BIOGRACE

Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

BioGrace workshop on harmonisation of GHG emission calculations

June 29, 2010

Utrecht

Aim of this workshop

1. Familiarise you with the project BioGrace and its products
2. Discuss with you if with the current set of regulations for GHG calculations “we” (regulators, scheme holders, auditors, economic operators) will run into problems with GHG calculations
3. If we agree that there is a problem, define the steps that we need to take.

Agenda

1. Opening and introduction
2. Project BioGrace
   Project aims and results, inconsistencies, requirements for EU-27 harmonisation

LUNCH

3. National GHG calculators
   UK, Germany, Spain, The Netherlands
   How to ensure that these calculators give the same result

Break

4. Requirements from voluntary certification schemes and from auditors checking information from economic operators
5. Closure

BIOGRACE
Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

Project BioGrace

Harmonisation of EU-27 biofuel greenhouse gas performance calculations

John P.A. Neeft
NL Agency
(formerly SenterNovem)

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1. Introduction
   - GHG calculations under RED and FQD
2. Why harmonisation of biofuel GHG calculations?
   “is there a problem?”
3. Project BioGrace
4. Is there a problem?
5. Discussion
6. What do we need to do?

Introduction

GHG calculations under Renewable Energy Directive (RED) and Fuel Quality Directive (FQD)

- RED and FQD: same sustainability criteria including GHG
- RED article 19:
  - Economic operators may use
    - default values (19.1.a)
    - actual values calculated according to Annex V.C (19.1.b)
    - sum of actual value and disaggregated default value (19.1.c)
  - In Europe default values only when feedstock is produced in area on list (19.2) or from waste/residue
- RED article 18:
  - Independent auditors must check information (18.3)
  - Can be part of voluntary certification schemes (18.4)

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Why harmonisation of biofuel GHG calculations?

1. Significant variation possible in actual GHG values (RED 19.1.b) following RED Annex V.C
   - Using same input values
   - Caused by variation in standard values (or "conversion factors" / "background processes") to convert kg, MJ or m^3 into $CO_{2,eq}$
2. This causes a problem using actual GHG values
   - Auditors can NOT check if standard values are correct
   - Economic operations can enhance the GHG performance of their biofuel without decreasing actual GHG emissions
3. Three possible solutions were discussed, of which two theoretical
4. Several GHG experts and MS policy makers…
   - …agree that harmonisation of standard values is best solution
   - …intend to implement this solution

Is there a problem? (1)

EXAMPLE 1: Different results from same biofuel

(same input values but different standard values)

Production FAME from Rapeseed

Overview Results

Parameter U

- Nitrogen Fertilizer
- P fertilizer
- K fertilizer
- CaO fertilizer (85%CaCO3+15%CaO,Ca(OH)2)
- Pesticides
- Diesel (direct plus indirect emissions)
- Natural gas (direct plus indirect emissions)
- Methanol (direct plus indirect emissions)

Production FAME from Rapeseed

Overview Results

Calculation	Total	RED Annex V Table D
All results in g $CO_{2,eq}$ / MJ_{FAME}		
Cultivation	**28**	**29**
Cultivation of rapeseed	27,3	28,5
Rapeseed drying	0,4	0,4
Processing	**12**	**15**
Extraction of oil	2,3	2,7
Refining of vegetable oil Esterification	9,4	12,8
Transport	**1**	**1**
Transport of rapeseed	0,2	0,2
Transport of FAME	0,7	0,8
Filling station	0,5	0,4
Totals	**41**	**46**

Why harmonisation of biofuel GHG calculations?

1. Significant variation possible in actual GHG values (RED 19.1.b) following RED Annex V.C
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2. This causes a problem using actual GHG values
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Project BioGrace

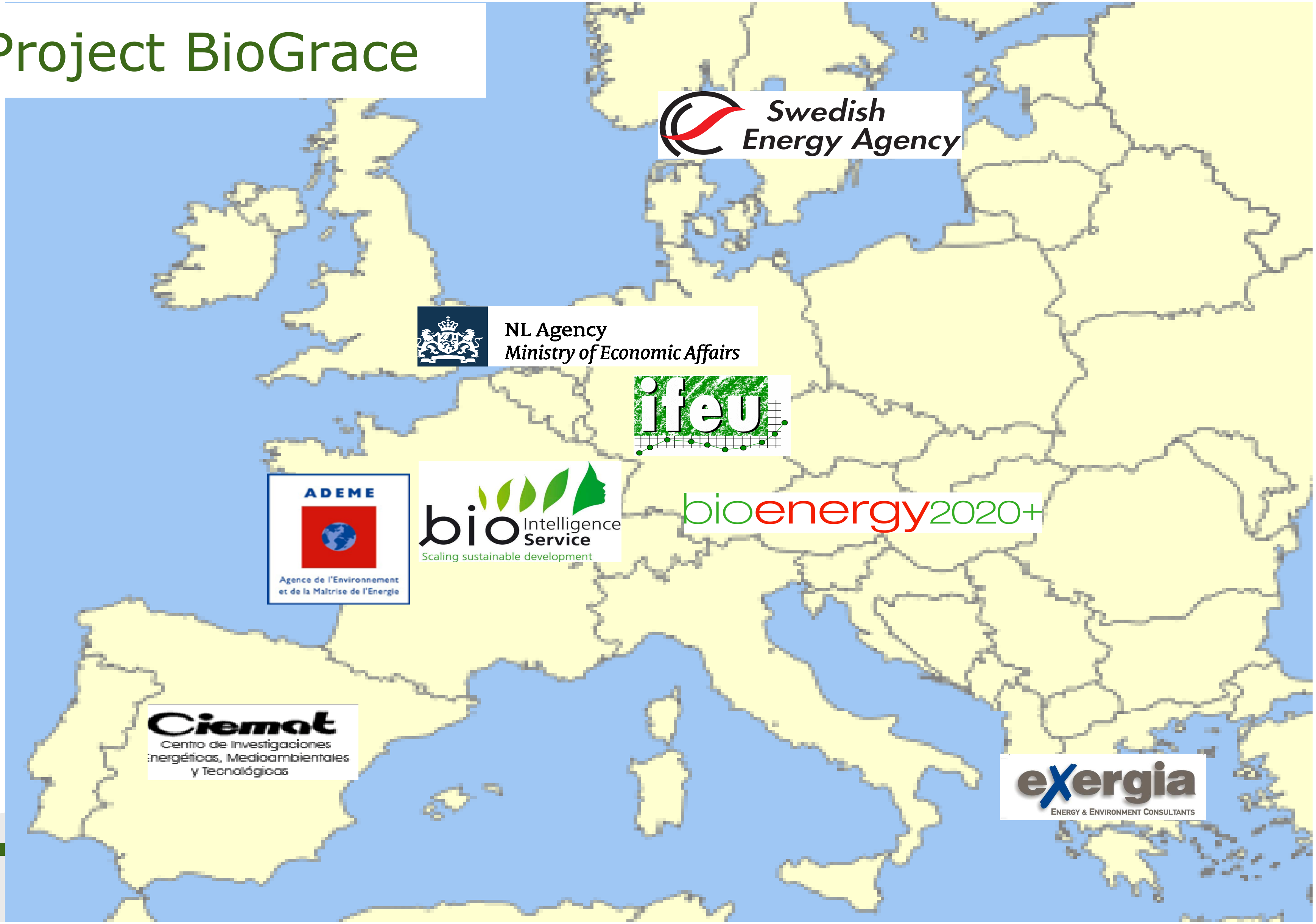
Aim of project:

- Harmonise calculations of biofuel greenhouse gas (GHG) emissions performed in EU-27 under legislation implementing the Renewable Energy and Fuel Quality directives

Consortium

- Agencies/organisations close to national governments and experts in GHG calculations
  - Coordinator: Agentschap NL (formerly SenterNovem)
  - Partners: ADEME, BE2020, BIO-IS, CIEMAT, IFEU, EXERGIA, STEM

Project BioGrace



Project BioGrace

Key objectives are:

