of life; **improve water quality**; **maintain water availability**; protect soil resources; improve air quality; minimise additional vehicle movements; maximise waste management opportunities; increase viability of local economies; enhance viability of farming; maintain tourism potential

Sustainability criteria – the issues

- Biodiversity
  - What is biodiversity?
  - Any land use change will change biodiversity (what is the baseline)
  - Climate change will change biodiversity
  - Whether biodiversity change is negative is a value judgement
- Water resources and quality
  - Do we have the data to make the predictions?

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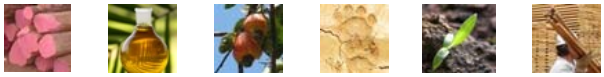
Sustainability criteria for biofuels – social issues

Neil Judd
ProForest



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What are the issues?

- Competition with food production
- Competition with other land uses
- Land tenure conflicts
- Consultation and consent
- Social impacts of production
  - Workforce
  - Local communities

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Is it possible to produce biofuels sustainably?

- Issues are both *direct* and *indirect*
- Direct: issues related to the production of the actual feedstock being used
  - Workforce issues
  - Impacts on communities locally affected by production
- Indirect: issues related to expanding production of, and demand for, feedstocks
  - Competition with food production
  - Competition with other land uses

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Addressing direct and indirect social impacts

- Direct issues can be addressed through approaches such as certification or sustainability reporting
- Indirect issues must be dealt with at a wider scale; general desire to address them but little progress on how to achieve this in practice
  - Reducing energy use and increasing efficiency
  - Local, regional (and global?) land-use planning
  - Strategies to address food security

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Examples of existing initiatives for biofuel feedstocks

- Global multistakeholder process for generic sustainability criteria
  - Roundtable on Sustainable Biofuels
- Statutory generic sustainability reporting requirements
  - UK RTFO Sustainable Biofuel Metastandard
- Global multistakeholder process for specific feedstock
  - Roundtable on Sustainable Palm Oil (RSPO) Principles and Criteria

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Scope of social criteria covered by existing initiatives

Issue	RSB Principles	RTFO Metastandard	RSPO P&C
Consultation	✓	✓ Principle 7	✓ Principles 1, 6 and 7
Human and labour rights	✓	✓ Principle 6	✓ Principle 6
Socio-economic development (including land rights)	✓	Land rights only Principle 7	✓ Principles 2, 6 and 7
Food security	✓	x	x

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Addressing Proposed Annex VIb criteria

Reporting on consequences for food prices and food security	•Broader scale initiatives
Consent by local communities	•Certification and/or sustainability reporting
Public access to information and participation	•Certification and/or sustainability reporting

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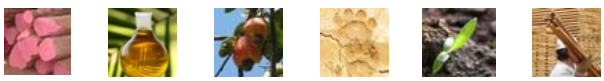
Q & A



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