Carbon & Sustainability Reporting under the RTFO

How to report the required carbon information

Philip Watson

Renewable Fuels Agency

E4tech

20th February 2008

Contents

Carbon information required

Using fuel chain default values

Using actual data

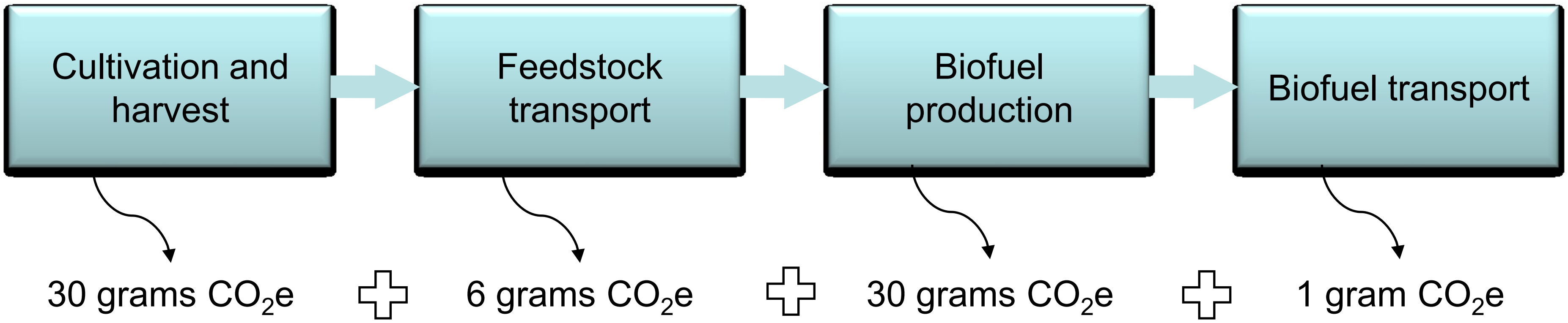
Two pieces of carbon reporting data are required in the monthly C&S reports

General Information						Sustainability Information	
Batch number	Internal Batch number (optional)	Fuel type	Quantity of fuel (litres)	Biofuel Feedstock	Feedstock Origin	Standard	Env
33006		Biodiesel	800,00				
33008		Biodiesel	100,00				
33009		Biodiesel	100,00				

Carbon Information	
Carbon intensity incl LUC g CO_2e / MJ	Accuracy level
55	2
45	2
177	2

What is the carbon intensity of a batch of biofuel?

- A measure of the amount of GHG emissions produced per unit of biofuel
- Includes any impact of changes in land use (30 Nov 2005)
- Expressed in units of carbon dioxide equivalent per unit of energy: grams CO_2e / MJ