1. **Cause transparency**
   Reproduce biofuel default GHG values (Annex V RED)
2. **Cause harmonisation**
   Cause that GHG calculation tools give the same results
3. **Facilitate stakeholders**
   Allow relevant stakeholders to calculate actual values
4. **Disseminate results**
   Make our results public to all relevant stakeholders

Project BioGrace

- Project coordinator: Agentschap NL (NL Agency)
  Dr. John P.A. Neeft
  e-mail: john.neeft@agentschapnl.nl

- Project partners:
  - ADEME, France (Bruno Gagnepain)
  - BE2020, Austria (Dina Bacovsky)
  - BIO IS, France (Remy Lauranson)
  - CIEMAT, Spain (Yolanda Lechon)
  - EXERGIA, Greece (Konstantinos Georgakopoulos)
  - IFEU, Germany (Horst Fehrenbach)
  - STEM, Sweden (Matti Parika)

- Project website: www.BioGrace.net
  (per June, 2010)

Project BioGrace – Our work

"**Bio**fuel **Gr**eenhouse Gas emissions: **a**lignment of **c**alculations in **E**urope"

Our work:

a) Create a uniform and transparent data set (conversion factors and input data)

b) Publish standard values, request policy makers to make reference from national legislation (implementing RED / FQD)

c) Cause GHG calculations to be transparent - reproduce biofuel default GHG values (Annex V RED)

d) Cause that existing GHG calculators give the same results

e) Allow relevant stakeholders to calculate actual values by providing tools (excel sheets, user-friendly GHG calculators)

f) Cause that products (data set, tools) are known by relevant stakeholders throughout Europe

Our work: a) Create a uniform data set

- Input data
- Standard values ("conversion factors")

Calculation per phase

Cultivation of rapeseed			Calculated emissions			
			Emissions per MJ fuel (end product)			
			g CO_2	g CH_4	g N_2O	g $CO_{2,\,eq}$
Yield						
Rapeseed	**3.113**	kg ha^{-1} $year^{-1}$				
Moisture content	**10,0%**					
Energy consumption						
Diesel	**2.963**	MJ ha^{-1} $year^{-1}$	6,06	0,00	0,00	6,06
Agro chemicals						
N-fertiliser	**137,4**	kg N ha^{-1} $year^{-1}$	9,08	0,03	0,03	19,00
CaO-fertiliser	**19,0**	kg CaO ha^{-1} $year^{-1}$	0,05	0,00	0,00	0,06
K_2O-f						
P_2O_5-						
Pestic						
Seedi						
Seeds						

STANDARD VALUES

parameter:	GHG emission coefficient			
unit:	gCO_2/kg	gCH_4/kg	gN_2O/kg	$gCO_{2\text{-}eq}$/kg
N-fertiliser	2827,0	8,68	9,6418	5917,2

Our work: b) Publish list of standard values

Publish list of standard values

- Make list with standard values publicly available
- Make sure that these standard values are used by everyone that makes GHG calculations under RED/FQD based legislation by *eg*:
  - Including them in all software tools
  - Causing that they are known by all GHG calculation experts
  - Showing that these (and only these) standard values lead to RED defaults
  - Requesting policy makers to make reference from national legislation (implementing RED / FQD)

Our work: c) Transparent calculations

Cause GHG calculations to be transparent

- Make excel sheets which show GHG calculations
- Excel sheets show:
  - Input data used
  - How to convert input data to GHG emissions
  - Allocation (energy content)
  - How to reproduce RED Annex V default GHG values
- Excel sheets allow for own input

Our work: c) Transparent calculations

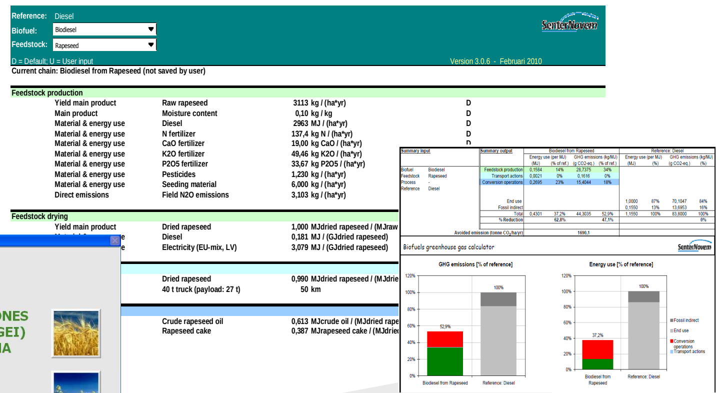
Cause GHG calculations to be transparent

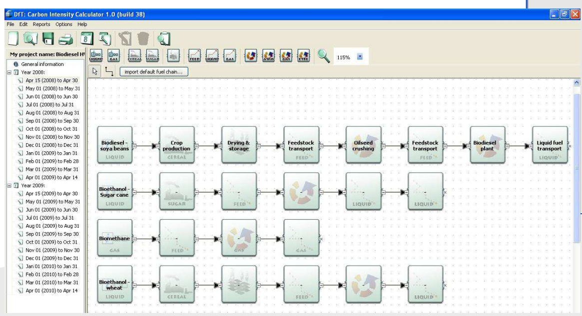
EXCEL sheet

Our work: d) Harmonise calculators

Harmonise existing GHG calculators

- Cause that existing GHG calculators give the same results
- GHG calculators are being developed in:
  - Germany
  - Spain
  - UK
  - Netherlands





Our work: e) Enable others to calculate

Facilitate stakeholders to calculate actual values

- Excel sheets and user friendly GHG calculators facilitate stakeholders to calculate actual values
- Both the Excel sheets and the calculators facilitate relatively simple calculations
  - Change input numbers
  - Add inputs
- The Excel sheets also facilitate stakeholders to make more complicated calculations:
  - Add process steps in biofuel production chain (*eg* add drying step, or extra transport step)
  - Set-up of complete new biofuel production chain

Our work: e) Enable others to calculate

- Planning for delivery of biofuel production pathways within Excel sheet:

	June/July 2010	September 2010	End of 2010
Ethanol	•Sugarbeet •Wheat NG boiler	•Corn •Sugarcane •Wheat NG CHP	•Wheat (process not specified) •Wheat – Lignite fired CHP •Wheat – Straw fired CHP
Biodiesel	•Rapeseed	•Palm oil •Palm oil (methane capture) •Sunflower •Used cooking oil	•Soy
PVO		•Rapeseed	
HVO	•Rapeseed		•Palm oil •Palm oil (methane capture) •Sunflower
Biogas			•Dry manure •Wet manure •MSW

Our work: f) Dissemination

Disseminate project results

- Cause that products (data set, tools) are known by relevant stakeholders throughout Europe
  - Website **www.BioGrace.net** from June 2010
  - GHG calculation expert workshop: September 2010
  - Policy maker workshops: October – November 2010
  - Stakeholder workshops: End 2010 / Early 2011
    - 6 workshops in all corners of Europe
    - workshops expected to be large (100-200 participants)

- Input is highly appreciated

Contents

Is there a problem?

Example 2

- ISCC voluntary certification system

  "For data taken from literature or data bases (heating values, emission factors, etc.) the respective source and year of publication must be documented and verified by the auditors."
  ISCC document "205 GHG Emission Calculation Methodology"

- Values from literature / databases

Natural gas (EU mix gas quality)

Value	Unit	Source
67,6	g CO_{2eq}/MJ	"List of standard values – Version 1 – Public" on www.BioGrace.net E3database of LBST and JEC consortium
53,9	g CO_{2eq}/MJ	EcoFYs/CE - Dutch GHG calculation tool – version 2_1 http://www.senternovem.nl/mmfiles/Technicalspecificationv2.1b20080813_tcm24-280269.pdf Elsayed MA, Matthews R and Mortimer ND, 2003, Carbon and energy balances for a range of biofuels options, Sheffield Hallam University/Resources Research Unit, Sheffield UK. http://www.forestry.gov.uk/pdf/fr_ceb_0303.pdf/$FILE/fr_ceb_0303.pdf

- BioGrace Excel GHG calculations

Is there a problem?

