BIOGRACE

Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

BioGrace project

Konstantinos Georgakopoulos and John Neeft
EXERGIA S.A. and NL Agency (formerly SenterNovem)
Policy maker workshop
25 November 2010, Athens

Agenda

1. Opening and introduction
2. BioGrace project in brief
3. Practical implementation of sustainability criteria in some Member States
4. Actions taken from Member States in SE Europe for the implementation of the RED into national legislation

BREAK

5. Major findings of the BioGrace project
6. Examples of national GHG calculators
7. Discussion and summary

BIOGRACE

Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

BioGrace project in brief

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Introduction

- GHG calculations under Renewable Energy Directive (RED) and Fuel Quality Directive (FQD)
- RED and FQD: same sustainability criteria including GHG
- RED article 19:
  - o 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)
  - o In Europe default values only when feedstock is produced in area on list (19.2) or from waste/residue
- RED article 18:
  - o Independent auditors must check information (18.3)
  - o The verification of compliance with the sustainability criteria can be part of voluntary certification schemes (18.4)

Introduction

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

Cultivation of rapeseed			Calculated emissions			
Yield			Emissions per MJ FAME			
			g CO_2	g CH_4	g N_2O	g $CO_{2,eq}$
Rapeseed	3.113	kg ha^{-1} $year^{-1}$				
Moisture content	10,0%					
By-product Straw	n/a	kg ha^{-1} $year^{-1}$				
Energy consumption						
Diesel	2.963	MJ ha^{-1} $year^{-1}$	6,07	0,00	0,00	6,07
Agro chemicals						
N-fertiliser	137,4	kg N ha^{-1} $year^{-1}$	9,08	0,03	0,03	18,89
CaO-fertiliser	19,0	kg CaO ha^{-1} $year^{-1}$	0,05	0,00	0,00	0,06
K_2O-fe						
P_2O_5-						
Pestic						
Seeding material						
Seeds- rapeseed	6	kg ha^{-1} $year^{-1}$	0,06	0,00	0,00	0,10

STANDARD VALUES	GHG emission coefficient			
parameter:				
unit:	gCO_2/kg	gCH_4/kg	gN_2O/kg	gCO_{2-eq}/kg
N-fertiliser	2827,0	8,68	9,6418	5880,6

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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
4. Several GHG experts and MS policy makers…
   - …agree that harmonisation of standard values is best solution
   - …intend to implement this solution

Why harmonisation of biofuel GHG calculations?

EXAMPLE 1: Different results from same biofuel
(same input values but different standard values)

Production of FAME from Rapeseed

Overview Results

Parameter

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

Production of FAME from Rapeseed

Overview Results

All results in g $CO_{2,eq}$ / MJ_{FAME}	Total	Default values RED Annex V.D
Cultivation e_{ec}	**27,7**	**29**
Cultivation of rapeseed	**27,29**	28,51
Rapeseed drying	**0,42**	0,42
Processing e_p	**16,5**	**22**
Extraction of oil	**3,29**	3,82
Refining of vegetable oil	**0,85**	17,88
Esterification	**12,39**	
Transport e_{td}	**1,3**	**1**
Transport of rapeseed	**0,15**	0,17
Transport of FAME	**0,73**	0,82
Filling station	**0,44**	0,44
Land use change e_l	**0,0**	0
e_{sca} + e_{ccr} + e_{ccs}	**0,0**	0
Totals	**45,6**	**52**

Emission reduction
Fossil fuel reference (diesel)
83,8 g $CO_{2,eq}$/MJ
GHG emission reduction
46%

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 operators can enhance the GHG performance of their biofuel without decreasing actual GHG emissions
3. Three possible solutions were discussed, of which two theoretical
   - One GHG calculation model (similar to Greet in VS/CA)
   - Harmonisation of standard values (conversion factors)
   - Regulators check all calculated own GHG values
4. Several GHG experts and MS policy makers…
   - …agree that harmonisation of standard values is best solution
   - …intend to implement this solution

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Formulation of project BioGrace

1. Dresden workshop (June 2, 2009) led to project
   - based on finding that harmonisation is needed
   - initiated by advisors to governments with expertise on GHG calculations (IFEU, RFA, SenterNovem = NL Agency)
2. Project received letters of support from governments
   - France, Germany, Netherlands, Spain, UK
3. Proposal for subsidy from “Intelligent Energy Europe”
   - Advantage: funding from EC
   - Disadvantage: long lead time (submission end of June 2009, start project in April 2010)
4. Work was already started 2nd half of 2009
   - Because of tight timeline implementation RED
5. Final preparation of project
   - Contract negotiation Dec. 2009 – March 2010

Project BioGrace

Biofuel **Gr**eenhouse Gas emissions:
alignment of **c**alculations in **E**urope

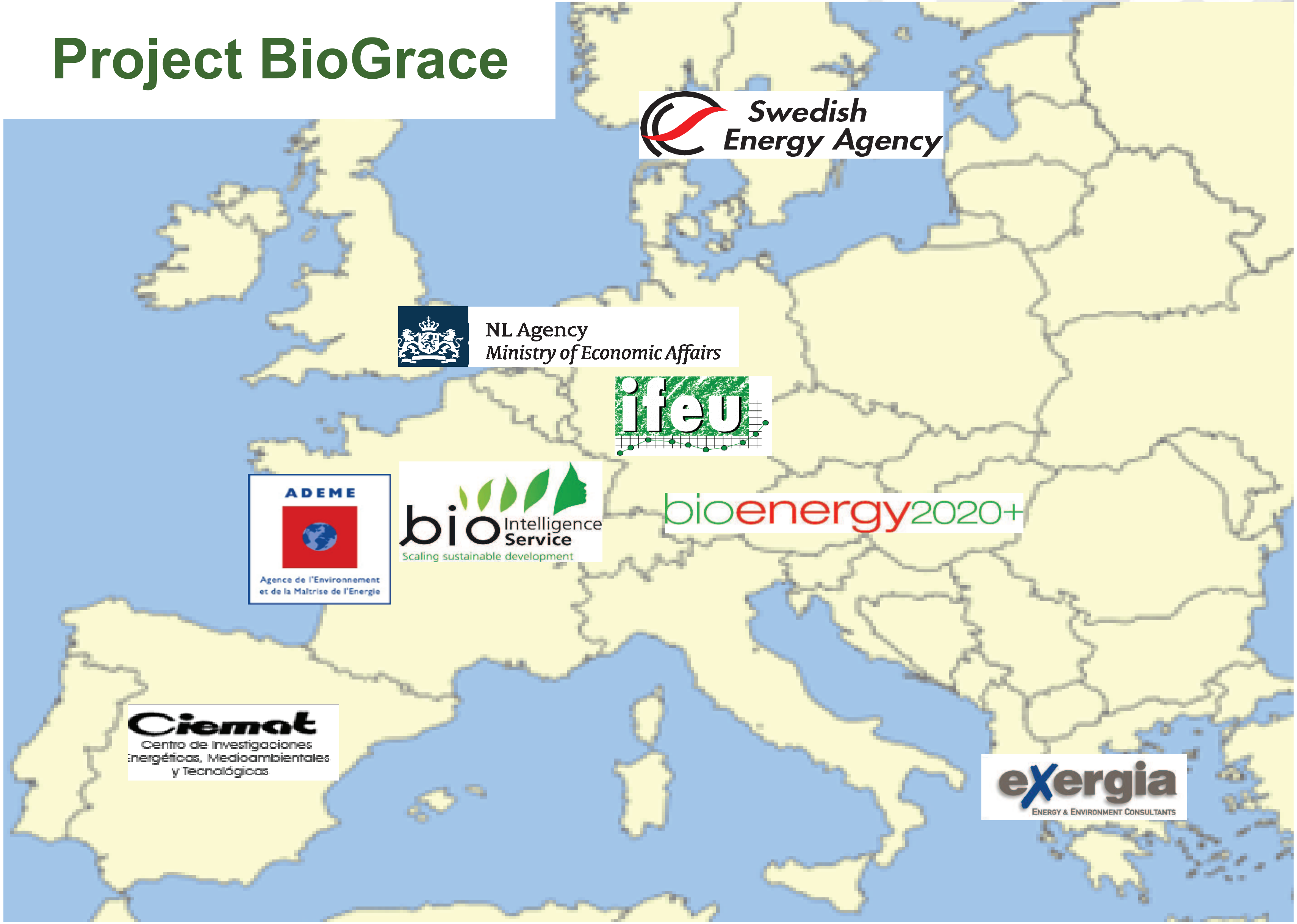
Aim of project:

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

Consortium

- o 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**
   Create a uniform and transparent list of standard values
   Reproduce the default GHG values of the 22 biofuel production pathways (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 by providing software tools
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 Parikka)
- Project duration: 2 years (April 2010 – March 2012)
- Project website: www.BioGrace.net

BIOGRACE

Harmonised Calculations of
Biofuel Greenhouse Gas Emissions in Europe

BioGrace project
Major findings

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Transparency & harmonisation

List of standard values

- o is publicly available
- o to be used by everyone that makes GHG calculations under RED/FQD based legislation

We are achieving this by:

- – Including values in all software tools
- – Causing that list is 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)

Transparency & harmonisation

Version 1 - Public

STANDARD VALUES parameter:	GHG emission coefficient								Fossil energy input		Density	LHV	Fuel efficiency	Transport exhaust gas emissions	
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	MJ_{fossil}/kg	MJ_{fossil}/MJ	kg/m3	MJ/kg (at 0% water)	MJ/t.km	gCH_4/t.km	gN_2O/t.km
Global Warming Potentials (GWP's)															
CO_2				1											
CH_4				23											
N_2O				296											
Agro inputs															
N-fertiliser	2827,0	8,68	9,6418	5880,6					48,99						
P_2O_5-fertiliser	964,9	1,33	0,0515	1010,7					15,23						
K_2O-fertiliser	536,3	1,57	0,0123	576,1					9,68						
CaO-fertiliser	119,1	0,22	0,0183	129,5					1,97						
Pesticides	9886,5	25,53	1,6814	10971,3					268,40						
Seeds- corn	-	-	-	-					-						
Seeds- rapeseed	412,1	0,91	1,0028	729,9					7,87						
Seeds- soy bean	-	-	-	-					-						
Seeds- sugarbeet	2187,7	4,60	4,2120	3540,3					36,29						
Seeds- sugarcane	1,6	0,00	0,0000	1,6											
Seeds- sunflower	412,1	0,91	1,0028	729,9											
Seeds- wheat	151,1	0,28	0,4003	275,9											
EFB compost (palm oil)	0,0	0,00	0,0000	0,0											
Fuels- gasses															
Natural gas (4000 km, Russian NG quality)															
Natural gas (4000 km, EU Mix qualilty)															
Fuels- liquids															
Diesel										1,16	832	43,1			
Gasoline											745	43,2			
HFO								84,98		1,088	970	40,5			
Ethanol											794	26,81			
Methanol						0,2900	0,0003	99,57		1,6594	793	19,9			
FAME											890	37,2			
Syn diesel (BtL)											780	44,0			
HVO											780	44,0			
Fuels / feedstock / byproducts - solids															
Hard coal					102,38	0,3835	0,0003	111,28		1,0886		26,5			
Lignite					116,76	0,0091	0,0001	116,98		1,0156		9,2			
Corn												18,5			
FFB												24,0			
Rapeseed												26,4			
Soybeans												23,5			
Sugar beet												16,3			
Sugar cane												19,6			
Sunflowerseed												26,4			
Wheat												17,0			
Animal fat												37,1			
BioOil (byproduct FAME from waste oil)												21,8			
Crude vegetable oil												36,0			
DDGS												16,0			
Glycerol												16,0			
Palm kernel meal												17,0			

