Release Notes – OverseerFM version 6.4.1

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Changes to crops in release 6.4.1

The update of OverseerFM to version 6.4.1 includes the addition of new crops and parameter updates for some existing crops.

This update responds to requests from users for OverseerFM to include a greater number of crops that better represent the diverse range of cropping rotations present in New Zealand. The OverseerFM update adds 15 new crops providing users with a choice of 71 crops in total.

OverseerFM contains a crop model that uses a set of coefficients to represent each crop type. The crop coefficients for 30 pre-existing crops have also been updated so that all crop coefficients are based on the most current crop information available.

The impact of these changes on the existing database is outlined below - where proxy crops have previously been used, the re-entry of these with the updated crop information may impact results.

Crop coefficients

The mechanisms and coefficients of the Overseer crop sub-model are based on Cichota et al. (2010). A crop is described by a set of biophysical parameters used to calculate biomass accumulation, the development of the canopy and the nutrient concentration within the different parts of a plant. These crop parameters are used in the calculation of nutrient loss estimates for cropping systems. A more detailed description is provided by Wheeler (2018).

How the crop coefficient changes and additions were determined

The updates to existing and the addition of new coefficients were developed by collating new and existing data and information on the different crops from field observations/measurements and published literature, alongside input from crop specialists (rural professionals, Foundation for Arable Research (FAR) and the New Zealand Institute for Plant and Food Research Limited). These parameters provide an average representation of each of the different crops in the model.

Tables 1 and 2 list the existing crop coefficients that have been updated (blue) and the new crop coefficients that have been added to the model (red). Unmodified crops (black).

Table 1:

Fodder	Forages	Grain	Green manure	Pasture seed	Green vegetable
Beets	Annual ryegrass	Barley spring	Brassica	White clover	Broccoli winter/spring
Kale	Forage barley spring	Maize short	Lupins	Cocksfoot	Broccoli summer
Rape	Forage oats spring	Maize medium	Mustard	Plantain	Brussel sprouts
Swedes	Forage oats autumn	Maize long	Oats and rye	Ryegrass	Cabbage winter/spring
Turnip bulb	Maize silage	Oats spring	Phacelia		Cabbage summer
Turnip leafy	Ryecorn spring	Oats autumn			Cauliflower winter/spring
	Ryecorn autumn	Wheat spring			Cauliflower summer
	Triticale spring	Wheat autumn			Lettuce
	Triticale autumn	Oil seed rape			Spinach
	Forage wheat spring	Sunflowers			
		Linseed (flax)			

Table 2:

Legume vegetables	Root vegetables	Other crops	Crop seeds	Permanent pasture
Beans green	Beet	Onions	Red beet	Pasture
Beans dried	Carrot	Squash	Carrot (OP)	
Lentils	Kumara	Sweet corn	Rape autumn	
Peas green	Parsnip	Tomato	Pak choi	
Peas dried	Potato short	Hemp (fibre)	Hemp (seed/oil)	
Broad beans	Potato medium	Tulip bulbs	Radish (OP)	
	Potato long			

