BIOGRACE II

Harmonised Greenhouse Gas Calculations for Electricity, Heating and Cooling from Biomass

BioGrace-I versus BioGrace-II

Relation to (1) policy developments and (2) work of JRC for the European Commission

John Neeft
BioGrace coordinator

John Neeft
BioGrace coordinator
BioGrace-II public workshop
30 October 2013, Brussels

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Introduction – what is BioGrace?

- BioGrace: both a **project** and a **GHG calculation tool**
- BioGrace-I versus BioGrace-II

BioGrace-I:

- Biofuels
- Calculations up to liquid fuel ("Well-to-tank")

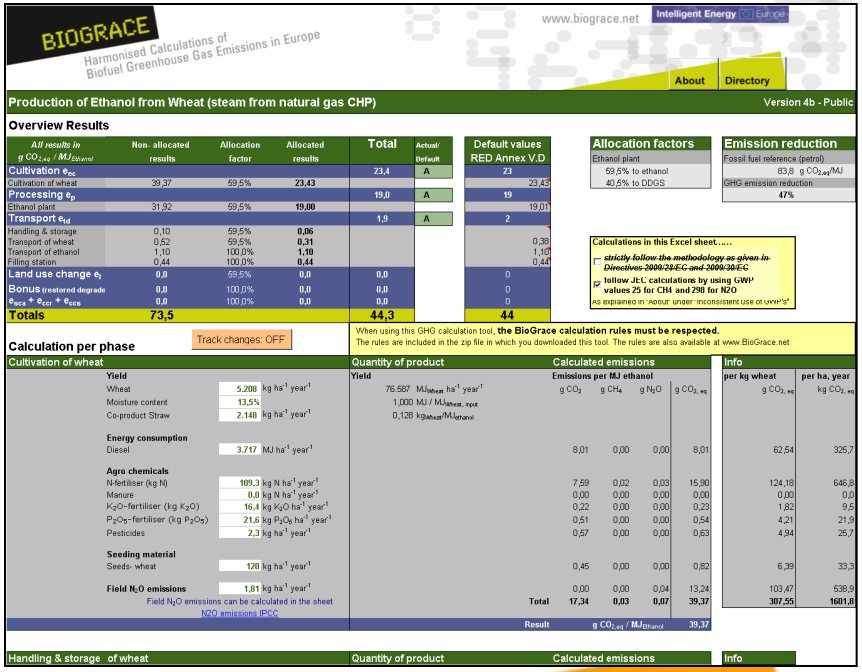
BioGrace-II:

- Electricity, heat and cooling from solid, gaseous and liquid biomass
- Calculations including conversion to electricity, heat and cooling

www.BioGrace.net

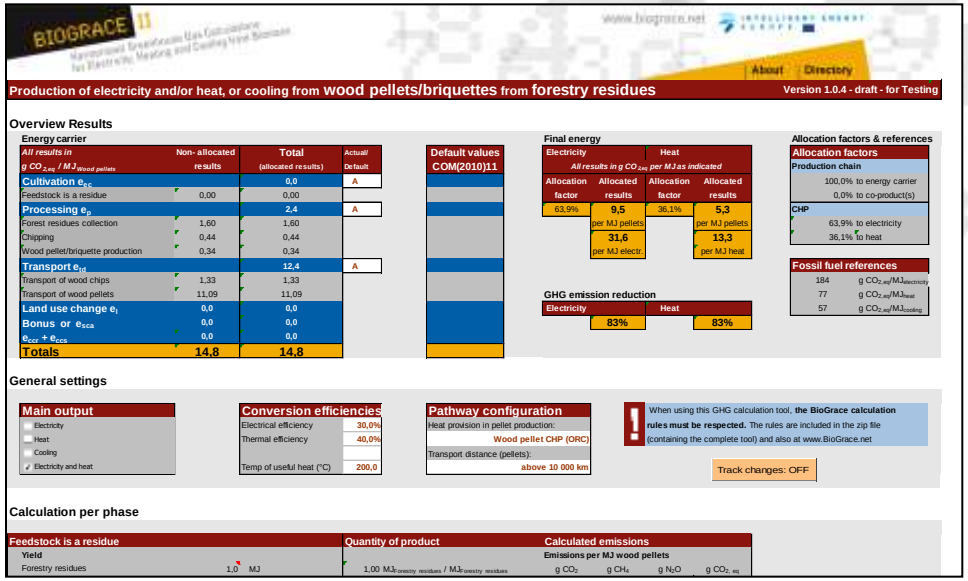
Introduction – what is BioGrace?

