

The Cool Farm Tool, a User's Guide

For Use with the CFT Version 1.1

Sustainable Food Lab

University of Aberdeen

Unilever plc.

April 2011

For more information, see growingforthefuture.com and sustainablefood.org

The Cool Farm Tool, a Users' Guide

Table of Contents

Table of Contents	2
Introduction.....	3
General Tips.....	4
Data Entry and Editing.....	4
Legend.....	4
Part 1:	5
General Information.....	5
Who is this section for? Everyone	5
Tips and explanations.....	5
Part 2:	6
Crop Management.....	6
Who is this section for? Crop Producers.....	6
Tips and explanations.....	6
Part 3:	10
Sequestration.....	10
Who is this section for? Crop Producers.....	10
Tips and explanations.....	10
Part 4:	11
Livestock.....	11
Who is this section for? Livestock Producers.....	11
Tips and explanations.....	12
Part 5:	14
Field Energy Use.....	14
Who is this section for? Everyone who uses farm machinery.....	14
Tips and explanations.....	14
Part 6:	15
Primary Processing	15
Who is this section for? On farm / local processors	15
Tips and explanations.....	15
	2

Part 7:	16
Transport	16
Who is this section for? Everyone	16
Tips and explanations.....	16
Part 8:	17
Results and Graphs.....	17
Tips and explanations.....	17
Boundary and Scope	17
Glossary	17

Introduction

The Cool Farm Tool is a farm-level greenhouse gas calculator for estimating net GHG emissions from agriculture. While harmonized with other calculators, this tool is distinguished by:

- Its **farmer focus**, being as management sensitive as possible while requiring only input data a farm manager would typically have
- In IPCC terminology, its use of **Tier II** approaches – empirical models built from hundreds of peer-reviewed studies.

This calculator takes the estimates of technical potential to the farm and uncovers what is practical and pragmatic from a farmer and field perspective. The Cool Farm Tool sits between calculators using simple emission factor approaches (IPCC Tier 1); and those Process Based Models which require a greater level of engagement on the part of the user and training to interpret (IPCC Tier 3).

The calculator has seven input sections, each on a separate Excel worksheet, relating to:

- **General Information** (location, year, product, production area, climate)
- **Crop Management** (agricultural operations, crop protection, fertilizer use, residue management)
- **Sequestration** (land use and management, above ground biomass)
- **Livestock** (feed choices, enteric fermentation, N excretion, manure management)
- **Field Energy Use** (irrigation, farm machinery, etc)
- **Primary Processing** (factory, storage, etc)
- **Transport** (road, rail, air, ship)

This Users' Guide goes through each of these sections and the results section to offer details and tips for accurately using the Cool Farm Tool to calculate your farm's greenhouse gas emissions. For a more technical explanation of the assumption data and the equations used in the model, please see the Cool Farm Tool technical guide.

General Tips

If your farm produces more than one type of crop, or produces both crops and livestock, or if you manage land in multiple discontinuous locations it will be helpful to go through the Cool Farm Tool for just one product and/or location at a time. You can do this by saving a blank copy of the Cool Farm Tool to your computer and then creating as many copies as you need for each crop, livestock type, and/or location. Be sure to save each copy with a descriptive name, such as "Corn_2010_Webster City". You will end up with several different emissions results. To find the Grand Total for your farm or business, you should add the final CO2 equivalent numbers from each of the product specific files.

Note that your *total* farm energy use may be attributable to several crops. You should only add the energy use that corresponds to each crop or product.

Data Entry and Editing

You may complete whichever sections you have data for, bearing in mind that some of the analyses are only available when the relevant input sections are completed.

Some worksheets are locked by default to prevent users from accidentally overwriting calculations. The password to unlock them is "StayCool".

Legend

Average Annual Temperature	xyz	A light orange cell color indicates a place for you to input a value.
Average Annual Temperature*	xyz	An asterisk (*) and/or a dark orange input cell indicates a mandatory input value.
Average annual temperature	xyz	Areas enclosed by a dashed green box indicate that more information is available for this entry value. Click on these boxes or hover your mouse over them to access additional information.

Help notes are embedded in the tool and will appear as you roll your cursor over the subject. For example:

Crop residue management (if this section is not completed then the worst case - "Removed; left untreated..." is assumed)

Amount of residue

Method

This is the plant matter which is not used as a product - e.g. straw, stalks, leaf litter, etc. If unknown, a default is estimated based on crop type and yield.
For tree crops we currently have no estimate. Please provide your own data in this case.

