Overseer Model Update 6.5.12 - Full impact assessment

2025-10-30

Introduction

The release of OverseerFM version 6.5.12 implements a series of targeted model corrections designed to improve the accuracy, consistency, and stability of nutrient and greenhouse gas (GHG) predictions across all farm system types. These updates address model defects identified through user feedback, internal validation, and regression testing.

This document presents the impact of version 6.5.12 on modelled nitrogen (N), phosphorus (P), and greenhouse gas (GHG) results, evaluated across the full OverseerFM production database. Comparative analyses were performed for approximately 180,000 farm analyses, of which nearly 160,000 include complete nutrient and emission results. These analyses collectively represent a wide range of enterprises, management practices, and environmental conditions.

Each correction was verified through controlled regression testing to confirm that it performs as intended and does not introduce unintended effects. The following changes are incorporated in this release:

- Defoliation and regrowth in oats (grain) and feed wheat (grain) – corrected overestimation of yield and N intake caused by double-counting during defoliation.
- Crop block event handling for “End Crop” events – fixed incorrect treatment as harvest events, ensuring unharvested crops return biomass to residue pools.
- Separation of weaning mobs in the Dairy Replacement enterprise – corrected mob merging errors that affected herd structure and phosphorus balance.
- Correction to digestibility values in dung allocation calculations – reinstated correct digestibility for stored feed supplements to fix inflated methane estimates.
- Revision of soil order averaging logic in fodder crop rotation blocks – replaced numerical averaging with area-dominance logic for more stable soil-based outputs.
- Correction to handling of dairy goat leftover feed in pastoral systems – fixed misreferenced management logic to ensure consistent feed processing.
- Safeguard for 100% field-loss inputs – added validation to prevent invalid calculations and ensure stable nutrient budgets for total crop loss cases.
- Correction to display of plant available water (PAW) at 60 cm – fixed inconsistent display logic; no change to underlying modelled values.

- Correction to organic fertiliser nitrogen allocation logic – rectified underestimation of organic N by treating organic and inorganic components independently.
- Improved messaging for invalid animal feeding or placement on structures – replaced generic nutrient balance errors with specific user guidance messages.
- Correction to total applied water display on the farm summary page – adjusted irrigation totals to reflect effective irrigated area excluding fodder rotations.

The subsequent sections of this document quantify these effects and provide detailed analyses of the direction and magnitude of change across farm types and nutrient components.

Impact on farm results

The impact of the change has been evaluated across 179217 analyses from the file: FullImpact_6.5.12_2025-10-29_1258.csv, which was extracted from the 'fm_20251028' database (table 'public.mt_doc_upgraderunresult') for the run titled 'Full Upgrade to 6.5.12 (Defect Fixes) 28-10-2025 (1/1)'.

The analysis is predominantly focused on dairy cattle systems, constituting 65% of the data. Additionally, the file incorporates analyses of mixed livestock (23%), non-dairy animal (10%), and crop/horticultural production (2%).

General statistics

The global statistics of the variations in N loss, P loss and GHG emissions are summarised on the following table, only for analyses that include strictly positive results for N, P, and GHG emissions were retained.

```
##  NLossPercentage    PLossPercentage     GHGPercentage
##  Min.   :-16.6667   Min.   :-100.0000   Min.   :-40.80313
##  1st Qu.:  0.0000   1st Qu.:   0.0000   1st Qu.:  0.00000
##  Median :  0.0000   Median :   0.0000   Median :  0.00000
##  Mean   :  0.2874   Mean   :  -0.1857   Mean   :  0.01648
##  3rd Qu.:  0.0000   3rd Qu.:   0.0000   3rd Qu.:  0.00000
##  Max.   :560.0000   Max.   :  50.0000   Max.   : 38.61111
##  NA's   :47         NA's   :47          NA's   :47
```

On average (NA's removed) for 159094 farms, the impact is 0.3% for N loss, -0.2% for P loss and 0% for GHG emissions. However, the dataset includes some outliers that exhibit significant positive and negative variations from these averages.

Analysis statistics

The number of analyses with GHG results:

- Total number of tested analyses 179217

- Total number of tested analyses with N loss results (before): 159175
- Total number of tested analyses with N loss results (after): 159359
- Total number of tested analyses without N loss results after update: 47
- Total number of tested analyses with N loss results after update (no results before): 232
- Total number of tested analyses with N loss results before and after: 159127

Resolved Errors Following Update

- Total number of tested analyses with N loss results after update (no results before): 232

Message Before	Count
Dairy replacements animals are not getting enough Ca from their feed for the month April. Please check how animals are allocated to crops and whether they should have alternate feed sources.	4
Dairy replacements animals are not getting enough Ca from their feed for the month August. Please check how animals are allocated to crops and whether they should have alternate feed sources.	3
Dairy replacements animals are not getting enough Ca from their feed for the month December. Please check how animals are allocated to crops and whether they should have alternate feed sources.	9
Dairy replacements animals are not getting enough Ca from their feed for the month January. Please check how animals are allocated to crops and whether they should have alternate feed sources.	24
Dairy replacements animals are not getting enough Ca from their feed for the month July. Please check how animals are allocated to crops and whether they should have alternate feed sources.	5
Dairy replacements animals are not getting enough Ca from their feed for the month June. Please check how animals are allocated to crops and whether they should have alternate feed sources.	4
Dairy replacements animals are not getting enough Ca from their feed for the month March. Please check how animals are allocated to crops and whether they should have alternate feed sources.	3
Dairy replacements animals are not getting enough Ca from their feed for the month May. Please check how animals are allocated to crops and whether they should have alternate feed sources.	2