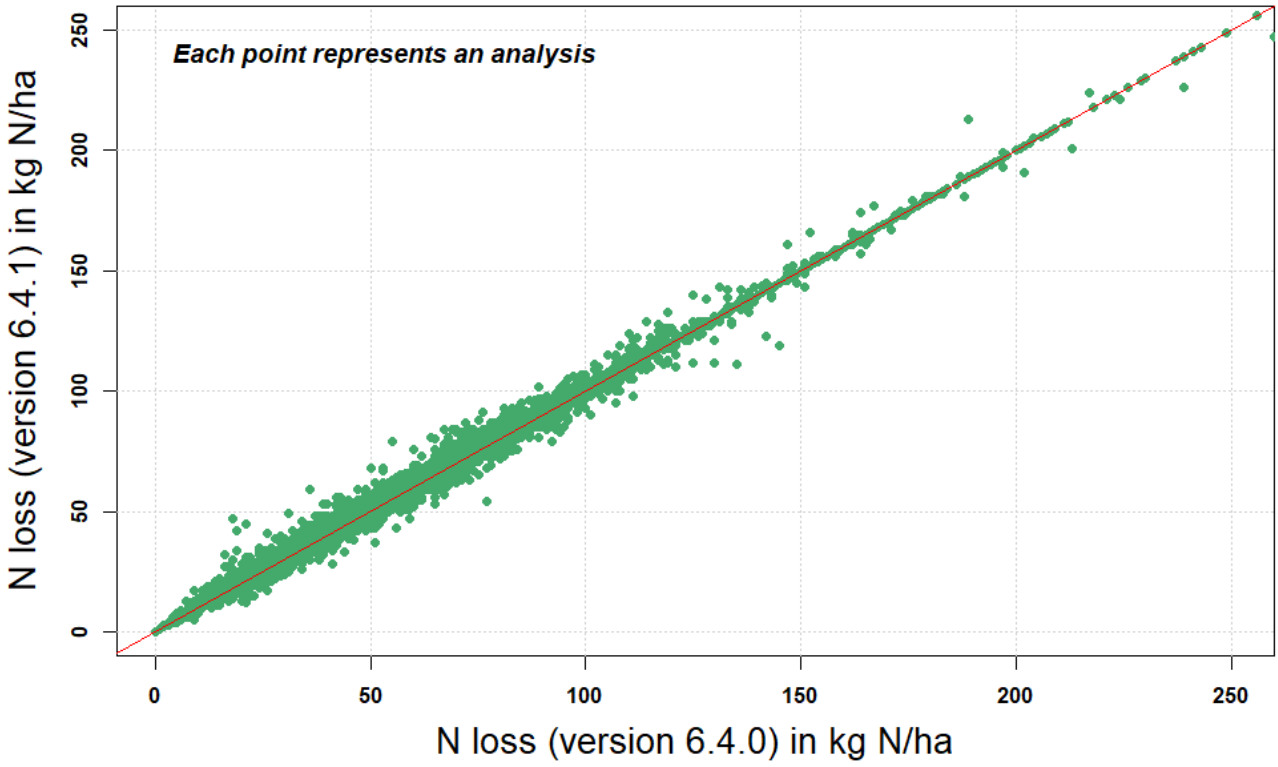
Additional information relating to the different crop categories in the Overseer model is provided in the Overseer knowledge base.

