



EUROPEAN COMMISSION  
DIRECTORATE GENERAL JRC  
JOINT RESEARCH CENTRE  
Institute for Environment and Sustainability



# The Farm Tool Carbon Calculator

<http://solagro.org/carbon-calculator>

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## Contact :

Nicolas METAYER : [nicolas.metayer@solagro.asso.fr](mailto:nicolas.metayer@solagro.asso.fr)

Palle HAASTRUP : [palle.haastrup@jrc.eu.europa.eu](mailto:palle.haastrup@jrc.eu.europa.eu)

**Summary (objectives, methodology, creation date, users and applications):**

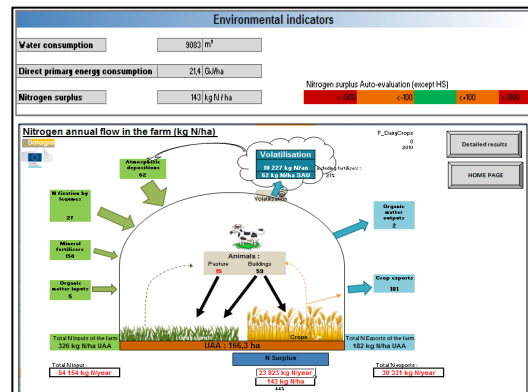
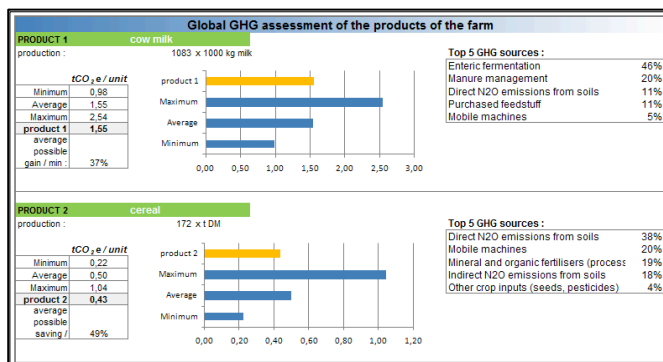
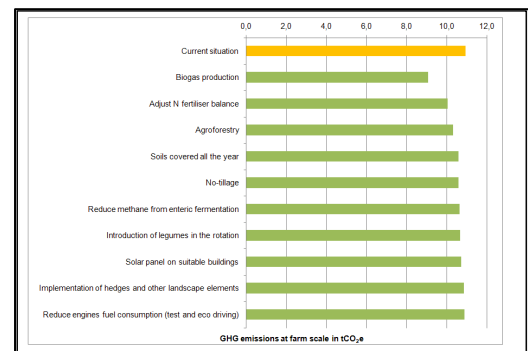
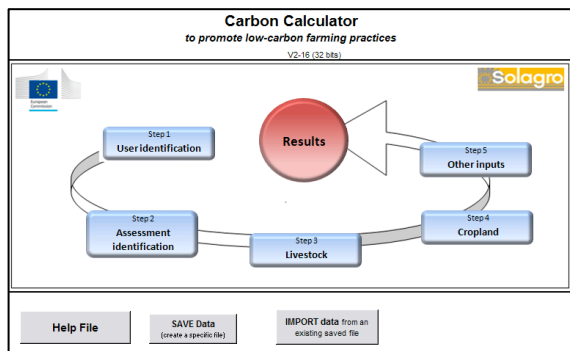
This pilot project was requested by the European Parliament to the European Commission to promote reductions of global warming emissions from farming and it was executed by the Joint Research Centre (JRC) and the Directorate-General for the Environment.

The overall aim of the project was to assess how efforts of European farmers to produce agricultural products with carbon-neutral or low carbon footprint farming practices might be incorporated into policy approaches, so as to promote reduction of greenhouse gas (GHG) emissions from agriculture.

The JRC was supported by two research groups: Solagro (France) that developed a prototype of the Carbon Calculator (CC) in 2013, and the Fragaria consortium that used the prototype to test the feasibility of the CC at farm level and assessed the possible policy options for promoting low carbon farming practices by using the CC. Few users are registered outside the JRC pilot project, especially because no dedicated promotion of the tool has been made.

This user friendly open-source carbon calculator is designed for assessing the life cycle GHG emissions from different types of farming systems across the whole EU. It quantifies direct and indirect GHG emissions according to the international standards and guidelines on Life Cycle Assessment and carbon footprint. In addition to the GHG emission quantification, the tool proposes mitigation options and sequestration actions suitable for single farms. Specific farming practices are recommended on the basis of emission reduction potential, potential leakage effects, inherent costs of implementation, and impact on other environmental issues.