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Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

1
35%

Production of Ethanol from Wheat (NG steam boiler)

Overview Results

All results in g $CO_{2,eq}$ / $MJ_{Ethanol}$	Non- allocated results	Allocation factor	Allocated results	Total
Cultivation e_{ec}				23,3
Cultivation of wheat	39,17	59,5%	**23,31**	
Processing e_p				29,4
Ethanol plant	49,40	59,5%	**29,40**	
Transport e_{td}				1,9
Handling & storage of whea	0,10	59,5%	**0,06**	
Transport of wheat	0,52	59,5%	**0,31**	
Transport of ethanol	1,10	100%	**1,10**	
Filling station	0,44	100%	**0,44**	
Land use change e_l	0,0	59,5%	0,0	0,0
e_{sca} + e_{ccr} + e_{ccs}	0,0	100%	0,0	0,0
Totals	**90,7**			**54,6**

Calculation per phase

Ethanol plant			Quantity of product
Yield			
Ethanol	**0,537**	$MJ_{Ethanol}$ / MJ_{Wheat}	40.688 $MJ_{Ethanol}$ ha^{-1} y
By-product DDGS	**1,14**	ton_{DDGS} / $ton_{Ethanol}$	0,531 MJ / $MJ_{Wheat, in}$
Energy consumption			
Electricity EU mix MV	**0,076**	MJ / $MJ_{Ethanol}$	
Steam (NG boiler)	**0,509**	MJ / $MJ_{Ethanol}$	

Standard calculation for wheat: 35% GHG reduction

Is there a problem?

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Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

2
31%

Production of Ethanol from Wheat (NG steam boiler)

Overview Results

All results in g $CO_{2,eq}$ / $MJ_{Ethanol}$	Non- allocated results	Allocation factor	Allocated results	Total
Cultivation e_{ec}				23,3
Cultivation of wheat	39,17	59,5%	**23,31**	
Processing e_p				32,4
Ethanol plant	54,48	59,5%	**32,42**	
Transport e_{td}				1,9
Handling & storage of whea	0,10	59,5%	**0,06**	
Transport of wheat	0,52	59,5%	**0,31**	
Transport of ethanol	1,10	100%	**1,10**	
Filling station	0,44	100%	**0,44**	
Land use change e_l	0,0	59,5%	0,0	0,0
e_{sca} + e_{ccr} + e_{ccs}	0,0	100%	0,0	0,0
Totals	**95,8**			**57,6**

Calculation per phase

Ethanol plant			Quantity of product
Yield			
Ethanol	**0,537**	$MJ_{Ethanol}$ / MJ_{Wheat}	40.688 $MJ_{Ethanol}$ ha^{-1} y
By-product DDGS	**1,14**	ton_{DDGS} / $ton_{Ethanol}$	0,531 MJ / $MJ_{Wheat, in}$
Energy consumption			
Electricity EU mix MV	**0,060**	MJ / $MJ_{Ethanol}$	
Steam (NG boiler)	**0,600**	MJ / $MJ_{Ethanol}$	

Actual value with changed input data in ethanol plant (electricity and steam input). Process uses more GHG than default process: 31% GHG reduction

Is there a problem?

3

Economic operator takes value for Natural gas from literature: 53,9 g $CO_{2,eq}$/MJ, from literature source "Elsayed, 2003"). As natural gas is no direct input in the calculation, he calculates the emission per MJ of steam in the same way as in done on the sheet "standard values" but with the new NG values

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www.biograce.net

STANDARD VALUES

parameter:	GHG emission coefficient							
unit:	gCO_2/kg	gCH_4/kg	gN_2O/kg	gCO_{2-eq}/kg	gCO_2/MJ	gCH_4/MJ	gN_2O/MJ	gCO_{2-eq}/MJ
User defined standard values								
Example 1 (diesel from standard values)				0,00	87,51	0,00	0,00	87,55
Example 2 (methanol from standard values)				0,00	92,80	0,29	0,00	99,57
Natural Gas (EU mix, Elsayed)				0,00	53,9	0	0	53,90
Electricity EU mix MV				0,00	119,3622	0,291083	0,005389	127,65
Steam (NG Boiler, EU Mix, Elsayed)				0,00	62,27613	0,005822	0,000108	62,44
				0,00				0,00
				0,00				0,00

Is there a problem?

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4
38%

Production of Ethanol from Wheat (NG steam boiler)

Overview Results

All results in g $CO_{2,eq}$ / $MJ_{Ethanol}$	Non- allocated results	Allocation factor	Allocated results	Total
Cultivation e_{ec}				23,3
Cultivation of wheat	39,17	59,5%	**23,31**	
Processing e_p				26,9
Ethanol plant	45,12	59,5%	**26,85**	
Transport e_{td}				1,9
Handling & storage of whea	0,10	59,5%	**0,06**	
Transport of wheat	0,52	59,5%	**0,31**	
Transport of ethanol	1,10	100%	**1,10**	
Filling station	0,44	100%	**0,44**	
Land use change e_l	0,0	59,5%	0,0	0,0
$e_{sca} + e_{ccr} + e_{ccs}$	0,0	100%	0,0	0,0
Totals	**86,4**			**52,1**

Calculation per phase

Ethanol plant			Quantity of product
Yield			
Ethanol	**0,537**	$MJ_{Ethanol}$ / MJ_{Wheat}	40.688 $MJ_{Ethanol}$ ha^{-1} y
By-product DDGS	**1,14**	ton_{DDGS} / $ton_{Ethanol}$	0,531 MJ / $MJ_{Wheat, in}$
Energy consumption			
Electricity EU mix MV	**0,060**	MJ / $MJ_{Ethanol}$	
Steam (NG Boiler, EU Mix, Elsa	**0,600**	MJ / $MJ_{Ethanol}$	

This new user defined standard value can be used simply by inserting the name on the calculation sheet. The GHG emission reduction now becomes 38%,

Without changing anything to the process of ethanol production!!

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What do we need to do?

We propose to discuss on an *example text*

- as outcome from this workshop
- to be communicated to biofuel policy makers of 27 Member States

We will also ask you at the end of the workshop if you will take action

- a few should start
- others can then follow

What do we need to do?

Proposal for *example text* (open for discussion)

1/3

RED Annex V.C gives a methodology for the calculation of biofuel GHG emissions. Calculations that are performed with this methodology can, however, easily lead to different results. These differences in results are caused by the use of different standard values (also called conversion factors or emission factors) which are not defined in the RED. Policy makers from EU member states have agreed that from national legislation implementing the RED they will make reference to a list of standard values on the EC transparency platform / on www.BioGrace.net. The use of this list leads to harmonisation of biofuel GHG calculations in Europe.

What do we need to do?

Proposal for *example text* (open for discussion)

2/3

National regulations containing this reference will prescribe that GHG calculations can only be performed with values from this list, with one exception. An economic operator may use an alternative standard value if this value is explicitly mentioned, if the value is substantiated and if the value is verified. The economic operator has to:

- mention the standard value, as an alternative to the values in the list with standard values, explicitly with the result of his calculation
- submit reliable information, conform RED Article 18.3, which shows how this alternative value was determined
- allow auditors to verify this information conform RED Article 18.3

What do we need to do?

Proposal for *example text* (open for discussion)

3/3

Proposal of text to be included in legislation (draft, to be discussed):

Article XX

1. When calculating actual biofuel GHG emissions, the factors as listed in the "List with Standard values" on the website www.BioGrace.net have to be used;
2. It is allowed to use factors other than the factors of Article XX.1 only if
   - these factors are explicitly named together with the result of the calculation;
   - reliable information is submitted, conform RED article 18.3, showing how these factors were determined;
   - auditors are allowed to verify this information conform RED Article 18.3.

