

| CFT 1.0 - CALCULATION ISSUES DESCRIPTION | | | | |
|--|----------------|--|---|--|
| WEBAPP | API | CFT METHOD | SUMMARY | DESCRIPTION |
| Yes | Yes | Crop GHG Fuel & Energy Use Any method referencing electricity | Energy - Electricity Factor for Poland treated as World | The electricity usage factor for Poland is not applied correctly due being stored as a duplicate factor entry in the database, the default world factor is applied instead. |
| Yes | Yes | Crop GHG Potato Storage | Crop Energy - Potato Storage Loading and Unloading | The fuel use factor for washing and grading is 0.034 each The fuel use factor for loading and unloading is 0.017 each The CFT applies a factor of 0.34 for all these operations resulting in an overstatement of emissions |
| Yes | Yes | Crop GHG Potato Storage | Crop Energy - Potato Storage Temperature Method | Potato storage emissions go down the lower the temperature is. Should be the opposite due to greater energy consumption for refrigeration. storage temperature is used instead of the difference between the average ambient temperature and the storage temperature. |
| Yes | Yes | Crop GHG Fertiliser Emissions | Crop Fertilizer - Compose-Your-Own Regions | Emission factors for the following fertilizer production regions are not present: S America, Middle East, SE Asia, Oceania These need to be included in the CFT |
| Yes | Yes | Crop GHG Fertiliser Emissions | Crop Fertilizer - Compose-Your-Own Urea Hydrolysis | The CFT does not account for CO2 emissions from urea hydrolysis after application to soil Urea releases 0.733 kg CO2/kg urea or 1.593 kg CO2/kg N |
| Yes | Yes | Crop GHG Crop Residue Management | Crop Residue - Factor Corrections | The clover and clover grass below-ground N fraction should be 0.016 not 0.16. The sorghum below-ground N-fraction should be 0.006 not 0. The perennial grasses ratio below:above ground should be 0.80 not 0.54 |
| Yes | Yes | Crop GHG Irrigation Energy Use | Crop Irrigation GHG Calculation - Pumping Depth and Distance not Impacting | The emission calculation is not varying for different height or distance values. The calculation should take height and distance into account |
| Yes | Yes | Crop GHG Carbon Biomass change from loss or gain of forest | Crop Carbon Forest Change - GHG Impact Not Linear | The land use change GHG impact should scale linearly with changes to land area. Under investigation |
| Yes | Yes | Crop GHG Carbon | Crop Carbon Out of Crop Biomass Change | It has come to light that the impact of trees added or removed is overstated in the calculation by a factor of approx 4 times. This has been corrected in CFT 1.0 |

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| WEBAPP | API | CFT METHOD | SUMMARY | DESCRIPTION |
| Yes | | Crop GHG Fertiliser Emissions | Crop Fertilizer - Compost Switchback Results Change | The GHG results of a crop assessment changes unexpectedly when compost is chosen as a fertilizer and the user saves the tab and returns to the Inputs tab |
| | Yes | Crop GHG Fertiliser Emissions | API Crop Fertilizer - Compose-Your-Own Validation | The validation of N ingredients in an API call with Compose Your Own NPK appears to not be taking place. An error should be returned when the ingredients are not entered correctly. The calculation may be wrong as a result. |
| | Yes | Crop GHG Fertiliser Emissions | P & K for custom NPK in API not creating any change | When composing our own fertilisers through the API we get the exact same calculations if we send with 100% K and 100% k20. Same goes for P & P2o5. So get same emission calcs when changing ID's for: k2o_percentage_type_id p2o5_percentage_type_id |
| * | * | Crop GHG assessment level issue | API Crop - JSON Export Bad Results | Crop webapp assessment JSON export producing inputs which give different results when calculated via the API |
| * | * | Crop GHG Fertiliser Emissions | API Crop Fertiliser - JSON Export Compose-Your-Own Bad P2O5 | Phosphorus, P205 and K, K2O selections in Compose Your Own fertilizer showing % values inconsistent with webapp when exported as JSON |
| | Yes | Dairy & Beef GHG assessment level issue | API Dairy - Feed Results Inconsistent by ID Name Description | Mismatch between id and name in several sections - manure and herd, feed component and herd, and grazing and herd |
| | Yes | Dairy & Beef GHG assessment level issue | API Dairy - Grazing Results Inconsistent by ID Name Description | Mismatch between id and name in several sections - manure and herd, feed component and herd, and grazing and herd |
| | Yes | Dairy & Beef GHG assessment level issue | API Dairy - Manure Results Inconsistent by ID Name Description | Mismatch between id and name in several sections - manure and herd, feed component and herd, and grazing and herd |
| | Yes | Dairy GHG Milk Production | API Dairy - True Protein Content v Crude Protein Content | User input of Crude Protein Content is wrongly interpreted as True Protein Content for users of API v1 (API v0 and UI not impacted) |