Available at www.BioGrace.net

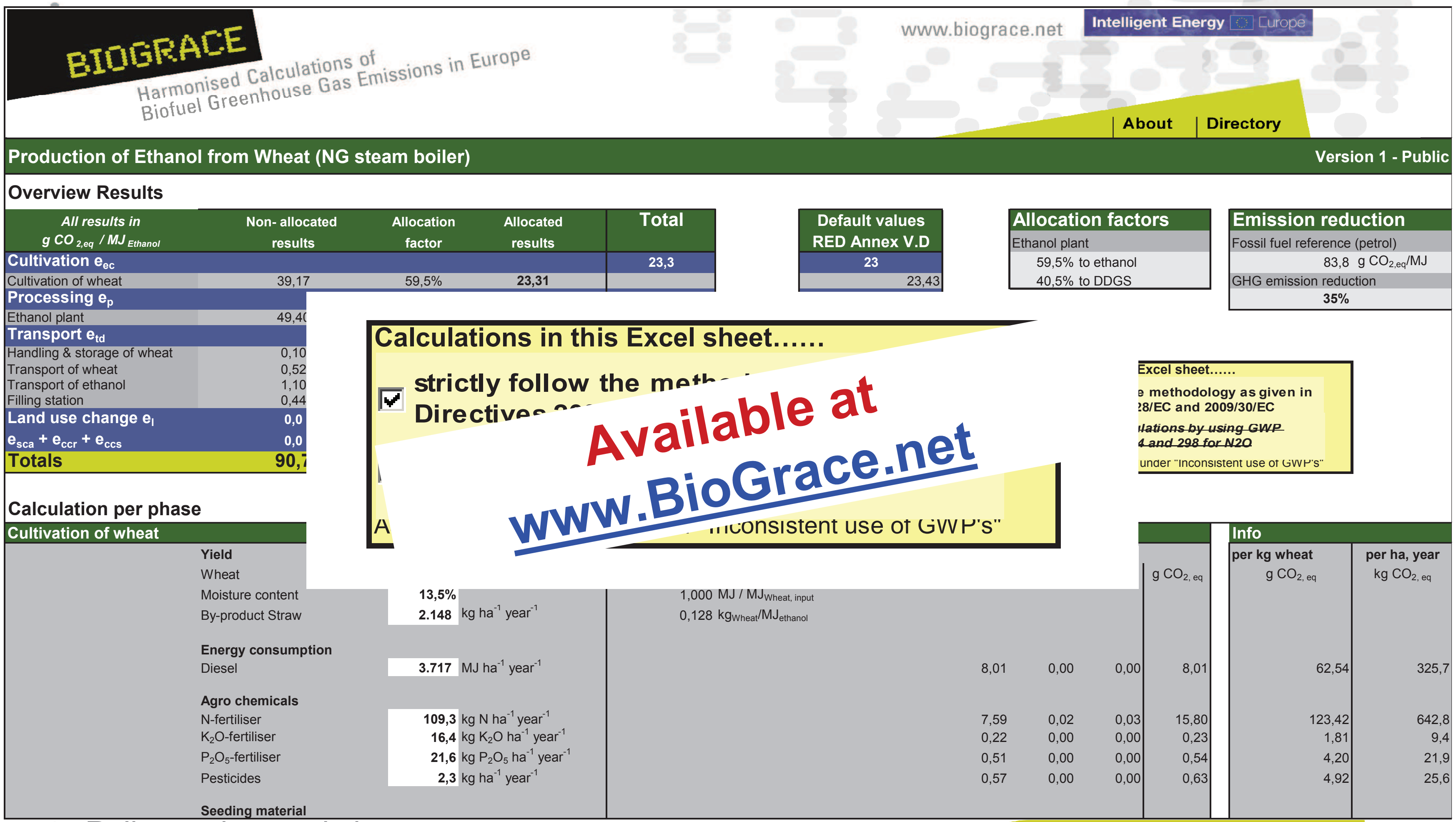
Transparency & harmonisation

Transparency & harmonisation

BioGrace GHG calculations

- Excel sheets show how GHG calculations are made:
  - 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
- Excel sheets allow to build own biofuel production pathway

Transparency & harmonisation



Transparency & harmonisation

- Planning for delivery of biofuel production pathways within BioGrace GHG calculation excel sheet:

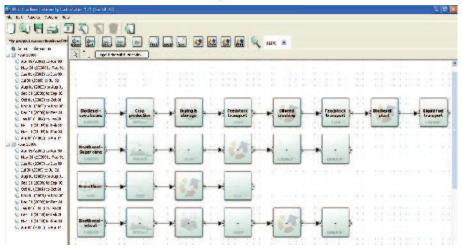
	Version 1 June/July 2010	Version 2 September 2010	Version 3 (& 4) End of 2010
Ethanol	Sugarbeet Wheat NG boiler	Corn Sugarcane Wheat (process not specified) Wheat – CHP – 3 chains	
Biodiesel	Rapeseed	Palm oil Palm oil (methane capture) Sunflower Used cooking oil Soy	
PVO		Rapeseed	
HVO	Rapeseed		Palm oil Palm oil (methane capture) Sunflower
Biogas			Dry manure Wet manure MSW

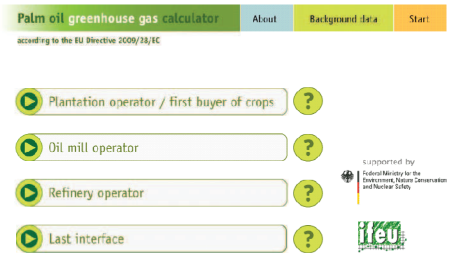
Transparency & harmonisation

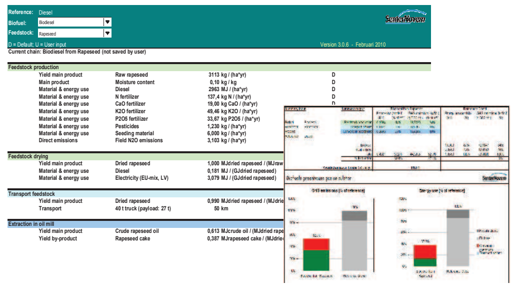
National GHG calculators

Harmonisation of calculators (existing / under development):

- o BioGrace will cause that GHG calculators give the same results
- o GHG calculators are being developed in:
  - – Germany
  - – Spain
  - – UK
  - – Netherlands







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Stakeholder involvement and dissemination

Excel sheets and user friendly GHG calculators facilitate stakeholders to calculate actual values:

1. Relatively simple calculations
   - Change input numbers
   - Add input parameters
   - Add user-defined standard values
2. 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

BIOGRACE
Harmonised Calculations of
Biofuel Greenhouse Gas Emissions in Europe

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
Cultivation e_{ec}			
Cultivation of wheat	39,17	59,5%	**23,31**
Processing e_p			
Ethanol plant	49,40	59,5%	**29,40**
Transport e_{td}			
Handling & storage of wheat	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**
$e_{sca} + e_{ccr} + e_{ccs}$	**0,0**	100%	**0,0**
Totals	**90,7**		

Calculation per phase

Cultivation of wheat

Yield		
Wheat	**5.208**	kg ha^{-1} year^{-1}
Moisture content	**13,5%**	
By-product Straw	**2.148**	kg ha^{-1} year^{-1}
Energy consumption		
Diesel	**3.717**	MJ ha^{-1} year^{-1}
Agro chemicals		
N-fertiliser	**109,3**	kg N ha^{-1} year^{-1}
K_2O-fertiliser	**16,4**	kg K_2O ha^{-1} year^{-1}
P_2O_5-fertiliser	**21,6**	kg P_2O_5 ha^{-1} year^{-1}
Pesticides	**2,3**	kg ha^{-1} year^{-1}
Seeding material		

Stakeholder involvement and dissemination

- BioGrace also aims to:
  - make a list of recommended standard values
  - present recommendations on calculation rules
  - add 'sophisticated' support sheets for calculation of
    - ✓ direct land use change (based on Commission Decision)
    - ✓ N_2O emissions (based on IPCC Tier 1)
- BioGrace will not:
  - add pathways to the Excel file with GHG calculations that are not listed in RED Annex V
  - help stakeholders making actual calculations
  - check actual calculations at the request of stakeholders
- Feedback by stakeholders is warmly welcomed

Stakeholder involvement and dissemination

- BioGrace products (data set, tools) are disseminated to stakeholders throughout Europe by:
  - Website www.BioGrace.net from June 2010
  - Presenting at conferences, workshops and stakeholder meetings
  - GHG calculation expert workshop: September 23, 2010
  - Policy maker workshops: Nov 12, 2010 in Stockholm
    Nov. 25, 2010 in Athens
  - Stakeholder workshops: Early 2011
    - 7 workshops in all corners of Europe
    - workshops expected to be large (100-200 participants)

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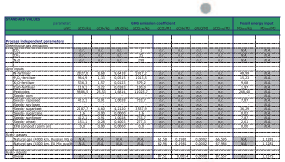
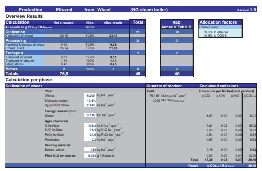
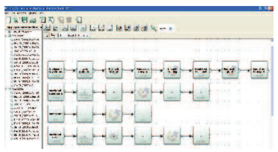
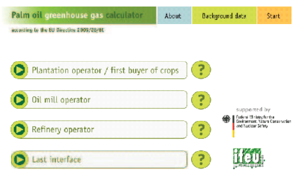
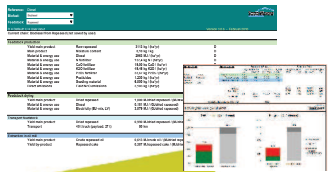
Concluding summary

- One biofuel, different GHG calculations => different results
- IEE funded project BioGrace will:

1. Cause harmonisation
   - Excel tool and GHG calculators give same result
   - All GHG calculations are based on one set of standard values
2. Cause transparency
   in how RED default values were calculated
3. Facilitate stakeholders
   - Tools that allow own input and/or modifications to pathways
4. Broadly disseminate results



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*

Complexity: *High* — *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

Practical implementation of sustainability criteria in UK

Konstantinos Georgakopoulos
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UK biofuels policy: the Road Transport Fuel Obligation (RTFO) - 1

- One of the Government's main policies for reducing GHG emissions from road transport
- Renewable Fuels Agency (RFA) is the organisation charged by the UK Government to run the Renewable Transport Fuel Obligation
- RTFO commenced on 15 April 2008, is intended to deliver reductions in CO_2 emissions from the road transport sector of 2.6 - 3.0 million tonnes per annum by 2010 by encouraging the supply of renewable fuels
- RTFO covers the supply of fuels for road transport use only

UK biofuels policy: the Road Transport Fuel Obligation (RTFO) - 2

- **Requires suppliers of fossil fuels to ensure that a specified percentage of the road fuels they supply in the UK is made up of renewable fuels**