Thank you for your attention

Intelligent Energy Europe

Project BioGrace – project background

Two approaches (ways of thinking) to perform biofuel GHG calculations on individual batches of biofuels

Poorer ***Applicability (part of legislation)*** ***Better***

High ***Complexity*** ***Low***

Scientific approach:

- High level of accuracy
- Case-specific numbers
- Variation (*eg* multiple years: crop rotation)
- Focus on correctness of results

Policy approach:

- Compromise between accuracy and applicability
- Average numbers
- Unambiguous and limited amount of variation
- Focus on applicability as part of legislation

BIOGRACE

Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

ISCC and other systems

Systems relating to RED

- ISCC (International Sustainability and Carbon Certification)
- REDCert
- RSPO (tending to introduce GHG standard)
- BSI (tending to introduce GHG standard)
- RTRS (tending to introduce GHG standard)

ISCC system

ISCC (International Sustainability and Carbon Certification)

- ISCC has been approved by BLE (Jan 2010) and has issued first certificates
- First ISCC certificates have been issued on April 30, 2010
- ISCC system is described in documents like:
    - ISCC 201 System Basics
    - ISCC 202 Sustainability Requirements
    - ISCC 203 Requirements for Traceability
    - ISCC 204 Mass Balance Calculation Methodology
    - ISCC 205 GHG Emission Calculation Methodology
    - ISCC 207 Risk Management
    - ISCC 254 Cooperation with other Certification Systems

ISCC system

Document “205 GHG Emission Calculation Methodology”:

- GHG information provision through:
  - Use of default value
  - Use of individually calculated values
  - Combination of default values and individually calculated value
- In case of individually calculated value:
  - Data on inputs must be gathered on-site
  - From scientifically recognized literature can be taken
    - Heating values of main product and by-products;
    - Emission factors
    - Emission factor of N_2O.
  - For data taken from literature or data bases (heating values, emission factors, etc.) the respective source and year of publication must be documented and verified by the auditors.

ISCC system

Question posed to ISCC

- “Do you agree that
  - the use of "scientifically recognized literature" easily can lead to the use of different values once the industry understands that they can look for the most favourable value available?
  - that, as a result, there is a need to harmonise these emission factors used by having a standard list and have members states refer to that list from national legislation. These should be used unless someone can show that they have used a very specific input (like the N-fertiliser coming from a specific producer with a low-emission production process) and can give proof for the emissions factor of that input.”

Answer by Jan Henke (ISCC)

- “We could not agree more. We have pointed out already at many different occasions to German and EU policy makers that a standard list of emission factors would be needed. The best would be if this comes from the EC. If this does not happen in future, ISCC is thinking about drawing one up and having this accepted by the respective authority.”

ISCC system

Question posed to ISCC

- Is it true that all values in the table below can be used?

Natural gas (EU mix gas quality)

Value	Unit	Source
67,6	g CO_{2eq}/MJ	"List of standard values – Version 1 – Public" on www.BioGrace.net E3database of LBST and JEC consortium
53,9	g CO_{2eq}/MJ	EcoFYs/CE - Dutch GHG calculation tool – version 2_1 http://www.senternovem.nl/mmfiles/Technicalspecificationv2.1b20080813_tcm24-280269.pdf Elsayed MA, Matthews R and Mortimer ND, 2003, Carbon and energy balances for a range of biofuels options, Sheffield Hallam University/Resources Research Unit, Sheffield UK. http://www.forestry.gov.uk/pdf/fr_ceb_0303.pdf/$FILE/fr_ceb_0303.pdf
68	g CO_{2eq}/MJ	Renewable Fuels Agency, C&S Technical Guidance version 3 http://www.renewablefuelsagency.gov.uk/page/guidance-v3
62,0	g CO_{2eq}/MJ	Renewable Fuels Agency, C&S Technical Guidance version 2 http://www.renewablefuelsagency.gov.uk/sites/rfa/files/_documents/Carbon_and_Sustainability_Guidance_Part_2.pdf
61	g CO2eq/MJ	Biofuel Greenhouse Gas Calculator of HCGA – www.hcga.com (search for "GHG")

- Currently, yes !

REDCert

Recently founded by German agricultural, biofuel and mineral oil associations. also preliminarily approved by BLE.

REDCert focusses the requirements of the RED, not going further.

REDCert has been founded to provide a certification system particuliarly for German biomass and biofuel producers.

RSPO

In the run-up to RSPO's General Assembly meeting, the RSPO's Greenhouse Gas (GHG) working group issued recommendations on ways to integrate potential effects on carbon emissions into the RSPO's current criteria for sustainable palm oil production.

The working group did not yet reach consensus on all the issues.

The RSPO's executive board, stated that:

"RSPO members are firmly committed to tackle their greenhouse gas emissions and to optimize their contribution to tackling climate change through flexible but time-defined voluntary actions.„

No focus on land-use change but minimzing fossil fuel use, methane emissions from effluent lagoons, fertilizer inputs, and management of peat land ground water levels

BIOGRACE

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Dutch GHG calculator

John P.A. Neeft

NL Agency

History

Background

- o Dutch government prepared a reporting obligation on sustainability for biofuels to start per 1-1-2009
- o This was abandoned after the publication of the draft Renewable Energy Directive (RED).

The Dutch GHG calculator

- o was developed in 2007/2008 by consultants EcoFys and CE
- o has been available for (Dutch) stakeholders to make GHG calculation on biofuels and learn to understand which are the most important factors that determine biofuel GHG emissions
- o has not been used extensively as there is currently no legal framework that makes use of it.

Status and planning

Status

- As compared to RED, the current public calculator contains
  - different methodology
  - different pathways (eg methanol from glycerine and ethanol from wheat straw)
- Currently calculator is being updated to be RED-proof
- New calculator will give exactly the same results as BioGrace GHG Excel calculator

Planning

- Publish first RED-proof version in July or August (4 chains)
- Include sheet to calculate emissions from direct land use change
- Publish next versions simultaneous to versions of BioGrace Excel file

Thank you for your attention

Intelligent Energy Europe

BIOGRACE

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How to ensure that GHG calculators give the same result

Biofuels versus Bio-electricity

Our discussion is on biofuels

- For biofuels, default value and methodology are fixed in RED+FQD
- For bio-electricity, sustainable criteria incl. GHG performance and methodology are not fixed within Europe
- EU MS can adapt bio-electricity sustainable criteria voluntarily

For bio-electricity

- It would be useful to start an attempt to harmonise calculations (and the methodology as well)
- Meetings take place, there is no concrete plan or project (yet)

Ensure that calculators give same result

GHG calculators of GE, NL, SP and UK:

- Are part of (or linked to) BioGrace project
- We will make sure that they give the same result

Other GHG calculators:

- Biofuel GHG calculators being developed by companies or institutions not linked to BioGrace:
  - Nesté Oil
  - Abengoa
  - ………
- There is no regulation that tells them to give the same result
- WHAT CAN / SHOULD WE DO?

Background

Two approaches (ways of thinking) to perform biofuel GHG calculations on individual batches of biofuels

Poorer ***Applicability (part of legislation)*** ***Better***

High ***Complexity*** ***Low***

Scientific approach:
- High level of accuracy
- Case-specific numbers
- Variation (*eg* multiple years: crop rotation)
- Focus on correctness of results

Policy approach:
- Compromise between accuracy and applicability
- Average numbers
- Unambiguous and limited amount of variation
- Focus on applicability as part of legislation

BIOGRACE

Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

National calculation tools under development

Germany

German Research Project “BioNachTHG”

Objectives:

The calculator tool shall

- facilitate the calculation of actual values (combination of actual values and disaggregated default values)
- lead to harmonized calculation by the economic operators and prevent diverging of results.
- support the GHG calculation for all bioenergy pathways which are relevant for the German market.
- Be harmonized within a European context (→ BioGrace).

Work packages

1. Broadening the scientific groundwork for the GHG calculation for bioenergy with respect to the requirements of the German sustainability regulations (BioSt-NachV, Biokraft-NachV); data base, methodical approaches;
2. Developing a user-friendly database supported calculation tool;
3. Performing practical tests;
4. Supporting of connected reporting requirements;
5. Supporting and advising German policy makers (BMU, BMELV etc.) concerning GHG relevant questions in the course of the implementation of 2009/28/EC.