**Preview of LC Farm results:**



<b>GENERAL DESCRIPTION</b>	
<b>Main objectives:</b>	The aim of the Carbon Calculator is to estimate the greenhouse gas (GHG) emissions from farming practices and to propose climate change mitigation actions at farm level. In that way, this tool contributes to assessing the impact of agriculture on GHG emissions and carbon sequestration. Mitigation actions are evaluated according to their GHG profile, feasibility and cost.
<b>Date of creation:</b>	2013
<b>Producer(s):</b>	Solagro, private non-profit organization for the JRC Country: France
<b>Interface:</b>	PC, Excel file (2007 or 2010) Websites: <a href="http://ies-webarchive-ext.jrc.it/mars/mars/Projects/LC-Farming.html">http://ies-webarchive-ext.jrc.it/mars/mars/Projects/LC-Farming.html</a> <a href="http://solagro.org/carbon-calculator">http://solagro.org/carbon-calculator</a> Geographic Information System (GIS): no
<b>Access to the tool:</b>	License: no, free access Price of the license (EUR): -
<b>Languages available:</b>	English
<b>Existing support documents:</b>	Flyer: / Questionnaire (list of data): no User manual: yes Methodological guidelines: yes Others: /
<b>Users:</b>	Number of users registered: 264 (including 234 in Europe) Type of users: unknown Number of Power Users (significant use of the tool): unknown
<b>Training sessions for users:</b>	Possibility to be trained: no Duration: / Number of users trained: /
<b>Assessments &amp; database</b>	Number of assessments registered: 159 linked to the JRC pilot study, mainly from Italy, France, Spain, Finland, UK and Hungary. Unknown outside JRC use. Average number of assessments registered per year: Unknown Assessments registered in a database: no Environmental references produced from the database: internal JRC draft references
<b>Support:</b>	Is it available for users: no Format: / Number of request/year: /
<b>Maintenance, development &amp; costs:</b>	Responsible: JRC Frequency of update: a revised version of LC-Farm is in progress for 2016 Costs: total cost of several thousands €.

<b>Environmental issues addressed and standards used</b>			
<b>Description:</b>	The Carbon Calculator focuses mainly on GHG emissions (farm and product approach) from farming practices and proposes mitigation actions. Methods of calculation and emission factors have been adapted to cover EU-27 specificities (e.g. climate, electricity grid, etc.). The design of the Carbon Calculator is based on methodological choices informed by European and International literature and the expectations of the JRC. Also, a peer-review meeting (Ispra, July 2012) discussed and validated the general methodological choices and suggested some additional specifications.		
	<b>Main indicators</b>	<b>Scope</b>	<b>Standards</b>
<b>Energy:</b>	Direct non-renewable energy consumption Renewable energy produced	Farm	GES'TIM: French national review for energy coefficient for agricultural inputs, LCA principle (farm gate).
<b>Climate change:</b>	Total GHG emissions at farm and product level for the main gases: CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFC and CO <sub>2</sub> from C stock changes. Farm and product GHG emissions reported per detailed sources of emissions. Carbon stock changes (soils and trees). GHG emissions saved from mitigation and sequestration actions. GHG balance (or efficiency).	Farm / Product	IPCC: Intergovernmental Panel on Climate Change FAO ELCD Organisational Environmental Footprint (OEF) and Product Environmental Footprint (PEF)
<b>Air quality:</b>	Ammonia volatilization	Farm / Product	IPCC FAO
<b>Nutrients:</b>	Nitrogen balance and pressure	Farm / Product	Soil balance methodology designed by the CORPEN, committee depending on French Ministry of Agriculture and Environment.
<b>Pesticides:</b>	Number of treatments	Crop	/
<b>Water:</b>	Water volume consumed	Farm	/
<b>Biodiversity:</b>	Linear of hedges	Farm	/
<b>Soil:</b>	% Soil covered in winter % Soil in no-tillage	Farm	
<b>Animal welfare:</b>	/	/	/
<b>Occupational health and safety:</b>	/	/	/
<b>Economy</b>	Inputs costs.	Farm	/