Message Before	Count
Dairy replacements animals are not getting enough Ca from their feed for the month November. Please check how animals are allocated to crops and whether they should have alternate feed sources.	8
Dairy replacements animals are not getting enough Ca from their feed for the month October. Please check how animals are allocated to crops and whether they should have alternate feed sources.	13
Dairy replacements animals are not getting enough Ca from their feed for the month September. Please check how animals are allocated to crops and whether they should have alternate feed sources.	5
Dairy replacements animals are not getting enough N from their feed for the month December. Please check how animals are allocated to crops and whether they should have alternate feed sources.	17
Dairy replacements animals are not getting enough N from their feed for the month November. Please check how animals are allocated to crops and whether they should have alternate feed sources.	6
Dairy replacements animals are not getting enough N from their feed for the month October. Please check how animals are allocated to crops and whether they should have alternate feed sources.	4
Dairy replacements animals are not getting enough P from their feed for the month December. Please check how animals are allocated to crops and whether they should have alternate feed sources.	38
Dairy replacements animals are not getting enough P from their feed for the month January. Please check how animals are allocated to crops and whether they should have alternate feed sources.	6
Dairy replacements animals are not getting enough P from their feed for the month November. Please check how animals are allocated to crops and whether they should have alternate feed sources.	3
Dairy replacements animals are not getting enough P from their feed for the month October. Please check how animals are allocated to crops and whether they should have alternate feed sources.	32
Dairy replacements animals are not getting enough P from their feed for the month September. Please check how animals are allocated to crops and whether they should have alternate feed sources.	1
Dairy replacements animals are not getting enough S from their feed for the month August. Please check how animals are allocated to crops and whether they should have alternate feed sources.	2
Dairy replacements animals are not getting enough S from their feed for the	1

Message Before	Count
month March. Please check how animals are allocated to crops and whether they should have alternate feed sources.	
Dairy replacements animals are not getting enough S from their feed for the month May. Please check how animals are allocated to crops and whether they should have alternate feed sources.	1
Dairy replacements animals are not getting enough S from their feed for the month October. Please check how animals are allocated to crops and whether they should have alternate feed sources.	4
Dairy replacements animals are not getting enough S from their feed for the month September. Please check how animals are allocated to crops and whether they should have alternate feed sources.	1
For Beef / dairy grazing in June, ME supplied in feed fed in the shed, on pads and as crops exceeded animal ME requirements by 137%. The feed was predominately fed from crops. Check crop yield, distribution of crops to animals or consider increasing grazing time on fodder crop if this message persists. Go to the 'Animal Reports' tab to see how much feed your animals require.	3
For Beef / dairy grazing in March, ME supplied in feed fed in the shed, on pads and as crops exceeded animal ME requirements by 224%. The feed was predominately fed from crops. Check crop yield, distribution of crops to animals or consider increasing grazing time on fodder crop if this message persists. Go to the 'Animal Reports' tab to see how much feed your animals require.	4
For Dairy in June, ME supplied in feed fed in the shed, on pads and as crops exceeded animal ME requirements by 155%. The feed was predominately fed from crops. Check crop yield, distribution of crops to animals or consider increasing grazing time on fodder crop if this message persists. Go to the 'Animal Reports' tab to see how much feed your animals require.	2
For Dairy replacements in August, ME supplied in feed fed in the shed, on pads and as crops exceeded animal ME requirements by 130%. The feed was predominately fed from crops. Check crop yield, distribution of crops to animals or consider increasing grazing time on fodder crop if this message persists. Go to the 'Animal Reports' tab to see how much feed your animals require.	1
For Deer in July, ME supplied in feed fed in the shed, on pads and as crops exceeded animal ME requirements by 176%. The feed was predominately fed from crops. Check crop yield, distribution of crops to animals or consider increasing grazing time on fodder crop if this message persists. Go to the 'Animal Reports' tab to see how much feed your animals require.	2
For Sheep in July, ME supplied in feed fed in the shed, on pads and as crops exceeded animal ME requirements by 138%. The feed was predominately fed	4

Message Before	Count
from crops. Check crop yield, distribution of crops to animals or consider increasing grazing time on fodder crop if this message persists. Go to the 'Animal Reports' tab to see how much feed your animals require.	
High pasture production (estimated to be 40.8 T/ha/year) from block Calf block Dryland XXXXXXXX is outside the model calibration range (35 T DM/ha/year). Check stock numbers, stock distribution between blocks, relative block productivity, supplements made and block areas	1
ME content of crops fed to Sheep is 17% greater than estimated ME requirements. Please either decrease crop yield or area, or increase stocking rate to get a valid nutrient budget. Go to the 'Animal Reports' tab to see how much feed your animals require.	1
Supplements and crops fed on pads and in the paddock are more than estimated animal intakes for Beef / dairy grazing in June. Source of supplementary feed: Crops in situ or on blocks 52%, Supplements: brought in 48%, check the amount of supplements brought in and fed on pasture, timing of that feeding (Advanced pasture supplement feeding, imported options), or time that animals are removed from pasture (wintering pad/animal shelter or grazing off), and supplement utilisation. Also check the amount of supplements from storage and timing of that feeding (Advanced pasture supplement feeding, internal options), or time that animals are removed from pasture (wintering pad/animal shelter or grazing off), and supplement utilisation. Consider reducing supplement inputs if this message persists. Note that animal requirements are met first from supplements fed on pads - if these are changed then supplements fed on pasture may also need to be modified. Go to the 'Animal Reports' tab to see how much feed your animals require.	4
Supplements and crops fed on pads and in the paddock are more than estimated animal intakes for Dairy replacements in January. Source of supplementary feed: Supplements: brought in 100%, check the amount of supplements brought in and fed on pasture, timing of that feeding (Advanced pasture supplement feeding, imported options), or time that animals are removed from pasture (wintering pad/animal shelter or grazing off), and supplement utilisation. Also check the amount of supplements from storage and timing of that feeding (Advanced pasture supplement feeding, internal options), or time that animals are removed from pasture (wintering pad/animal shelter or grazing off), and supplement utilisation. Consider reducing supplement inputs if this message persists. Note that animal requirements are met first from supplements fed on pads - if these are changed then supplements fed on pasture may also need to be modified. Go to the 'Animal Reports' tab to see how much feed your animals require.	1

Message Before	Count
Total feed for Dairy grazing in June is under-estimated as it is only 39% of animal ME requirements. Go to the 'Animal Reports' tab to see how much feed your animals require.	2
NA	11

Errors After Update

- Total number of tested analyses without N loss results after update: 47.