Working steps in WP1

Broadening the scientific groundwork for the GHG calculation

1. Alignment and coordination with ongoing processes
   – communication with institution which are working for the Commission in that area (→ BioGrace!);
2. Analysing the demand for data to be elaborated;
3. Focal point land-use change:
   data and approaches;
4. Data base – addition of further and more specific types of raw material (crops), production pathways and geographic proveniences
5. documentation

Selection of pathways for the calculator

Yellow marked: Default values exist

biofuel	type	raw material / crop
Ethanol	cereals	Wheat (yellow)
		Maize (yellow)
		Rye
	bulbs/beets/ pulp	Sugarbeet (yellow)
		Sugarcane (yellow)
		Cassava
Plant oil / Biodiesel	oil seeds	Rapeseed (yellow)
		Oil palm (yellow)
		Soybean (yellow)
		Sunflower (yellow)
		Coconut
		Jatropha
	residues	Used oil (veg.) (yellow)
Solid biomass	wood/whole plants	Short rotation coppice (yellow)
		Switch grass (yellow)

Selection of pathways for the calculator

data matrix

feedstock	**Palm oil**							
origin	*South East Asia*					*South America*		
	Malaysia	Indonesia	Thailand	Papua-New Guinea	other SE-Asia	Columbia	Peru	Brasil (Amazon.)
cultivation	Plantation /	Plantation /	...		...			
	Small holder	Small holder	Small holder	...	...			
	...	...						
transport	...	...						
mill	...	...						

Working plan

Arbeitspaket	2009		2010												2011									
	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10
AP 1 Verbreiterung der wissenschaftlichen Grundlagen der THG-Berechnung für Bioenergie gemäß BioSt/Biokraft-NachV: Daten, methodischen Herangehensweisen																								
1.1 Abstimmungsprozesse – Austausch den für die Kommission tätigen Einrichtungen, insbesondere JRC, Ecofys																								
1.2 Analyse des Bedarfs an zu erarbeitenden Daten																								
1.3 Schwerpunkt Landnutzungsänderung, Daten und Modellansätze																								
1.4 Datenbasis - Ergänzung der Rohstoffarten, Produktionspfade, Herkunftspfade																								
1.5 Dokumentation																								
AP 2 Erstellung eines anwenderfreundlichen datenbankbasierten Rechen-Tools																								
2.1 Entwicklung der NachV-kompatiblen Modellstruktur, Festlegung des Gesamtumfangs, Gestaltung des möglichen Erweiterungsfähigkeit																								
2.2 Aufbau der Datenbank und der Rechenverknüpfungen																								
2.3 Austausch und Abgleich mit analogen Tool-Entwicklungen in Europa																								
2.4 Gestaltung des Tools mit anwenderfreundlicher Eingabemaske , Webbasierte Lösung																								
AP 3 Durchführung von Praxistests																								
3.1 Interne Tests, Plausibilisierung, Optimierung, Abgleich mit anderen Tools																								
3.2 Workshops mit betroffenen Kreisen, Vertretern aus der Produktionskette zur Durchführung von beispielhaften Testläufen;																								
Auswertung, Dokumentation und ggf. Anpassung des Tools																								
EU-weiter Abschluss-Workshop																								
AP 4 Unterstützung und Anbindung bezüglich anknüpfender Berichtspflichten																								
4.1 Entscheidungshilfen zur Erfüllung der Berichtspflichten im Kontext der RL 2009/28/EG																								
4.2 Lösungsansätze für mögliche Doppelanrechnungen z.B. THG Minderungen zwischen CDM-Mechanismus und BioSt-NachV																								
AP 5 Wissenschaftlich-technische Unterstützung der Fachpolitik zu allen THG-spezifischen Fragen, die sich aus der weiteren Umsetzung und Entwicklung der RL 2009/28/EG ergeben																								
Berichterstellung																								
Koordination; geplante Treffen																								
MEILENSTEINE				1							2							3						4

Working plan - modification

- The "complete" version of the calculator will be accomplished by the end of 2011.

- Demand for an immediately available tool at least for:
  - Palm oil biodiesel and palm oil (from mills without methane capture)
  - soybean oil biodiesel

  } default values <35% saving

→ Simplified spreadsheet solution. .

Requirements for simplified tool

- Data aligned within the BioGrace project
(basic set-up of the tool is calibrated with default values)
- Application is in line with BLE Guidance
- Strongly addressed to economic operators:
1 sheet dedicated for cultivators, mill operators, refinery operators, etc.

German Research Project “BioNachTHG”

Simplified tool

	A	B	C	D	E	F
1	**I. Akteursebene Anbau von Biomasse (Anbaubetriebe, Ersterfasser)**					
2						
3	**Schritt-für-Schritt Anleitung für Möglichkeit B:**					
4						
5	Basisformel:					

$$e_{ec}' = \frac{Emission_{Dünger}\left[\frac{kgCO_2}{ha * a}\right] + Emission_{Diesel}\left[\frac{kgCO_2}{ha * a}\right] + Emission_{Strom}\left[\frac{kgCO_2}{ha * a}\right]}{Ernteertrag_{Haupterzeugnis}\left[\frac{kgErnteertrag}{ha * a}\right]}$$

	A	B	C	D	E	F
12						
13	**ERGEBNIS:**		**0,124**	**kg CO2äq/kg Palmfruchtstände**		
14						
15						
16	**Eingabe Akteur:**					
17	**SCHRITT 1:**	**THG-Emissionen aus Landnutzungsänderungen**				
18						
19	Flächentyp (aktuell)	Ackerland ausdauernd (tropisch feucht)	48			
20	Flächentyp (zum Referenzzeitpunkt)	Grünland (tropisch feucht)	48			
21	Kohlenstoffbestand (aktuell)		48	tC/ha		
22	Kohlenstoffbestand (zum Referenzzeitpur		48	tC/ha		
23	**Emission Landnutzungsänderung**		**0**	**kg CO2äq pro ha pro Jahr**		
24						
25	**Eingabe Akteur:**					
26	**SCHRITT 2:**	**THG-Emissionen aus dem Anbau**				
27	Ernteertrag:	19.000	kg Palmfruchtstände pro ha pro Jahr			
28	Wassergehalt (Palmfruchtstände)	34	%			
29	Anbaufläche	30	ha			
30						
31	Verbrauch Dünger:					
32	Stickstoff	128,0	kg N pro ha pro Jahr			
33	Phosphat	144,0	kg P_2O_5 pro ha pro Jahr			

Akteur Anbau / Akteur Ölmühle / Akteur Raffinerie / Akteur LST / Hintergrunddaten RED / Hintergrunddaten IFEU

Simplified tool

	A	B	C	D	E	F
1	**II.**	**Akteursebene Betreiber von Ölmühlen**				
2						
3	**Schritt-für-Schritt Anleitung für Möglichkeit B:**					
4						
5						
6	**ERGEBNIS:**	**1422**	**g CO2äq/kg**	**Palmöl (roh)**		
7						
8						
9	**Eingabe Akteur:**					
10	**SCHRITT 1:**	**Vorprodukte**				
11	Palmfruchtstände	6.000	t/Jahr			
12	Wahlmöglichkeit					
13	Teilstandardwert	126	g CO2äq/kg FFB			
14	berechneter Wert		g CO2äq/kg FFB			
15						
16	**SCHRITT 2:**	**Daten Ölmühle**				
17	Einsatz FFB	6.000	t/Jahr			
18	Palmölertrag	1350	t/Jahr			
19	Palmkernöl	0	t/Jahr			
20	Kernschrot	150	t/Jahr			
21						
22	Heizölverbrauch	0	l pro Jahr			
23	Erdgasverbrauch:	0	kWh pro Jahr			
24	Stromverbrauch:	0	kWh pro Jahr			
25	Hexanverbrauch	0	t/Jahr			
26	POME Methanabfan	1	(0) mit Methanabfangung; (1) ohne Methanabfangung			
27						
28						
29						
30	**SCHRITT 3:**	**Errechnung THG-Wert Mühle**				
31	Heizölverbrauch	0,0	g CO2äq pro kg Öl			
32	Erdgasverbrauch	0,0	g CO2äq pro kg Öl			
33	Stromverbrauch	0,0	g CO2äq pro kg Öl			