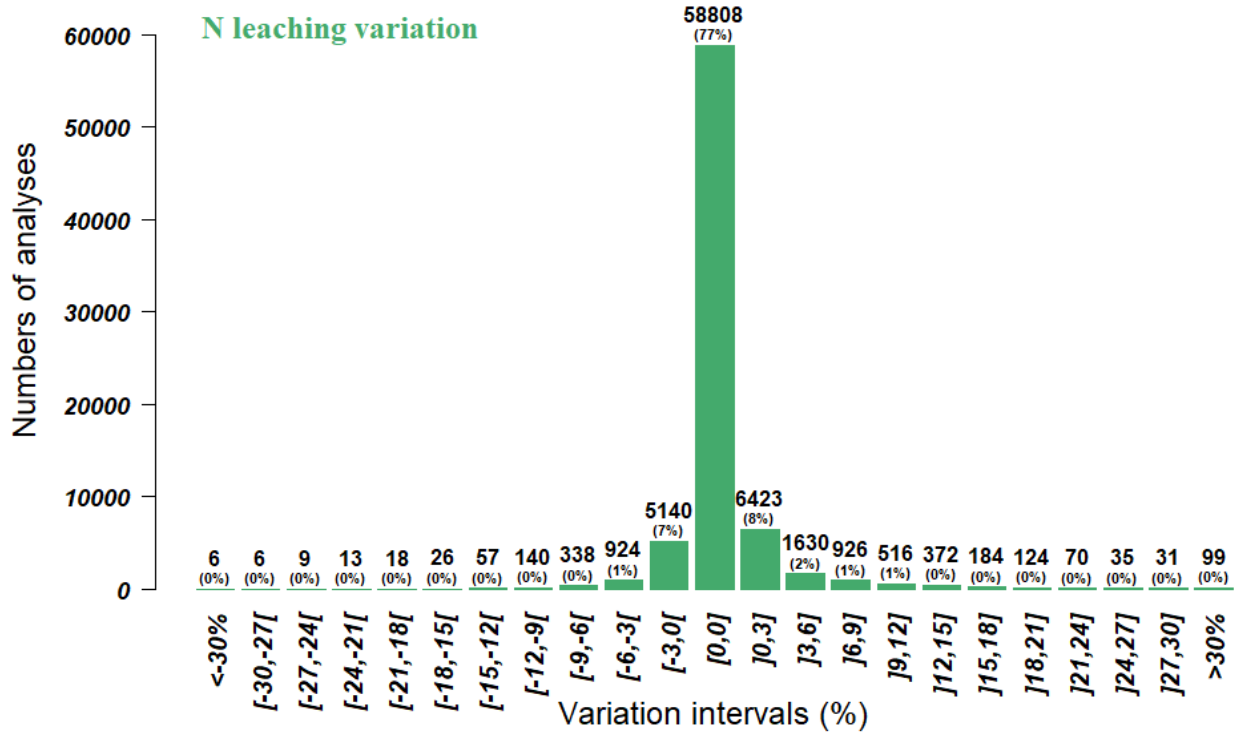
Impact of the changes

The following graphs show the impact of updates to the pre-existing crops (see Tables 1 and 2) on N and P losses for the analyses in OverseerFM (75895).

- The overall average percentage change in nutrient loss estimates is minimal (N loss + 0.4%, P loss -0.5%).
- 77% of N loss and 91% of P loss estimates are unchanged.
- For Canterbury (39,089 analyses), 63% of N loss estimates remain unchanged with a total of 87% N loss estimates changing by <3%.
- Larger percentage changes in nutrient estimates (N) are expected in relation to changes in crop coefficients for *barley (spring), carrot, oat (autumn), peas, sweet corn, and wheat (spring and autumn)* crops that alter the amount of accumulated biomass or the duration of growth.
- There is no significant impact in GHG emission estimates across all analyses.

Figure 1. Impact on Nitrogen loss estimates


Each point represents an analysis
N loss (version 6.4.1) in kg N/ha
N loss (version 6.4.0) in kg N/ha
0
50
100
150
200
250


N leaching variation
Numbers of analyses
Variation intervals (%)
60000
50000
40000
30000
20000
10000
0
6 (0%)
6 (0%)
9 (0%)
13 (0%)
18 (0%)
26 (0%)
57 (0%)
140 (0%)
338 (0%)
924 (1%)
5140 (7%)
58808 (77%)
6423 (8%)
1630 (2%)
926 (1%)
516 (1%)
372 (0%)
184 (0%)
124 (0%)
70 (0%)
35 (0%)
31 (0%)
99 (0%)
<-30%
[-30,-27[
[-27,-24[
[-24,-21[
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[-18,-15[
[-15,-12[
[-12,-9[
[-9,-6[
[-6,-3[
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]3,6]
]6,9]
]9,12]
]12,15]
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]24,27]
]27,30]
>30%