<b>Current use of the Farm tool</b>	
<b>Context:</b>	<p>The use of the Carbon Calculator is currently limited to the JRC study, with test of the first version of the tool in the main agricultural Member States in Europe.</p> <p>However, other users also downloaded the tool, probably people working in LCA approach or managing similar tools for the agricultural sector.</p>
<b>Farming systems suitable:</b>	<p><u>All:</u> arable lands, permanent crops, grasslands, animals.</p> <p><u>Main farming systems:</u> dairy milk, cereals, fodder.</p>
<b>Scope:</b>	<p>The assessment is carried out at farm level for a cultivation period of a year.</p>
<b>Time per step:</b>	<p><u>Data collect:</u> ½ day to 1 day</p> <p><u>Data entry:</u> ½ day</p> <p><u>Results &amp; Comparisons:</u> ½ day</p>
<b>User friendliness:</b>	<p>Easy</p>
<b>Data (type, quality, control):</b>	<p><u>Type of data:</u> Farm accounting, CAP statement, fertilization plan, livestock, irrigation, energetic invoices.</p> <p><u>Default farm data automatically suggested by the tool:</u> no, it is mandatory for the user to specify the real farm data. The only exception concerns climatic data suggestions for spring mean temperature at NUTS2 level.</p> <p><u>Data entry control:</u> several systems have been implemented to get more robust results. For example, an asterisk (*) in the different boxes indicates mandatory data. Similarly, if data is forgotten or not in the right format (numeric, decimal, date, text. etc.), message boxes indicate the user to correct these data or to validate a question.</p> <p>The user is responsible for ensuring the quality of the data entered into all modules of the tool. Any error in data input can affect the accuracy of the assessment produced by the Carbon Calculator.</p> <p><u>Other process helping for data control &amp; quality:</u></p> <ul style="list-style-type: none"> <li>• Reading carefully the user manual</li> </ul>
<b>Results:</b>	<p><u>Type of environmental results:</u></p> <ul style="list-style-type: none"> <li>- <u>Indicators:</u> yes, including attenuation potential of mitigation and sequestration actions automatically calculated.</li> <li>- <u>Score (or points system):</u> no</li> <li>- <u>Action plan:</u> no</li> <li>- <u>Comparison interface:</u> yes, possibility to compare the farm/product.</li> <li>- <u>Simulation or modelization interface:</u> yes, the user has the possibility to modify data entry of the assessment to observe changing in the farm environmental performances.</li> </ul>
<b>Aim of the Farm tool:</b>	<p><u>Raising awareness:</u> yes</p> <p><u>Certification process:</u> no</p> <p><u>Other:</u> /</p>
<b>Tool deliverables:</b>	<p><u>Type of document:</u> 5 pages gathering the results (graphics, tables).</p> <p><u>Format:</u> pdf</p>
<b>Tool results currently used for CAP:</b>	<p><u>Greening:</u> no</p> <p><u>AECM (agri-environment-climate measure):</u> no</p> <p><u>Other (farm investments, etc.):</u> no</p>
<b>Other existing uses for administrative purposes:</b>	<p>/</p>
<b>Uses of the tool by research:</b>	<p>Unknown</p>
<b>Perspectives:</b>	<p>This tool could be used in certification schemes or in the CAP (monitor climate change).</p>

<b>Ability of the Farm tool / CAP Greening measures and perspectives</b>	
<b>Crop diversification:</b>	<p><u>Current situation:</u> arable land, permanent crops and grasslands are registered for a cultivation period but the Carbon Calculator produces no kind of crop diversification indicator.</p> <p><u>Perspective to catch greening:</u> Given the way that surfaces of each crop is registered, it is easily possible to calculate the crop diversity indicators on arable lands as stated in the Greening of the CAP.</p>
<b>Permanent grasslands:</b>	<p><u>Current situation:</u> permanent grasslands are identified during the assessment, but just for the cultivation period of a year, and without any consideration of potential remarkable characteristics (dry, wet, extensive, Natura 2000).</p> <p><u>Perspective to catch greening:</u> the farm ratio reference for permanent grasslands of the farm should be specified to check that the 5% threshold is respected. Also, surface of environmentally sensitive permanent grasslands (in Natura 2000 areas and outside such areas) should be clearly identified. For this specific category, the assessment should clearly check that these surfaces are not ploughed or converted.</p>
<b>Ecological Focus Area (EFA):</b>	<p><u>Current situation:</u></p> <p>Data available in the Carbon Calculator assessment allow to calculate the % of EFA indicator at farm level, but using partially assumptions detailed below, which reduces its final reliability:</p> <ul style="list-style-type: none"> <li>- The following EFA categories (fallow land, nitrogen-fixing crops, catch crops) are calculated through surfaces and their contribution to the % EFA can be considered as robust.</li> <li>- The following categories (isolated trees, hedges and agroforestry) can also be converted, as EFA but their precise location on the farm is unknown (especially if these EFA are adjacent to arable lands).</li> <li>- Furthermore, some EFA categories are missing (SRC, afforested areas, buffer strips) and may also contribute to the % of EFA at farm level.</li> </ul> <p><u>Perspective to catch greening:</u> It is needed to update data entry for the EFA categories in the tool, specify which are on or adjacent to the farm arable lands, and convert them into surface equivalence on the Greening coefficients. With the modifications cited before, it will be possible to calculate if the threshold of 5% EFA for arable lands is reached.</p>