- BioGrace started in 2010
- In 2010-2012, BioGrace-I has
  - Produced a user-friendly tool for biofuels
  - Harmonised calculations
  - Send in tool for recognition as "voluntary scheme"
    - Excel tool
    - Calculation rules
    - User manual
    - List of additional standard values



Introduction – what is BioGrace?

- BioGrace-II:
  - Since April 2012
  - Produce user-friendly tool for electricity and heat and cooling from solid, gaseous and liquid biomass
    - Excel tool
    - Calculation rules
    - User manual
    - List of additional standard values



Introduction – what is BioGrace?

- o Input values
- o Standard values

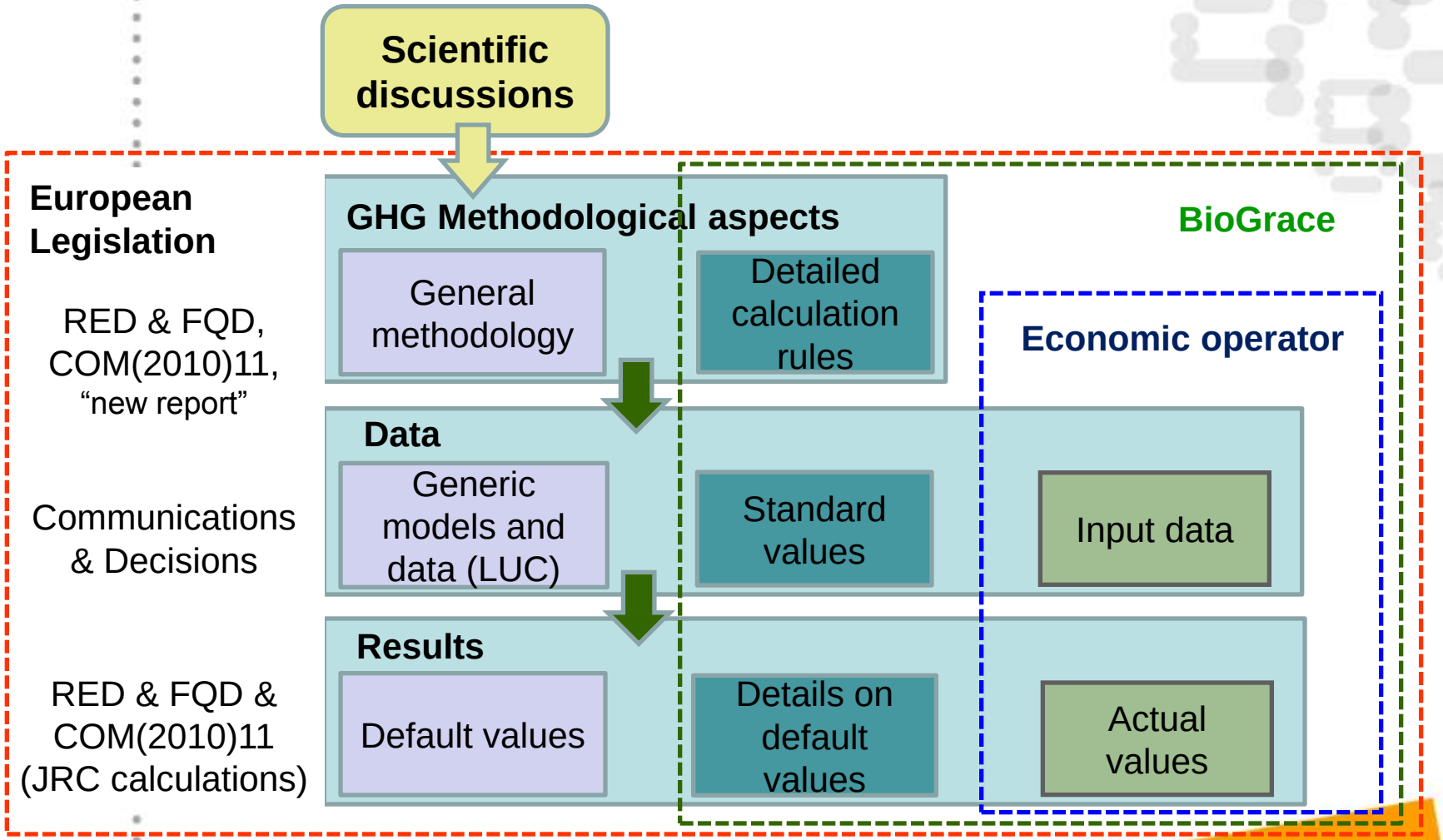
Cultivation of rapeseed			Calculated emissions			
Yield			**Emissions per MJ FAME**			
			g CO_2	g CH_4	g N_2O	g $CO_{2,eq}$
Rapeseed	3.113	kg ha^{-1} $year^{-1}$				
Moisture content	10,0%					
By-product Straw	n/a	kg ha^{-1} $year^{-1}$				
Energy consumption						
Diesel	2.963	MJ ha^{-1} $year^{-1}$	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-f						
Pestic						
Seeding material						
Seeds- rapeseed	6	kg ha^{-1} $year^{-1}$	0,06	0,00	0,00	0,10

