

EN

EN

EN



EUROPEAN COMMISSION

Brussels, 10.8.2010
COM(2010) 427 final

**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND
THE COUNCIL**

**on the feasibility of drawing up lists of areas in third countries with low greenhouse gas
emissions from cultivation**

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

on the feasibility of drawing up lists of areas in third countries with low greenhouse gas emissions from cultivation

(text with EEA relevance)

1. INTRODUCTION

The Renewable Energy Directive¹ (the Directive) sets out sustainability criteria for biofuels and bioliquids. For biofuels, corresponding criteria are set out in the Fuel Quality Directive². They apply to biofuels and bioliquids produced in the EU and to imported biofuels and bioliquids.

A part of these sustainability criteria is a mechanism to ensure that the biofuels and bioliquids used to meet EU targets have greenhouse gas savings of at least 35% compared to the fuels they replace³ when substituting fossil fuels with biofuels. In order to facilitate compliance with this criterion, the Directive contains in part A of Annex V default values for greenhouse gas savings for different fuel production pathways.

As a general rule, producers may always cite a default value for the biofuel and the bioliquid they supply, as an alternative to calculating an actual value. However, for raw materials cultivated in the Union, default values may only be used if the raw materials are cultivated in areas included in lists submitted by Member States, where emissions from cultivation can be expected to be lower than or equal to those reported under part D of Annex V of the Directive⁴.

The Directive requires the Commission to report, by 31 March 2010, on whether a similar approach could be applied for raw materials cultivated in third countries. This is the report complying with that obligation⁵.

This Report uses the article numbers of the Renewable Energy Directive to refer to specific provisions. Table 1 below indicates where corresponding provisions for biofuels are found in the Fuel Quality Directive. References in this Report to "the Directive" refer to the Renewable Energy Directive. Where the Fuel Quality Directive contains a corresponding provision, they apply equally to that Directive.

¹ Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, OJ L 140/16 of 5.6.2009

² Directive 98/70/EC as amended by Directive 2009/30/EC

³ Rising to 50% in 2017 and 60% in 2018 when produced in new installations.

⁴ Article 19(2) of the Renewable Energy Directive

⁵ Article 19(4) of the Renewable Energy Directive

Table 1: Articles and annexes referred to in this Report

Renewable Energy Directive	Fuel Quality Directive
Article 19: Calculation of the greenhouse gas impact of biofuels and bioliquids	Article 7d: Calculation of life cycle greenhouse gas emissions of biofuels
Annex V: Rules for calculating the greenhouse gas impact of biofuels, bioliquids and their fossil fuel comparators	Annex IV: Rules for calculating life cycle greenhouse emissions from biofuels

2. DEFAULT VALUES FOR GREENHOUSE GAS EMISSIONS

The default values in the Directive divide the greenhouse gas emissions from biofuel and bioliquids production pathways into three parts: "cultivation", "processing" and "transport and distribution". The default values in the Directive are based on the JEC Well-to-Wheel study⁶. The "cultivation" element typically contributes 30 – 70 % of overall emissions, depending on the pathway; "processing" is responsible for 25 – 60 %, and the remaining emissions (often relatively minor, normally in the range of: 2 – 20 %) come from "transport and distribution".

The main constituents of the cultivation element, according to the JEC Well-to-Wheel study, are fertiliser production, machinery emissions and N₂O emissions from soil⁷. The last of these accounts for 40 – 70 % of the cultivation emissions (in some cases even more), depending on the pathway. Some examples can be seen in table 2 below, where total cultivation emissions and N₂O emissions from soil are compared, together with overall total pathway emissions⁸.

Table 2: Greenhouse gas emissions from cultivation compared to total pathway emissions

	Cultivation emissions [gCO _{2eq} /MJ]	Total pathway emissions [gCO _{2eq} /MJ]	Cultivation as percentage of total pathway emissions	N ₂ O emissions [gCO _{2eq} /MJ]	N ₂ O emissions as percentage of cultivation emissions
Sugar beet ethanol	12	33	35%	6,2	54%
Sugar cane ethanol	14	24	60%	6,9	47%
Rape seed biodiesel	29	46	63%	18,0	62%
Sunflower biodiesel	18	35	50%	9,4	53%

Fertiliser production and machinery emissions from cultivation are not expected to be difficult to estimate for different regions. By contrast, N₂O emissions show substantial spatial variation and are difficult to estimate. Different approaches to doing this exist and the uncertainty is

⁶ The data are obtained from Institute for Environment and Sustainability of the Commissions Joint Research Centre (JRC), as part of the JRC-, EUCAR- and Concawe-consortium (JEC), which is responsible for the JEC Well-to-Wheel study: <http://ies.jrc.ec.europa.eu/our-activities/support-to-eu-policies/well-to-wheels-analysis/WTW.html>

⁷ IPCC default methodology assumes that continuous cultivation on mineral soils without changing cultivation practices does not change the soil carbon content. According to the same methodology, continuous cultivation on organic soils leads to significant soil carbon losses. However, a very limited amount of crops are grown on organic soils in the EU. Consequently, the JEC Well-to-Wheel study, which describes typical circumstances, does not include soil carbon changes from cultivation.

⁸ The exact values for all parts of the pathways; "cultivation", "processing" and "transport and distribution" can be found in part D of Annex V of the Directive.

considerable. In view of the above, this report focuses on the feasibility of reliably estimating regional N₂O emissions in third countries.