Part 1:

General Information

Who is this section for? Everyone

Everyone using the tool must fill in this section. It establishes certain factors that will affect emissions on your farm whether you produce crops, livestock, or both. Chief among these is your location – the Cool Farm Tool will calculate the emissions from electricity in your area based on your country or (if you are in the United States) your state. Your per-unit volume GHG figure is based on the production figure you enter here. This is true of livestock production (milk, eggs) as well as agricultural crops. Because data you enter in this section affects the results in other sections, it's important that you **complete this section first**. Fill it in as completely as possible; this will make sure that the Cool Farm Tool calculates the rest of your data accurately.

Tips and explanations

- Filling out the location and the year does not affect other data – it is for your own record keeping. This will be especially useful if you manage land in multiple areas or if you wish to analyze data from multiple years.
- The Country and State section is a drop down menu, be sure to select your state if you farm in the United States. Different countries and different states have different average emissions levels for their utility supplied electricity. Filling in this information will help the tool know how much emissions are associated with your farm's electricity usage.
- First pick a crop or product that you will focus on in this iteration of the tool. (Cell E11)
- How much land is devoted to growing your selected crop or producing your agricultural product? (Note that this should be the total land used for the crop selected for cell E11 **for this particular location** (if you farm in more than one location). You may also enter all your data on a per-acre or per-hectare basis and multiply by the size of the location.
- How much fresh product is produced on this land (If you know your fresh yield or average fresh yield, multiply this by the total area that you use to produce your chosen product.)
- How much finished product is produced on this land (If your fresh product and your finished product are exactly the same, then just enter in the same figure as in E11. If your finished product is different than your fresh product, then fresh product will be used to calculate the crop residues, and finished product will be used in the reporting section. As mentioned above, please remember to fill these sections out if you want the tool to calculate your GHGs per unit of animal product such as fluid milk, beef etc.
- For the Climate section, there are only two options – Tropical and Temperate. These are tied to just two default options for annual average temperature – Temperate Climates are assumed to have an average annual temperature of 50°F or 10°C. Tropical Climates are assumed to have an average of 64.4°F or 18°C. If you know your own climate's average temperature, and it is different from either of these two averages – enter the correct average temperature in cell

E24. Be sure you have selected the right unit in cell F24! You should still choose temperate or tropical in cell E23 in this case, choose whichever is closest to your climate. This decision affects emissions from fertilizer and soil carbon management (e.g. organic amendments, tillage, cover cropping, etc)

Part 2:

Crop Management

Who is this section for? Crop Producers

If you produce crops for sale or for feeding to livestock, the information you provide on how you manage your crop production will compute the emissions that come from your fertilizer, pesticide, and machinery use as well as the emissions from your soil conditions and crop residue. If you only produce livestock and no crops at all you do not need to fill out this section. The rest of the tips for Part 2 only apply to crop producers.

Tips and explanations

Here is a list of the data you will need ahead of time in order to complete the crop management section of the Cool Farm Tool.

1. For “Crop Type” in cell E14 – if you do not see your exact crop listed in the drop down menu, choose the category at the end of the list that includes your crop. This choice effects n₂o emission and estimates of crop residues.
2. *If you produce rice*, you will be asked the following:
 - Days under cultivation
 - Water management before cultivation. Choices:
 - Not flooded pre-season (for less than 180 days)
 - Not flooded pre-season (for more than 180 days)
 - Flooded pre-season
 - Water management during cultivation. Choices:
 - Upland
 - Continuously flooded
 - Intermittently flooded
 - Intermittently flooded - multiple aeration
 - Rainfed
 - Drought prone
 - Deep water
3. What is your soil texture? Fine, Medium, or Coarse? This information is usually available through routine soil tests. The help provides translation from typical U.S soil categories (clay, loam, sandy-loam, silt etc) to Fine, Medium or Coarse.