CFT 1.0 - CALCULATION ISSUES DESCRIPTION

| WEBAPP | API | CFT METHOD | SUMMARY | DESCRIPTION |
|--------|-----|---------------------------|--|---|
| | Yes | For review | API Dairy - Feed Fertilizer Manure Phase IDs | Mismatch between id and name in several sections - manure and herd, feed component and herd, and grazing and herd |
| * | * | For review | API Dairy Fertilizer - JSON Export Bad P2O5 and K2O Types | Same issue as CFT-5427, encountered in Dairy Pathway |
| Yes | Yes | Dairy & Beef GHG Feed Use | Dairy Beef Feed - Fresh Weight Factors applied on Dry Matter Feed | The feed database provides emission factor per fresh weight The user enters the feed amount in dry weight The CFT applies the fresh weight factor to the dry weight resulting in an understatement of emissions |
| Yes | Yes | Dairy & Beef GHG Feed Use | Dairy Beef Feed - On Farm Grass and Hay Factors | The on farm grass hay emission factor should be 42.8 not 0 The on farm grass silage emission factor should be 24.5 not 246 |
| Yes | Yes | Dairy & Beef GHG Manure | Dairy Beef Manure - Methane Factor | The factors for Liquid Slurry with Natural Crust Cover are overstated The options for Pit Storage below Animal Confinements (< 1 month) and (> 1 month) need to be included |

CFT 1.0 - NEW SCIENCE DEVELOPMENTS

| CFT METHOD | SUMMARY | DESCRIPTION | Source | NEW DATA REQUIRED FOR NEW ASSESSMENTS? | BREAKING CHANGE? (API) |
|---|--|--|---------------------------|--|---|
| All CH4 / N2O Calculations | GWP - 6th Assessment Report | The current CFT calculations for CO2 equivalent for Methane and Nitrous Oxide are based on Assessment Report 4 which was published in 2007. CFT 1.0 will bring the CFT calculations into line with Assessment Report 6 2021. EFs are: AR6 GWP 100 CH4 - 27,9 (changing from AR4 25) AR6 GWP 100 N2O - 273 (changing from AR4 298) Note - GWP AR6 can only be applied where the CFT works out the emission from Methane or Nitrous Oxide values. In some cases, EF factors are supplied to the tool with the GWP embedded. We are working on specifying which EF work with another GWP than AR6 and will communicate once full information is available. | | No | No |
| Dairy & Beef GHG Feed Use | Feed Factor Update - Global Feed LCA Institute (GFLI) | <ul style="list-style-type: none"> + Feed items will be the same as current Feedprint feeds, but will be mapped to the GFLI database for new emission factors. + New optional parameter for feed production region makes EFs more accurate (up to 89 production locations worldwide, country availability depending on feed type). Deprecation approach production region: If no region will be selected, region will be set to "world". + New factors will provide CH4 and N2O breakdowns which will be reported in the results breakdown. + Compound feeds will carry forward with current recipes and updated with GFLI factors for components according to their proportion in each mix. + GFLI does not cover roughages, these will be continued with current Feedprint factors + The system boundary for GFLI factors is till farm gate of the feed producing farm for unprocessed feed items, or till feed factory gate for processed feed items. They do not provide the transport emissions. Users will need to add transport from farm/factory gate to the assessed farm themselves in the "transport" tab/ API transport section. + Soy Land Use Chance carbon impact will be discounted from emissions where Soy Certified checkbox is checked, allowing to show beneficial effect when soy comes from non-deforested areas. | Global Feed LCA Institute | <p>Yes, transport from feed producing farm/factory gate; this is entered in the CFT "transport" tab/API transport section</p> <p>Optional to enter specific production region of feed item for more accurate EFs. See deprecation approach in description.</p> | No (most likely). New API request format for CFT 1.0 will include new object (feed production region), but current API request format will continue to work after update. See description for deprecation approach, and deprecation note. New JSON request formats will be shared in due time. |
| Crop GHG Fuel & Energy Use Field Operations | Factor Update - Machinery | <ul style="list-style-type: none"> + New method to calculate machinery-related emissions based on horse power and time, next to existing method. + Enhanced emission factors for 41 existing machines (of which 8 are additional variations of existing machine types, e.g. baler machine will have silage baler or round or square bale options). + New EFs for 38 new machines. + Deprecation: 14 deprecated machines. They will continue to be available for pre-existing assessments. Please see deprecation notice for important details. + Expected increase of CO2 emissions for many machines. | | <p>Maybe, see list below of new option of existing machines, and new machine types.</p> <p>NOTE: + 14 deprecated machines (see list below).</p> | No 14 deprecated machines will continue to be available for pre-existing assessments. See deprecation note. |
| Crop GHG Irrigation Energy Use | WFLDB - Irrigation Factors | <ul style="list-style-type: none"> + New method to calculate irrigation-related emissions based on used water volume (m3 x EF) and location; will be available as second option in addition to the existing method considering "pumping depth, distance and volume". + The new method uses local emission factors from World Food Lifecycle Database from different world regions, or defaults if no specific EFs available. | | <p>No. Optional to choose new irrigation method which needs water volumes in m3.</p> <p>NOTES: + New method doesn't need data for depth & distance.</p> | No existing pumping volume and depth method will continue to be available |