  Targets *2009/10 → 3.25%*

  2013 → 5% by volume

- **Requires companies to submit reports (Carbon & Sustainability reporting)** to RFA on:
  - The **type** and **volume** of fuel supplied
  - The **feedstock** and **country of origin**
  - Any **social** or **environmental sustainability standards** met in growing the feedstock
  - The **greenhouse gas savings of the biofuel** taking into account of any direct land-use changes

UK biofuels policy: the Road Transport Fuel Obligation (RTFO) - 3

- An **obligated supplier** (fossil fuel supplier) must prove to the RFA that it has met its Obligation by producing Renewable Transport Fuel Certificates (**RTFCs**) at the end of the year
- **One RTFC is awarded for every litre of biofuel** reported to the RFA. An obligated supplier can obtain them either by supplying biofuel itself, or by trading with other biofuel suppliers
- Suppliers may also buy out of their obligation for 30 pence per litre from the 2010/11 reporting period
- Biofuels eligible for support include:
  - Bioethanol, biodiesel, pure plant oil, biogas (methane), biobutanol, bio-ETBE and HVO

Carbon & Sustainability reporting system - 1

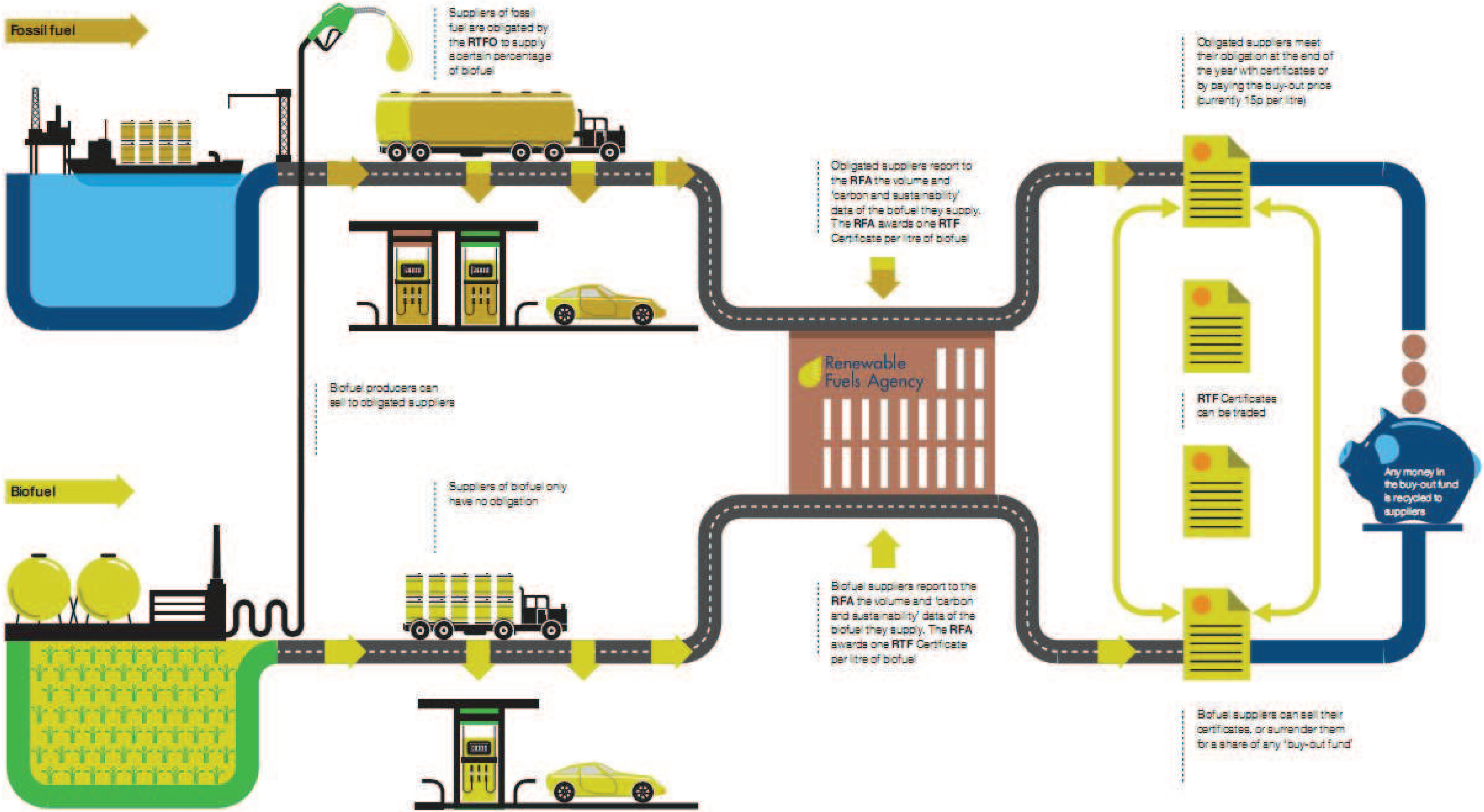
- Encourages the best biofuels
- Is based on a full "lifecycle analysis" of emissions all throughout the production chain
- Is a stepping stone to mandatory criteria
- The RTFO is based on meta-standard sustainability criteria, and relates to environmental and social principles
  - Fuels meeting the environmental standard must be grown with due regard for protecting biodiversity; carbon stocks; and soil, air and water quality
  - To meet the social standard, workers' rights and land rights must be respected
- Requires independently verified reports
- Requires monthly and/or annually submitted C&S reports

Carbon & Sustainability reporting system - 2

- Annual targets for company performance

Company targets	2008-2009	2009-2010	2010-2011
Percentage of feedstock meeting a Qualifying Environmental Standard	**30%**	**50%**	**80%**
Annual GHG saving of fuel supplied	**40%**	**45%**	**50%**
Data reporting of renewable fuel characteristics	**50%**	**70%**	**90%**

How the RTFO works



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Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

Practical implementation of sustainability criteria in Germany

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Implementation of the RED in Germany

- Relevant legislation:
  - Tax law for energy (EnergieStG)
  - Federal law for emission control (BImSchG)
  - Sustainable-biofuels ordinance (Biokraft-NachV)
  - Law for priority of renewable energy (EEG)
  - Biomass-electricity-sustainability ordinance (BioSt-NachV)

  The Ordinances apply to biomass that is to be used for biofuels or bioelectricity as from January 1, 2011
- The implementation of RED in Germany shall ensure that biomass is produced in compliance with **mandatory sustainability standards**, and thus the conditions for certain fees, rate or tax compliance are met
- Responsible authority for the implementation of the biomass ordinances: **BLE** (The German Federal Agency for Agriculture and Food)

Competency of BLE

- Recognition and supervision of certification systems and certification bodies
- Providing a web based application for suppliers
- Maintain a central information register
- Evaluation of the regulations for the Federal Government
- Enforcement of the regulations

Certification systems

- Certification systems for the purposes of the regulations specify the **requirements for sustainable biomass production**
- They **make sure that the requirements of the regulations** to all stages of production, transportation and distribution (delivery) of biomass will be **fulfilled**
- Certification systems in Germany **have to be recognized by BLE or by the Commission**
- Germany has already **recognized two certification systems** (**REDcert** & **ISCC** - International Sustainability and Carbon Certification)

ISCC and REDcert

- The **purpose** of the systems is to **ensure compliance** with the requirement of sustainable production of biomass according to the RED
- **ISCC** System is the first standard approved (Jan 2010) by BLE under the German bioenergy sustainability ordinances, in view of the requirements of the RED
- The first successful ISCC audits already took place and the first certificates have been issued for a biodiesel production plant based on rapeseed in Germany and for a bioethanol plant based on grains in Europe
- **REDcert** was founded on Feb 2010 by leading associations and organizations in the German agricultural and biofuel sector and approved as a certification system on Jun 2010

Biofuels for transport in Greece: Situation -Policies - Best Practice Experience

Myrsini Christou

Head of Biomass Department
Center for Renewable Energy Sources - CRES

Biograce workshop

Athens, 25/11/2010

Institutional framework

- ✓ The harmonisation with the EU Directive 2003/30/EC and the introduction of biofuels in the Greek market was through their integration into the existing institutional framework for petroleum products, with an appropriate supplement and amendment of Law 3054/2002 "Organization of the oil market and other provisions, by Law **3423/2005** "Introduction to Greek Market biofuels and other renewable fuels".

- According to **Law 3653/2008**, biodiesel is no more subjected to the special tax status meaning that practically the distributed biodiesel is no longer tax exempted. The same Law also regulates the quota allocation, the call for tenders, and the final decisions, especially for the year 2008.

- **Law 3769/2009** allows the distribution of biofuel blends with refined crude oil beyond the limit specified in the Decisions of the Supreme Chemical Council (ACHS), if the other specifications of these blends lie within the limits of standards. In these cases a special mark in the fuel tanks has to be displayed.

  Specific issues like the amount of quota allocation, call for tenders and evaluation criteria are managed through **Joint Ministerial Decisions.**

Current situation

- Biodiesel is still the main biofuel for the Greek transport sector

- Biodiesel quantities required to meet the 5.57% target were fully tax exempted until 2007.

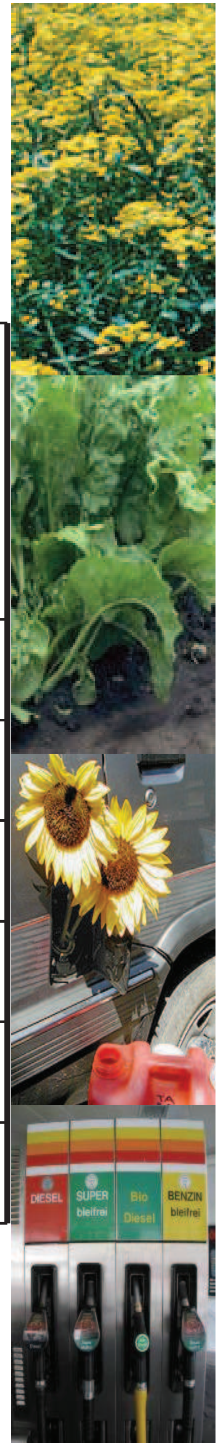
- Biodiesel quantities blended with oil are decided on an annual basis under a quota scheme. A call for interest is announced every year by the Ministry of Environment, Energy and Climate Change.

- The market for pure biodiesel does not exist as yet.

- Bioethanol is not produced or consumed as yet.