Message After	Count
Dairy replacements animals are not getting enough Ca from their feed for the month July. Please check how animals are allocated to crops and whether they should have alternate feed sources.	1
Error: In-farm supplements has feed intake but digestibility is missing or zero.	3
For Beef / dairy grazing in July, ME supplied in feed fed in the shed, on pads and as crops exceeded animal ME requirements by 125%. The feed was predominately fed from crops. Check crop yield, distribution of crops to animals or consider increasing grazing time on fodder crop if this message persists. Go to the 'Animal Reports' tab to see how much feed your animals require.	4
For Dairy replacements in April, ME supplied in feed fed in the shed, on pads and as crops exceeded animal ME requirements by 121%. The feed was predominately fed from crops. Check crop yield, distribution of crops to animals or consider increasing grazing time on fodder crop if this message persists. Go to the 'Animal Reports' tab to see how much feed your animals require.	1
For Dairy replacements in July, ME supplied in feed fed in the shed, on pads and as crops exceeded animal ME requirements by 126%. The feed was predominately fed from crops. Check crop yield, distribution of crops to animals or consider increasing grazing time on fodder crop if this message persists. Go to the 'Animal Reports' tab to see how much feed your animals require.	2
For Dairy replacements in July, ME supplied in feed fed in the shed, on pads and as crops exceeded animal ME requirements by 157%. The feed was predominately fed from crops. Check crop yield, distribution of crops to animals or consider increasing grazing time on fodder crop if this message persists. Go to the 'Animal Reports' tab to see how much feed your animals require.	4
For Dairy replacements in July, ME supplied in feed fed in the shed, on pads and as crops exceeded animal ME requirements by 182%. The feed was predominately fed from crops. Check crop yield, distribution of crops to animals or consider increasing grazing time on fodder crop if this message persists. Go to the 'Animal Reports' tab to see how much feed your animals require.	2
For Dairy replacements in May, ME supplied in feed fed in the shed, on pads and as crops exceeded animal ME requirements by 477%. The feed was predominately fed from crops. Check crop yield, distribution of crops to animals or consider increasing grazing time on fodder crop if this message persists. Go to the 'Animal Reports' tab to see how much feed your animals require.	1

Message After	Count
For Dairy replacements in May, ME supplied in feed fed in the shed, on pads and as crops exceeded animal ME requirements by 478%. The feed was predominately fed from crops. Check crop yield, distribution of crops to animals or consider increasing grazing time on fodder crop if this message persists. Go to the 'Animal Reports' tab to see how much feed your animals require.	1
High pasture production (estimated to be 35.1 T/ha/year) from block ****Ch - Lis/Lat - Pasture to remove feed errors is outside the model calibration range (35 T DM/ha/year). Check stock numbers, stock distribution between blocks, relative block productivity, supplements made and block areas	1
High pasture production (estimated to be 35.3 T/ha/year) from block ****Ch - Lis/Lat - Pasture to remove feed errors is outside the model calibration range (35 T DM/ha/year). Check stock numbers, stock distribution between blocks, relative block productivity, supplements made and block areas	2
High pasture production (estimated to be 35.8 T/ha/year) from block ****Ch - Lis/Lat - Pasture to remove feed errors is outside the model calibration range (35 T DM/ha/year). Check stock numbers, stock distribution between blocks, relative block productivity, supplements made and block areas	3
High pasture production (estimated to be 37.3 T/ha/year) from block Grass is outside the model calibration range (35 T DM/ha/year). Total RSU excced 40 SU and if not fed brought in supplements can lead to high pasture production. Also check stock distribution between blocks, relative block productivity and block areas	3
High pasture production (estimated to be 50.6 T/ha/year) from block XXXXXXXXX is outside the model calibration range (35 T DM/ha/year). Check stock numbers, stock distribution between blocks, relative block productivity, supplements made and block areas	2
Insufficient feed supplied to Beef / dairy grazing on wintering pad/animal shelter when the 'Pad/shelter only' feeding regime is selected. Only 54% were supplied. Supplements need to be diverted to the wintering pad/animal shelter. Go to the 'Animal Reports' tab to see how much feed your animals require.	1
Insufficient feed supplied to Dairy replacements on wintering pad/animal shelter when the 'Pad/shelter only' feeding regime is selected. Only 78% were supplied. Supplements need to be diverted to the wintering pad/animal shelter. Go to the 'Animal Reports' tab to see how much feed your animals require.	7
There were no nutrients available for K for the month of August to feed to Dairy replacements animals. This occurs when animals are not on pasture, fed supplements or on a crop for the month listed.	2
Total stockunits must be greater than or equal to 0.1 RSU/ha on grazed area of	7

Message After	Count
farm. Currently it is set at 0.1	

Graphs of variations

In the following graphs, the variation in farm results is defined as the following ratio:

$$Variation = \frac{Value_{After} - Value_{Before}}{Value_{Before}}$$

The *Value* could be the N loss, P loss or the GHG emissions value.