4. What is your soil organic matter content? If you have soil tests that tell you the exact level, you can enter it in cell E24, otherwise choose the range from the following options listed in the drop down list.
5. Is your soil moist or dry? (Irrigated soils should be classed as moist.) Moist soils have slightly higher N₂O emissions than dry ones.
6. Is your soil drainage good or poor? Soils with poor drainage have significantly higher N₂O emissions than those with good drainage
7. What is your soil pH? This information affects de-nitrification, and will have an impact on N₂O emissions. Choose from these options:
 - pH ≤ 5.5
 - 5.5 < pH ≤ 7.3
 - 7.4 < pH ≤ 8.3
 - pH > 8.3
8. Which fertilizers do you use? Note that if you know the specific application rate of the nutrient itself (like N, K, or Ca etc.) you can select the product you apply in column E and then select the specific “*nutrient*” in column F. If you only know the rate of application of the *product* you use (i.e. the volume of solution you purchase for use), be sure to select “*product*” from the drop down menu in column F.

The fertilizers to choose from are the following:

Ammonium Bicarbonate - 30% N	Urea ammonium nitrate solution - 32% N
Ammonium nitrate - 35% N	Compost (zero emissions) - 1% N
Ammonium sulphate - 21% N	Compost (fully aerated production) - 1% N
Anhydrous ammonia - 82% N	Compost (other non-zero emissions) - 1% N
Calcium ammonium nitrate - 27% N	Cattle Farmyard manure - 0.6% N
Calcium nitrate - 15% N	Pig Farmyard manure - 0.7% N
Compound NK - 19.5% N; 29.5% K	Sheep Farmyard manure - 0.7% N
Compound NPK 15%N 15% K ₂ O 15% P ₂ O ₅	Horse Farmyard Manure - 0.7% N
Diammonium phosphate - 14% N; 44% P ₂ O ₅	Poultry layer manure - 1.9% N
Kainit / Magnesium Sulphate - 11% K ₂ O; 5% MgO	Broiler/Turkey litter - 3% N
Lime - 52% CaO	Cattle Slurry - 0.26% N
Limestone - 55% CaCO ₃ / 29%CaO	Pig slurry - 0.36% N
Lime, algal - 30% CaO	Separated Pig slurry - liquid part - 0.36% N
Monoammonium phosphate - 11% N; 52% P ₂ O ₅	Separated Pig slurry - solid part - 0.5% N
Muriate of potash / Potassium Chloride - 60% K ₂ O	User defined Compost (fully aerated production) based fertilizer
Phosphate/Rock Phosphate - 25% P ₂ O ₅	User defined Ammonium sulphate based fertilizer
Potassium sulphate - 50% K ₂ O; 45% SO ₃	User defined Anhydrous ammonia based fertilizer
Super phosphate - 21% P ₂ O ₅	
Triple super phosphate - 48% P ₂ O ₅	
Urea - 46.4% N	

Compost

You will see that there are three options for compost used as a fertilizer. If you buy compost from off-site, you should use one of the two non-zero emissions compost options - either fully aerated if you know that the compost you purchased was fully aerated or the "non fully aerated production". If you produce your own compost on site, you will fill information about compost production within the crop residue management section of the crop management tab. If you fill in this information accurately, your emissions will be accounted for there - so you should choose "zero-emissions compost" in the fertilizer section.

Producing compost causes GHG emissions. Often this process improves on what might have happened otherwise to that raw material. If you know that the raw material for the compost would have caused more emissions, you may decide to choose "compost – zero emissions." This choice depends on what you're interested in modeling.

Not on the list

If you don't see the kind of fertilizer that you use listed in the drop down menu, either choose the closest match or you can enter your own fertilizer by following steps a-e below.

- a) Go to the tab labeled "A5. User-defined fertilizers".
 - b) If you have an internal name for the fertilizer, enter that in column A (optional).
 - c) In column B select the starter materials that your fertilizer is based on. Choose from the drop down list.
 - d) There are some assumptions built in about the amount of nutrients in the various fertilizers, and for dry matter content and carbon for organic fertilizers. You may wish to specify how much of each nutrient is in your particular solution. If so, enter your actual values for N, P2O5, and K2O in the orange boxes in columns C through E, rows 10-13.
 - e) Note that if the fertilizer you entered is a standard one for you, you will need to add details about the nutrient content of this fertilizer in every iteration of the Cool Farm Tool you do OR you can open a new copy of the Cool Farm Tool, add in your own fertilizer information (before adding any other data) and then save a copy to use as your own default.
9. What is the application method for your fertilizer? Choose from the following options:
- Apply in solution
 - Broadcast
 - Broadcast or incorporate then flood
 - Broadcast to floodwater at panicle initiation
 - Incorporate

"Fertigation" is classified as "incorporation" in this list.