Biodiesel supply and consumption (2005 – 2010)

Year	Estimated Automotive Diesel Consumption ('000 tons)	Biodiesel required (%)	Biodiesel Required (tons)	Inland production (tons)	Imports (tons)	Total consumption (tons)
2005	2.084	2,00	46,976			
2006	2.125	3,00	80,000	47,743	3,803	51,546
2007	2.167	4,00	100,000	91,863	2,605	94,468
2008	2.208	4,50	112,117	69,356	6,909	76,265
2009	2.296	5,00	160,000			
2010	2.290	5,75	144,000			



Estimation of Bioethanol required (2005 – 2010)

Year	Estimated Automotive Gasoline Consumption ('000 tons)	Bioethanol used (%)	Bioethanol Required (tons)
2005	3.707	2,00	120.442
2006	3.800	2,50	154.329
2007	3. 892	3,00	189.678
2008	3.984	4,00	258.883
2009	4.077	5,00	331.157
2010	4.169	5,75	389.424

Source: www.ypan.gr

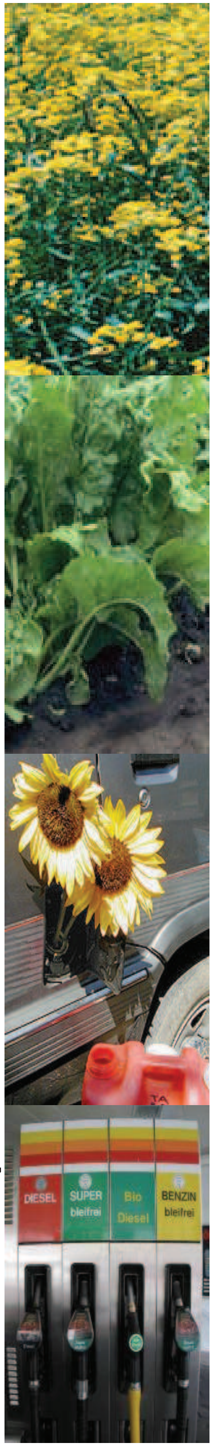
ΚΑΠΕ
CRES

Biodiesel production and supply

Company	Capacity (t)	Quota for 2010 (t)
Agroinvest S.A,	230,000	13,484
P.N Pettas S.A, Patras	99,000	24,545
GF ENERGY A.E	99,000	15,747
ELVI-Hellinika Viopetrelaia S.A, Kilkis	79,200	28,290
ELIN Biokafsima S.A, Volos	73,300	9,422
MANOS S.A	33,000	10,105
Biodiesel Ltd, Thessaloniki	21,000	6,222
FYTOENERGEIA S.A	21,000	11,076
Staff Colour S.A, Larisa	11,000	2,460
Vert Oil S.A, Thessaloniki	10,450	0
Mil Oil Hellas S.A, Kilkis	9,900	3,010
Bioenergia Papantoniou S.A, Halkidiki	9,000	0
Ekkokistiria-Klostiria B.Ellados S.A, Xanthi	6,600	3,914
Imports		15,724
Total	*702,450*	*144,000*

Note: Imported oils (seed oils, soya oils) 70-80%
Locally produced (cottonseed/sunflower/cooking oils) 10-20%

Biodiesel plants allocation



Biodiesel

Main Resources

- *Sunflower, rapeseed*

  (92ML biodiesel for 2010)

- *Vegetable oils (cotton seed and cotton seed oil, soy oil, etc.)*

  (12 ML biodiesel for 2010)

  Sunflower and rapeseed account for 30% of the biodiesel consumption)

- *Cooking oils and animal fats*

  (13 ML for 2010)

  6% of the total biodiesel consumption

Facts

- Competition from food sector
- New CAP (Reg. 2003/1782/EC)
- Imports
- Substantial quantities available in the Greek market
- Good yielding potential for sunflower & rapeseed
- 16,000 ha grown with sunflower in 2005
- 92,600 ha estimated to be grown mainly with sunflower in 2010.

National 2020 target and estimated trajectory of energy from renewable sources in heating and cooling, electricity and transport

%	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
RES-H&C	12,76	14,7	15,7	16,2	16,8	17,3	17,9	18,3	18,4	18,8	18,9	19,7
RES-E	8,03	13,3	15,7	18,8	21,8	25,1	27,6	29,7	31,8	33,7	36,7	39,8
RES-T	0,02	1,7	3,3	4,1	4,8	5,6	6,3	7,1	7,8	8,6	9,4	10,1
Overall RES share	6,96	8,0	8,8	9,5	9,9	10,5	11,4	12,4	13,7	14,6	16,0	18,0

Source: NREAP for 20-20-20, 2010, www.ypeka.gr

KAПE
CRES

Actions taken by Greece to harmonize the RED into national legislation

Three working groups have been formed by the Ministry of Environment, Energy and Climate Change for the harmonization of Directive 2009/28/EC and 2009/30/EC

- Group 1: Deals with all issues except for the biofuels and other bioliquids for transport and relevant sustainability criteria
- Group 2: Deals with harmonization of Directive 2009/28/EC (mainly articles 17-21) and 2009/30/EC (mainly articles 7b-7e)
- Group 3: Deals with harmonization of Directive 2009/30/EC (mainly article 7a)

Deadline for reporting is the 26th November 2010

too difficult to meet!

Actions taken by Greece to harmonize the RED into national legislation

Group 2

Coordinated by: Athanassios Zaharopoulos/MEECC

Members:

S. Lekatos, N. Nomikos / Supreme Chemical Council (ACHS),

E. Papadopoulou, I. Drosinou / Ministry of Rural Development and Food

G. Briasoulis / Ministry of Infrastructure, Transport and Networks

M. Christou, M. Zarkadoula / CRES

D. Kekos, P. Christakopoulos / National Technical University of Athens

G. Papadakis, G. Skarakis / Agricultural University of Athens

F. Zannikos, D. Karonis / National Technical University of Athens

M. Smiri, D. Marda / PASEGES (National Union of Agricultural Unions in Greece

BIOGRACE

Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

Examples of National GHG calculators

John Neeft
NL Agency (formerly SenterNovem)
Policy maker workshop
25 November 2010, Athens

Contents

Introduction

Rules and methodology for GHG calculations

- RED article 19: Economic operators may use
  - o default values (19.1.a)
  - o actual values calculated according to Annex V.C (19.1.b)
  - o sum of actual value and disaggregated default value (19.1.c)
- RED Annex V.C + June communications: Methodology

Making actual calculations not straightforward

- Some kind of tool or software is needed
  - o Some companies will develop own tools
  - o Many others will use publicly available tools

This presentation is about publicly available tools
BioGrace Excel tool has already been presented

Introduction

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

Cultivation of rapeseed			Calculated emissions			
Yield			**Emissions per MJ FAME**			
			g CO_2	g CH_4	g N_2O	g $CO_{2,\ eq}$
Rapeseed	3.113	kg ha^{-1} $year^{-1}$				
Moisture content	10,0%					
By-product Straw	n/a	kg ha^{-1} $year^{-1}$				
Energy consumption						
Diesel	2.963	MJ ha^{-1} $year^{-1}$	6,07	0,00	0,00	6,07
Agro chemicals						
N-fertiliser	137,4	kg N ha^{-1} $year^{-1}$	9,08	0,03	0,03	18,89
CaO-fertiliser	19,0	kg CaO ha^{-1} $year^{-1}$	0,05	0,00	0,00	0,06
K_2O-fe						
P_2O_5-						
Pestic						
Seeding material						
Seeds- rapeseed	6	kg ha^{-1} $year^{-1}$	0,06	0,00	0,00	0,10

STANDARD VALUES	GHG emission coefficient			
parameter: / unit:	gCO_2/kg	gCH_4/kg	gN_2O/kg	$gCO_{2\text{-}eq}/kg$
N-fertiliser	2827,0	8,68	9,6418	5880,6

Contents

Dutch tool - General information

Background

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

The Dutch GHG calculator

- was developed in 2007/2008 by consultants EcoFys and CE
- has been available for (Dutch) stakeholders to make GHG calculation on biofuels
- has not been used extensively due to lack of legal framework in 2008 – 2010
- was recently updated and made “RED”- proof by Agency NL

BIOGRACE
Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

Intelligent Energy Europe

Dutch GHG tool

Reference: Diesel
Biofuel: Biodiesel
Feedstock: Rapeseed

Load Default Values | Calculate Results | Adapt Chain | Chain management | Disclaimer

D = Default; U = User input

Version 3.1 - aug

Current chain: Biodiesel from Rapeseed (not saved by user)

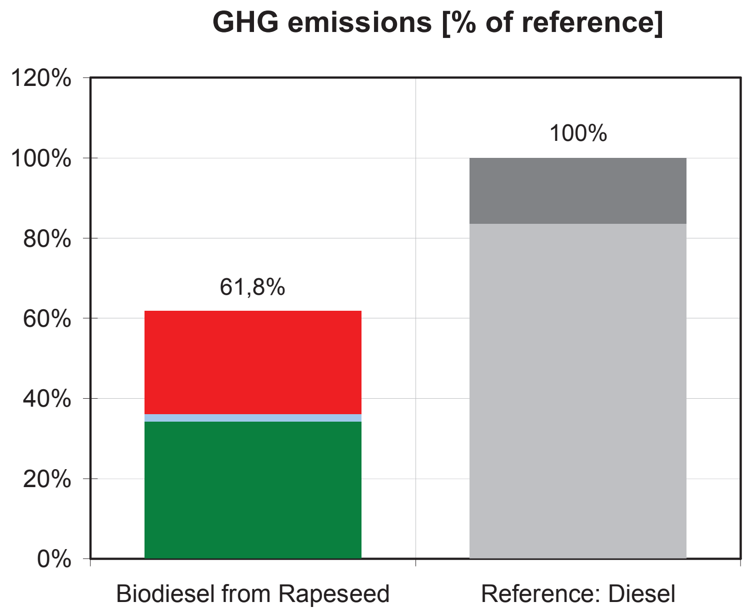
Feedstock production						
	Yield main product	Raw rapeseed		3113	kg / (ha*yr)	D
	Main product	Moisture content		0,10	kg / kg	D
	Material & energy use	Diesel		2963	MJ / (ha*yr)	D
	Material & energy use	N fertilizer		137,4	kg N / (ha*yr)	D
	Material & energy use	CaO fertilizer		19,00	kg CaO / (ha*yr)	D
	Material & energy use	K2O fertilizer		49,46	kg K2O / (ha*yr)	D
	Material & energy use	P2O5 fertilizer		33,67	kg P2O5 / (ha*yr)	D
	Material & energy use	Pesticides		1,230	kg / (ha*yr)	D
	Material & energy use	Seeding material - rapeseed		6,000	kg / (ha*yr)	D
	Field emissions	Field N2O emissions		3,103	kg / (ha*yr)	D
	Field emissions	Direct Land Use Change	No		g CO2/MJbiofuel	D
Feedstock drying						
	Yield main product	Dried rapeseed		1,000	MJdried rapeseed / (MJraw rapeseed)	D
	Main product	Moisture content		0,10	kg / kg	D
	Material & energy use	Diesel		0,181	MJ / (GJdried rapeseed)	D
	Material & energy use	Electricity (EU-mix, LV)		3,079	MJ / (GJdried rapeseed)	D
Transport feedstock						
	Yield main product	Dried rapeseed		0,990	MJdried rapeseed / (MJdried rapeseed)	D
	Main product	Moisture content		0,10	kg / kg	D
	Transport	Truck for dry product (Diesel)		50	km	D
Extraction in oil mill						
	Yield main product	Crude vegetable oil		0,613	MJcrude oil / (MJdried rapeseed)	D
	Yield by-product	Rapeseed cake		0,387	MJrapeseed cake / (MJdried rapeseed)	D