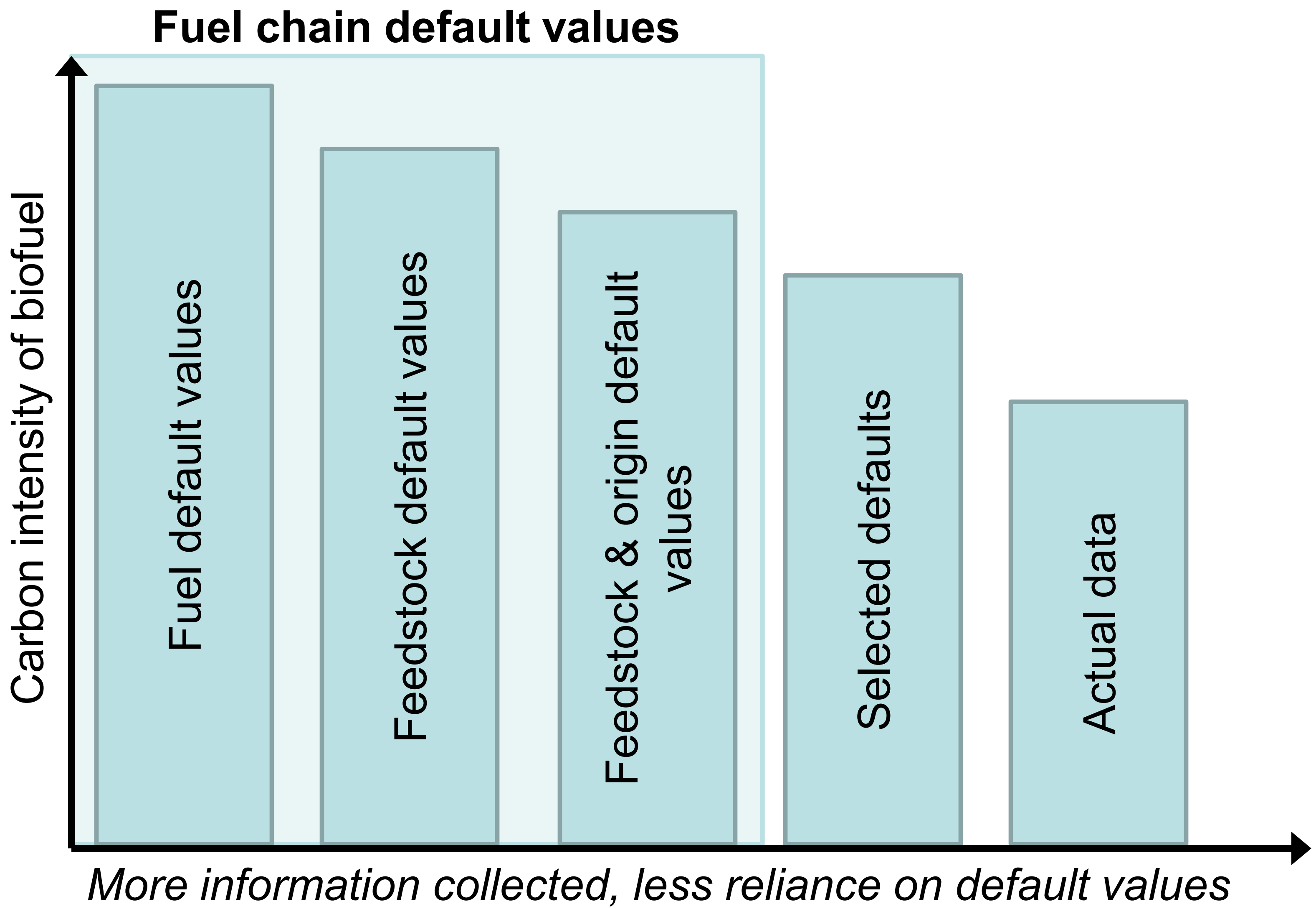


Carbon intensity = 67 grams CO_2e / MJ

Renewable Fuels Agency

E4tech

Companies can rely on default values or collect information about the biofuel & how it was produced

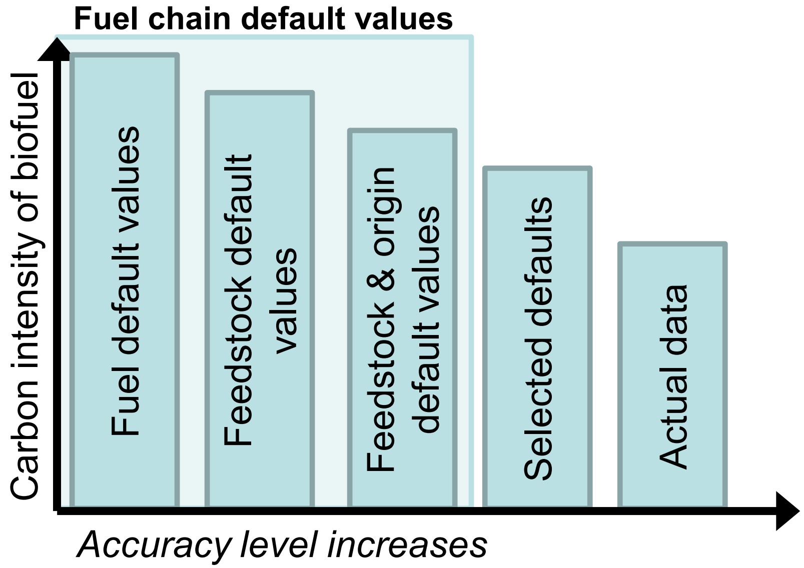


Renewable Fuels Agency

E4tech

What is the accuracy level of a batch of biofuel?

