Farmscoper

Frequently Asked Questions

The census data in Farmscoper Upscale does not accurately reflect my catchment(s) – what should I do?

The census data in v3 of Farmscoper were taken from the 2010 Defra June Agricultural Survey (JAS). In v4, the census data have been updated to the 2015 JAS.

The number of livestock and crop areas for the catchment(s) on the 'Census' sheet in Farmscoper Upscale can be edited simply by over-writing the data. The number of farms, by farm type, found on the different soils and climates, which are on the 'Locations' sheet, can also be edited by over-writing the data. It may also be appropriate to edit the fertiliser rates (which are on the 'Fertiliser' sheet, available by clicking the 'Show Farm Practice Worksheets' option on the 'Control' sheet).

An alternative approach for just a single catchment is to use the default data for the catchment and edit the actual farm-level data that is produced on the 'Farm Results' sheet. Once this has been edited, the 'Run Data' button can be used to re-generate the Farmscoper Create files for all the farms.

I want to change the livestock grazing practices, and make a seasonal model, e.g. to test measures for bathing water catchments.

The duration of grazing is fixed in Farmscoper, as it was incorporated within the baseline modelling used to create the pollutant emission database. The values for percent of the year at grazing (on the 'Farm' sheet) are fixed.

I have some farms where the fields are really well connected to the watercourse - is there a way of creating a highly connected version of the normal model farms so that the measures that address this will be appropriately upgraded on these farms?

Connectivity for field losses is fixed as it was incorporated within the baseline modelling used to create the pollutant emission database. The connectivity for a given climate and soil combination thus reflects the average connectivity for land in England and Wales with that climate and soil. Connectivity for steading losses is determined by the percentage of fields next to watercourses value (on the 'Farm' sheet in Farmscoper Create or the 'Census' sheet in Farmscoper Upscale).

Note that for a single farm, the pollutant emissions on the 'Outputs' sheet in Farmscoper Create could be over-written, altering losses in the surface pathway to reflect different connectivity.

What would I need to change if I wanted to create a scenario where fertiliser application rates are greatly reduced?

The fertiliser rates on the 'Farm' sheet in Farmscoper Create or the 'Fertiliser' sheet in Farmscoper Upscale can be edited. If fertiliser rates to grassland are being edited, then it may also be appropriate to alter the number of grazing livestock to reflect changes in forage production. Note that Farmscoper is designed to represent changes around current practice where responses will be linear

with changes in fertiliser use, and thus does not necessarily accurately capture behaviour far away from the norm (e.g. zero fertiliser N).

How do I represent a scenario where manures are exported off a farm?

This can be done on the 'Farm' sheet in Farmscoper Create. If less than 100% of the manure for a manure type is accounted for on rows 71 to 88 of the 'Farm' sheet, it automatically assumes the rest is exported (see row 93 in 'Farm' sheet).

How do I represent land use change?

The Farmscoper method library does not include mitigation methods based around whole field land use change, as these can be represented by modifying the farm input data in terms of crop areas and livestock numbers. In order to determine the impacts of land use change, it is necessary to create two sets of input data (pre- and post-land use change) and compare the outputs produced for baseline pollutant losses and / or pollutant losses with mitigation method implementation.

When creating a land use change scenario, it is important to consider the impacts of increases or decreases in the grassland area upon the number of livestock that can be supported. A simplistic assumption would be that an x% increase in the grassland area would result in an x% increase in the numbers of cattle and sheep.

For a single farm, the data entered in the 'Farm' sheet of Farmscoper Create can be modified to represent any land use change (and then saved with a different file name). The two copies of this allow a comparison of the land use change on the baseline pollutant loads. If these two copies of Farmscoper are run through the same copy of Farmscoper Evaluate, then the impacts of mitigation implementation AND land use change on pollutant loads can be determined. Note that to determine the combined impacts of both method implementation and land use change, the outputs from Farmscoper Evaluate for the file with land use change need to be compared to the outputs from Farmscoper Evaluate without land use change.