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

Introduction – what is BioGrace?

- BioGrace consortium constantly looks for feedback
  - To improve Excel tool, calculation rules, user manual, and the list of additional standard values
  - Your feedback is most welcome!
    - today
    - during the days or weeks to come

Relation to policy developments and to work of JRC



Relation to policy developments and to work of JRC

- Strong relation between JRC work / EC policy and BioGrace has consequences for:

  1. Content

     (how does BioGrace create a GHG calculation tool)

  2. Timing

     (when is GHG calculation tool made, when is it updated)

Relation to policy / JRC

1. Content

- BioGrace has strong relation to EC legislation and reports:
  - Basics are determined by “Brussels”
    - Methodology
    - Default values, “starting” input values, standard values
  - Secondary content is determined by BioGrace:
    - Calculation rules and additional standard values
    - Design of tool, user-friendliness, restrictions
- BioGrace tools have two uses
  - allow stakeholders to make actual calculations
  - make transparent how default values were calculated

Relation to policy / JRC

1. Content

- Some current scientific discussions have not (yet) been implemented in policy
  - forest carbon stock changes (“carbon debt”)
  - indirect land use change
- BioGrace will not include such topics in tools before policy makers have decided:
  - to include the issues into legislation
  - to amend the GHG calculation methodology

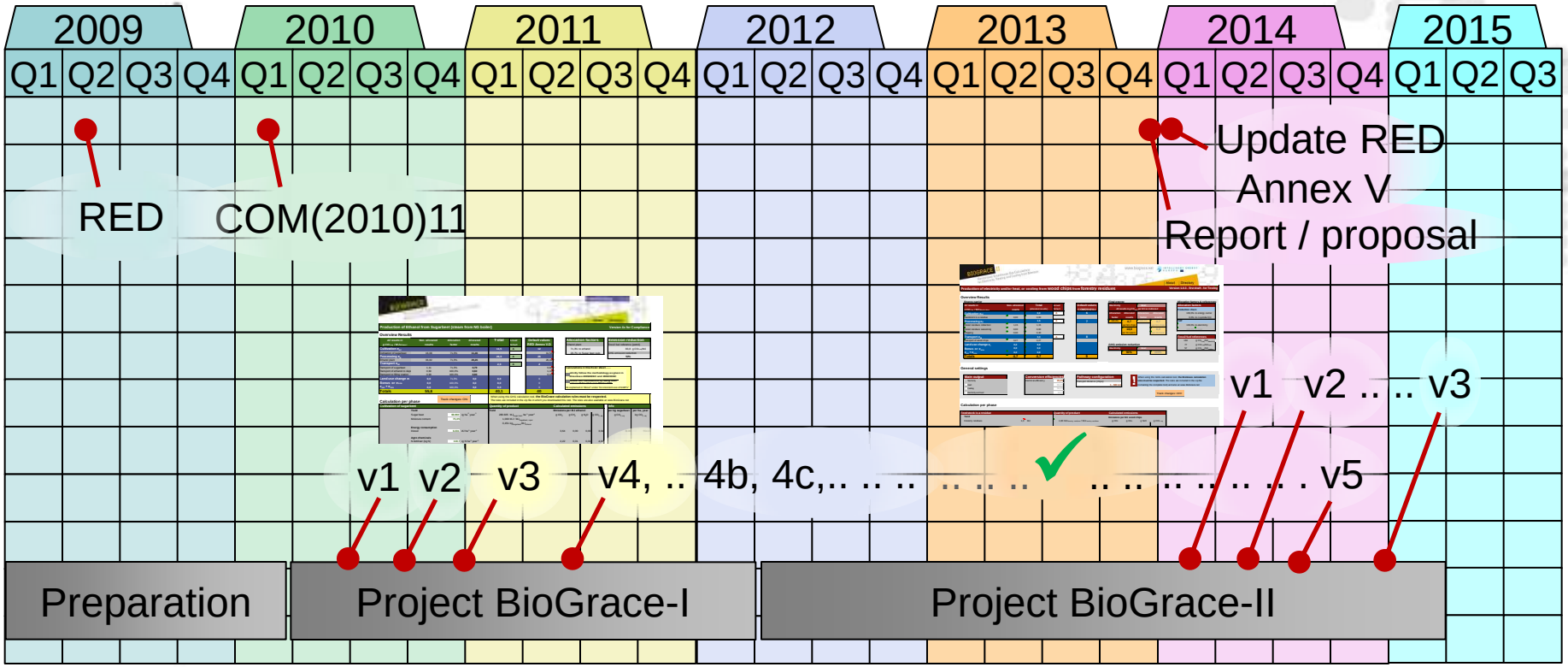
Relation to policy / JRC

1. Content

- BioGrace follows Commission and JRC and makes decisions implementable for stakeholders
  - BioGrace-II tool is made using JRC's calculations as input for new report
  - BioGrace will only use pathways for which default values are given in directive / report
    - *eg* no jatropha pathway in BioGrace-I,
      no miscanthus pathway in BioGrace-II
  - Tool is flexible and allows inserting new steps (within a pathway) and constructing new pathways
  - Tool contains features that facilitate verifiers checking actual calculations