10. Do you use an emissions inhibitor with your fertilizer? If so, do you use a nitrification inhibitor or is your fertilizer polymer coated?

IMPORTANT! Note that in order to take account of the soil carbon effects of using organic (carbon based) fertilizers such as compost or composted manure you must complete the corresponding section of section [1a. Sequestration](#); the [Management Change](#) section.

The Tool will not calculate the soil carbon effects until you say how long ago you started applying compost or manure.

11. How many pesticide applications do you do per year?

- Each dose of each pesticide counts as a separate application.
 - For split applications, two applications at half the rate count as one.
- If you do tank mixes, count each pesticide in the mix as a separate application.
- Entering this information will account for the energy required to produce pesticides. The values in the literature typically only account for the active ingredient, not the entire formulation. If you have better data, you can change the default in the "Default Factors" tab in cell F8 (the default factor reflects the average of a range of pesticides).
- The Cool Farm Tool uses a very simple model of emissions from pesticide use is employed. Because of the number of agro-chemicals available to farmers it is beyond the scope of this model to incorporate a detailed emissions sub-model for this aspect. Future versions of the CFT may allow the option of inputting specific crop protection products for those products that have robust data on their specific emissions factors.

12. How much crop residue remains post-harvest and how do you manage it?

- Residue is defined as the plant matter from crop production that is not used as a sellable product - e.g. straw, stalks, leaf litter, etc. If the quantity is unknown, a default is estimated based on crop type and fresh yield vs. finished yield. It is important to note that this is the “dry matter” content of the residues. Dry matter content can be around 90% for cereals and beans and about 10-20% for vegetables.
- Note that for tree crops we currently have no estimate. If you grow tree crops, please enter your own data for the amount of residue per year. You can chose tonnes (metric tons)/acre, tonnes/hectare, kg/hectare, kg/acre, or tons (US tons – 2000 pounds)/acre.
- Choose from the following management options:
 - Removed; left untreated in heaps or pits
 - Removed; non-Forced Aeration Compost
 - Removed; Forced Aeration Compost
 - Left on field; Incorporated or mulch
 - Burned

- Exported off farm
- **IMPORTANT** If you choose “Left on field; Incorporated or mulch” you may be able to choose “residue incorporation” in the sequestration tab. See next section.

Part 3:

Sequestration

Who is this section for? Crop Producers

This section is only relevant to those farmers who produce at least some vegetative matter – whether it’s trees, bushes, crops for sale or grains for feeding onsite animals. If you are purely a livestock producer and you purchase all your feed, you do not need to fill out anything on this tab. This section tracks how land use and management affect your overall GHG emissions. This section will also allow you to test what the impact of potential changes in land and crop residue handling management could make in terms of greenhouse gas emissions.

Tips and explanations

Most of this section focuses on changes made within the last 20 years.

1. Land Use Changes section - enter any recent changes you’ve made in how you manage your land. For example, where long-term grassland/pasture has been converted to arable production, or forest has been cleared. Enter "No" if land use has been constant for 20 years or more. That is to say – if your land was previously a forest, but it was converted to arable land more than 20 years ago, you do not need to enter any change.
2. Management Changes section – This section refers to long term changes in how you manage your land. It is not designed to account for annual fluctuations, e.g. conversion from conventional (always) to no-till (always) would be represented by "Conventional to No-till". If you do go back and forth between conventional and reduced or no-till cultivation, use your best judgment about which practices to indicate and over what time frame.
 - a. Select the choice in tillage change that most closely matches your situation. (i.e. choose the description that best matches what your tillage practices were BEFORE you made a change, and what tillage practices you changed to. Then enter the numbers of years ago that you made this change and on what % of your productive land. Tillage changes are a switch from one of the following practices to a different practice.
 - No-till: Direct seeding without primary tillage, minimal soil disturbance in seeding zone. Weed control via herbicides.
 - Reduced-till: Primary and/or secondary tillage with reduced soil disturbance (shallow and without full inversion). Normally leaving >30% surface coverage at planting.
 - Conventional till: Substantial soil disturbance, such as plowing, and/or frequent tillage operations. Little surface coverage with residues at planting time.