Akteur Anbau | **Akteur Ölmühle** | Akteur Raffinerie | Akteur LST | Hintergrunddaten RED | Hintergrunddaten IFEU

Outlook

- By the end of July the simplified palm oil calculator will be available
- For testing certification shall be involved
- Working the “complete” version will proceed as scheduled

Presentation of national GHG calculation tools under development:

the Spanish GHG calculator

BioGrace workshop on harmonisation of GHG emission calculations

Utrech June 29, 2010

GOBIERNO DE ESPAÑA
MINISTERIO DE CIENCIA E INNOVACIÓN
Ciemat
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas

Background (1/5)

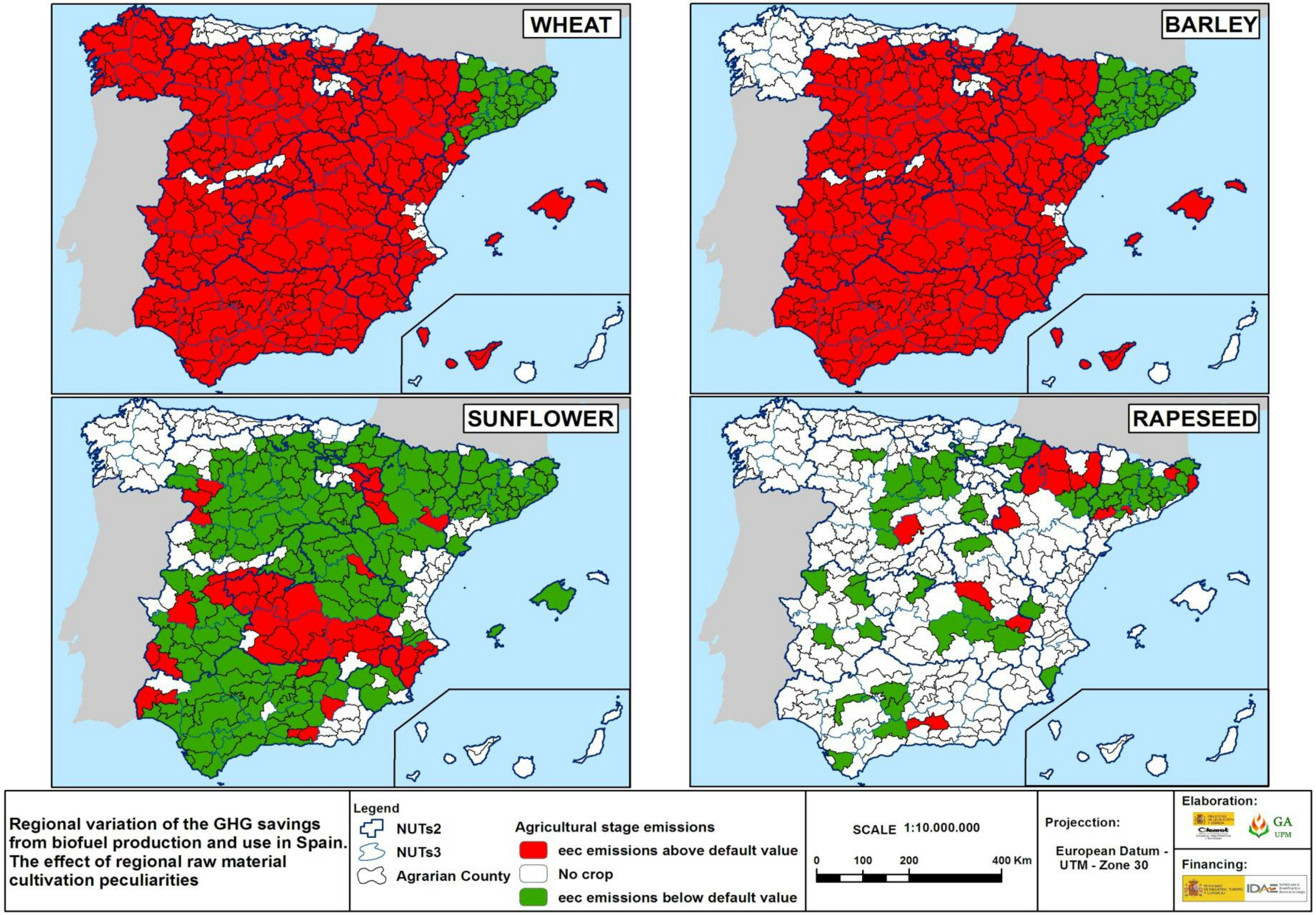
The Spanish GHG calculator is being developed by CIEMAT in the framework of a contract with the Spanish Institute for Diversification and Saving of Energy (IDAE).

Aim: to provide stakeholders (especially farmers and small biofuel companies) with a tool to calculate the GHG emissions required by the RED.

Focus: on the agricultural stages.

Reason: After the work performed to comply with the Art 19.2 of the RED is was patent that for some crops, many of the region's ec values are above the default values for cultivation and therefore cultivation default values in the RED cannot be used. Instead, actual values or averages calculated for smaller geographical areas than those used in the calculation of the default values should be used.

Background (2/5)



Background (3/5)

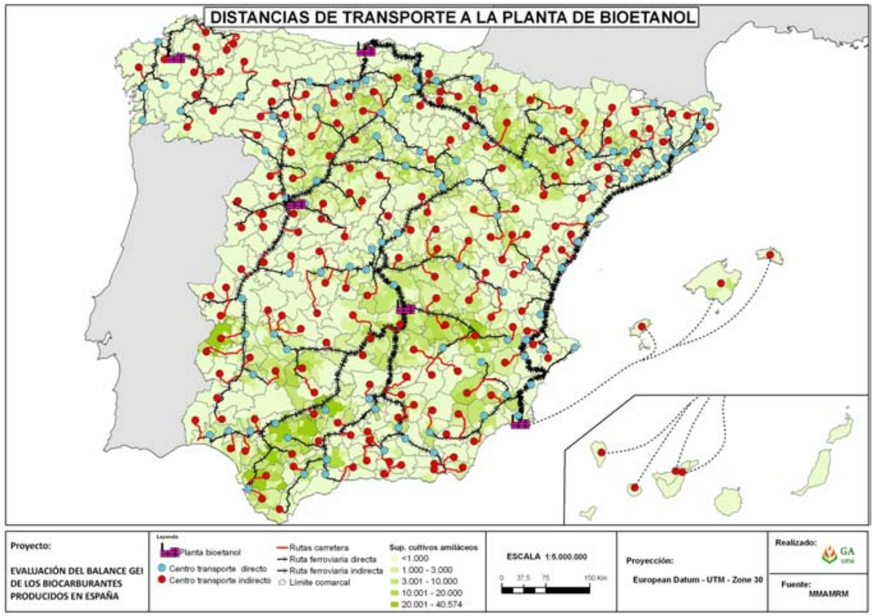
Agricultural inputs and yields for 6 crops used to produce biofuels in Spain have been collected at the level of agrarian county (NUTs4). Results were subsequently aggregated into NUTs3 and NUTs2 scale.

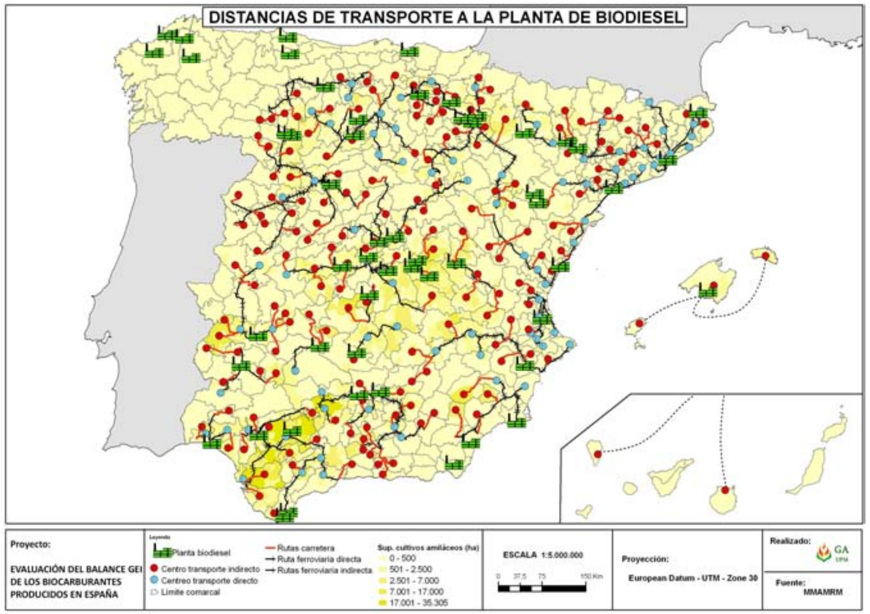
All the agricultural inputs collected for the different Spanish counties are now uploaded in the tool so that any farmer in the country can select his/her county and crop and the default values regarding agricultural inputs and yields will appear in the tool.