Relation to policy / JRC

2. Timing



Further aims of BioGrace-II

A. Harmonisation of GHG calculations for electricity, heat and cooling from biomass
   - Cause that calculations by two different persons (in different countries, using different tools) give the same result
   - At least three tools around:
     - UK Solid and Gaseous Biomass Carbon Calculator
     - Wallonian tool “Calcul des Certificates Verts”
     - BioGrace-II GHG calculation tool
   - Companies, NGO’s and public certification initiatives (IWPB, ISCC plus, NTA8080) are in favour of harmonisation
   - Discussions between member states are starting, BioGrace will organise policy maker workshops

Further aims of BioGrace-II

B. Dissemination and stakeholder feedback
- Public workshops (like this one)
- Smaller feedback sessions
  - First round completed, report is available
  - Second round in 2014

C. Train-the-trainers sessions - verifiers
- Training sessions for BioGrace-I (biofuel) tool completed
- Training sessions for BioGrace-II in 2014 and early 2015
- On-line instruction videos

Where to find more information

- Project coordinator

  Agentschap NL (Agency NL)
  John Neeft
  e-mail: john.neeft@agentschapnl.nl

- Project partners

  - AEBIOM, Europe (Jean-Marc Jossart)
  - BE2020, Austria (Nikolaus Ludwiczek)
  - BIO IS, France (Perrine Lavelle)
  - IFEU, Germany (Horst Fehrenbach)
  - STEM, Sweden (Anders Dahlberg)
  - VREG, Belgium (Jimmy Loodts)

Where to find more information

- All information is available:
  - on www.BioGrace.net
  - and is for free

Concluding summary

- BioGrace produces GHG calculation tools for biofuels and electricity, heat and cooling from biomass
  - To make transparent how default values were calculated
  - To allow stakeholders to make actual calculations
- Tools are policy related
  - They follow methodology and default values from EC / JRC
  - They will not include iLUC or carbon debt unless included in EC methodology
- BioGrace also aims to
  - Cause harmonisation
  - Take stakeholder input into account
  - Get verifiers trained
- Make sure that we receive your feedback !