For a single catchment using Farmscoper Upscale, either the relevant data in the 'Census' and 'Location' sheets can be modified, or, once the catchment has been processed from Upscale (i.e. 'Run from Census' has been done), the livestock and cropping data for each farm type on the 'Farm Results' sheet can be modified. For multiple catchments, the 'Farm Results' approach cannot be used as it only contains the data for the last catchment processed. It is important to use a new 'Working Directory' for Farmscoper Upscale when generating the land use change outputs, or the initial Farmscoper Create files generated will be overwritten. The Farmscoper Upscale file should also be saved with a different file name. Baseline pollutant loads (from the 'Output Create' sheet in the two copies of Farmscoper Upscale) can then be compared, or the impacts of land use change and mitigation can be determined by using the same copy of Farmscoper Evaluate within each Farmscoper Upscale.

How do I include local information on measure uptake?

The Farmscoper Evaluate workbook contains default implementation rates for each mitigation method which are derived from national survey data, with modifiers to implementation rates included to represent the impacts of being located inside a Nitrate Vulnerable Zone, being on different soil types and the intensity of livestock management.

If these default rates are not appropriate for a single farm, then more appropriate values can be entered into the 'Method List' worksheet – either using the default rates as a starting point or beginning with all rates set to zero.

For one or more catchments, it may be appropriate to modify the system used to generate the default national rates (from the 'Settings – Priors' sheet made visible from the 'Method Settings' sheet). Alternatively, values may be entered directly into the 'Method List' worksheet. Where different rates are required for different farms and modification of the system used to generate the default national rates is not sufficient, then a number of different copies of Farmscoper Evaluate should be created. These different files can then be used with Farmscoper Upscale, using one of two approaches:

- Each copy of Farmscoper Evaluate can be applied to all farms in the catchment(s) and the appropriate results extracted from the 'Output Evaluate' sheet,

- The FarmSummary.csv file in the working directory of Farmscoper Upscale can be modified so that only certain farms are processed through Farmscoper Evaluate, and the results from the 'Output Evaluate' sheet aggregated after each set of farms are processed.

What year(s) do the different datasets in Farmscoper come from?

The census data in v3 of Farmscoper were taken from the 2010 Defra June Agricultural Survey (JAS). In v4, the census data have been updated to the 2015 JAS. The fertiliser data in the Upscale workbook comes from the British Survey of Fertiliser Practice for 2010 or 2015 as appropriate for v3 or v4. The remainder of the datasets come from a variety of sources and years, typically between 2004 and 2012 and could thus be considered representative of typical practice for *c*. 2010.

The cost data is explicitly laid out by year in the Cost workbook.

What is meant by the 'Baseline' and 'Prior Implementation' scenarios in FARMSCOPER?

Baseline scenario losses represent the pollutant loadings in the absence of mitigation methods. The baseline scenario results over-estimate present day actual pollutant load as many mitigation methods are already part implemented by farmers in response to existing policy instruments. Calculated pollutant loads that take account of present day method implementation are referred to as 'prior implementation' scenario losses. Baseline pollutant losses from agricultural land were calculated using a range of computer models used in policy support at farm and national scale.

How do I use the outputs from FARMSCOPER with SAGIS?

SAGIS is a catchment tool to help with the calculation of pollution source apportionment. The annual nitrate loads from agricultural land are determined using NEAP-N (as kg-N ha^{-1}), and annual phosphorus loads from agricultural land are from the PSYCHIC model (as kg-TP ha^{-1}).

FARMSCOPER derived percentage reductions in phosphorus and nitrate loads should be used with SAGIS rather than the actual loads produced by the model. To translate the FARMSCOPER estimated pollution load reductions, the farm types need to be split in to arable or livestock, and the FARMSCOPER percentage reductions in load then used to reduce contributions from arable or livestock P sources in the SAGIS scenario tester. The farm types used at different spatial scales and how they best link to SAGIS are shown below.

England, RBD	WMC, OC	WFD WB, N2K	SAGIS Category
Cereals General Horticulture	Cereals General Horticulture	Arable	Arable
Indoor Pig Outdoor Pig	Pig	Housed	Livestock
Poultry	Poultry		
Dairy Mixed	Dairy Mixed	Intensive Livestock	
LFA Grazing Lowland Grazing	LFA Grazing Lowland Grazing	Extensive Livestock	

Is it possible to optimise by farm type at a catchment scale?