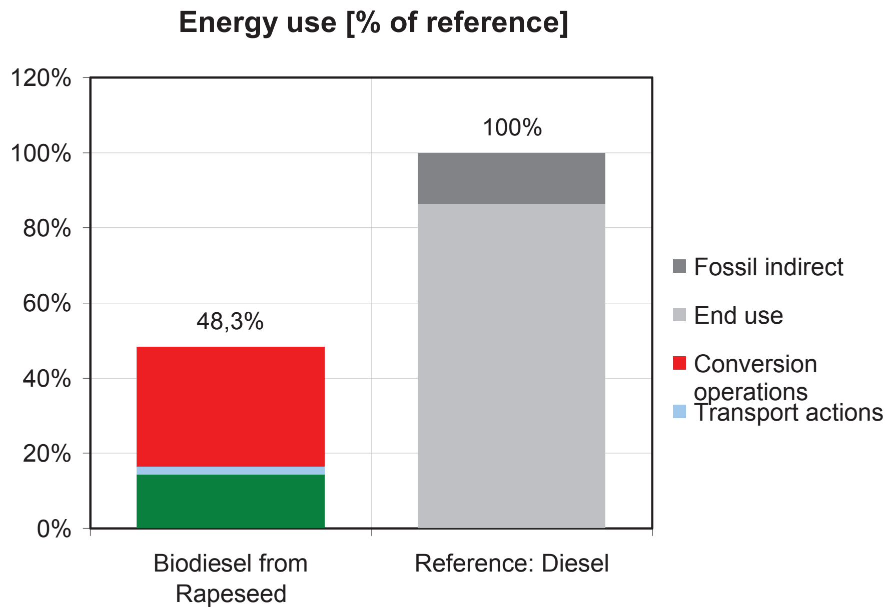
Dutch GHG tool

Summary Input		Summary output	Biodiesel from Rapeseed				Reference: Diesel			
			Energy use (per MJ)		GHG emissions (kg/MJ)		Energy use (per MJ)		GHG emissions (kg/MJ)	
			(MJ)	(% of ref.)	(g CO2-eq.)	(% of ref.)	(MJ)	(%)	(g CO2-eq.)	(%)
Biofuel	Biodiesel	Feedstock production	0,1672	14%	28,7496	34%				
Feedstock	Rapeseed	Transport actions	0,0233	2%	1,4345	2%				
Process	-	Conversion operations	0,3677	32%	21,5636	26%				
Reference	Diesel									
Print summary results		End use					1,0000	87%	70,1047	84%
Show detailed results		Fossil indirect					0,1550	13%	13,6953	16%
		Total	0,5582	48,3%	51,7477	61,8%	1,1550	100%	83,8000	100%
Return to input		**% Reduction**		**51,7%**		**38,2%**				**0%**
		Avoided emission (tonne CO_2/ha/yr)			**1371,5**					

Biofuels greenhouse gas calculator

NL Agency
Ministry of Economic Affairs





Dutch GHG tool

Biofuel	Biodiesel
Feedstock	Rapeseed
Process	-
Reference	Diesel

Return to overview results

Return to input

	Absolute Numbers (including allocation)					Relative contribution (including allocation)			
	Energy use [MJ fossil fuel/ MJ biofuel]	Emission CO2 [kg CO2/ MJ biofuel]	Emission N2O [kg CO2-eq/ MJ biofuel]	Emission CH4 [kg CO2-eq/ MJ biofuel]	Emission GHG [kg CO2-eq/ MJ biofuel]	Energy use [%]	Emission CO2 [%]	Emission N2O [%]	Emission CH4 [%]
Feedstock production									
Diesel	0,047	3,555	0,00E+00	0,00E+00	3,555	8,4%	6,9%	0,0%	0,0%
N fertilizer	0,092	5,319	5,370	0,376	11,065	16,5%	10,3%	10,4%	0,7%
CaO fertilizer	5,13E-04	0,031	1,41E-03	1,29E-03	0,034	0,1%	0,1%	0,0%	0,0%
K2O fertilizer	6,55E-03	0,363	2,47E-03	0,024	0,390	1,2%	0,7%	0,0%	0,0%
P2O5 fertilizer	7,02E-03	0,445	7,03E-03	0,014	0,466	1,3%	0,9%	0,0%	0,0%
Pesticides	4,52E-03	0,166	8,38E-03	9,89E-03	0,185	0,8%	0,3%	0,0%	0,0%
Seeding material - rapeseed	6,46E-04	0,034	0,024	1,72E-03	0,060	0,1%	0,1%	0,0%	0,0%
Field N2O emissions	0,00E+00	0,00E+00	12,575	0,00E+00	12,575	0,0%	0,0%	24,3%	0,0%
Direct Land Use Change	-	0,00E+00	-	-	0,00E+00	-	0,0%	-	-
Total Feedstock production	**0,159**	**9,914**	**17,989**	**0,427**	**28,331**	**28,4%**	**19,2%**	**34,8%**	**0,8%**
Allocation burden of this and previous steps to main product Raw rapeseed				100,0%					
Allocation burden of this and previous steps to by-product Raw rapeseed				0,0%					
Allocation burden of this step to Biodiesel at end-of-chain				58,6%					
Feedstock drying									
Diesel	2,13E-04	0,016	0,00E+00	0,00E+00	0,016	0,0%	0,0%	0,0%	0,0%
Electricity (EU-mix, LV)	8,51E-03	0,377	5,05E-03	0,021	0,403	1,5%	0,7%	0,0%	0,0%
Total Feedstock drying	**8,72E-03**	**0,393**	**5,05E-03**	**0,021**	**0,419**	**1,6%**	**0,8%**	**0,0%**	**0,0%**
Allocation burden of this and previous steps to main product Dried rapeseed				100,0%					
Allocation burden of this and previous steps to by-product Dried rapeseed				0,0%					
Allocation burden of this step to Biodiesel at end-of-chain				58,6%					
Transport feedstock									
Truck for dry product (Diesel)	2,29E-03	0,173	0,00E+00	2,43E-04	0,173	0,4%	0,3%	0,0%	0,0%
Total Transport feedstock	**2,29E-03**	**0,173**	**0,00E+00**	**2,43E-04**	**0,173**	**0,4%**	**0,3%**	**0,0%**	**0,0%**

BIOGRACE
Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

Intelligent Energy Europe

Dutch GHG tool

Reference: Diesel
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Load Default Values | Calculate Results | Adapt Chain | Chain management | Disclaimer

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Version 3.1 - aug

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Material & energy use	Seeding material - rapeseed		6,000	kg / (ha*yr)	D
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Field emissions	Direct Land Use Change	No		g CO2/MJbiofuel	D
Feedstock drying					
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Main product	Moisture content		0,10	kg / kg	D
Transport	Truck for dry product (Diesel)		50	km	D
Extraction in oil mill					
Yield main product	Crude vegetable oil		0,613	MJcrude oil / (MJdried rapeseed)	D
Yield by-product	Rapeseed cake		0,387	MJrapeseed cake / (MJdried rapeseed)	D

BIOGRACE

Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

Intelligent Energy Europe

Dutch GHG tool

DIRECT LAND USE CHANGE CALCULATION | Return to input

1. Standard Soil Carbon stock in mineral soil (SOC_{ST})

Climate region	Boreal	See figure 1	The blue fields are drop down boxes.
Soil type	High activity clay soils	See figure 3 & 2	

Result SOC_{ST} 68 ton C / ha

2. Factors reflecting the difference in Soil Organic Carbon (SOC) compared to the Standard Soil Organic Carbon (SOC_{ST})

Actual land use

Default=Calculate with standard values: Default
User = Own calculation incl. measured value

Type of land	Cropland	See tables 3, 6 and 8
Climate region	Temperate/Boreal, dry	
Land use F_{LU}	Cultivated	0,8
Management F_{MG}	Full-tillage	1
Input F_I	Low	0,95

Result SOC_A 51,68 ton C / ha

Reference land use

Default=Calculate with standard values: Default
User = Own calculation incl. measured value

Type of land	Cropland	See tables 3, 6 and 8
Climate region	Temperate/Boreal, dry	
Land use F_{LU}	Cultivated	0,8
Management F_{MG}	Full-tillage	1
Input F_I	Low	0,95

Result SOC_{ref} 51,68 g C / ha

3. Above and below ground vegetation (Cveg)

Actual land use

Default=Calculate with standard values: Default
User = Own calculation incl. measured value

Type of land	Cropland (General)
Domain	
Climate region	
Ecological zone	
Continent	
Crop type	

Result $C_{VEG,A}$ 0 ton C / ha

Reference land use

Default=Calculate with standard values: Default
User = Own calculation incl. measured value

Type of land	Forest 10-30% canopy cover, excl plantations
Domain	Temperate
Climate region	
Ecological zone	Temperate continental forest
Continent	Asia, Europe (<= 20 y)
Crop type	

Result $C_{VEG,\ ref}$ 2 ton C / ha

4. Bonus (eb) for cultivation on restored degraded land under the conditions provided for in point 8 of Annex V of directive.

Bonus: No

No = 0 g CO_2/MJ
Yes = -29 g CO_2/MJ

Total results

Result: CO_2 emission caused by direct land use change 8,5625592 **g CO_2/MJ biofuel**

Calculate Results Re-calculate the results if you changed the values here or at the input page.

Dutch tool - Summary

Contents

- o Excel-based tool
- o Tool is rather similar to BioGrace Excel sheets, but
  - – It is more user-friendly:
    no calculations details, results in graphs
  - – DLUC calculations are user-friendly
- o The software programming makes it less flexible
  - – More difficult to modify pathways or build new ones

Status

- o Tool is available on-line via
  www.senternovem.nl/gave_english/ghg_tool
- o All 16 chains (BioGrace) are included
- o Updates follow updates of BioGrace Excel sheet

Contents

German tool - general information

Background

- No public tool has been available so far in Germany
- Aim: to facilitate stakeholders calculating actual values (combination of actual values and disaggregated default values)

The German GHG calculator

- is made by IFEU, contracted by BMU
- should be finalised mid 2011
- should be in line with BLE Guidance
- is strongly linked to economic operators: 1 sheet dedicated for cultivators, mill operators, refinery operators, etc.

BIOGRACE
Harmonised Calculations of
Biofuel Greenhouse Gas Emissions in Europe

Intelligent Energy Europe

German GHG tool

Palm oil greenhouse gas calculator | About | Background data | Start

according to the EU Directive 2009/28/EC

- Plantation operator / first buyer of crops ?
- Oil mill operator ?
- Refinery operator ?
- Last interface ?

supported by
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

ifeu

BIOGRACE
Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

Intelligent Energy Europe

German GHG tool

Palm oil greenhouse gas calculator | About | Background data | Start

according to the EU Directive 2009/28/EC

ifeu

Version 1

About this calculation tool

This Excel tool is designed to help stakeholders in the palm oil production chain by facilitating their greenhouse gas (GHG) calculations according to the Renewable Energy Directive (RED) (*2009/28/EC*) and the Fuel Quality Directive (*2009/30/EC*). From 2011 onwards, biofuels and bioliquids need to prove a GHG reduction of at least 35 % compared to fossil fuels in order to qualify for state incentive programs or the renewable energy targets of the European Member States. Germany has implemented the European sustainability criteria in two ordinances; the biomass electricity sustainability ordinance and the biofuels sustainability ordinance.

This tool complements the "Guidance on Sustainable Biomass Production' published by the Federal Agency for Food and Agriculture (BLE) and is the tool-version of chapter IX. "Concrete calculation of greenhouse gas reductions".
http://www.ble.de/cln_099/nn_417472/DE/06__Aktuelles/03__Pressemitteilungen/2010/100205__BroschuereNachhaltigeBiomasse.html?__nnn=true

Calculation of GHG emissions

This tool facilitates GHG calculations according to RED Art. 19 (1) (b) and (c)
- to calculate actual values in accordance with the methodology laid down in part C of Annex V" ;
- to combine actual values with disaggregated default values in part D or E of Annex V.