N loss variation

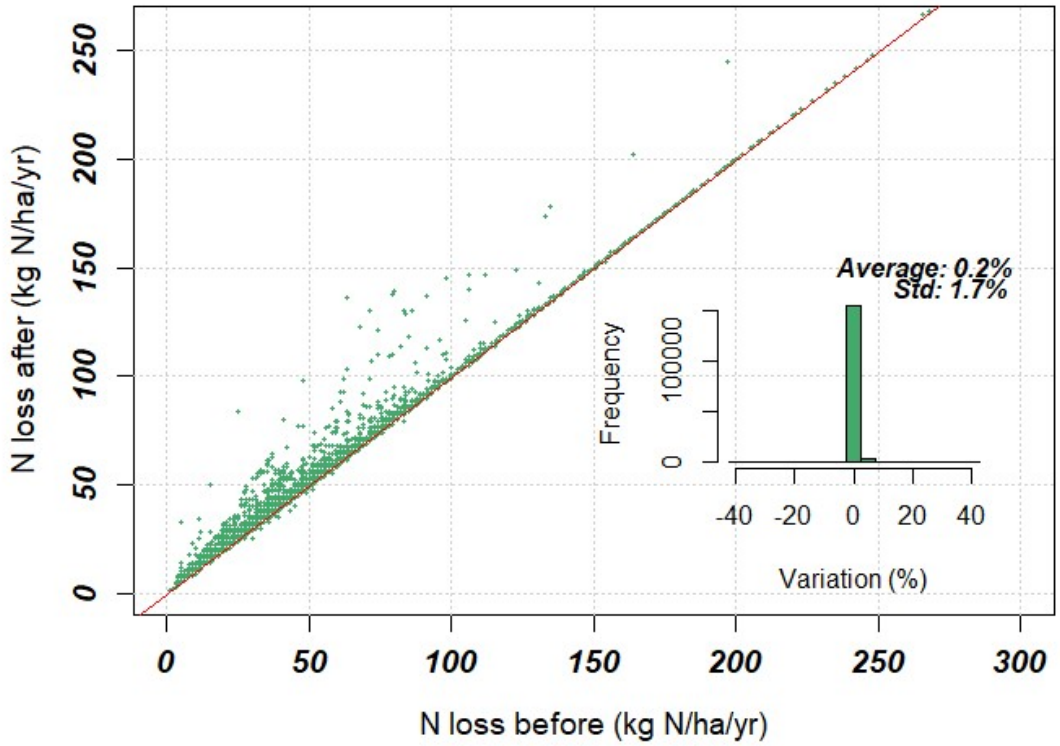

Figure 1: total N-loss variation

On average, there is an average variation of 0.3%, with maximum/minimum variations of 560%/-16.7%.

Out of 160083 analyses:

- 1558 (1%) show a positive or negative variation greater than 5%,
- 814 (0.5%) show a positive or negative variation greater than 10%,
- 332 (0.2%) show a positive or negative variation greater than 20%.

Distribution of N loss variation by range

Variation Range	< -100%	-100% to -75%	-75% to -50%	-50% to -25%	-25% to -15%	-15% to -5%	-5% to 5%	5% to 15%	15% to 25%	25% to 50%	50% to 75%	75% to 100%	> 100%
Number	0	0	0	0	1	34	158304	1006	299	320	87	15	17
Frequency (%)	0	0	0	0	0	0	98.9	0.6	0.2	0.2	0.1	0	0

N loss variation magnitude

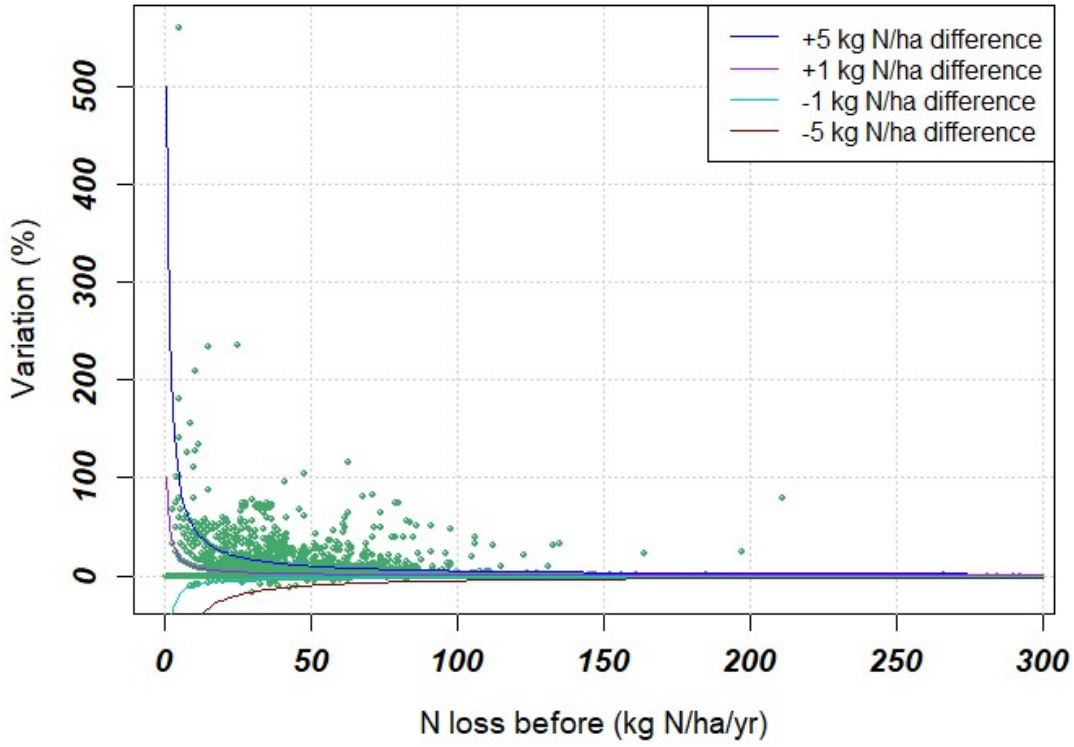

Figure 2: total N-loss variation magnitude

The majority of N loss values does not change, most of the changes are between -5 and +5 kg N/ha.

Largest positive N loss variation

This section highlights the most positive significant changes in N loss, focusing on changes that exceed 20% and a difference of more than 5 kg N/ha in N loss before and after. The analysis aims to identify analyses in which the recent update had an impact on N loss, both in terms of percentage change and absolute value.

In total, there is a total of 414 (0.3%) analyses in this case, the top 30 is the following (one analysis per farm):

REDACTED to maintain farm confidentiality.

Explanation of the variations greater than 20%:

Here is information on farms with variation greater than 20%:

REDACTED to maintain farm confidentiality.

The analyses above show that all variations greater than 50% can be attributed to three specific model corrections introduced in version 6.5.12:

- Correction to the “End Crop” event handling, which now retains crop residues within the system instead of removing them as harvested yield.