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|--|--|---|---|---|
| Crop GHG Pesticide Emissions | WFLDB - Pesticide Factors + Enhanced Method | <ul style="list-style-type: none"> + Emission factors come from the World Food Lifecycle Database and more granular. + New method allows for the user to select between the type of treatments: Pesticide, Herbicide, Insecticide or Fungicide (they have different EFs). + The input categories seed treatment and post emergence are enhanced to calculate based on application rate as kg /ha and the percentage of active ingredient (i.e. same parameters as soil treatment). + Deprecation approach for "application doses": Existing assessments or API calls for seed treatment or post emergence will calculate under the new method with the following assumption that one application dose is equal to "type of treatment: Pesticide"; "application rate: 1kg per hectare, 50% active ingredient". Please see deprecation note for further important details. | <p>Yes, + Application rates (kg/ha) and % of active ingredients for seed treatment & post-emergence. + Type of treatment (Pesticide, Herbicide, Insecticide and Fungicide).</p> | <p>No (most likely) New API request format for CFT 1.0 will include new object (type of treatment), but current API request format will continue to work after update. See description for deprecation approach, and deprecation note. New JSON request formats will be shared in due time.</p> |
| Crop GHG Carbon Biomass change from loss or gain of forest | IPCC 2019 - Carbon Sequestration Forest Biomass | <ul style="list-style-type: none"> + IPCC 2019 recommended factor updates for carbon sequestration or release from forest biomass changes. The forest types remain as per the current CFT, where Western Europe and Easter Europe will become Europe, and Latin America will become South America (this is only relevant for background calculation, not the available front-end options). + Some forest types are not available in the 2019 set, thus will be continued with 2006 emission factors. + 3 forest cases ignore the 20 year distinction in the calculation (coniferous forest and primary tundra woodland in North America). | No. | No (most likely) |
| Crop GHG Carbon Soil emissions from change in management practice or LUC | IPCC 2019 - Carbon Sequestration Practice Change | <ul style="list-style-type: none"> + IPCC 2019 recommended factor updates for carbon sequestration from changes in management practices. + Temperate climate has been separated into cold (<=10°C) and warm (>10°C) temperate for most changes in management. This temperature differentiation has only relevance for some scenarios (LUC, tillage). | No. | No (most likely) |
| Crop GHG Paddy Emissions | Enhanced Method with Factor Update - IPCC 2019 - Rice Methane | <ul style="list-style-type: none"> + IPCC 2019 recommended update of the rice methane method and related emission factors. + New option to use a default cultivation period. This is specific for different world regions. Where a user may not know the "time under cultivation", selecting this default option will apply the IPCC 2019 recommended value based on the farm location. + Additional water regimes options for pre-season: Non-flooded pre-season >365; unknown. | No. Optional to select new water regime options. | No (most likely) deprecation approach under review |
| Crop GHG Fuel & Energy Use Waste Water Emissions | IPCC 2019 - Waste Water | <ul style="list-style-type: none"> + IPCC 2019 recommended update to waste water treatments and related emission factors. + Name changes of treatments: <ul style="list-style-type: none"> - None river, lake, sea discharge change to Discharge to aquatic environments (Tier 1) - Option None - stagnant change to Stagnant sewer - Option None - fast flowing change to Flowing sewer (open or closed) + 5 new options: <ul style="list-style-type: none"> - Discharge to reservoirs, lakes and estuaries (Tier 2) - Discharge to aquatic environments other than reservoirs, lakes and estuaries (Tier 2) - Constructed wetlands - surface flow - Constructed wetlands - horizontal subsurface flow - Constructed wetlands - vertical subsurface flow + Deprecation: 1 deprecated treatment due to missing EF: sludge treatment - anaerobic digestion. Please see deprecation note for futher important details. | <p>No. Optional to indicate new treatment types.</p> <p>NOTES: + 1 deprecated treatment, see description.</p> | <p>No 1 deprecated treatment will continue to be available for pre-existing assessments. See deprecation note.</p> |