With this calculator you can calculate your GHG emissions for the whole production chain or just a part of it. For each part of the production chain there is one calculation sheet with a step-by-step manual:

BIOGRACE

Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

Intelligent Energy Europe

German GHG tool

Palm oil greenhouse gas calculator | About | Background data | Start

according to the EU Directive 2009/28/EC

1	2	3	4	5	6	7	8	9	10	11
BACKGROUND DATA										
parameter:	GHG emission coefficient								Fossil energy input	
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	MJ_{fossil}/kg	MJ_{fossil}/MJ
Global Warming Potentials (GWP's)										
CO_2				1						
CH_4				25						
N_2O				298						
Agro inputs										
N-fertiliser	2827,0	8,68	9,6418	5917,2					48,99	
P_2O_5-fertiliser	964,9	1,33	0,0515	1013,5					15,23	
K_2O-fertiliser	536,3	1,57	0,0123	579,2					9,68	
CaO-fertiliser	119,1	0,22	0,0183	130,0					1,97	
Pesticides	9886,5	25,53	1,6814	11025,7					268,40	
Seeds- corn	-	-	-	-					-	
Seeds- rapeseed	412,1	0,91	1,0028	733,7					7,87	
Seeds- soy bean	-	-	-	-					-	
Seeds- sugarbeet	2187,7	4,60	4,2120	3557,9					36,29	
Seeds- sugarcane	1,6	0,00	0,0000	1,6					0,02	
Seeds- sunflower	412,1	0,91	1,0028	733,7					7,87	
Seeds- wheat	151,1	0,28	0,4003	277,3					2,61	
EFB compost (palm oil)	0,0	0,00	0,0000	0,0					0,00	
Fuels- gasses										
Natural gas (4000 km, Russian NG quality)					61,58	0,1981	0,0002	66,59		1,1281
Natural gas (4000 km, EU Mix quality)					62,96	0,1981	0,0002	67,98		1,1281
Fuels- liquids										
Diesel					87,64	-	-	87,64		1,16
Gasoline										
HFO					84,98	-	-	84,98		1,088
Ethanol										
Methanol					92,80	0,2900	0,0003	100,15		1,6594
FAME										
Syn diesel (BtL)										

BIOGRACE
Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

Intelligent Energy Europe

German GHG tool

Palm oil greenhouse gas calculator | About | Background data | Start

according to the EU Directive 2009/28/EC

- Plantation operator / first buyer of crops ?
- Oil mill operator ?
- Refinery operator ?
- Last interface ?

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German GHG tool

Palm oil greenhouse gas calculator | About | Background data | Start

according to the EU Directive 2009/28/EC

I. Market actor: Plantation operator, first purchaser

Step-by-step manual for calculating GHG emissions of oil palm cultivation

Final Result
Please provide this info together with your batch to oil miller.

Please note: When combining FFB batches and averaging GHG emissions, GHG value for each batch may not exceed **280g CO_2eq/kg FFB**

The CO_2 emissions from oil palm cultivation amount to

123,7 g CO_2eq/kg FFB ?

Size of the FFB batch

0 kg

Enter your operating data in step 1-4 to calculate CO_2 emissions of your FFB batch

STEP 1 - GHG emissions from land use changes

Do FFB´s originate from plantation areas that were plantation areas before january 1st 2008?

yes — Emissions from land use change are zero.

no — Click here to calculate emissions in sheet "land use changes"

Which emissions arose from land use changes?

0 kg CO_2eq per ha per year

STEP 2 - GHG emissions from cultivation

German GHG tool

Palm oil greenhouse gas calculator

About | Background data | Start

according to the EU Directive 2009/28/EC

I. Market actor: Plantation operator, first purchaser

Step-by-step manual for calculating CO_2 emissions from land use change

The European Commission has published guidelines for the calculation of land carbon stocks (notified under document C (2010) 3751). These consist of tables with values for carbon stock in soils, above and below ground biomass for different soil types, climate regions, vegetation types etc.

Result
value will be added in sheet »actor cultivator« step 1

#WAARDE!

kg CO_2eq per ha per year

confirm value and back

Specify the parameters in step 1-4 to calculate CO2 emissions from land use changes

STEP 1 - Carbon stock in above and below ground biomass on 01.01.2008 (CS_R)

Please select:

Vegetation type	Forest (10-30% canopy cover)	?
Domain		
Climate region		
Ecological zone		
Continent		
Above and below ground carbon on 01.01.08	Please make a valid selection	t C/ha

STEP 2 - Soil carbon on 01.01.2008 (CS_R)

Climate region	Tropical, moist	?

Please select:

Soil type	Low activity clay soils
Standard soil carbon t C/ha	47

German GHG tool

Palm oil greenhouse gas calculator | About | Background data | Start

according to the EU Directive 2009/28/EC

I. Market actor: Plantation operator, first purchaser

Step-by-step manual for calculating GHG emissions of oil palm cultivation

Final Result
Please provide this info together with your batch to oil miller.

Please note: When combining FFB batches and averaging GHG emissions, GHG value for each batch may not exceed **280g CO_2eq/kg FFB**

The CO_2 emissions from oil palm cultivation amount to

123,7 g CO_2eq/kg FFB ?

Size of the FFB batch

0 kg

Enter your operating data in step 1-4 to calculate CO_2 emissions of your FFB batch

STEP 2 - GHG emissions from cultivation

What is your FFB yield per ha per year?

19.000 kg FFBs per ha per year ?

What is the size of your cultivation area?

28 ha

How much fertilizer did you apply per ha per year? Please enter the amount for each of the following fertilizers.

N-fertiliser	128,0	kg N per ha per year ?
P_2O_5-fertiliser	144,0	kg P_2O_5 per ha per year ?
K_2O-fertiliser	200,0	kg K_2O per ha per year ?

BIOGRACE
Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

Intelligent Energy Europe

German GHG tool

Palm oil greenhouse gas calculator | About | Background data | Start

according to the EU Directive 2009/28/EC

- Plantation operator / first buyer of crops ?
- Oil mill operator ?
- Refinery operator ?
- Last interface ?

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Biofuel Greenhouse Gas Emissions in Europe

Intelligent Energy Europe

German GHG tool

Palm oil greenhouse gas calculator | About | Background data | Start

according to the EU Directive 2009/28/EC

II. Market actor: Oil mill operator

Step-by-step manual for calculating CO_2 emissions of CPO production

Final Result
Please provide this info together with your batch to refinery.

Please note: When combining CPO batches and averaging GHG emissions, GHG value for each batch may not exceed **1190g CO_2eq/kg CPO**

The CO_2 emissions from palm oil mill amount to
1517 g CO_2eq/kg CPO ?

Size of the CPO batch
30000 kg

Enter your operating data in step 1-4 to calculate CO_2 emissions of your CPO batch

STEP 1 - GHG emissions of pre-products

What GHG emissions arose from the production of the FFBs? Indicate whether you want to use the default value or a calculated value.

default value — Click here to use default value "126" g CO_2eq/kg FFB in the field below

calculate value — Click here to calculate your emissions in g CO_2eq/kg FFB.

126 g CO_2eq/kg FFB

STEP 2 - GHG emissions from oil mill operation

How many tons of FFB´s did you process per year?

10.000 t FFB/year ?

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German GHG tool

Palm oil greenhouse gas calculator

About | Background data | Start

according to the EU Directive 2009/28/EC

Mixing CPO batches from several suppliers and averaging GHG emissions

Overall quantity metric tonnes	Overall GHG value g CO_2eq/kg FFB
0	0

confirm value and back

Supplier#	Plantation name	FFB quantitity metric tonnes	GHG value g CO_2eq/kg FFB
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

fill in the information delivered by your suppliers

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Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

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German GHG tool

Palm oil greenhouse gas calculator | About | Background data | Start

according to the EU Directive 2009/28/EC

- Plantation operator / first buyer of crops ?
- Oil mill operator ?
- Refinery operator ?
- Last interface ?

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German tool - Summary

Contents

- o Excel-based tool
- o Tool differs from BioGrace Excel sheets:
  - – Pathways are split in partial calculations
  - – DLUC calculations are user-friendly
- o The software programming makes it inflexible
  - – Not possible to modify pathways or build new ones

Status

- o Tool is available on-line via www.ifeu.de/english
- o Currently one chain available: palm oil
- o Cereals-to-ethanol and oilseeds-to-biodiesel chains ready end of 2010

Contents

Spanish tool - general information

Background

- No public tool has been available so far in Spain
- Aim: to provide stakeholders (especially farmers and small biofuel companies) with a tool to calculate the GHG emissions required by the RED

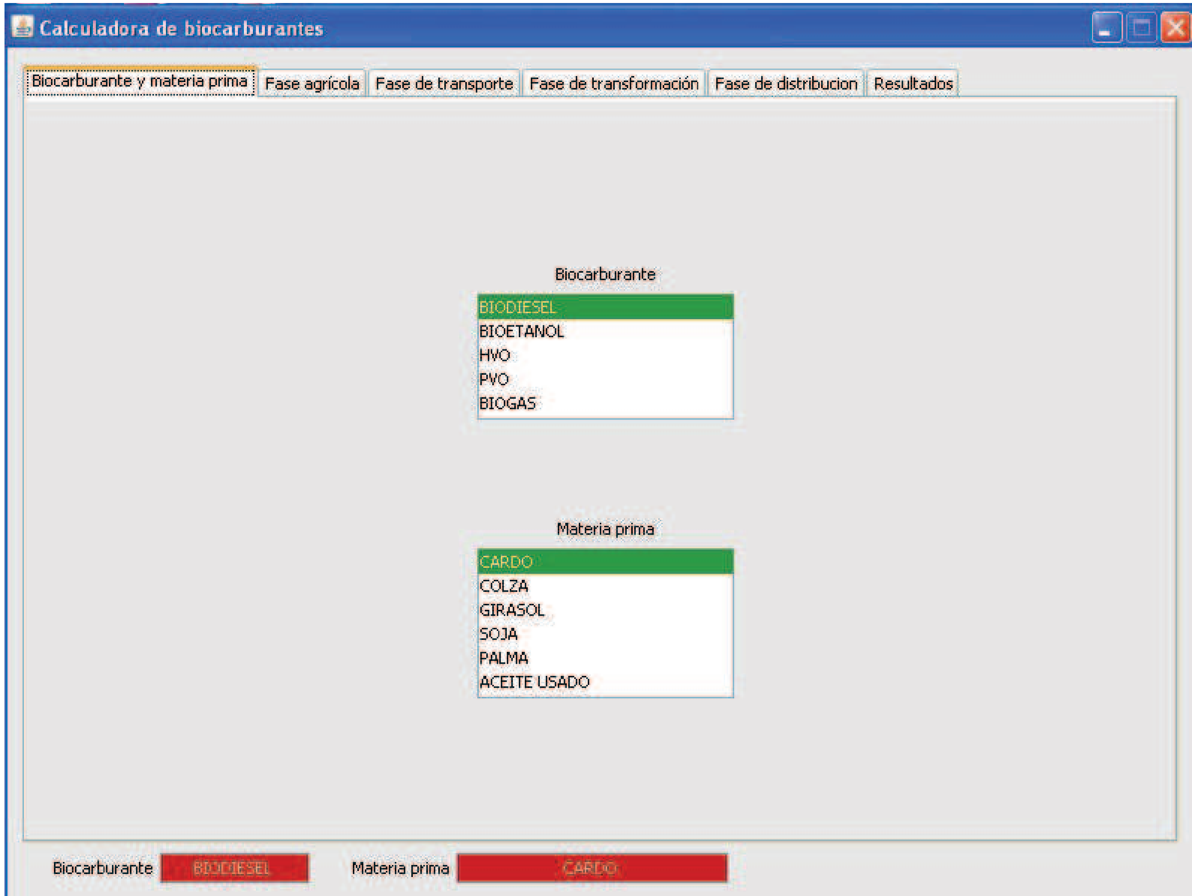
The Spanish GHG calculator

- being developed by CIEMAT, contracted by IDEA
- focuses on agricultural stages
- uses data from NUTS study (actual values or averages calculated for smaller geographical areas)