- Correction to defoliation logic in feed wheat, which previously caused double-counting of yield and nitrogen uptake, leading to overestimated N removal and reduced soil N.

- Correction to organic fertiliser nitrogen allocation, which now includes both inorganic and organic N fractions, increasing total soil N through decomposition and mineralisation.

Importantly, no significant changes were observed in dairy farm systems; all large variations occurred in mixed or cropping enterprises directly affected by these specific fixes.

Largest negative N loss variation

This section highlights the most significant negative changes in N loss, focusing on changes that exceed -5% and an absolute difference of more than 3 kg N/ha in N loss before and after. The analysis aims to identify analyses in which the recent update had an impact on N loss, both in terms of percentage change and absolute value.

In total, there is a total of 5 (0%) analyses in this case, the top 15 is the following (one analysis per farm):

REDACTED to maintain farm confidentiality.

Here is information on farms with variation less than -5%:

REDACTED to maintain farm confidentiality.

P loss variation

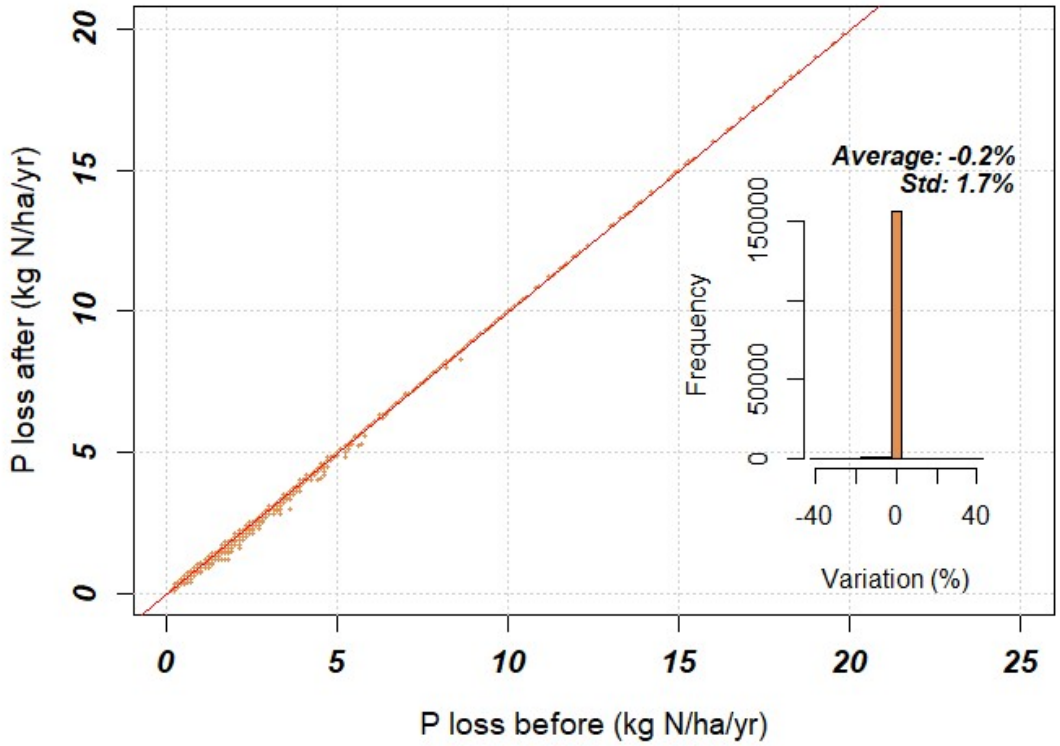

Figure 3: total P-loss variation

Low impact. On average, there is an average variation of -0.2%, with maximum/minimum variations of 50%/-50%.

- Out of 159116 analyses, 2502 (1.6%) show a positive or negative variation greater than 5%,
- and 1343 (0.8%) show a positive or negative variation greater than 10%,
- and 216 (0.1%) show a positive or negative variation greater than 20%.