Alternatively he/she will be able to change these values in order to insert his/her actual values.

Background (4/5)

Transport distances from the different localizations to the closest transformation plant (in operation or in construction) are estimated using a GIS approach. By means of a multimodal network analysis, the optimal routes from production fields to the closest biofuel plant by road, railway or ship were calculated.





These distances are uploaded in the tool

Background (5/5)

Typical and defaults values for transformation processes are also uploaded in the tool, so that the user can obtain the emissions of the whole production chain of the biofuel selected.

Actual values for processes can also be inserted in the tool.

Initially we used a set of emission factors, LHV and characterization factors different from those used in the calculation of the default values. We are now in the process of introducing the BioGrace standard values into our calculator so that the tool can reproduce the default values of the RED.

Status (1/2)

The calculator is still under development.

We have built the agricultural database that is red by the tool. Crops included in the database are:

- ✓ wheat
- ✓ barley
- ✓ rapeseed
- ✓Sunflower
- ✓Sweet sorghum
- ✓Cynara cardunculus

We have worked out and almost finished one biofuel chain:

- ✓biodiesel from rapeseed

But still we have not completed all the calculations.

Status (2/2)

We have used the IPCC methodology (Tier1) to calculate N2O emissions from the agricultural land. These emissions are included in our database.

However, we are setting up an ambitious project aimed to develop a N2O emissions database for energy crops in different regions of Spain based on actual measures. This database will be included in the tool.

Work to be done and planning

• Include all the 22 biofuel chains of the RED according to the work plan of BioGrace so that the calculator lead to the Annex V default values with the pre-set input data.

• Include land use change calculations and N2O emission calculations using IPCC Tier 1 for other crops not included in our database (soy, sugar cane, palm, sugarbeet).

UK RTFO: RED-ready carbon reporting & the Carbon Calculator

29 June 2010
Utrecht, BioGrace workshop

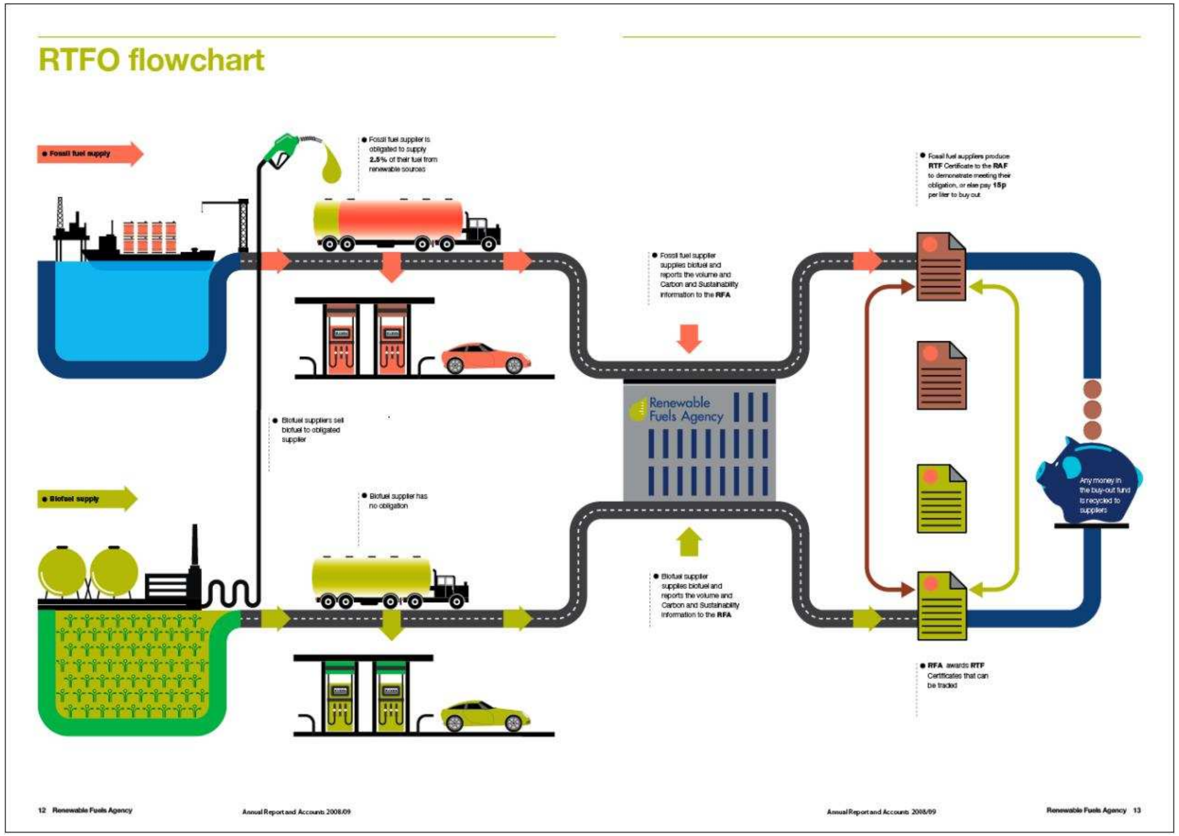
Dr Keeley Bignal
Carbon & sustainability reporting manager
Renewable Fuels Agency

Presentation outline

- UK biofuel policy – the RTFO
- 'RED-ready' C&S reporting
- Biofuel fuel chains calculated
- Replication of the RED default values
- Calculating of carbon defaults for biofuel chains not included in the RED
- Demonstration of the UK's Carbon Calculator

UK biofuels policy: the Road Transport Fuel Obligation

- Introduced in 2008
- Duty point obligation
- 2.5% rising to 5% 2013
- Tradable certificates & buy-out option (30ppl)
- Carbon & sustainability reporting



C&S reporting overview

- Encourage the best biofuels
- Lifecycle analysis of carbon emissions
- RTFO Meta-Standard for sustainability
- Stepping stone to mandatory criteria
- 'RED-ready' C&S reporting from Year 3
- Independent verification
- Annual targets for company performance

Company targets	2008-2009	2009-2010	2010-2011
Percentage of feedstock meeting the 'Qualifying' Environmental Standard	30%	50%	80%
GHG saving	40%	45%	50%
Data provision	50%	70%	90%

Biofuel fuel chains calculated – ethanol, ETBE & TAEE

Incl. in RED

- Corn in EC
- Farmed wood
- Sugar beet
- Sugar cane
- Waste wood
- Wheat – unknown process, lignite as process fuel in CHP plant, natural gas in boiler/CHP, straw in CHP
- Wheat straw

Not incl. in RED

- Barley
- Corn not in EC
- Molasses
- Spent sulphite liquor

Biofuel fuel chains calculated – biodiesel – ME & HVO (& cHVO)

Incl. in RED

- Oilseed rape
- Sunflower
- Soy
- Palm – unknown process, with & without methane capture
- UCO
- Tallow

Not incl. in RED

- Coconut
- Corn oil
- Jatropha

Biofuel fuel chains calculated

Incl. in RED

Biogas

- Dry manure
- MSW
- Wet manure

FT diesel

- Farmed wood
- Waste wood

Not incl. in RED

PPO

- Oilseed rape
- soy

Procedure for replicating RED default values

- **RED LCA methodology**
- **Reference data from JEC consortium**
- **“Input data relevant to calculating default GHG emissions from biofuels according to RE Directive Methodology” (available on the European Commission’s Joint Research Centre’s website)***
- **JEC Well to Wheels Study (available on the Joint Research Centre / EUCAR / CONCAWE website)*#**

