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RÉPUBLIQUE FRANÇAISE

NOTE FROM THE FRENCH AUTHORITIES

Subject: Biofuels: report listing the NUTS level 2 areas, pursuant to Article 19(2) of Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

Article 19(2) of Directive 2009/28/EC provides that: *'By 31 March 2010, Member States shall submit to the Commission a report including a list of those areas on their territory classified as level 2 in the nomenclature of territorial units for statistics (NUTS) or as a more disaggregated NUTS level […] where the typical greenhouse gas emissions from cultivation of agricultural raw materials can be expected to be lower than or equal to the emissions reported under the heading 'Disaggregated default values for cultivation' in part D of Annex V to this Directive, accompanied by a description of the method and data used to establish that list. That method shall take into account soil characteristics, climate and expected raw material yields.'*

The abovementioned report for France is attached.

Five biofuel production pathways were studied: sugar beet, common wheat, grain maize, rapeseed and sunflower. The list of the NUTS 2 regions was drawn up according to reliable data currently available at national level in mainland France, based on the methodology developed as part of the analysis of the life cycle of first generation biofuels in France which was published in April 2010. In terms of taking account of nitrous oxide emissions (N_2O), it was based on aspects relating to methods communicated by the Joint Research Centre (JRC) following the request from the French authorities. The emission headings used are those listed in paragraph 6, part C of Annex V to the Directive.

The French authorities highlight however that the calculation done by the JRC is based on the hypothesis that the direct emissions of N_2O are mainly the result of the type of soil and climate, and are only linked to nitrogen inputs in a secondary way and not proportionally; the analysis of the life cycle for first generation biofuels in France has led to higher values for N_2O emissions, as mentioned in the annex of the report.

In view of this observation, the French authorities call on the European Commission to improve the methodology developed by the JCR as a matter of priority in order to significantly increase its robustness and accuracy; they would like the European Commission to inform them of its plans.

In addition, the French authorities inform the European Commission that France will propose to put this subject on the agenda of the next Environment Council.

Finally, France intends, if necessary, to update the data relating to greenhouse gas emissions linked to the agricultural phase of the production chain of biofuels, based on the technical and scientific progress made at national and European level, and based on the development of crops of agricultural raw materials, particularly in the overseas territories.

FRENCH REPORT
PURSUANT TO ARTICLE 19(2) OF DIRECTIVE 2009/28/EC

CONTENTS

I - Context

Article 19(2) of Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources provides that the Member States must identify by 31 March 2010 the regions (NUTS 2 areas) or departments (NUTS 3 areas) in which the greenhouse gas emissions linked to the agricultural phase of the production of biofuels are lower than or equal to the default values shown under the 'Disaggregated default values for cultivation' heading of part D of Annex V to the Directive. They must also specify the method and the data used to draw up this list.

In accordance with the methodology developed in part C of Annex V to the Directive, it is a question of calculating the emissions from the extraction or cultivation of raw materials (parameter e_{ec}); the land-use changes should not be taken into consideration.

This report meets this obligation.

II – Scope of the report

Five types of crops of agricultural raw materials produced in mainland France and used for the production of biofuels were considered:
- for the bioethanol production pathway: sugar beet, common wheat and grain maize;
- for the biodiesel production pathway: rapeseed and sunflower.

For each of these pathways, the following production regions were studied:

Agricultural raw materials	Production regions studied
Sugar beet	Alsace, Auvergne, Lower Normandy, Burgundy, Centre, Champagne-Ardenne, Upper Normandy, Ile-de-France, Nord/Pas-de-Calais, Picardy (10 regions)
Common wheat	Alsace, Aquitaine, Auvergne, Lower Normandy, Burgundy, Brittany, Centre, Champagne-Ardenne, Franche-Comté, Upper Normandy, Ile-de-France, Lorraine, Midi-Pyrénées, Nord/Pas-de-Calais, Loire Region, Picardy, Poitou-Charentes, Rhône-Alpes (18 regions)
Grain maize	Alsace, Aquitaine, Auvergne, Lower Normandy, Burgundy, Brittany, Centre, Champagne-Ardenne, Franche-Comté, Upper Normandy, Ile-de-France, Lorraine, Midi-Pyrénées, Nord/Pas-de-Calais, Loire Region, Picardy, Poitou-Charentes, Rhône-Alpes (18 regions)
Rapeseed	Auvergne, Lower Normandy, Burgundy, Brittany, Centre, Champagne-Ardenne, Franche-Comté, Upper Normandy, Ile-de-France, Languedoc-Roussillon, Limousin, Lorraine, Midi-Pyrénées, Nord/Pas-de-Calais, Loire Region, Picardy, Poitou-Charentes, Rhône-Alpes (18 regions)
Sunflower	Aquitaine, Auvergne, Burgundy, Centre, Champagne-Ardenne, Ile-de-France, Languedoc-Roussillon, Midi-Pyrénées, Loire Region, Poitou-Charentes, Rhône-Alpes (11 regions)

Other regions currently have low levels of production of the abovementioned crops; given the lack of data representing the technical itineraries, they could not be assessed. They are shown in the table below.

Agricultural raw materials	Production regions not studied	Share of the regions in relation to the total cultivated area in France	
Sugar beet	Franche-Comté	0.30%	0.46%
	Lorraine	0.03%	
	Loire Region	0.09%	
	Rhône-Alpes	0.03%	
Common wheat	Corsica	0.00%	0.65%
	Languedoc-Roussillon	0.07%	
	Limousin	0.46%	
	Provence-Alpes-Côte d'Azur	0.09%	
Grain maize	Corsica	0.05%	0.66%
	Languedoc-Roussillon	0.07%	
	Limousin	0.29%	
	Provence-Alpes-Côte d'Azur	0.23%	
Rapeseed	Alsace	0.32%	1.29%
	Aquitaine	0.79%	
	Provence-Alpes-Côte d'Azur	0.17%	
Sunflower	Alsace	0.12%	3.52%
	Lower Normandy	0.14%	
	Brittany	0.02%	
	Franche-Comté	1.48%	
	Upper Normandy	0.02%	
	Limousin	0.27%	
	Lorraine	0.32%	
	Picardy	0.13%	
	Provence-Alpes-Côte d'Azur	0.98%	

For these different regions, in accordance with paragraph 6, part C of Annex V, estimates for emissions could be made at a later stage for the smaller areas, depending on the local crop routes.

France intends, if necessary, to extend the scope of the report at a later stage, based on the availability of data relating to the production of energy crops at national level and depending on the development of crops of agricultural raw materials, particularly in the overseas territories**.**

The calculation methodology and the list of regions identified are set out in detail below.

III - The method and data used

Preamble

In order to calculate the greenhouse gas emissions linked to the production of agricultural raw materials and to identify the French regions which comply with the default values of the 'cultivation' phase laid down in the Directive, France has a robust national methodology developed as part of an analysis of the life cycle of first generation biofuels in France carried out by ADEME[1] since 2008 and bringing together all players involved (State, agricultural and industrial professionals, environmental protection associations). The results of this study were published on 8 April 2010 on the ADEME website (http://www2.ademe.fr).

[1] French Agency for the Environment and Energy Management.

This methodology was not strictly applied when drawing up this report in an effort to harmonise it with the method for estimating agricultural greenhouse gas emissions with the calculation tool developed by the Joint Research Centre (JRC) which produced the default values shown in part D of Annex V to Directive 2009/28/EC (see Annex).

1) Description of the method

a) General framework

The method used is based on the methodology developed as part of the analysis of the life cycle of first generation biofuels in France. The methodological elements provided by the JRC[2] were used to calculate nitrous oxide emissions (N_2O) linked to the use of nitrogenous fertilisers.

In accordance with the method used by the JRC and which resulted in the default values shown in part D of Annex V to Directive 2009/28/EC, the following headings were taken into consideration to calculate the greenhouse gas emissions linked to the production of agricultural raw materials:
- production and use of fertiliser inputs (mineral nitrogen, potassium K_2O, phosphoric acid P_2O_5 and calcium oxide CaO).
- production and use of plant health products (various pesticides);
- production of seeds;
- consumption of diesel necessary for mechanisation.