P loss variation magnitude

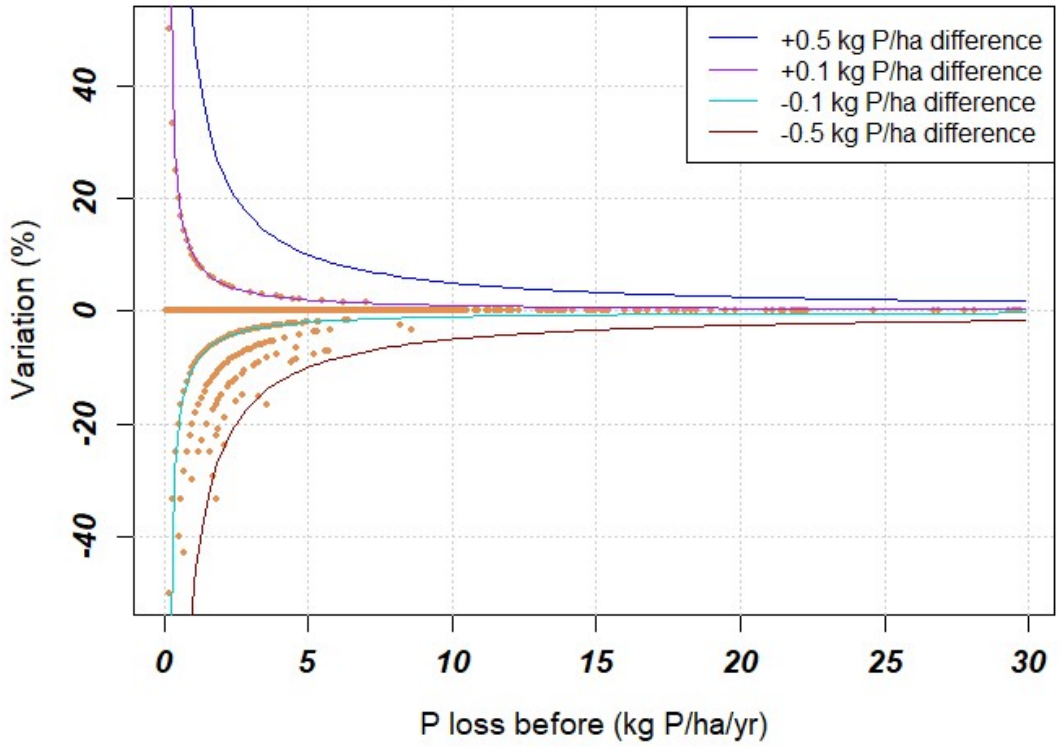

Figure 4: total P-loss variation magnitude

Distribution of P loss variation by range

Variation Range	< -100%	-100% to -75%	-75% to -50%	-50% to -25%	-25% to -15%	-15% to -5%	-5% to 5%	5% to 15%	15% to 25%	25% to 50%	50% to 75%	75% to 100%	> 100%
Number	0	0	13	139	343	1912	156614	58	27	10	0	0	0
Frequency (%)	0	0	0	0.1	0.2	1.2	98.4	0	0	0	0	0	0

Nearly 99% of analyses show changes in phosphorus (P) loss within ±5%, with the majority of differences corresponding to only ±0.1 kg P/ha. Overall, most of the larger changes observed represent slight decreases in modeled P loss, indicating that the release maintains stable phosphorus behaviour across systems.

Largest P loss variation

This section highlights the most positive significant changes in P loss, focusing on changes that exceed 5% and a difference of more than 0.25 kg P/ha in P loss before and after. The analysis aims to identify analyses in which the recent update had an impact on P loss, both in terms of percentage change and absolute value.

In total, there is a total of 106 (0.1%) analyses in this case, the top 30 is the following (one analysis per farm):

REDACTED to maintain farm confidentiality.

The small decrease in modelled P loss for these analyses is due to an update in how Overseer determines the representative soil order or soil group within mixed-soil fodder crop rotation blocks.

Previously, the model used a numeric or alphabetic weighting method to select the representative soil, which could occasionally assign an unrealistic soil type. The model now correctly bases the representative soil on the dominant soil by area within the block.

The change in P loss resulted in a shift from a soil type with lower P retention to one with higher P retention. Soils with higher P retention bind phosphate more strongly, reducing the amount of soluble P that can be lost through runoff or drainage.

GHG emission variation

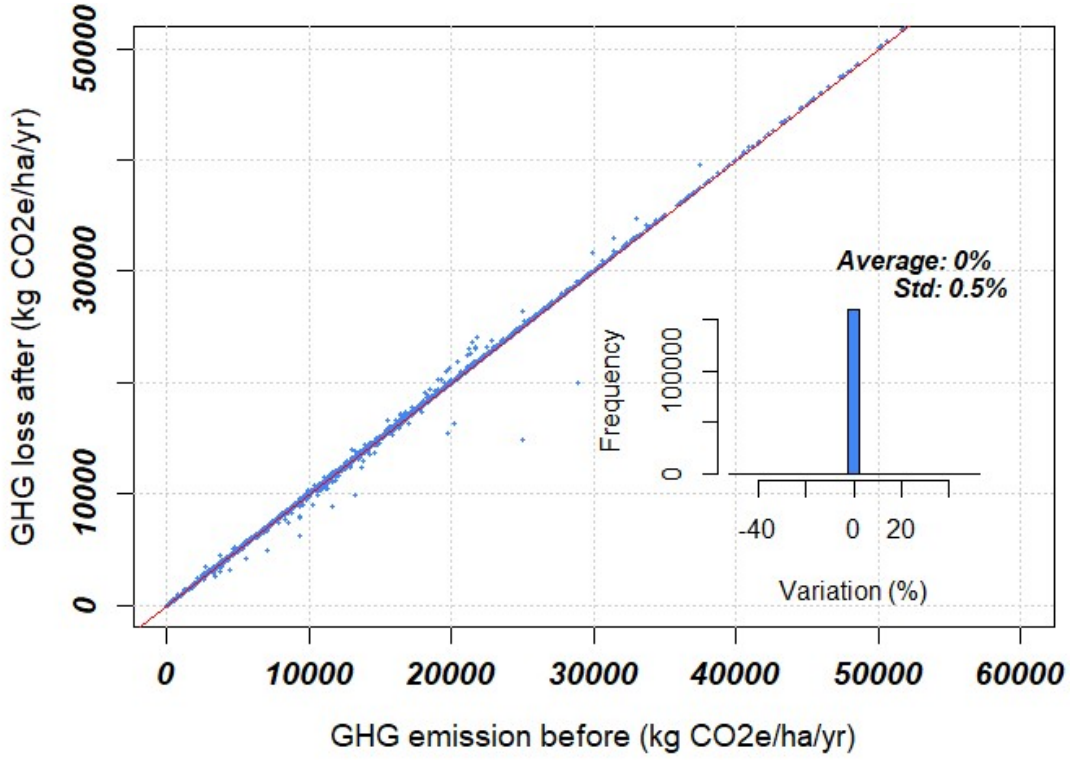

Figure 5: total GHG emissions variation

On average, there is an average variation of 0%, with maximum/minimum variations of 40.6%/-40.8%.

- Out of 159942 analyses, 152 (0.1%) show a positive or negative variation greater than 5%,
- and 59 (0.04%) show a positive or negative variation greater than 10%,
- and 24 (0.02%) show a positive or negative variation greater than 20%.

Distribution of GHG emission variation by range

Variation Range	< -100%	-100% to -75%	-75% to -50%	-50% to -25%	-25% to -15%	-15% to -5%	-5% to 5%	5% to 15%	15% to 25%	25% to 50%	50% to 75%	75% to 100%	> 100%
Number	0	0	0	12	12	55	159790	62	6	5	0	0	0
Frequency (%)	0	0	0	0	0	0	99.9	0	0	0	0	0	0

This distribution confirms that GHG emissions are highly stable under the new model version, and that the limited variations observed are confined to specific systems directly affected by minor corrections (e.g., revised feed digestibility or small adjustments in dung CH4 allocation).