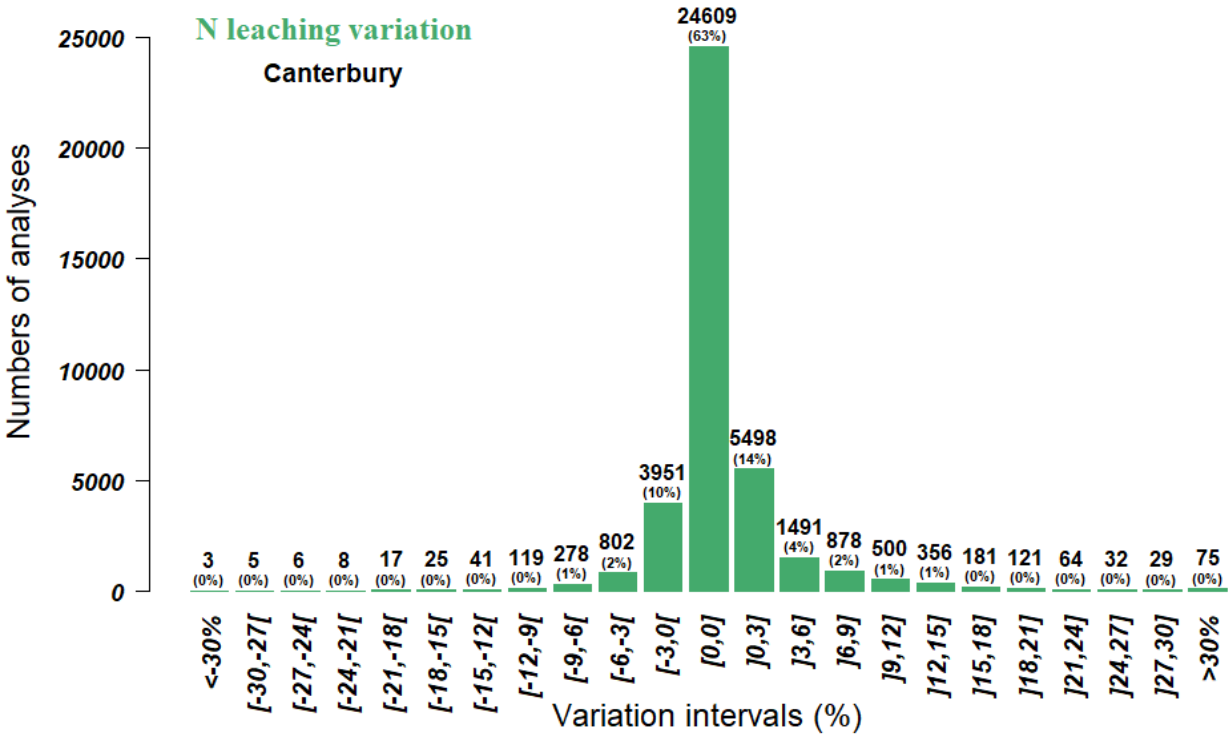
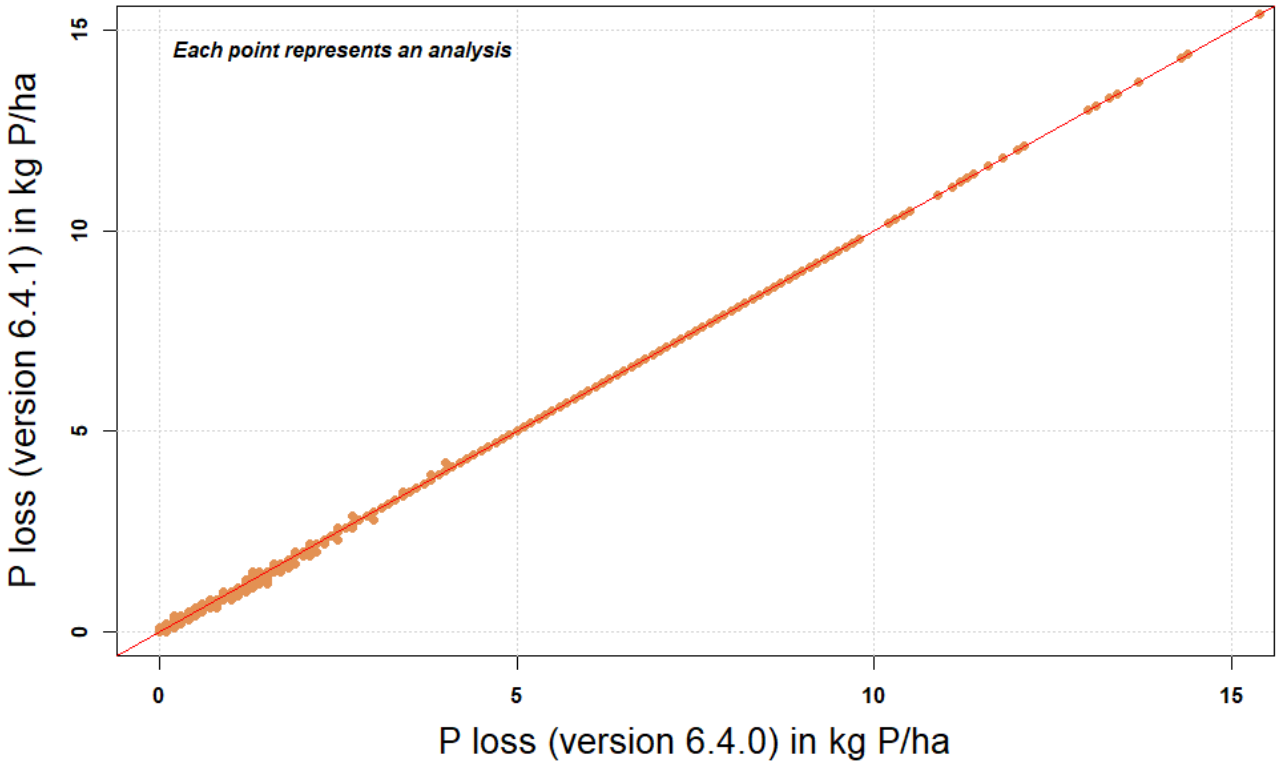
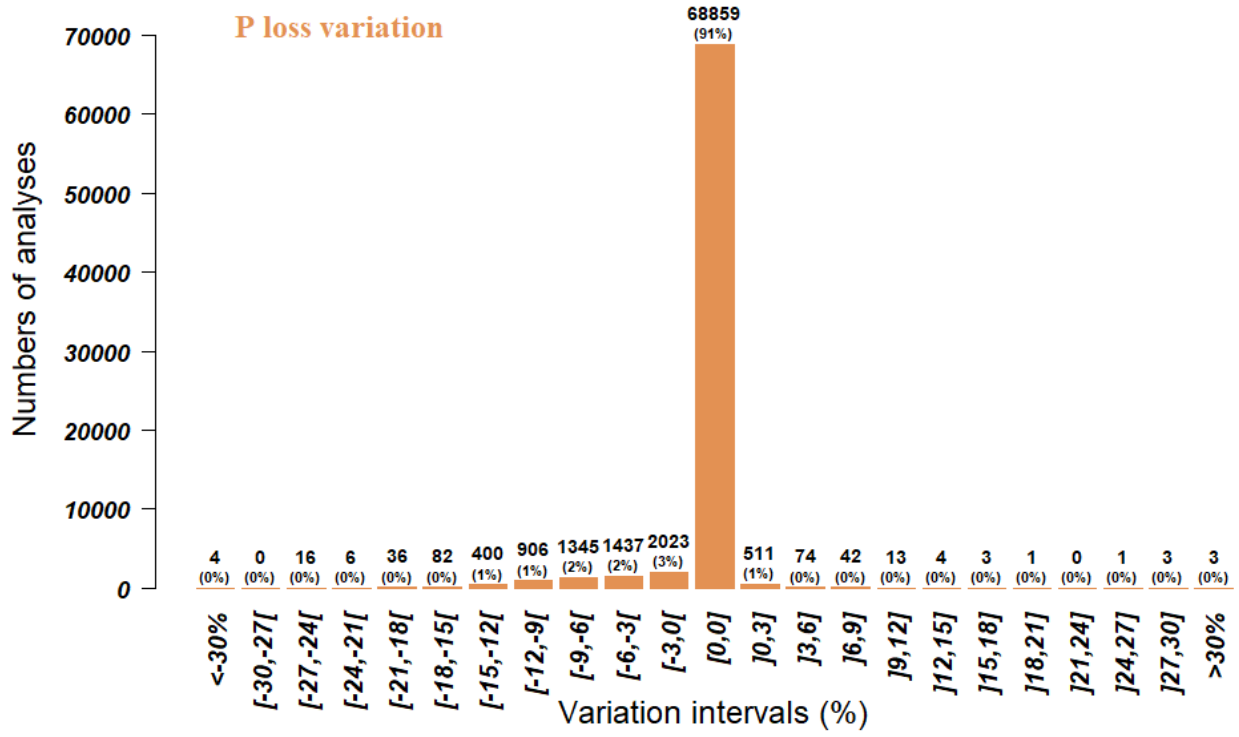


Figure 2. Impact on Phosphorus Loss Estimates


Each point represents an analysis
P loss (version 6.4.1) in kg P/ha
P loss (version 6.4.0) in kg P/ha
0
5
10
15


P loss variation
Numbers of analyses
Variation intervals (%)
70000
60000
50000
40000
30000
20000
10000
0
4 (0%)
0 (0%)
16 (0%)
6 (0%)
36 (0%)
82 (0%)
400 (1%)
906 (1%)
1345 (2%)
1437 (2%)
2023 (3%)
68859 (91%)
511 (1%)
74 (0%)
42 (0%)
13 (0%)
4 (0%)
3 (0%)
1 (0%)
0 (0%)
1 (0%)
3 (0%)
3 (0%)
<-30%
[-30,-27[
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]9,12]
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]15,18]
]18,21]
]21,24]
]24,27]
]27,30]
>30%

References

Cichota R., Brown H., Snow V.O., Wheeler D.M., Hedderley D., Zyskowski R., and Thomas S. (2010). A nitrogen balance model for environmental accountability in cropping systems. New Zealand Journal of Crop and Horticultural Science 38: 189-207.

Wheeler, D.M. (2018). Characteristics of crops. Technical Manual for the description of the OVERSEER nutrient Budgets engine.