Spanish GHG tool

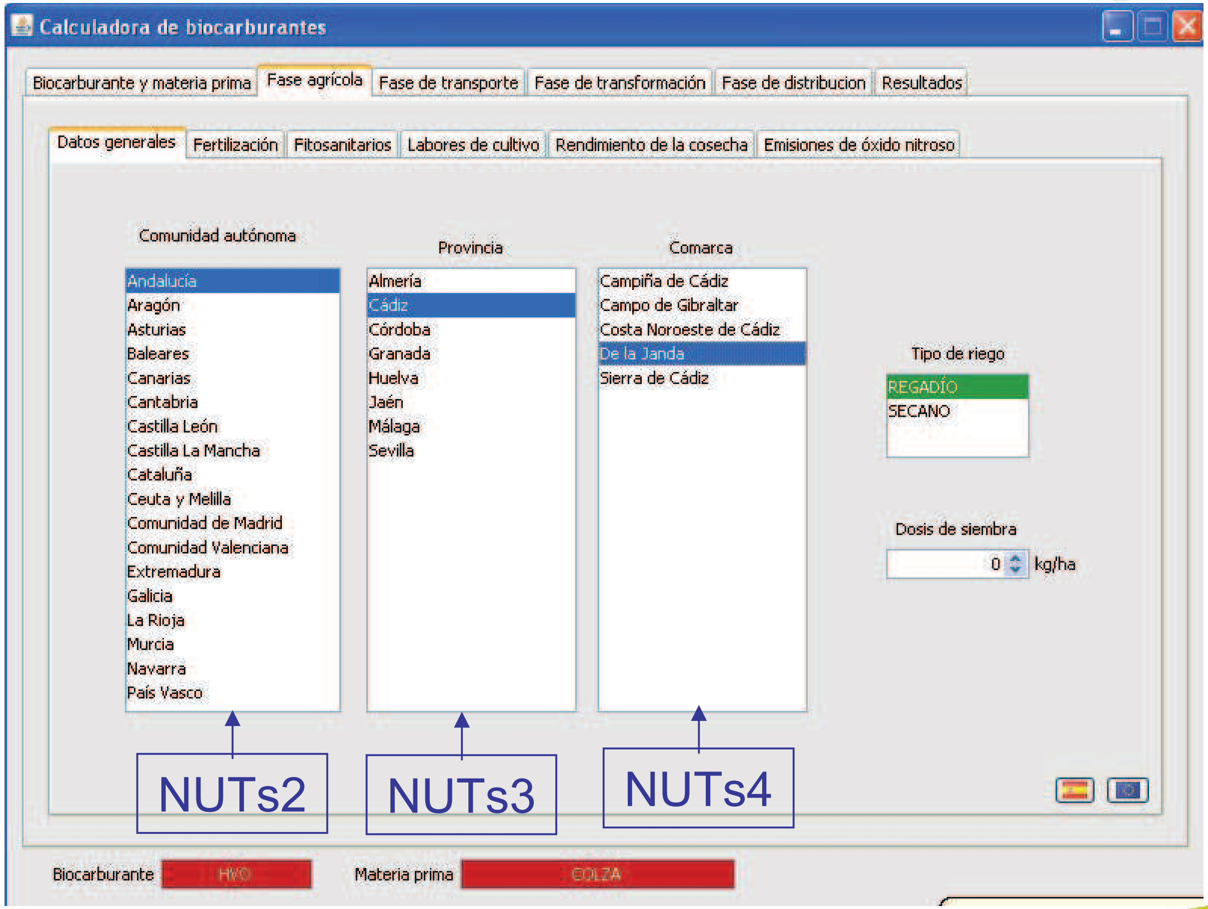
Spanish GHG tool

Biofuel and raw material selection screen



Spanish GHG tool

Agricultural county selection screen



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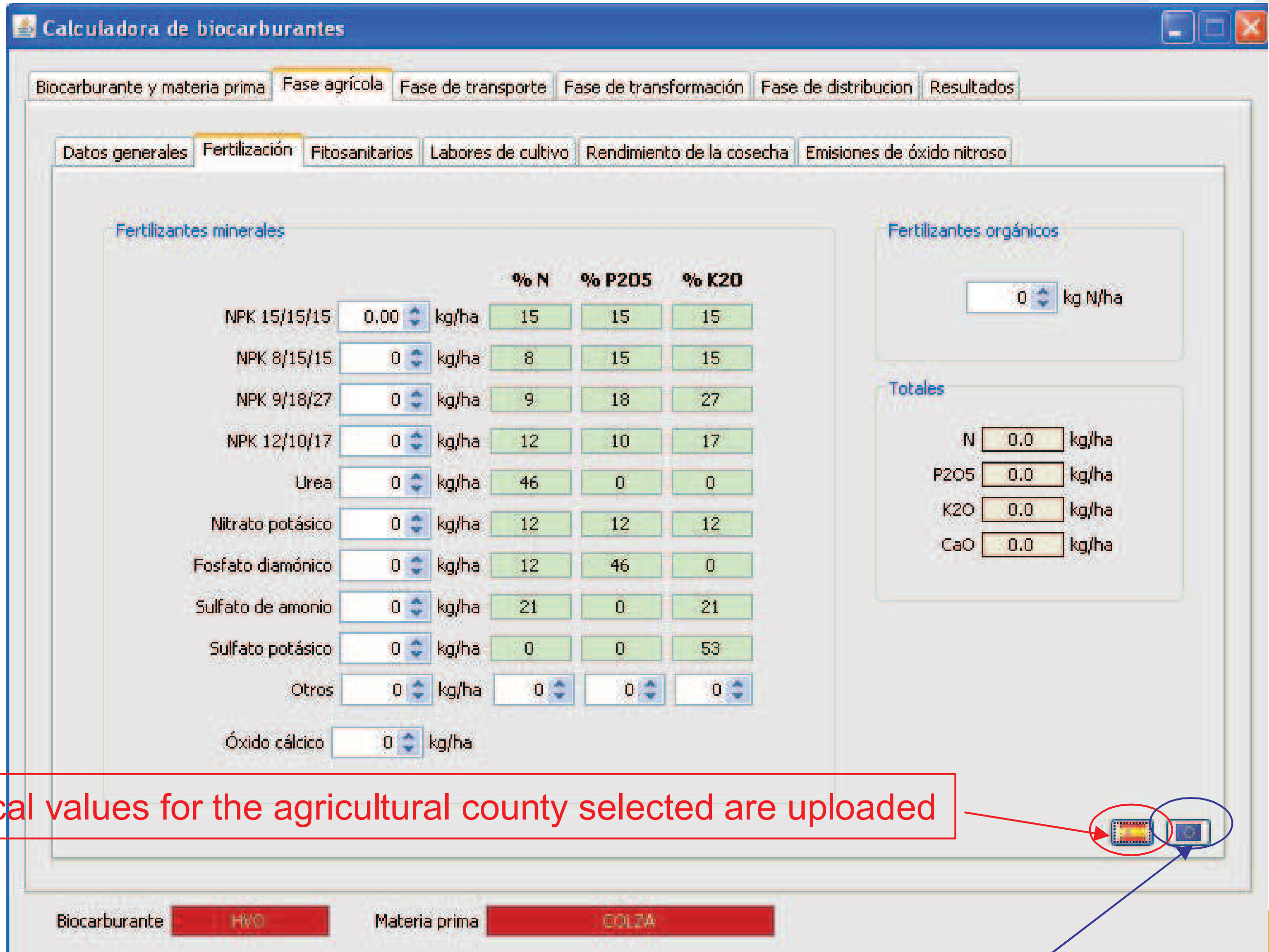
Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

Intelligent Energy Europe

Spanish GHG tool

Fertilization data input screen



Typical values for the agricultural county selected are uploaded

Values to reproduce the default values of the RED are uploaded

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Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

Intelligent Energy Europe

Spanish GHG tool

Transformation data input screen

Values to reproduce the default values of the RED are uploaded

Spanish tool - Summary

Contents

- Tool build in Java
- Focus on Spain:
  - Will contain data on agricultural inputs and yields for 6 crops used to produce biofuels in Spain at the level of agrarian county (NUTs4)
  - 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.
- For processing and transport: RED default values
- Standard values from BioGrace