GHG emissions variation magnitude

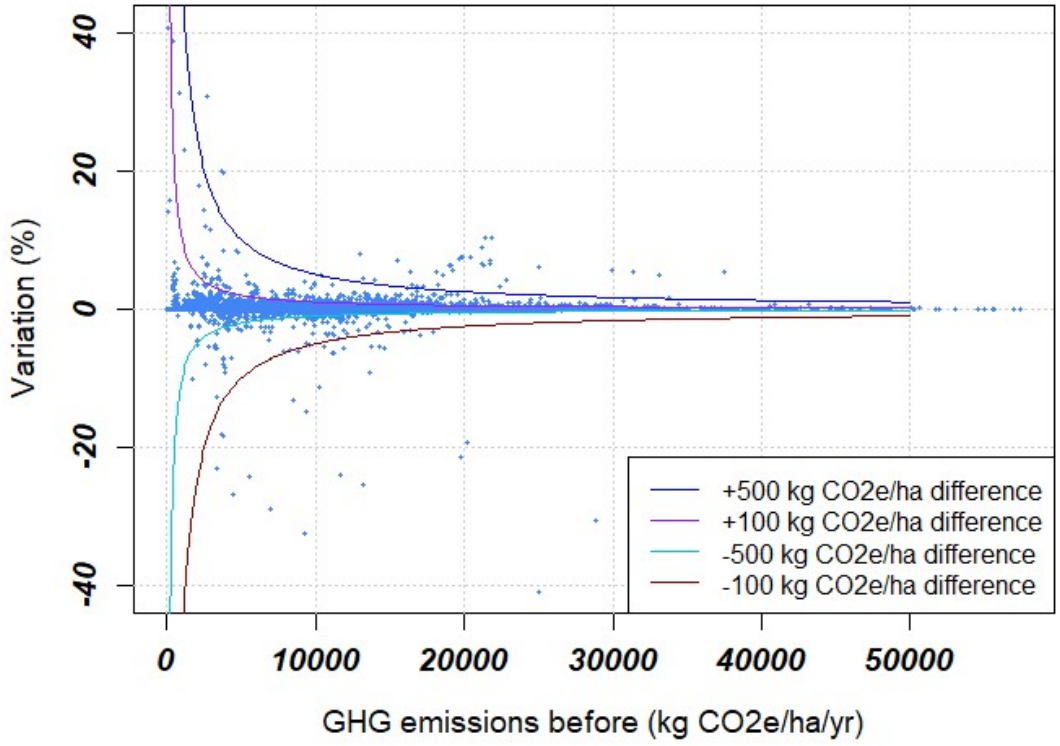

Figure 6: total GHG emissions variation magnitude

The majority of GHG emissions changes result in an increase less than +/- 100 kg CO2e/ha, but but 0.015% show a positive or negative variation greater than 20%.

Largest GHG emissions variation

This section highlights the most positive significant changes in GHG emissions, focusing on changes that exceed 10% and a difference of more than 125 kg CO2e/ha in GHG emissions before and after. The analysis aims to identify analyses in which the recent update had an impact on GHG emissions, both in terms of percentage change and absolute value.

In total, there is a total of 54 (0%) analyses in this case, the top 30 is the following (one analysis per farm):

REDACTED to maintain farm confidentiality.

Across all affected analyses, variations are consistent with the nature of the corrections:

- Decreases occur where overestimated feed digestibility or yield previously inflated CH4 or N2O emissions.
- Increases occur where corrected residue handling or soil N cycling now reflect higher organic matter returns.

CH4 emissions

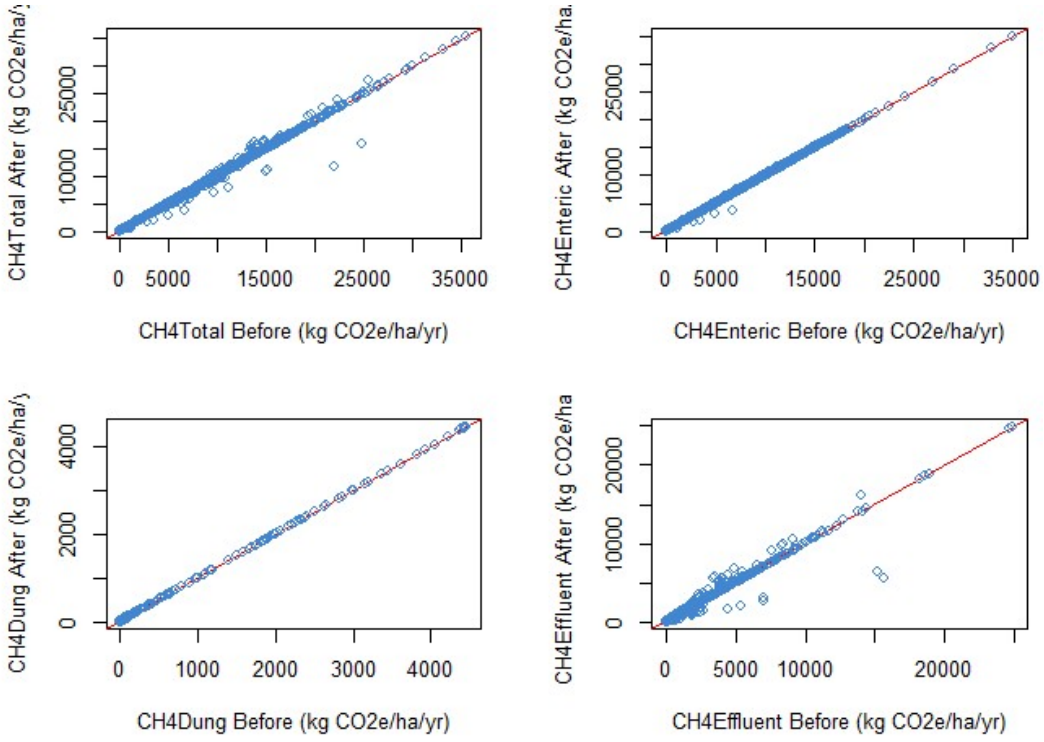

Figure 7: CH4 emissions variation

The variations in CH4 emissions mainly arise from two model corrections introduced in version 6.5.12.