Co-funded by the Intelligent Energy Europe Programme of the European Union

Thank you for your attention

Production of Ethanol from Wheat (steam from natural gas CHP)

Version 4b - Public

Overview Results

All results in g $CO_{2,eq}$ / $MJ_{Ethanol}$	Non- allocated results	Allocation factor	Allocated results	Total	Actual/ Default	Default values RED Annex V.D
Cultivation e_{ec}				23,4	A	23
Cultivation of wheat	39,37	59,5%	**23,43**			23,43
Processing e_p				19,0	A	19
Ethanol plant	31,92	59,5%	**19,00**			19,01
Transport e_{td}				1,9	A	2
Handling & storage	0,10	59,5%	**0,06**			
Transport of wheat	0,52	59,5%	**0,31**			0,38
Transport of ethanol	1,10	100,0%	**1,10**			1,10
Filling station	0,44	100,0%	**0,44**			0,44
Land use change e_l	**0,0**	59,5%	**0,0**	**0,0**		0
Bonus (restored degrade	**0,0**	100,0%	**0,0**	**0,0**		0
$e_{sca} + e_{ccr} + e_{ccs}$	**0,0**	100,0%	**0,0**	**0,0**		0
Totals	**73,5**			**44,3**		**44**

Allocation factors

Ethanol plant
59,5% to ethanol
40,5% to DDGS

Emission reduction

Fossil fuel reference (petrol)	83,8 g $CO_{2,eq}$/MJ
GHG emission reduction	**47%**

Calculations in this Excel sheet…..

- ☐ ~~*strictly follow the methodology as given in Directives 2009/28/EC and 2009/30/EC*~~
- ☑ **follow JEC calculations by using GWP values 25 for CH4 and 298 for N2O**

As explained in "About" under "Inconsistent use of GWP's"

Calculation per phase

Track changes: OFF

When using this GHG calculation tool, **the BioGrace calculation rules must be respected.**
The rules are included in the zip file in which you downloaded this tool. The rules are also available at www.BioGrace.net

Cultivation of wheat

			Quantity of product	Calculated emissions				Info	
Yield			**Yield**	**Emissions per MJ ethanol**				**per kg wheat**	**per ha, year**
Wheat	5.208	kg ha^{-1} $year^{-1}$	76.587 MJ_{Wheat} ha^{-1} $year^{-1}$	g CO_2	g CH_4	g N_2O	g $CO_{2,eq}$	g $CO_{2,eq}$	kg $CO_{2,eq}$
Moisture content	13,5%		1,000 MJ / $MJ_{Wheat,\ input}$						
Co-product Straw	2.148	kg ha^{-1} $year^{-1}$	0,128 $kg_{Wheat}/MJ_{ethanol}$						
Energy consumption									
Diesel	3.717	MJ ha^{-1} $year^{-1}$		8,01	0,00	0,00	8,01	62,54	325,7
Agro chemicals									
N-fertiliser (kg N)	109,3	kg N ha^{-1} $year^{-1}$		7,59	0,02	0,03	15,90	124,18	646,8
Manure	0,0	kg N ha^{-1} $year^{-1}$		0,00	0,00	0,00	0,00	0,00	0,0
K_2O-fertiliser (kg K_2O)	16,4	kg K_2O ha^{-1} $year^{-1}$		0,22	0,00	0,00	0,23	1,82	9,5
P_2O_5-fertiliser (kg P_2O_5)	21,6	kg P_2O_5 ha^{-1} $year^{-1}$		0,51	0,00	0,00	0,54	4,21	21,9
Pesticides	2,3	kg ha^{-1} $year^{-1}$		0,57	0,00	0,00	0,63	4,94	25,7
Seeding material									
Seeds- wheat	120	kg ha^{-1} $year^{-1}$		0,45	0,00	0,00	0,82	6,39	33,3
Field N_2O emissions	1,81	kg ha^{-1} $year^{-1}$		0,00	0,00	0,04	13,24	103,47	538,9
Field N_2O emissions can be calculated in the sheet N2O emissions IPCC			**Total**	**17,34**	**0,03**	**0,07**	**39,37**	**307,55**	**1601,8**
			Result			g $CO_{2,eq}$ / $MJ_{Ethanol}$	**39,37**		

Handling & storage of wheat

			Quantity of product	Calculated emissions				Info	
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P_2O_5-fertiliser (kg P_2O_5)	21,6	kg P_2O_5 ha^{-1} $year^{-1}$		0,51	0,00	0,00	0,54	4,21	21,9
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Production of Ethanol from Wheat (steam from natural gas CHP)