Similarly, in accordance with the method set out in part C of Annex V to the Directive, the consumption of energy for irrigation on the one hand, and drying and ventilation during the storage of grain on the other hand, was not taken into account, nor the depreciation of agricultural equipment and buildings (see paragraph 1 of part C of Annex V to Directive 2009/28/EC).

For each type of energy crop, for each region studied, these headings were converted into greenhouse gas emissions according to the following general formula:

quantity of inputs (kg or l) linked to the heading considered (per kilogramme of grain or per kilogram of sugar for sugar beet) per hectare for a given crop and region _____ **yield** of the crop considered (per kilogramme of grain per hectare) in a given region	x	**rate of energy allocation** (%) in France (proportion of emissions allocated to biofuels, the rest being allocated to by-products) _____ **industrial processing yield** in France (in Mega Joules of biofuels/kg of grain)	x	**factor of greenhouse gas emissions** in France (in kg CO_{2eq} by quantity of inputs)

The results by heading were then added together to reach an overall greenhouse gas emissions value for the crop phase, expressed in gCO_{2eq}/MJ of biofuels.

[2] Following a request made in a note from the French authorities in January 2010.

France intends, if necessary, to update the data relating to greenhouse gas emissions linked to the agricultural phase of the production chain of biofuels, based on the technical and scientific progress made at national and European level.

b) Details about the calculation of nitrous oxide emissions

The calculation was done based on the methodology used by the JRC which means that the different types of soil, climate and crop routes can be taken into account.

Contrary to the approach used in the analysis of the life cycle of first generation biofuels in France, based on the guidelines of the Intergovernmental Panel on Climate Change (IPCC), the JRC's approach is based on the observation that (direct and indirect) emissions of nitrous oxide are not directly correlated to the yield of agricultural crops and to the application of nitrogenous fertilisers and that these are mainly the result of the type of soil and climate.

There is currently no calculation method which is sufficiently robust or validated to vary the nitrous oxide emissions rate by French region. The average generic values used by the JRC were therefore applied to all of the French regions studied:

Greenhouse gas emissions (in kg N_2O / ha)	**Common wheat**	**Sugar beet**	**Grain maize**	**Rapeseed**	**Sunflower**
Average values	1.84	3.37	0.85	3.11	1.45

c) Industrial processing: yields and allocation

The industrial phase is characterised by a processing yield which translates the conversion of kilograms of grain (or sugar) into kilograms of biofuels and the production of by-products, to which a share of the environmental impact can be allocated, in particular greenhouse gas emissions.

Processing yields

The processing yields have been provided by French industry, as part of the analysis of the life cycle of first generation biofuels in France. For confidentiality reasons linked to industrial secrecy, these have been presented in the form of ranges of values in the following table:

Crops	Average industrial yield in France	
Sugar beet	0.47 - 0.49	kg ethanol/kg white sugar
Common wheat	0.29 - 0.31	kg ethanol/kg grain
Grain maize	0.35 - 0.38	kg ethanol/kg grain
Rapeseed	0.39 - 0.41	kg biodiesel/kg grain
Sunflower	0.40 - 0.43	kg biodiesel/kg grain

The net calorific values necessary to convert these values into megajoules of biofuels produced are those used in Annex III to Directive 2009/28/EC:
- wheat, sugar beet and corn ethanol: 27 MJ/kg;
- rapeseed and sunflower biodiesel: 37 MJ/kg.

Energy allocations

The production of biofuels from agricultural raw materials also generates by-products which can be used in animal feed, land application or for the production of energy. A part of the impact of the

agricultural phase must therefore be allocated to them, according to an energy allocation based on the net calorific value of the different by-products.

The allocation ratios used are based on the analysis of the life cycle of first generation biofuels in France and are based on industrial processing units in operation. For confidentiality reasons, these are rounded up to average values.

Crops	Allocation ratios
Sugar beet	80%
Common wheat	65%
Grain maize	71%
Rapeseed	59%
Sunflower	60%

2) Data used

a) Primary data

The primary data relate to the technical agricultural itineraries and to the yields of the different crops in the regions considered. They have been provided by the statistical services of the Ministry of Agricultural and supplemented by the technical institutes concerned[3].