3. STATUS OF RESEARCH IN THE FIELD OF N₂O EMISSIONS FROM CULTIVATION OF CROPS

There are two different ways of modelling N₂O emissions:

- **process-based eco-system models** replicating the processes and factors causing emissions in the soil;
- **statistical techniques** identifying correlations between controlling factors and emissions recorded through field measurements⁹.

Both approaches can be used to develop emissions factors such as those presented by the IPCC for accounting of greenhouse gas emissions under the UNFCCC. The IPCC proposes three different approaches of increasing complexity according to available data and models. The simplest one is called Tier 1, where emission factors are multiplied by values for e.g. fertilizer application. However, the Tier 1 approach is a broad simplification. An indication of the uncertainty is the -70%, +300% uncertainty range given for the direct emissions default factors provided by IPCC¹⁰ for the Tier 1 approach. Even this range does not capture some field measurements made.¹¹

An example of a **process based model** is the DNDC-model. This was used to calculate the N₂O emissions for the European crops presented in the JEC Well-to-Wheel report¹². A process-based model such as the DNDC model may deliver accurate results, as a range of environmental factors can be considered, including their interactions. Nevertheless, the result hinges on the quality of the input data including the validation over the domain in which it is applied. On a global level with regional resolution, the current available data would not be of sufficient quality.

An alternative to a process based model is a **statistical model**, such as the one developed by Stehfest and Bouwman (the S&B model). The model represents the frontier of current statistical understanding of N₂O emissions. However, the model is uncertain as pointed out by Smeets et al.¹³ and some shortcomings exist, in particular;

- a) the model is based on around 1000 field measurements, but none of those are from boreal areas,
- b) organic soils are excluded since those measurements strongly influenced the predicted emission from mineral soils,

⁹ Stehfest and Bouwman 2006 N₂O and NO emissions from agricultural fields and soils under natural vegetation: summarizing available measurement data and modelling of global annual emissions pp. 207 - 228

¹⁰ 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 11, table 11.1

¹¹ JEC WTW report, Well-to-Tank report version 2c, March 2007 page 31

¹² The calculations are based on a recent version of the DNDC model – a soil chemistry model (page 31 of the WTT report (version 2c – 2007 available here: <http://ies.jrc.ec.europa.eu/our-activities/support-to-eu-policies/well-to-wheels-analysis/WTW.html>)

¹³ Smeets, Bouwman, Stehfest, van Vuuren, Posthuma The contribution of N₂O to the greenhouse gas balance of first-generation biofuels pp. 1 - 23

c) crop type is recognised as an important parameter for N₂O emissions, however, the sample of field measurements used as a basis of the model is not extensive enough to cover all crops. There is thus a need to improve the statistical model by reducing its uncertainties by increasing the amount of field measurements under varying conditions¹⁴.

The Joint Research Centre (JRC) of the Commission is working on analysis of N₂O emissions disaggregated down to regional level. The current level of sophistication is a global implementation of the Stehfest and Bouwman model¹⁵ for a range of crops used for biofuels and bioliquids. However; the accuracy of the input data, together with the fact that most biofuels and bioliquids fall under the grouping "other crops", when crop type is of major importance for determining the emissions, strongly suggests that this work does not now provide the basis for binding legislative proposals.

4. APPROPRIATE ACTION TO ADDRESS THE UNCERTAINTY OF N₂O EMISSIONS FROM CULTIVATION IN THIRD COUNTRIES

The understanding of factors influencing N₂O emissions from agricultural soils is evolving rapidly, but is still rather limited. In the light of this a better understanding of the issue is needed before attempts can be made to address the issue in relation to third countries.

The Commission has made the results obtained by the current work of JRC available on its website, together with a description of the methodology and the data used. In doing this, the Commission aims to obtain feedback on the methodology and the data used, in order to improve the modelling, which at a later stage might serve as a basis for a legislative proposal. Of particular relevance is the improved understanding of N₂O emissions from crops typically cropped in third countries, and the inclusion of those in N₂O models. Statistical data on key parameters, such as soil characteristics, fertilizer use and yields are also limited in some regions and need attention.

5. CONCLUSION

Article 19(4) of the Directive requires the Commission to assess the feasibility of extending this requirement to third countries. In light of above, the Commission is of the view that, while desirable, it is not yet feasible to set up legally binding lists of areas for third countries where a major component of the underlying calculation is uncertain and can easily be

¹⁴ Smeets, Bouwman, Stehfest, van Vuuren, Posthuma The contribution of N₂O to the greenhouse gas balance of first-generation biofuels pp. 1 - 23

¹⁵ A description of the model is found here: Stehfest and Bouwman 2006 N₂O and NO emissions from agricultural fields and soils under natural vegetation: summarizing available measurement data and modelling of global annual emissions pp. 207 - 228

questioned, and where third countries have had no possibility to contribute on the methodology and data used.

It is therefore not appropriate, at least at this stage to produce legislative lists for third countries based on the current modelling of N₂O emissions from agriculture. However, it is important to enhance the understanding of the topic and survey the data used in view of a new assessment in 2012. The Commission has thus published the preliminary results of the JRC work together with all necessary data and description of methodology to support such a process on the webpage of the JRC¹⁶. It will use this as the basis for a discussion with third countries in the framework of its dialogue and exchange with them under Article 23(2) of the Renewable Energy Directive.

¹⁶ Updated versions, including detailed description of calculation methods and input data will be provided under: <http://afoludata.jrc.ec.europa.eu/index.php/dataset/files/221>