Status

- First draft version December 2010, final version expected mid-2011

Contents

UK tool - general information

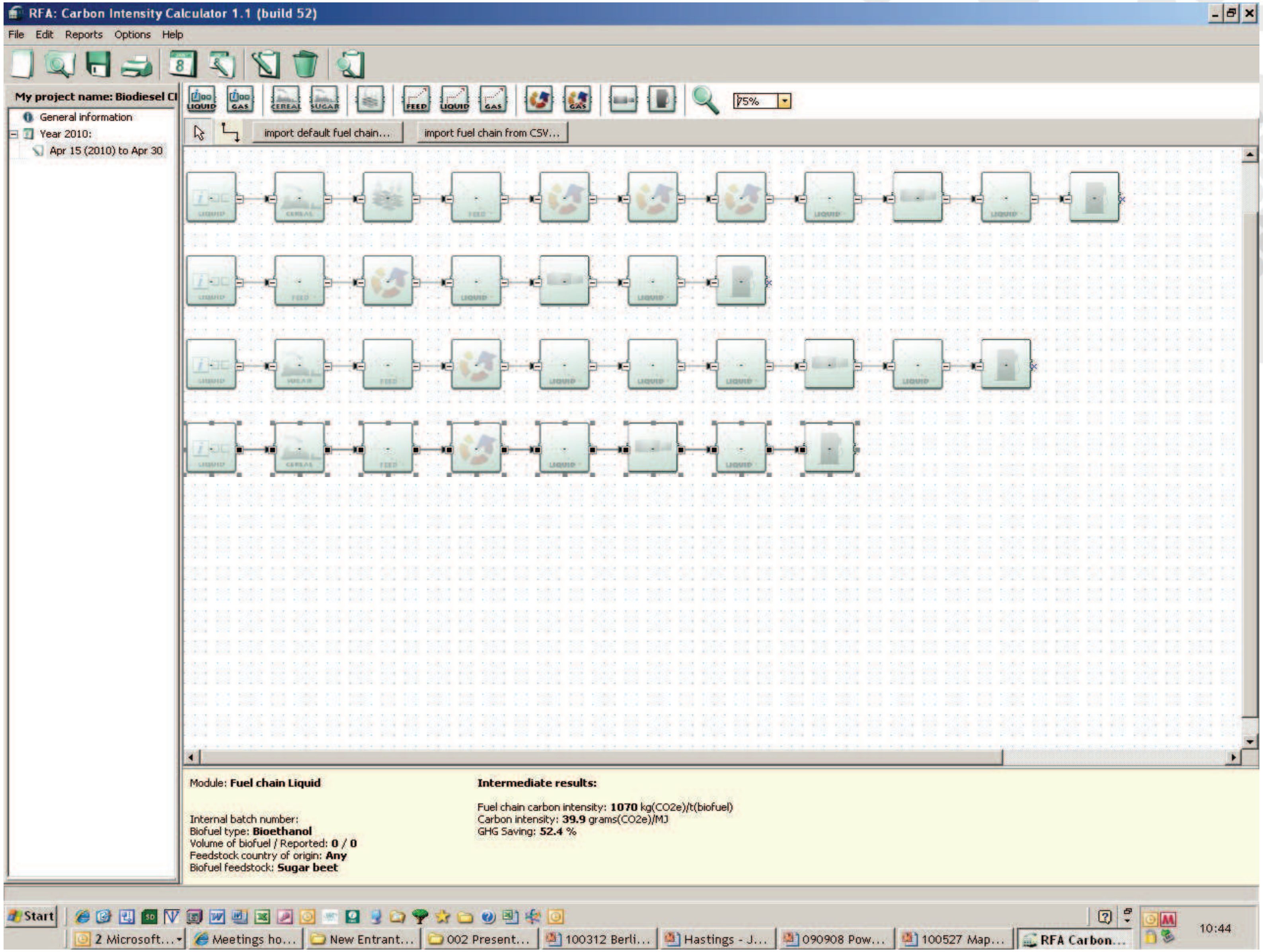
Background

- UK GHG calculator was developed under RTFO reporting scheme
- Calculator existing since 2008, regularly updated
- Aim is to facilitate stakeholders calculating actual values under RTFO reporting

The UK GHG calculator

- was made and is regularly updated by consultant E4Tech, contracted by RFA
- has recently been made “RED-proof”
- strongly linked to RTFO reporting scheme
- Provides more “standard values” as compared to BioGrace

UK GHG tool


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
RFA Carbon...
10:44

UK GHG tool

7.2 Fuel chain – Liquid

Basic data	
Module description	A brief description of the module. This field is optional.
Details and links to verification evidence	Any further details can be added here, including, for example links to any evidence which supports the actual data used within this module. This field is optional.
Internal batch number	A batch number for your own reference can be entered here. This field is optional.
Fuel type produced	The biofuel type of this batch / fuel chain. This field is compulsory. This field can only be changed if no modules follow the 'Fuel chain – Liquid' module.
Country	The country in which the feedstock was produced (NOT necessarily the country in which the biofuel was produced). This field is compulsory ('Unknown' can be selected if relevant). This field can only be changed if no modules follow the 'Fuel chain – Liquid' module.
Biofuel feedstock	The type of feedstock from which the biofuel was produced. This field is compulsory ('Unknown' can be selected if relevant). This field can only be changed if no modules follow the 'Fuel chain – Liquid' module.

UK GHG tool

7.2 Fuel chain – Liquid

Quantity of fuel	The quantity of biofuel in this batch (measured in litres) – this is the quantity of fuel the software enters into the monthly CSV report which can be uploaded to the RFA Operating System.
Quantity of fuel recorded in the RFA Operating System	If you make any adjustments to fuel quantities recorded on the RFA Operating System after uploading a monthly CSV report, the new quantities can be recorded in this field (measured in litres). Annual reports can only be prepared if fuel quantities are recorded in this field.
Fuel chain default value	This field shows the appropriate fuel chain default value, based on the data you supplied on fuel type, feedstock and country of origin.
Social and Environmental	
Land use on 01 Jan 2008	The land use, on 1st January 2008, for the land on which the biofuel feedstock was grown. Definitions of the land use are given in the Technical Guidance for RTFO year 3 Part 1 Annex H.
Standard	The sustainability standard to which the reported feedstock was produced – see Section 3.3 of the Technical Guidance for RTFO year 3 Part 1 for further details.
Social level	The 'Social level' achieved by the sustainability standard selected. This field will generally not need to be changed.

UK tool - Summary

Contents

- Tool build in LCA-software package
- Tool can produce supplier monthly and annual C&S reports
- Tool differs from BioGrace Excel sheets:
  - More than 250 biofuel production pathways included
  - DLUC calculations not included
- The software programming makes it flexible
  - Rather easy to modify pathways or build new ones

Status

- Tool on-line via www.renewablefuelsagency.gov.uk including a user manual
- All chains available (and more) but not all chains give same result (yet) as compared to RED defaults

Contents

Conclusions

Several GHG calculators available

- Two exist since 2008, three (including BioGrace Excel sheets) are newly developed
- Project BioGrace will ensure that all calculators will give the same result
- Some allow to modify or build new pathways, others don't

National GHG calculators have different aims

- Some are more focussed on national data or national reporting, others are more international oriented
- Focus on different aspects
  - Agricultural stages (Spain)
  - Supply of data through the chain of custody (Germany)

Thank you for your attention

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BIOGRACE

Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

Discussion

John Neeft
NL Agency (formerly SenterNovem)
Policy maker workshop
25 November 2010, Athens

Contents

1. "Is there a problem" – a second example
2. Reference to standard values
3. Discussion

“Is there a problem?” – a second example

- o 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”
- o Values from literature / databases

Natural gas

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

- o BioGrace Excel GHG calculations

"Is there a problem?" – a second example

BIOGRACE
Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

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} $year^{-1}$
By-product DDGS	**1,14**	ton_{DDGS} / $ton_{Ethanol}$	0,531 MJ / $MJ_{Wheat, input}$
			0,04 $kg_{Ethanol}$/$MJ_{Ethanol}$
Energy consumption			
Electricity EU mix MV	**0,076**	MJ / $MJ_{Ethanol}$	
Steam (from NG boiler)	**0,509**	MJ / $MJ_{Ethanol}$	
NG Boiler			
CH_4 and N_2O emissions from NG boiler			
Natural gas input / MJ steam	**1,111**	MJ / MJ_{Steam}	
Natural gas (4000 km, EU Mix	0,566	MJ / $MJ_{Ethanol}$	
Electricity input / MJ steam	**0,020**	MJ / MJ_{Steam}	
Electricity EU mix MV	0,010	MJ / $MJ_{Ethanol}$	

1
35%

Standard calculation for wheat: 35% GHG reduction

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Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

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"Is there a problem?" – a second example

BIOGRACE
Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

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} $year^{-1}$
By-product DDGS	**1,14**	ton_{DDGS} / $ton_{Ethanol}$	0,531 MJ / $MJ_{Wheat, input}$
			0,04 $kg_{Ethanol}$/$MJ_{Ethanol}$
Energy consumption			
Electricity EU mix MV	**0,060**	MJ / $MJ_{Ethanol}$	
Steam (from NG boiler)	**0,600**	MJ / $MJ_{Ethanol}$	
NG Boiler			
CH_4 and N_2O emissions from NG boiler			
Natural gas input / MJ steam	**1,111**	MJ / MJ_{Steam}	
Natural gas (4000 km, EU Mix	0,667	MJ / $MJ_{Ethanol}$	
Electricity input / MJ steam	**0,020**	MJ / MJ_{Steam}	
Electricity EU mix MV	0,012	MJ / $MJ_{Ethanol}$	

2
31%

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

"Is there a problem?" – a second example

3

Economic operator takes value for Natural gas from literature: 53,9 g $CO_{2,eq}$/MJ, from literature source "Elsayed, 2003"). He adds this standard value to the sheet "user defined standard values" which makes the value available for calculations.

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Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

www.biograce.net

STANDARD VALUES

parameter:	GHG emission coefficient							
unit:	gCO_2/kg	gCH_4/kg	gN_2O/kg	$gCO_{2\text{-}eq}$/kg	gCO_2/MJ	gCH_4/MJ	gN_2O/MJ	$gCO_{2\text{-}eq}$/MJ
User defined standard values								
Example 1 (diesel from standard values)				0,0	87,64	0,0000	0,0000	87,64
Example 2 (methanol from standard values)				0,0	92,80	0,2900	0,0003	99,57
Example 3 (N-fertiliser from standard values)	2827,0	8,68	9,6418	5880,6				0,00
Natural gas (Elsayed)				0,0	53,90	0,0000	0,0000	53,90
				0,0				0,00
				0,0				0,00

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“Is there a problem?” – a second example

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Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe

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} $year^{-1}$
By-product DDGS	**1,14**	ton_{DDGS} / $ton_{Ethanol}$	0,531 MJ / $MJ_{Wheat, input}$
			0,04 $kg_{Ethanol}$/$MJ_{Ethanol}$
Energy consumption			
Electricity EU mix MV	**0,060**	MJ / $MJ_{Ethanol}$	
Steam (from NG boiler)	**0,600**	MJ / $MJ_{Ethanol}$	
NG Boiler			
CH_4 and N_2O emissions from NG boiler			
Natural gas input / MJ steam	**1,111**	MJ / MJ_{Steam}	
Natural gas (Elsayed)	0,667	MJ / $MJ_{Ethanol}$	
Electricity input / MJ steam	**0,020**	MJ / MJ_{Steam}	
Electricity EU mix MV	0,012	MJ / $MJ_{Ethanol}$	

4
38%

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!!

Contents

Reference to standard values

- **Problem**
  Many standard values around (databases, reports), which can all be freely used

- **Solution 1**
  Commission adds list of standard values to RED Annex V.C (as well as FQD Annex IV.C) when updating Annex V

  The Commission was asked to do so.
  Their answer: this is too detailed and would increase the risk of delaying the Annex V amendment

- **Solution 2**
  Member states include the list of standard values into their national legislation when implementing the RED

Transparency & harmonisation

Reference to standard values

Solution 2

Member states include the list of standard values into their national legislation when implementing the RED

- **Three options:**

HOW?

1. By including (a limited number of the) standard values in (an annex to) legislation
   Word files with standard values are available
2. By making reference to the list of standard values
   Reference to the Commission website would be sufficient
3. By requesting the national regulating authority to implement it, e.g. in guidelines. *UK has already done so*

- **Include text** that standard values must be used unless economic operator can show proof (1) that alternative input was used (2) for GHG emissions of that input

Reference to standard values

Status on implementing solution 2 (Nov. 12, 2010)

We have already approached a number of member states (and will discuss with all 27 member states):

- **UK has implemented option 3**
  Keeley Bignal (UK RFA) *"It is important that all GHG calculations for biofuels are performed consistently and accurately across Europe: one means for ensuring this happens is to require economic operators to use the BioGrace standard values"*
- **Austria, Belgium, France, Ireland, Germany, Lithuania, Netherlands, Portugal, Spain, Sweden** consider to implement one of the three options. But: CRITICAL MASS is required:

  Hans de Waal (NL biofuel policy maker): *"We certainly consider to make reference to the standard values from Dutch legislation. We need, however, a critical mass of member states before we decide to do so".*

Contents

Discussion

- Questions or reactions?
- Any further information needed?
- What is your country's position?

Thank you for your attention

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