Version 4b - Public

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Bonus (restored degrade	**0,0**	100,0%	**0,0**	**0,0**		0
$e_{sca} + e_{ccr} + e_{ccs}$	**0,0**	100,0%	**0,0**	**0,0**		0
Totals	**73,5**			**44,3**		**44**

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			Quantity of product	Calculated emissions				Info	
			Yield	Emissions per MJ ethanol				per kg wheat	per ha, year
			76.587 MJ_{Wheat} ha^{-1} $year^{-1}$	g CO_2	g CH_4	g N_2O	g $CO_{2,eq}$	g $CO_{2,eq}$	kg $CO_{2,eq}$
Yield			1,000 MJ / $MJ_{Wheat, input}$						
Wheat	5.208	kg ha^{-1} $year^{-1}$	0,128 $kg_{Wheat}/MJ_{ethanol}$						
Moisture content	13,5%								
Co-product Straw	2.148	kg ha^{-1} $year^{-1}$							
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			Result			g $CO_{2,eq}$ / $MJ_{Ethanol}$	**39,37**		

Harmonisation of GHG emission calculations

- At the start of the BioGrace-I project, different GHG calculation tools gave different results:
  - German tool (IFEU)
    http://ifeu.de/nachhaltigkeit/pdf/THG-Rechentools-Testversionen%20Juli2011.zip
  - Netherlands tool (Agency NL)
    http://www.agentschapnl.nl/en/programmas-regelingen/determine-biofuel-greenhouse-gas-emissions-production-transport-fuels-made-bio
  - Spanish tool (CIEMAT)
    http://www.idae.es/index.php/relcategoria.1037/id.686/relmenu.322/mod.pags/mem.detalle
  - UK tool (DfT / E4Tech)
    http://www.dft.gov.uk/publications/carbon-calculator
- BioGrace caused that these tools now give the same result, by:
  - Using the same set of standard values
  - Track down and change differences in calculations

Harmonisation of GHG emission calculations

- Results from harmonisation (full table available at www.biograce.net):

	Table A RED Annex V/FQD Annex IV	Diferences with BIOGRACE tool			
Biofuel production pathways	Default value	The Netherlands ANL	Germany IFEU	Spain CIEMAT	UK
Ethanol wheat lignite	70	0,0	0,0	-0,1	0,0
Ethanol wheat (proces fuel not specified)	70	0,0	0,0	-0,1	0,1
Ethanol wheat (natural gas - steam boiler)	55	0,0	0,0	0,0	0,0
Ethanol wheat (natural gas - CHP)	44	0,0	0,2	0,0	0,0
Ethanol wheat (straw)	26	0,0	0,0	0,0	-0,6
Ethanol corn	43	0,0	0,2	0,0	0,0
Ethanol sugarbeet	40	0,0	0,0	0,6	-0,2
Ethanol from sugarcane	24	0,0	0,0	-0,2	-0,1
Biodiesel rape seed	52	0,0	-0,5	0,0	-0,1
Biodiesel palm oil	68	0,0	0,3	-0,1	-0,2
Biodiesel palm oil (methane capture)	37	0,1	0,4	-0,2	-0,1
Biodiesel soy	58	0,1	0,0	0,1	-0,2
Biodiesel sunflower	41	0,0	-0,4	0,0	-0,1
Biodiesel UCO	14	0,0		0,0	
PVO rape seed	36	0,0	0,0	0,1	-0,1
HVO rape seed	44	0,0		0,1	-0,1
HVO palm oil	62	0,0		0,0	-0,1
HVO palm oil (methane capture)	29	0,0		0,0	-0,1
HVO sunflower	32	0,0		0,0	0,0
Biogas - dry manure	15	0,0		0,0	0,0
Biogas - wet manure	16	0,0		-0,2	0,0
Biogas - Municipal organic waste.	23	0,0		0,0	-0,1

LCAs: science versus policy implementation

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

Complexity	Poorer	Applicability (part of legislation)	Better
High	**Scientific approach:** • High level of accuracy • Case-specific numbers • Variation (*eg* multiple years: crop rotation) • Focus on correctness of results		
Low			**Policy approach:** • Compromise between accuracy and applicability • Average numbers • Unambiguous and limited amount of variation • Focus on applicability as part of legislation