FRENCH REPORT

PURSUANT TO ARTICLE 19(2) OF DIRECTIVE 2009/28/EC AND TO ARTICLE 7(d-2) OF DIRECTIVE 2009/30/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 and Article 7(d-2) of Directive 2009/30/EC on fuel quality provided 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 was 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 2009/28/EC and of part D of Annex IV to the Directive 2009/30/EC. They had to also specify the method and the data used to draw up this list. In 2010, France submitted a first report covering five sectors with relevant regions to these pathways and with relevant data collected. In the beginning of 2013, France conducted an additional calculation for two sectors for completing 2010 report. By the end of 2013, France performed a complementary set of calculation for one sector.

In accordance with the methodology developed in part C of Annex V to the Directive 2009/28/EC and in part D of Annex IV to the Directive 2009/30/EC, 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

This report is focused on the sunflower biodiesel production pathway in the Limousin region.

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**	
Sunflower	Alsace	0.12%	2.2%
	Basse-Normandie	0.14%	
	Bretagne	0.02%	
	Franche-Comté	1.48%	
	Haute Normandie	0.02%	
	Lorraine	0.32%	
	Picardie	0.13%	

For these different regions, in accordance with paragraph 6, part C of Annex V to the Directive 2009/28/EC, 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, similar as 2010 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).

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 and in part D of Annex IV to Directive 2009/30/EC.

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 and in part D of Annex IV to Directive 2009/30/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);
- 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 2009/28/EC, 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 and paragraph 1 of part C of Annex IV to Directive 2009/30/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:

[1] French Agency for the Environment and Energy Management

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

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 gCO2eq/MJ of biofuels.

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 fertilizers 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)	**Sunflower**
Average values	1.45

However, French authorities remind that the assumptions of calculation performed by JRC underlying that direct emissions of N_2O are mainly the result of soil type and climate, and would be bound to nitrogen as secondary and not proportional; life cycle assessment for first biofuels generation in France led to higher values for N_2O emissions, as mentioned in the appendix to the report. In view of this observation, French authorities are asking to European Commission to continue improving the methodology developed by JRC, in order to increase robustness and accuracy. They wish, in this regard, that Commission may make them part of the progress of this work and its intent.

c) Industrial processing: yields and allocation

The industrial stage is characterized by a transformation yield, which reflects the conversion of kilograms of grains in kilograms of biofuel and byproducts, which can be assigned a part of the environmental impacts, especially emissions of greenhouse gases.

Processing yields

The processing yields have been provided by French industry, as part of the analysis of the life cycle of 1st 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	
Sunflower	0.40-0.43	kg biodiesel/kg grains

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:

- 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
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 in 2009 and 2010 during the previous study by the statistical services of the Ministry of Agricultural and supplemented by the technical institutes concerned[3] . These data were kept in order to ensure consistency between the calculation data reported in 2010 and the additional data in this report. Only the quantity of fertilizer has been updated.

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

[3] Oilseeds (sunflower, rapeseed): CETIOM (centre technique interprofessionnel des protéagineux métropolitains)

Fertilisers P_2O_5 et K_2O	COMIFER[4]
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:

	Biodiesel **Sunflower**
Yield (kg per hectare)	2 397
Mineral nitrogen (kg per ha)	38
Fertiliser P_2O_5 (kg P per ha)	29
Fertiliser K_2O (kg K per ha)	25
Plant health products (in kg of active material per ha)	2.2
Seeds (kg per ha)*	5
Diesel (L per ha) (MJ/ha)	66.8 2 395

* : 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 or MJ).

Parameters	**Values** **Sunflower**	**Sources**
Average P content (kg of P_2O_5/kg of grain with reference moisture content)	0.012	COMIFER
Average K content (kg of K_2O_5/kg of grain with reference moisture content)	0.0105	COMIFER
Greenhouse gas emissions linked to the production of seeds (kg CO2eq/kg)	2.03	LCA study on First generation biofuels, 2010, ADEME, based on ECOINVENT data

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

Parameters	Values	Sources
Greenhouse gas emissions linked to the production of manure and fertilisers (kg CO_2eq) :		LCA study on First generation biofuels, 2010, ADEME, based on ECOINVENT data
-mineral nitrogen (/kg N)	5.3	
-P_2O_5 (/kgP_2O_5)	0.56	
-K_2O (/kg K_2O)	0.44	
-plant health products (/kg)	7.71	
Greenhouse gas emissions linked to the combustion of diesel (kg CO_2eq /kg)	3.66	
N_2O emissions (kg CO 2eq /kg)	298	GIEC

IV. Lists of regions (NUTS 2 areas)

This section presents results obtained for the production of biodiesel from sunflower in the Limousin region. As indicated in the table below, GHG emissions from this pathway are below the default value contained in the 'Disaggregated default values for cultivation' section of part C of Annex V to Directive 2009/28/EC.

1) Biodiesel production pathways

a) Sunflower

French regions studied, where emissions calculated are lower than the default values	Emissions in g CO_2 eq /MJ
Default emission values laid down in Annex V to Directive 2009/28/EC	18
Limousin	16