DEPRECATION NOTE

Where new options are available in the tool, the deprecation approach is to automatically set a default value. Webapp and API users can select the new options available for more accurate results.

Where some options are discontinued because the science has moved on and the latest guidance no longer references these, we are using a deprecation approach to minimise the impact on users of the Cool Farm Tool. For example 14 farm machines are not part of the machinery update.

Sludge treatment - anaerobic digestion is not part of the waste water update. We cannot maintain these deprecated options indefinitely because they are out of date and cannot be legitimately used for a long period. Keeping them in the codebase will create complexity that will become expensive and high risk to maintain. Therefore, we kindly ask you to be aware and act on following aspects:

- + Where deprecated options occur on an existing assessment, the assessment will be calculated by CFT 1.0 with the updated methodology except the deprecated value that is calculated based on the old factor/method.
- + The option will be marked with the term "deprecated" as a suffix on the name.
- + **Users should review all deprecated options and change them to continuing options as soon as reasonably practicable.**
- + **Users are discouraged from using deprecated options on new assessments but may do so for a period if necessary.**
- + **Deprecated items will be removed from the tool after one year.**
- + Assessments referencing deprecated items after one year will fail (i.e. will appear as incomplete until corrected).
- + API calls will continue to work with deprecated options for one year.
- + API calls that reference deprecated options will receive an information message on the API response noting that deprecated options have been referenced.
- + API calls referencing deprecated options after one year will fail.
- + The removal of deprecated items will be delivered as part of the CFT 2.0 implementation on 1 February 2023.

CFT 1.0 - LIST OF ITEMS

New GFLI Factors

Roughage feeds will be unchanged (GFLI does not provide roughage factors)

Compound feeds will be unchanged, but new GFLI factors will be delivered for the ingredients of existing compound items

New GFLI factors will be delivered for the following existing feed items;

Wheat

Barley

Maize / corn grain

Oats

Rice

Rye

Sorghum

Other cereals

Brans

Maize / Corn gluten feed (a by-product of processing)

Dried distillers grains (DDGS) / Draff

Brewer's grain

Potato starch

Sugarbeet / sugarcane molasses

Soybean cake/meal

Rapeseed cake/meal

Sunflower cake/meal

Cottonseed cake/meal

Palm kernel cake/meal

Other oil cake/meal

Soybean

Peas

Beans

Other pulses

Cassava / tapioca

Sweet potato

Fodder beet

Other root crops

Other feed

Vegetables residues

Milk powder (dry matter)