- The accuracy level of a batch of biofuel conveys information about the type of data used to establish a biofuel's carbon intensity
- Information about accuracy levels will help the RFA establish the:
  - Type of data typically being collected by obligated suppliers
  - Conservativeness of industry-wide estimates of carbon intensity
  - Accuracy of default values



Contents

Carbon information required

Using fuel chain default values

Using actual data

Example: selecting fuel chain default values

Fuel type	Feedstock type	Country of origin	Type of default value	Carbon intensity (g CO_2e / MJ)
Bioethanol	Unknown		Fuel	61
	Sugar cane	Brazil	Feedstock & origin	24
		Mozambique	Feedstock & origin	30
	Molasses	Unknown	Feedstock	40

Example: selecting accuracy levels for fuel chain default values

Fuel type	Feedstock type	Country of origin	Type of default value	Accuracy Level
Bioethanol	Unknown		Fuel	0
	Sugar cane	Brazil	Feedstock & origin	2
		Mozambique	Feedstock & origin	2
	Molasses	Unknown	Feedstock	1

What if there is no appropriate fuel chain default value?

- Inform the RFA as soon as possible of intention to introduce a new biofuel chain into the market
- If necessary, they will specify an interim fuel chain default value – see Annex G of Technical Guidance

How is the impact of changes of land use calculated?

- Carbon intensity must be reported including any impact of land use change (30 Nov 2005)
- Default values for impact of land use change are provided in the Technical Guidance – see Table 26 (page 86-89)
- If land use in November 2005 is unknown, impact on carbon intensity is zero

Fuel type	Feedstock	Country	Land use on 30 Nov 2005	Carbon intensity (gCO_2e/MJ)		
				Default value	Impact of LUC (from Table 26)	Reported to RFA
Bioethanol	Sugarcane	Brazil	Unknown	24	0	24
Biodiesel	Oilseed rape	UK	Cropland	55	0	55
Biodiesel	Soya	Brazil	Grassland (ag use)	78	609	687

Contents

What actual data should be collected?

Step in the supply chain	Focus for data collection
Crop production	Nitrogen fertiliser application rate Crop yield Fuel consumption for cultivation
Feedstock or liquid fuel transport	Transport distances
Conversion (e.g. biofuel plant, crushing plant etc)	Yield Fuel demand Electricity demand Co-product treatment

What type of actual data can be used?

- “Real time” data is not required:
  - All actual data used for conversion stages can be based on characteristics averaged over 12 months
  - Averaged data would still be subject to verification – therefore, care needs to be taken that averages are representative
- Farm surveys
  - Actual data for crop production inputs can be collected using statistically accurate surveys (e.g. crop yield, nitrogen fertiliser)
  - Surveys would be considered valid for one crop growing season
  - Surveys should be field-based, not farm-based

Example of using actual data to calculate carbon intensity

- A biodiesel producer (who is using UK oilseed rape) collects the following actual data on their biodiesel plant:
  - Plant yield: 0.98 tonnes biodiesel / tonne feedstock
  - Natural gas use: 1500 MJ / tonne biodiesel
  - Electricity: 349 MJ / tonne biodiesel

Example – using the actual data to replace single default values

Stage 6 - Conversion

Basic data						
Plant yield	[t biodiesel / t rapeseed oil]	0.98				
Conversion Inputs				Emissions factor ($kgCO_{2e}$/MJ)		Emissions ($kgCO_{2e}$/t ethanol)
Natural gas	[MJ/t biodiesel]	1500	x	0.062	=	93
Electricity imported	[MJ/t biodiesel]	349	x	0.131	=	46
				Emissions factor (kgCO2e/kg)		
Methanol	kg/t biodiesel	113	x	2.75	=	311
Potassium hydroxide	kg/t biodiesel	26	x	2.42	=	63
Allocation factor (%age of emissions attributable to biodiesel)	%					90
Totals						Total Emissions [$kgCO_{2e}$/t biodiesel]
Module total						461
Contribution to fuel chain						461

Renewable Fuels Agency

E4tech

Example – calculating the new carbon intensity

Module	Default chain for UK	Using actual data
1 - Crop production	1945	1886
2 - Drying and storage	71	69
3 - Feedstock transport	29	28
4 - Feedstock transport	0	0
5 - Conversion (crushing)	-468	-454
6 - Feedstock transport	0	0
7 - Conversion (esterification)	471	461
8 - Liquid fuel transport and storage	0	0
Total (kg CO_2e/t biodiesel)	**2048**	**1990**