Tips and explanations

5. Related to the advice in [General Tips](#) – if you raise more than one type of animal (commercially) it will be much easier to keep track of one type of animal at a time. You should consider saving multiple copies of the Cool Farm Tool – one for each animal type.
6. Life Cycle vs. Snapshot – this section allows you to choose whether you are interested in the emissions from your entire herd or flock at a single point in time (one year), or for the emissions from the entire lifespan of the animals. This can be a useful way to compare the effects that certain changes have on your emissions from livestock. Life Cycle will give you the emissions for your chosen animal type over the course of its entire life. This choice is especially useful if you would like to be able to calculate the emissions per dozen eggs, per gallon or liter of milk, or per pound or kilogram of edible meat.
7. Livestock type
 - a. Choose the livestock category that best describes the animals you raise. Remember that if you raise more than one type of animal, it may be best to run the tool separately for each type.
 - b. If you choose hens – you will have four breed options to choose from. If you do raise one of those breeds (or a very similar breed) the Cool Farm Tool will fill in many details for you. If you raise a different breed, simply don't select any of those breeds and fill in the rest of the information as you would for any other animal.
8. Life phases – Animals go through different life phases, and these have different feed requirements (and produce different amounts of manure).
 - a. Enter the length of the juvenile life phase. This is the length of time between birth and maturity. For example, for laying hens, this is the average time in weeks between when a chick hatches and when she begins to lay eggs. For a milk cow this is the time between birth and first lactation. For a hog or for beef cattle, this is the time from birth to adult size.
 - b. Enter the length of the Adult Productive Phase. For meat animals, this is the entire adult life. For dairy animals, or egg producing birds this is the amount of time during the adult life (minus the dry periods, or molting periods) that the animals produce milk or eggs.
 - c. Enter the length of the Adult non-Productive Phases. This is the total amount of time that a milk producing animal or an egg producing bird is out of production. Note that if there are multiple periods of non-productive time during the adult lifespan of the animal, these periods should be added up and the adult total non-productive time should be entered here.
 - i. Note that if you are raising animals for meat, you need only enter the life cycle phase information if you have markedly different feeding patterns for juvenile animals as compared to adult animals. In that case, enter the phase length that you feed the animals as juveniles and the corresponding feed ration components, and then do the same for the adult phase.

- d. If you are doing a calculation on a snapshot of what emissions your total livestock flock or herd produces, you should enter in only the number of juvenile animals you have at this time, the number of productive adults you have at this time, and the number of non-productive adults you have at this time. The total CO₂-eq result you see in at the bottom of the livestock section “annualized emissions in kg per year” is an annual estimate based on the number of animals you entered and how they are fed. If you want the per-day emissions for your animals, divide the total CO₂-eq result by 365.
 - e. If you want to know the total emissions for the lifecycle of your animals, put in the number of animals you have in total as the number for juvenile, productive adult, and non-productive adult. For example, if you have 1,000 hens total and you raise these hens from chicks through end of life, put in 1,000 as the number for juvenile phase, 1,000 for the Adult Productive Phase, and 1,000 for the Adult non-productive phases.
 - i. In this case, you will want to refer to the CO₂-eq results for “whole lifecycle” – these are found starting on row 103.
 - f. You will notice that each life phase section asks for similar data – feed characteristics and manure management. Often, the feed used for juvenile animals is a different amount per animal and a different composition than the feed used for adult animals. Similarly, dairy cows or laying hens will have different feed requirements while they are lactating or laying than they do when they are pregnant or molting. These different sections allow you to account for these differences in feed requirements and composition over the lifespan of the animals.
9. Feed Characteristics – Note that each animal phase will ask you for feed characteristics. Be sure to fill out **all three** sections if you have animals of different phases. If you are testing a snapshot of your farm, **and** you only have one phase of animal at the time you are evaluating, then you only need to fill out feed and manure information for the corresponding section.
- a. If you feed your animals entirely grain or a feed mix, enter 100 for the percentage of diet from feed mix.
 - b. If your animals feed from a combination of grazing and feed mix, enter the approximate percentage of their diet they obtain from feed mix, and then choose from the drop down list for the type of grazing to which your animals have access. Select from the following options:
 - High quality forage (e.g. vegetative legumes & grasses)
 - Moderate quality forage (e.g. mid season legume & grasses)
 - Low quality forage (e.g. straws, mature grasses)

Choose also whether you animals have access to pasture or open grazing. Animals in “open” grazing are more active and have higher maintenance energy requirements. Pasture animals are confined in areas with sufficient forage requiring modest energy expense to acquire feed. Open Grazing large areas Animals graze in open range land or hilly terrain and expend significant energy to acquire feed.