Organic household waste

Sugar beet pulp

Citrus pulp

Soy hull

Bypass fat

Grass hay

Molasses

Whey powder

Mineral mix

Lucerne/Alfalfa hay

Clover hay

Oat hay

Sorghum silage

| Machinery - Continuing Machines | Machinery Purpose | Variant on Existing? |
|--|----------------------|----------------------|
| baler (250 kg round bale) | Harvesting | |
| baler (250 kg square bale) | Harvesting | new variant |
| baler (silage) | Harvesting | new variant |
| beet harvester - self-propelling | Harvesting | new variant |
| beet harvester - standard | Harvesting | |
| combine | Harvesting | |
| corn combine | Harvesting | |
| forage harvester - corn hoeing with chipper | Harvesting | |
| forage harvester - forage harvester | Harvesting | new variant |
| manure spreader | Harvesting | |
| mower-conditioner - rotary mower with conditioner | Harvesting | |
| mower-conditioner - self-propelling rotary mower with conc | Harvesting | new variant |
| mower/grader - mower - cultivation | Harvesting | |
| mower/grader - rotary mower - cultivation | Harvesting | new variant |
| potato harvester | Harvesting | |
| potato windrower | Harvesting | |
| windrower/swather - rotary hay rake | Harvesting | |
| windrower/swather - rotary tedder | Harvesting | new variant |
| biocide spraying | Spraying / Spreading | |
| fertiliser spraying | Spraying / Spreading | |
| fertiliser spreading | Spraying / Spreading | |
| herbicide spraying | Spraying / Spreading | |
| chisel plough | Tillage | |
| disc harrow | Tillage | |
| disc harrowing | Tillage | |
| grain drill | Tillage | |
| grain drill-notill | Tillage | |
| hoe drill | Tillage | |
| moldboard plough | Tillage | |
| pneumatic drill | Tillage | |
| potato planting - potato planter - automatic | Tillage | |
| potato planting - potato planter - semiautomatic | Tillage | new variant |
| rod weeder | Tillage | |
| roller harrow | Tillage | |
| roller harrowing | Tillage | |
| roller packer | Tillage | |
| rotary hoe/ bed tiller | Tillage | |
| row crop cultivator | Tillage | |
| row crop planter | Tillage | |
| subsoiler | Tillage | |
| sweep plough | Tillage | |
| tine harrow/seed handling transport | Tillage | |
| tooth harrow | Tillage | |

| Machinery - New Machines | Machinery Purpose |
|---|---------------------------|
| peas harvester | Combine harvest |
| pressing of dry crop (straw/hay) high-density pick-up baler (| Combine harvest |
| liming | Fertilization (comercial) |
| pump tank truck - drag hose | Fertilization (organic) |

| | |
|--------------------------------------|----------------------------|
| vacuum tanker | Fertilization (organic) |
| forage harvester | Forage harvest - grassland |
| wagon for ventilated hay | Forage harvest - grassland |
| wagon for wilted material | Forage harvest - grassland |
| wrapping of bales | Forage harvest - grassland |
| crop protection - syringe | Fruits/orchards |
| fertilization - spraying | Fruits/orchards |
| mulching - flail mulcher | Fruits/orchards |
| winter cut - flail mulcher | Fruits/orchards |
| scrubbing | Maintenance |
| flaming | Mechanical pest management |
| grooming | Mechanical pest management |
| hoeing and grooming | Mechanical pest management |
| Kartoffelrodelader | Root harvest |
| self-propelling Kartoffelrodelader | Root harvest |
| self-propelling potato harvester | Root harvest |
| combination rotary harrow/ sower | Sowing/planting |
| combination spike drum/sower | Sowing/planting |
| mulching - seeding - corn | Sowing/planting |
| combine harrow (harrow + seed drill) | Tillage |
| subsoiling | Tillage |
| all-around weeder | Viniculture |
| chopping wine wood | Viniculture |
| crop protection - syringe | Viniculture |
| foliage cut | Viniculture |
| grape harvester | Viniculture |
| grass seeding | Viniculture |
| grubbing | Viniculture |
| hilling of mounds | Viniculture |
| milling | Viniculture |
| mowing - disc mower | Viniculture |
| mulching - flail mulcher | Viniculture |
| roatry cultivation of tramlines | Viniculture |
| subsoiling | Viniculture |

| Machinery - Deprecated Machines | Machinery Purpose |
|--|--------------------------|
| cotton picker | Harvesting |
| cotton stripper/potato topper | Harvesting |
| forage blower/washer | Harvesting |
| rake | Harvesting |
| tomato harvester | Harvesting |
| coulter | Tillage |
| disc gang | Tillage |
| disk bedder | Tillage |
| field cultivator/ridger | Tillage |
| land plane/destoner | Tillage |
| manure injections | Tillage |
| potato destoner | Tillage |
| power harrow | Tillage |
| ridging | Tillage |
| ridging | Tillage |