***for input data**

 # for emission factors (standard values) – v2c (RED used v3 but not public)

Issues & challenges for biofuel chains in RED

- **Emission factors are slightly different - we used version 2c of the JEC WtW report whereas the BioGrace project has shown that the version used for the RED calculations is version 3 (not yet publically available);**
- **The GWPs used in the RED calculations (25 for CH_4, 298 for N_2O) are different from the ones published in the RED and used in the RFA calculations (23 for CH_4, 296 for N_2O);**
- **Most input data for the wheat to bioethanol chain (NG as process fuel in steam boiler) are the same. However, based on personal communications with John Neeft, we know this is not true for all other chains**

Chains which could not be replicated

Fuel	Feedstock	Process	Problematic stage(s)	RED CI (in g CO_2e / MJ)	Calc CI (in g CO_2e / MJ)	Diff between calc and RED CI
HVO biodiesel	Sunflower	n/a	Cultivation	32	36	4
HVO biodiesel	Palm oil	Process not specified	Cultivation and processing	62	66	4
HVO biodiesel	Palm oil	Process with methane capture at mill	Cultivation and processing	29	33	4
Biodiesel ME	Soy	n/a	Processing	58	57	1
Biodiesel ME	Palm oil	Process not specified	Cultivation	68	69	1
Biodiesel ME	Palm oil	Process with methane capture at mill	Cultivation	37	38	1
Biodiesel UCO	Used cooking oil	n/a	Processing	14	19	5
Ethanol	Wheat	Lignite as process fuel in CHP plant	Processing	70	68	2
Ethanol	Corn (community produced)	n/a	Cultivation	43	41	2
Biogas	Municipal Organic	n/a	Processing	23	25	2

Procedure for calculating carbon defaults for biofuel chains not included in the RED

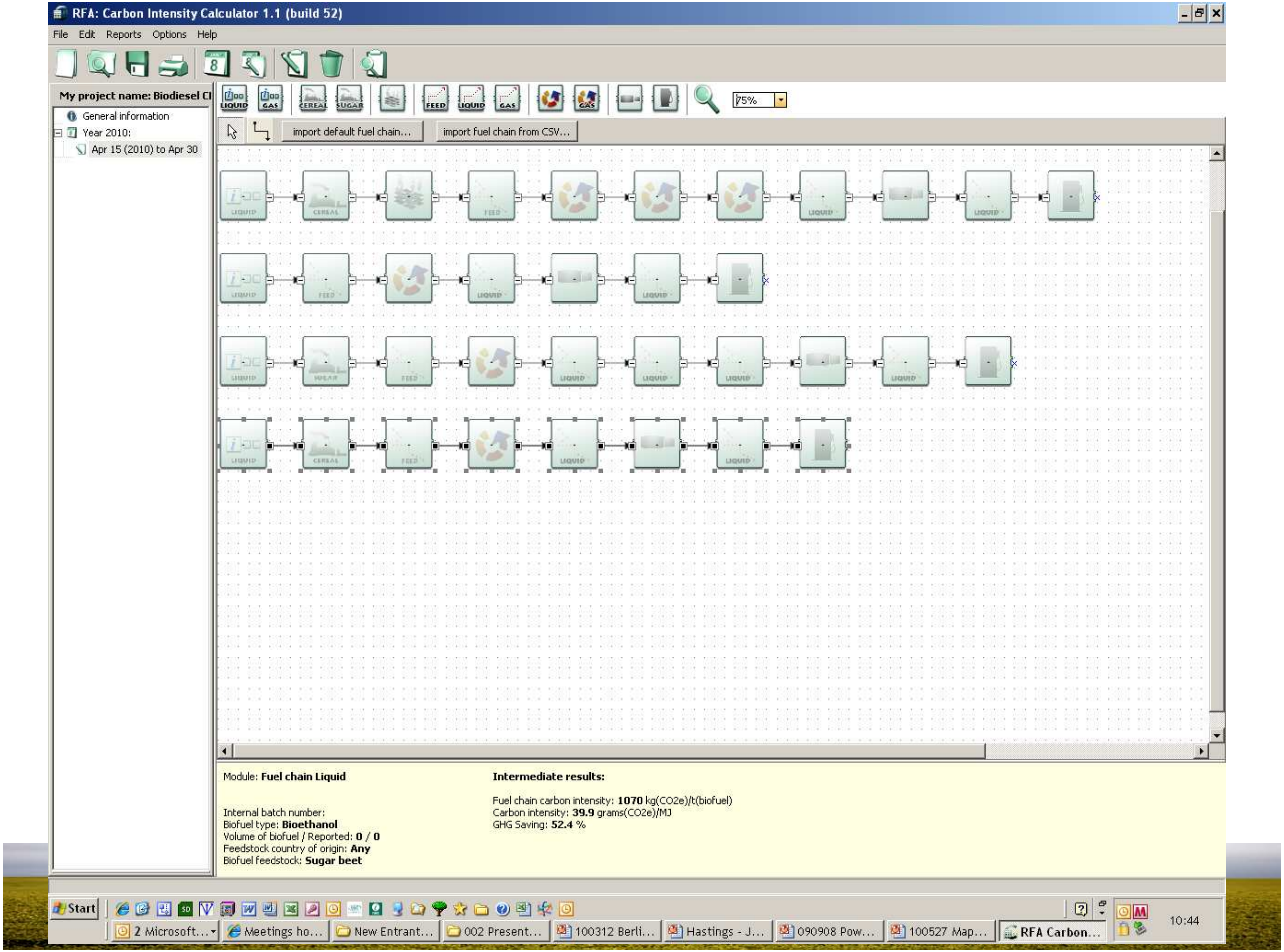
- **Already had carbon defaults using old RTFO LCA methodology**
- **This included country-specific cultivation and process information**
- **To recalculate:**
  - **Used input data collected for RTFO chains**
  - **Used emission factors/standard values used in RED**
  - **Changed the treatment of co-products to RED methodology i.e. allocation by energy except for some types of co-produced electricity**

Issues & challenges for biofuel chains not in RED

- **How to deal with data that is typically country specific e.g. emission factors for electricity, transport distances?**
- **Approach: used data from the most common fuel chain supplied to UK (from Years 1 & 2 of RTFO)**
- **More details were available in RTFO than RED e.g. on type of fertiliser – different emission factors of different types of fertiliser vs one EF for N fertiliser etc**
- **Approach: used RED emission factors**

The UK’s Carbon Calculator software tool

- For GHG calculations of biofuel fuel chains
- >250 fuel chains
- New ‘RED-ready’ version now available
- Can produce supplier monthly C&S reports
- & supplier annual C&S reports
- Free from our website: www.renewablefuelsagency.gov.uk
- User manual also available


RFA: Carbon Intensity Calculator 1.1 (build 52)
File Edit Reports Options Help
My project name: Biodiesel CI
General information
Year 2010:
Apr 15 (2010) to Apr 30
import default fuel chain...
import fuel chain from CSV...
75%
Module: Fuel chain Liquid
Internal batch number:
Biofuel type: Bioethanol
Volume of biofuel / Reported: 0 / 0
Feedstock country of origin: Any
Biofuel feedstock: Sugar beet
Intermediate results:
Fuel chain carbon intensity: 1070 kg(CO2e)/t(biofuel)
Carbon intensity: 39.9 grams(CO2e)/MJ
GHG Saving: 52.4 %
Start
2 Microsoft...
Meetings ho...
New Entrant...
002 Present...
100312 Berli...
Hastings - J...
090908 Pow...
100527 Map...
RFA Carbon...
10:44

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enquiries@renewablefuelsagency.org

Renewable Fuels Agency

Thank you

keeley.bignal@rfa.gsi.gov.uk
Tel +44 (0) 207 944 8262

www.renewablefuelsagency.org