If you create your own feed mixture (or if you want to test effects changes in the feed mixture will have on total emissions) you can enter in the components you use and their percentages in the final feed ration starting in column K.

10. Manure management

- a. Choose from the drop down list of manure management techniques. If you raise more than one type of livestock, be sure to select the manure management system that fits the animal type for this iteration of the tool.

Part 5:

Field Energy Use

Who is this section for? Everyone who uses farm machinery.

The section is necessary for all farmers who employ the use of farm machinery.

Tips and explanations

The Field Energy section allows you to account for the emissions from your on-farm energy use. This includes both electricity and fuel use. Farms use electricity for heating, lighting, some machinery and many other things. Some farms generate their own electricity, and others purchase grid electricity from a utility. Utilities differ around the world and within United States about what fuel mix they use for electricity generation, and how much renewable energy they use. Farms use liquid fuel (petrol or diesel) for running the machinery required to work the soil and to harvest, among many other purposes. Farmers also use liquid fuel (petrol or diesel) in the vehicles they use to transport necessary inputs such as fertilizer, seeds, pesticides, etc. and finished products to their point of sale, but emissions from transport are accounted for in the [Transport](#) section.

- If you also do processing of your products onsite, you can include those calculations in this tab (and skip primary processing altogether) or separate out that energy usage for calculating in the next section, [Primary Processing](#). The difference is that the results column will not be able to show you how much of your total emissions comes from field energy use as opposed to primary processing.
- The Cool Farm Tool does NOT assume a zero emissions factor for renewable energy. Emissions for electricity from renewable energy are quite a bit lower than for electricity from the grid – but not zero. This is because the CFT takes development energy costs for renewable energy technology into account.

Practically what this means is that if you are producing your own electricity onsite from renewable sources, you should still enter the amount of renewably sourced electricity into the tool and not assume that it doesn't need to be accounted for.

- For liquid fuels, the Cool Farm Tool includes a default assumption that the emissions from bio-diesel and bio-ethanol are half of those from the fossil fuel based counter-part. The actual emissions factors for bio-fuels can vary widely, however. If you use bio-diesel or bio-ethanol, we STRONGLY recommend that you determine your own emissions factor and enter it into the default factors page.
- The section that starts on row 29 is a calculator to use ONLY if you don't know your total annual use of diesel fuel, petrol, electricity, and any of the other fuels listed. However, if you know how much electricity you use, but don't have a firm figure for how much petrol or diesel you use, you can fill in both total annual electricity usage in cell E7 and then use the calculator sections for tillage, spraying/spreading, and harvesting. Note that any details you enter into the tillage, spraying/spreading, and harvesting sections will automatically update the CO2-eq emissions number. You don't have to go back to the section starting in row 14 to enter your totals.
- If you are certain that the amount of fuel used for tillage, spraying/spreading, or harvesting is different than what is assumed by the Cool Farm Tool, you can change those numbers in column F. Just be sure to include a note (click on "review" and then "new comment") explaining why you made that change.
- Note that for tillage, spraying/spreading, and harvesting the "number of operations" refers to conducting the chosen operation (e.g. harvesting, tilling, etc.) over the entire production area you entered in cell E12 of the [General Section](#).

Part 6:

Primary Processing

Who is this section for? On farm / local processors

This section is for producers of products that are partially or completely processed on the farm site. For example, many egg producers clean and package eggs onsite; some grain producers mill and mix grain onsite; and coffee producers might dry or wet process their beans before sale.

Tips and explanations

This section allows you to account for the energy required to do the processing of your products. This might include the electricity or other fuel used to power washers, refrigerators, grinders, driers, and packaging equipment.

- Enter the known energy usage for any processing you do onsite. Be sure to check to units to be sure you've entered the right amounts.

If you use a fuel other than electricity, diesel, high density biomass, fuel wood, coal, gas (natural gas not gasoline), or oil, you can enter the amount in cell F21. You will also need to enter emissions values for this fuel in the Default Factors Section cell F22.