Parameters	Source
Average agricultural yield (average value for the period 2005-2009)	Annual surveys (2005-2008), statistical services of the Ministry of Agriculture FranceAgriMer (2009)
Mineral nitrogen fertilisers, plant health products and seeds	'Crop practices' survey (2006), statistical services of the Ministry of Agriculture Technical institutes
Fertilisers P_2O_5 and K_2O	COMIFER[4]
Liming materials (CaO)	Technical institutes (sugar beet)
Diesel	Technical institutes

The corresponding national average values, obtained by weighting based on the cultivated areas per department, are presented by way of example in the table below, with the headings in italics being those for which a national average value was used in the calculations, as there was no regional data available:

	Bioethanol			Biodiesel	
	Sugar beet	Common wheat	Grain maize	Rapeseed	Sunflower
Yield (kg or kg of sugar for sugar beet, per hectare)	14 479	6 960	8 984	3 326	2 397
Mineral nitrogen (kg per ha)	108	165	156	165	56
Fertiliser P_2O_5 (kg P per ha)	35	45	54	42	29
Fertiliser K_2O (kg K per ha)	126	35	49	28	25

[3] Cereals (wheat, corn): Arvalis Institut du végétal
Oilseeds (sunflower, rapeseed): CETIOM (centre technique interprofessionnels des protéagineux métropolitains)
Sugar beet: ITB (Institut technique français de la betterave industrielle)

[4] Centre français d'étude et de développement de la fertilisation raisonnée

Fertiliser CaO (tonnes per ha)	*0.81*	*0*	*0*	*0*	*0*
Plant health products (in kg of active material per ha)	3.8	2.1	1.7	2.6	2.2
Seeds (kg per ha)*	1	139	31	3	5
Diesel (l per ha) *(MJ/ha)*	*170* *6096*	*93* *3335*	*93* *3335*	*68* *2438*	*66.8* *2395*

* : as some regions do not have data on the quantity of seeds used and of plant health products applied for rapeseed, sunflower and grain maize, the highest value identified for the French regions surveyed was applied to these regions for the crop in question.

b) Secondary data

The secondary data relate to generic parameters for chemical conversion, energy conversion or conversion of greenhouse gas emissions:
- average potassium (P) and calcium (K) content of exported grains;
- unitary emission factors (in kg eq. CO_2/kg of MJ).

Parameters	**Values**					**Sources**
	Sugar beet	Common wheat	Grain maize	Rapeseed	Sunflower	
Average P content (kg of P_2O_5/kg of grain with reference moisture content)	0.0005	0.0065	0.006	0.0125	0.012	COMIFER
Average K content (kg of K_2O_5/kg of grain with reference moisture content)	0.0018	0.005	0.0055	0.0085	0.0105	COMIFER
Greenhouse gas emissions linked to the production of seeds (kg CO_{2eq}/kg)	2.13	0.632	2.03	1.95	2.03	ACV study on first generation biofuels, 2010, ADEME, based on ECOINVENT data

Parameters	**Values**	**Sources**
Greenhouse gas emissions linked to the production of manure and fertilisers (kg CO_{2eq}): - mineral nitrogen (/kg N) - P_2O_5 (/kg P_2O_5) - K_2O (/kg K_2O) - CaO (t/ha) - plant health products (/kg)	 5.3 0.56 0.44 24.5 7.71	ACV study on first generation biofuels, 2010, ADEME ECOINVENT database
Greenhouse gas emissions linked to the combustion of diesel (kg CO_{2eq}/kg)	3.66	
N_2O emissions (kg CO_{2eq}/kg)	298	IPCC

IV – List of regions (NUTS 2 areas)

This section presents, for each of the five energy crops produced in mainland France, the list of regions for which greenhouse gas emissions are less than the default values contained in the *'Disaggregated default values for cultivation'* section of part C of Annex V to Directive 2009/28/EC.