Example – converting the new carbon intensity to the correct units

- The new carbon intensity, calculated using actual data is:
  - 1990 kg CO_2e / tonne biodiesel
- However, for reporting to the RFA, the result must be given per unit of energy (grams CO_2e / MJ)
- The result above is divided by the *lower heating value* of biodiesel, given in "General Default Values" section of the guidance:
  - 1990 / 37.2 = 53 grams CO_2e / MJ

	Carbon intensity		GHG saving
	kg CO_2e / tonne	grams CO_2e / MJ	
Default value	2048	55	36%
Actual data	1990	53	38%

Accuracy levels when using selected defaults or actual data

- When selected defaults or actual data is used, the following accuracy levels are reported to the RFA, provided:
- The data is used for a source of emissions which contributes a significant proportion of total fuel chain GHG emissions (see next slide)

Type of default value or data	Accuracy level
Selected default – RFA defined	3
Selected default – Industry defined	4
Actual data	5

Accuracy level 3 can be used for the following data points, which have RFA defined selected default values

Section of biofuel chain	Data points eligible for higher accuracy level
Crop production	Type of nitrogen fertiliser (e.g. urea, ammonium nitrate) Type of phosphorus fertiliser
Feedstock transport	Mode of transport (where the default distance is greater than 300 km by truck, or 1,500 km by ship)
Conversion	Fuel type used for heat (e.g. natural gas, coal etc)

Accuracy levels 4 and 5 can be used for the following data points

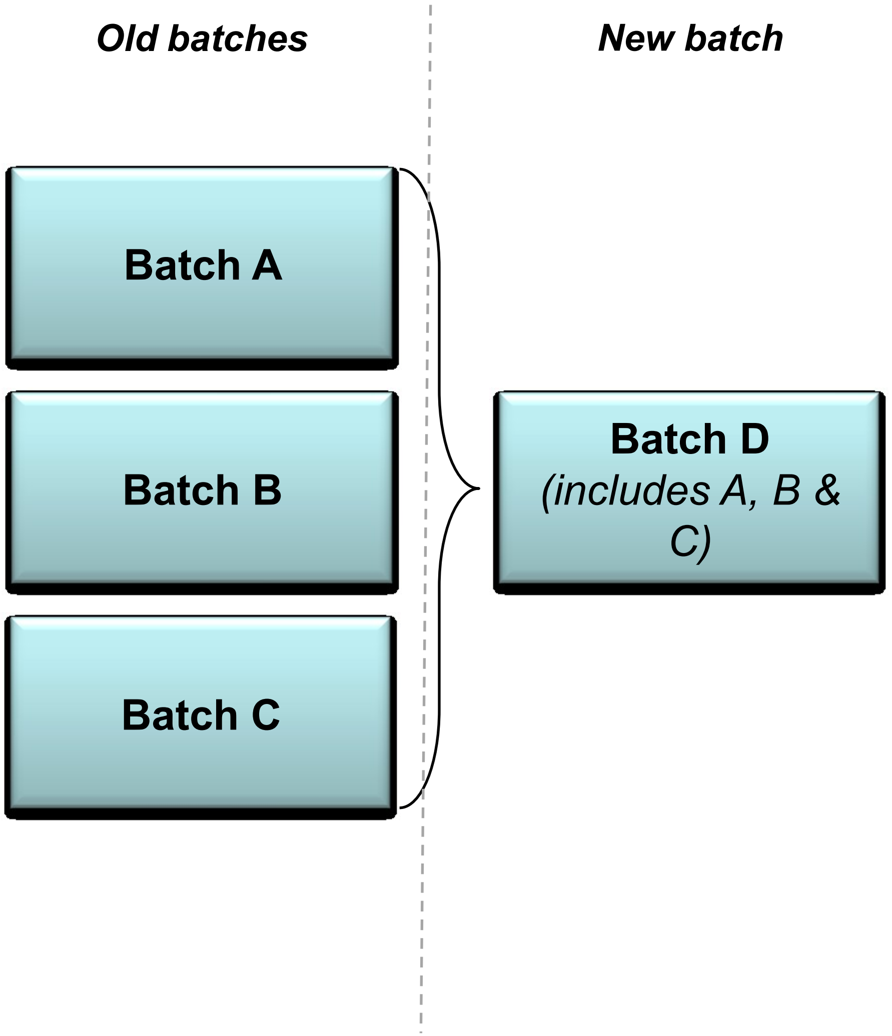
Section of biofuel chain	Data points eligible for higher accuracy level
Crop production	Crop yield; nitrogen fertiliser application rate or type; diesel for cultivation
Drying and storage	Moisture removed during drying; amount of fuel used for heating
Feedstock transport	Distances and modes (where the default is greater than 300 km by truck, or 1,500 km by ship)
Conversion	Process yield; fuel type used; natural gas or other fuel use; electricity use; all co-product data; methanol used (biodiesel); treatment of POME, alternative waste treatment credit (biomethane, UCO & tallow biodiesel)