The Upscale workbook does not allow the use of the optimisation features in Farmscoper Evaluate. However, the Upscale workbook produces and saves each Farmscoper Create file as it builds all the farms for a catchment. These can be manually put through Farmscoper Evaluate (and mitigation method implementation optimised) rather than using the Upscale workbook.

How would I assess the maximum potential of CSF-only measures?

The 'Method List' worksheet in the Farmscoper Evaluate workbook has a column that identifies methods associated with CSF. If each of these (and only these) methods is set to TRUE in the 'Active' column on this worksheet, then the Evaluate will determine the maximum potential impact of CSF on the farm (or catchments – if being run from Farmscoper Upscale). This will assume that these methods will be implemented 100% on all relevant land – it may be appropriate to set the 'Maximum Implementation' rate on the 'Method List' worksheet to a value less than 100%.

Note that CSF measures include land use change, which has to be represented by modifying the input cropping and livestock data as it is not included as a mitigation method.

Is it possible to model the effect of poor farm practices e.g. leaking slurry tanks?

FARMSCOPER predicts pollutant losses associated with typical agricultural practice. It will not correctly predict losses or the impacts of mitigation where management is far away from typical (e.g. very low or very high fertiliser usage, extensive areas of severe poaching). Losses from leaking slurry tanks can be highly variable over time and between farms, but should be very small on average and so have not been included as a source in Farmscoper.

Have the pollutant losses in Farmscoper been calibrated?

Neither the outputs of Farmscoper nor the underlying models for predicting pollutant losses to water have been calibrated. However, the outputs of the underlying nutrient and sediment models have been validated against measured water quality data at a range of spatial scales (and the outputs of Farmscoper have been shown to match the outputs of these underlying models at water management catchment and national scale). The underlying models (and Farmscoper) are not expected to accurately predict the pollutant losses for any specific catchment, but the outputs should correlate with observed data across a number of catchments.

What is the uncertainty in mitigation method effectiveness?

The impacts of mitigation methods are expressed as a percentage reduction against one or more sets of coordinates in the source apportionment system used in Farmscoper. Impacts are typically expressed on a simple scale of 2, 5, 10, 25, 50 and 80% reductions to reflect the uncertainty in the underlying evidence on method efficacy.

The overall uncertainty for a mitigation method depends upon the contribution of the coordinates tackled by the mitigation method. For example, if surface runoff contributes 20% of the load on a farm, and a mitigation method reduces the runoff load by 50%, the overall impact is a 10% reduction. If the uncertainty in method effectiveness is represented by assuming a reduction in runoff of between 20 and 80%, then the overall impact varies between a 4% and 16% reduction, which is less important than the initial uncertainty in method efficacy suggests.

When multiple mitigation methods are selected, uncertainty in the effectiveness of each mitigation method should counteract one another (assuming the uncertainty is not correlated) and so the net effect should be greater confidence in the predictions.

Uncertainty in method effectiveness can be investigated using the 'Sensitivity Options' in Farmscoper Evaluate. This utilises the maximum and minimum impact values from the 'Method Impacts' sheet, randomly selecting an impact value from within this range to use in the assessment, and repeating the process 1,000s of times to allow a distribution of potential overall reductions to be produced.

Can new mitigation methods be added?

A new mitigation method can be added to Farmscoper Evaluate by entering a new row of data on the 'Method List' sheet and then one or more rows of data as required on the 'Method Impacts' and 'Method Costs' sheets. New data must be entered in the row directly beneath the existing data. The format of the data in each sheet can be copied from data already entered for existing methods in the rows above. Note that it is the numeric Method ID in column A that is fundamental – the Method Name on the 'Impacts' and 'Costs' worksheet is looked up from the 'Method List' worksheet using a formula and the Method ID.

Adding data for a new method on the 'Settings-Plans' and 'Settings-Priors' sheet is optional. Instead of entering data directly on the 'Method Costs' sheet, the new method can also be added to the Farmscoper Cost workbook and then this loaded into Farmscoper Evaluate.