1) Bioethanol production pathways

a) Sugar beet

French regions studied, where emissions calculated are lower than the default values	**Emissions in g equivalent CO_2 /MJ**
Default emission values laid down in Annex V to Directive 2009/28/EC	12
Alsace	8
Auvergne	9
Lower Normandy	9
Burgundy	11
Centre	9
Champagne-Ardenne	9
Upper Normandy	9
Ile-de-France	10
Nord/Pas-de-Calais	10
Picardy	9

c) Common wheat

French regions studied, where emissions calculated are lower than the default values	**Emissions in g equivalent CO_2 /MJ**
Default emission values laid down in Annex V to Directive 2009/28/EC	23
Alsace	20
Lower Normandy	20
Burgundy	23
Brittany	19
Centre	23
Champagne-Ardenne	21
Franche-Comté	23
Upper Normandy	18
Ile-de-France	20
Lorraine	22
Nord/Pas-de-Calais	18
Loire Region	21
Picardy	19
Poitou-Charentes	23
Rhône-Alpes, only for the department of Ain	22

c) Grain maize

French regions studied, where emissions calculated are lower than the default values	**Emissions in g equivalent CO_2 /MJ**

Default emission values laid down in Annex V to Directive 2009/28/EC	20
Alsace	10
Aquitaine	13
Auvergne	11
Lower Normandy	8
Burgundy	11
Brittany	7
Centre	11
Champagne-Ardenne	11
Franche-Comté	12
Upper Normandy	10
Ile-de-France	11
Lorraine	11
Midi-Pyrénées	12
Nord/Pas-de-Calais	8
Loire Region	10
Picardy	10
Poitou-Charentes	13
Rhône-Alpes	11

2) Biodiesel production pathways

a) Rapeseed

French regions studied, where emissions calculated are lower than the default values	**Emissions in g equivalent CO_2 /MJ**
Default emission values laid down in Annex V to Directive 2009/28/EC	29
Auvergne	28
Lower Normandy	22
Burgundy	25
Brittany	20
Centre	24
Champagne-Ardenne	23
Franche-Comté	25
Upper Normandy	21
Ile-de-France	23
Languedoc-Roussillon	27
Limousin	28
Lorraine	24
Midi-Pyrénées	28
Nord/Pas-de-Calais	19
Loire Region	23
Picardy	22
Poitou-Charentes	25
Rhône-Alpes	28

b) Sunflower

French regions studied, where emissions calculated are lower than the default values	**Emissions in g equivalent CO_2 /MJ**

Default emission values laid down in Annex V to Directive 2009/28/EC	18
Aquitaine	17
Auvergne	12
Burgundy	13
Centre	15
Champagne-Ardenne	13
Ile-de-France	12
Languedoc-Roussillon	12
Midi-Pyrénées	17
Loire Region	14
Poitou-Charentes	16
Rhône-Alpes	14

Annex

The estimates for agricultural greenhouse gas emissions resulting from the application in the French regions of the methodology developed as part of the analysis of the life cycle of first generation biofuels in France, are higher than the values which are obtained by replicating the calculation method developed by the Joint Research Centre (JCR), in particular given the gaps in the modelling of nitrous oxide emissions linked to nitrogen fertilisers.

In fact, the national modelling, which comes under the Tier 1 level of the IPCC guidelines, is based on a direct link between the quantities of nitrogen fertiliser applied and the direct emissions of nitrous oxide, whereas the JRC methodology which comes under the Tier 3 level of the IPCC guidelines, considers that direct emissions of nitrous oxide are mainly the result of the type of soil and climate and are only linked to nitrogen inputs in a secondary way and not proportionally.

By way of example, the differences observed at national level for the assessment of nitrous oxide emissions are as follows:

N_2O emissions (in kg N_2O / ha)	**Bioethanol pathway**			**Biodiesel pathway**	
	Common wheat	**Sugar beet**	**Maize**	**Rapeseed**	**Sunflower**
National methodology, as part of the analysis of the life cycle of first generation biofuels	4.17	4.68	4.60	4.55	2.05
Methodology of the Joint Research Centre (JRC)	1.84	3.37	0.85	3.11	1.45