Example: using different accuracy levels

Description	Type of data	Accuracy Level
Producer has surveyed farms to obtain crop yield and nitrogen fertiliser data	Actual data	5
Soy exported from Brazil was move from farm to port by rail (not by truck as is the default value)	RFA defined selected default	3
Wheat yields and fertiliser application rates were drawn from a survey of agronomic practices in Lincolnshire over the last five years	Industry defined selected default	4

Calculating the carbon intensity and accuracy level of combined batches of biofuel

- Several batches of biofuel with identical characteristics but different carbon intensity & accuracy level may be combined into one batch
- The new carbon intensity is the weighted-average (volume-based) carbon intensity of old batches
- Accuracy level of new batch is:
  - The accuracy level of old batch which makes up 50% volume of new batch
  - Weighted average of old batches (to zero decimal places)



Renewable Fuels Agency

E4tech

Example of calculating the carbon intensity and accuracy level of combined batches of biofuel

Batch Number	Quantity of fuel	Carbon intensity	Accuracy level
1	1,000	30	5
2	3,000	55	3

- Carbon intensity
  - Batch 1 contributes 25% of the volume of the combined batch
  - Batch 2 contributes 75%
  - Carbon intensity of combined batch

    = (25% x 30) + (75% x 55)

    = 49 g CO_2e / MJ
- Accuracy level
  - Batch 2 > 50% of total volume
  - Accuracy level of combined batch = 3

Example of calculating the carbon intensity and accuracy level of combined batches of biofuel

Batch Number	Quantity of fuel	Carbon intensity	Accuracy level
1	1,000	30	5
2	3,000	55	3
3	3,000	41	4

Carbon intensity

- Batch 1 contributes 14%,
- Batches 2 & 3 both contribute 43%
- Carbon intensity of combined batch

= (14% x 30) + (43% x 55) + (43% x 41)

= 45 g CO_2e / MJ

Accuracy level

- No batch > 50% of total volume

= (14%x 5) + (43% x 3) + (43% x 4)

= 3.7

= 4

Questions

Contents

Biofuels Carbon Calculator

Example – providing actual data for co-products

- A bioethanol producer (who is using UK wheat) builds a bioethanol plant with gas turbine CHP, which has the following characteristics:
  - Natural gas use: 17,000 MJ / tonne bioethanol
  - Electricity (import): 0 MJ / tonne bioethanol
  - Electricity export (i.e. co-product): 5,000 MJ / tonne bioethanol

Example – providing actual data for co-products

Stage 5 - Conversion

Basic data						
Plant yield	[t bioethanol / t wheat]	0.292				
Conversion Inputs				Emissions factor ($kgCO_{2e}$/MJ)		Emissions ($kgCO_{2e}$/t bioethanol)
Natural gas	[MJ/t bioethanol]	17000	x	0.062	=	1054
Co-products				Credit [$kgCO_2e$/unit coproduct]		
Quantity of DDGS produced & sold as animal feed	[t DDGS / t bioethanol]	1.14	x	-488	=	-556
Quantity of electricity exported	[MJ / t bioethanol]	5000	x	-0.106	=	-530
Totals						Total emissions [kg CO2e / t bioethanol]
Module total						-32
Contribution to fuel chain						-32

Renewable Fuels Agency

E4tech

Example – providing actual data for co-products

Module	Default chain for UK	Using actual data
1 - Crop production	1275	1275
2 - Drying and storage	49	49
3 - Feedstock transport	68	68
4 - Feedstock transport	0	0
5 - Conversion	231	-32
6 - Liquid fuel transport and storage	0	0
Total (kg CO_2e/t bioethanol)	**1623**	**1360**
GHG saving (%)	**29%**	**40%**