- Note that in the Default Factors section you will see one column for "values" and one column for "defaults". The values are used in your actual equations, and are based on other data you supply.

The defaults are included as a reference so that the user can revert to them as needed. Defaults should NOT be altered.

Part 7:

Transport

Who is this section for? Everyone

This section is for all farmers who transport inputs to the farm, or finished products from the farm to a point of sale. Transport includes having materials delivered or removed, even if you do not use your own vehicles to transport products. This section will be relevant to all commercial farmers.

Tips and explanations

You can include more than one kind of transport in each of the four sections. For example, you may have some products that come to your farm by heavy goods vehicle, some that come in a diesel light goods vehicle, and some that come by rail. You can enter each of these three options separately. If you have multiple goods that come by one means of transportation, you will want to add up all the total miles or transport. If it's easier to keep track of, you can also enter separate listings for different goods even if they come by the same vehicle type. This may be especially useful if you are accounting for both inputs and transport out of your finished goods.

- Quantity is the amount of goods you cause to be transported. Be sure to choose the right unit in column F.
- Distance calls for the distance that the goods travel to get to you from their origin, or the distance that your products travel to get to their point of sale. This is the one way distance, not the round trip distance even if your vehicle does make a round trip.
- For Road transport:
 - In column J you have three choices for the question: add vehicle weight?
 - Yes – returning empty
 - Yes – single journey
 - No

Yes – returning empty is what you would choose if you take product out in a vehicle, drop it off, and return in an empty vehicle. Alternatively, you might also calculate the emissions from importing farm inputs and you might order products that arrive, are dropped off, and return empty.

Yes – single journey is what you should choose if you wish to calculate the emissions for the product being transported plus the emissions from the weight of the vehicle itself. Choosing “No” will calculate just the emissions from the product transported in the type of vehicle you choose.
- In the mode section, choose the vehicle that best fits your transport vehicle type.

Part 8:

Results and Graphs

Tips and explanations

This section shows you in words, graphs, and numbers what the total emissions are for your farm. It will indicate clearly where the emissions come from (as in – how much of the total comes from land management, how much from transportation, etc.). This can give you a good idea of what aspects of your farm you could make changes to in order to reduce your total emissions.

Keep in mind that the section that ends up as the greatest source of emissions might not always be the best place to try to make changes first. Sometimes changes in other areas may be more feasible – technically or financially. Be sure to look at all possible changes that you could make on your farm to evaluate the effect on total emissions.

Also keep in mind that some changes might reduce your emissions just a little, but would also help you save money, or have a better marketing angle. These might be worth pursuing, especially if some other changes have a higher implementation cost. Making a combination of changes that can reduce GHG emissions can end up being less expensive than one massive change. Each farmer's situation will be different.

Boundary and Scope

This Users Guide is designed to help you use the Cool Farm Tool but does not dictate how to draw the boundaries around the system you are evaluating. You have options about how much transport to account for – whether you account for the inbound transport of all inputs, and whether you account for the outbound transport of your finished product. You can also decide to calculate that actual emissions factors for your feed components if you grow them yourself or have access to information from the growers you purchase from.

These are decisions that will be dictated by the reasons you are conducting the GHG estimation exercise. It is important that you are aware that other farmers may use the tool differently and that the system boundaries – such as whether input transport is included or not – must be clear before any farm-to-farm comparisons can be made. As the field of agricultural carbon footprinting matures, protocols will be developed for common guidance.

Glossary

GHG - Greenhouse Gas. These include:

- CO₂ emissions – carbon dioxide, given a weight of 1 in the CO₂-equivalent scheme
- CH₄ emissions – methane, given a weight of 25 in the CO₂-equivalent scheme
- N₂O emissions – nitrous oxide, given a weight of 296 in the CO₂-equivalent scheme

N - Nitrogen, an important nutrient in soils and fertilizers. Plants require nitrogen for proper leaf production. Too much nitrogen in fertilizers, or in composting can lead to ammonia or increased methane production. Proteins are high in nitrogen.

C - Carbon, a key component of all life forms and found in concentrated form in carbohydrates including cellulose. When animals breathe they release carbon in the form of CO₂. When plants and animals decompose, microbes digest the material and also release carbon in the form of CO₂.