- Most differences occur in CH4 emissions from effluent systems, following the correction to feed digestibility for stored supplements. Previously, digestibility was incorrectly set to zero, causing all supplement dry matter to be treated as dung, thereby overestimating effluent CH4 emissions. With the fix, digestibility is now correctly applied, reducing the amount of dung entering effluent systems and therefore lowering CH4 emissions.

- Smaller changes also appear in enteric CH4 emissions, linked to the correction of defoliation and regrowth logic in oats and feed wheat. The revised handling removes double-counting of feed eaten by non-farm animals, reducing total feed intake and resulting in slightly lower enteric CH4 emissions.

N2O emissions

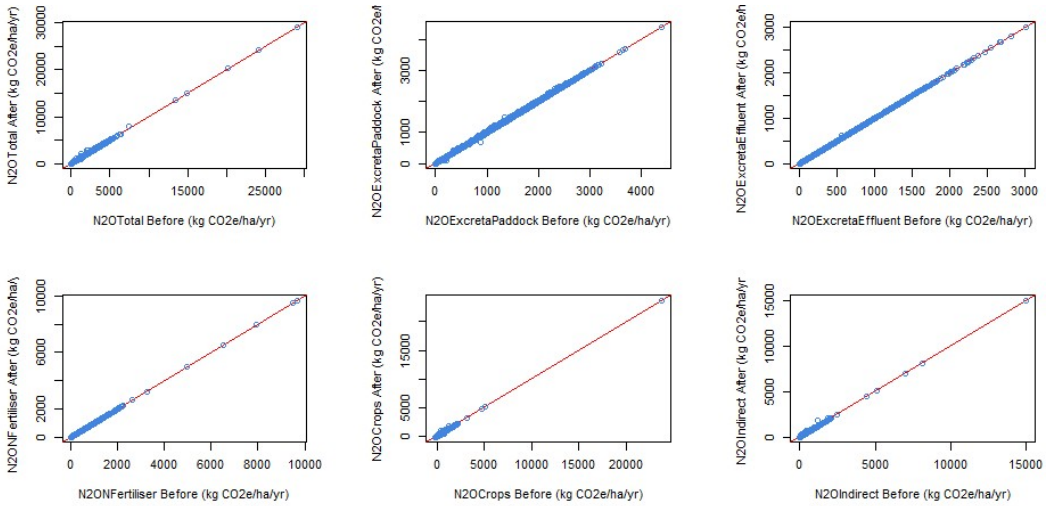

Figure 8: N2O emissions variation

The observed variations in N2O emissions are minor and primarily arise from three sources.

- First, small changes in N2O emissions from paddocks occur due to the correction of feed digestibility: change in dung deposited in paddocks, leading to minor variations in soil N2O emissions.
- Second, adjustments to “End Crop” handling result in more crop residues remaining in the soil, increasing N mineralisation and therefore direct N2O emissions from residue decomposition.
- Finally, in some cases, the “End Crop” correction also leads to higher N leaching, contributing to a small rise in indirect N2O emissions associated with nitrate losses.

Overall, the magnitude of these changes is small, and total N2O emissions remain stable across the dataset, confirming that the updates primarily improve the accuracy of emission allocation rather than altering system-level results.

CO2 emissions

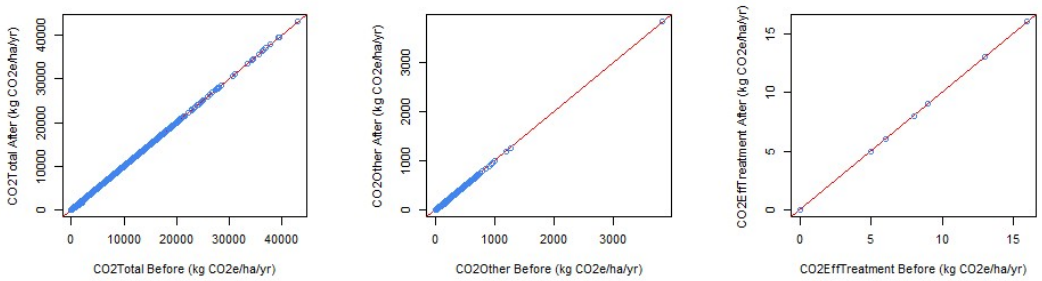

Figure 9: some CO2 emissions variation

No visible variation.

NCE and surplus

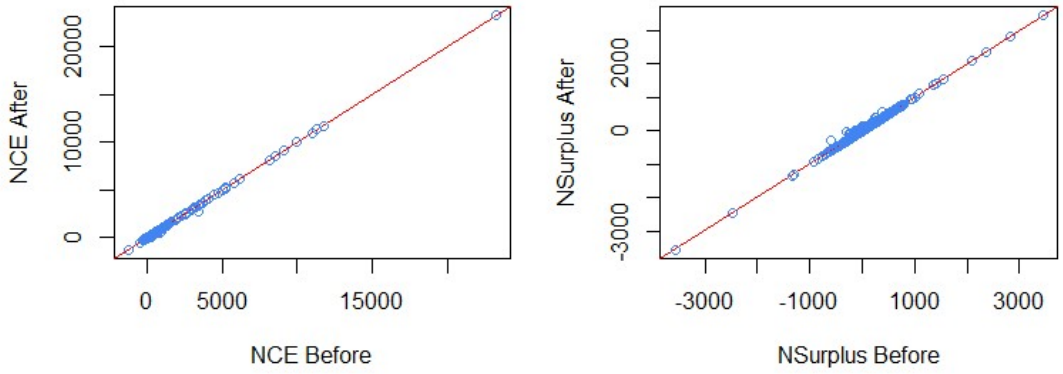

Figure 10: NCE and N Surplus

Very low impact, due to the change of the “EndCrop” management.

Nitrogen budget

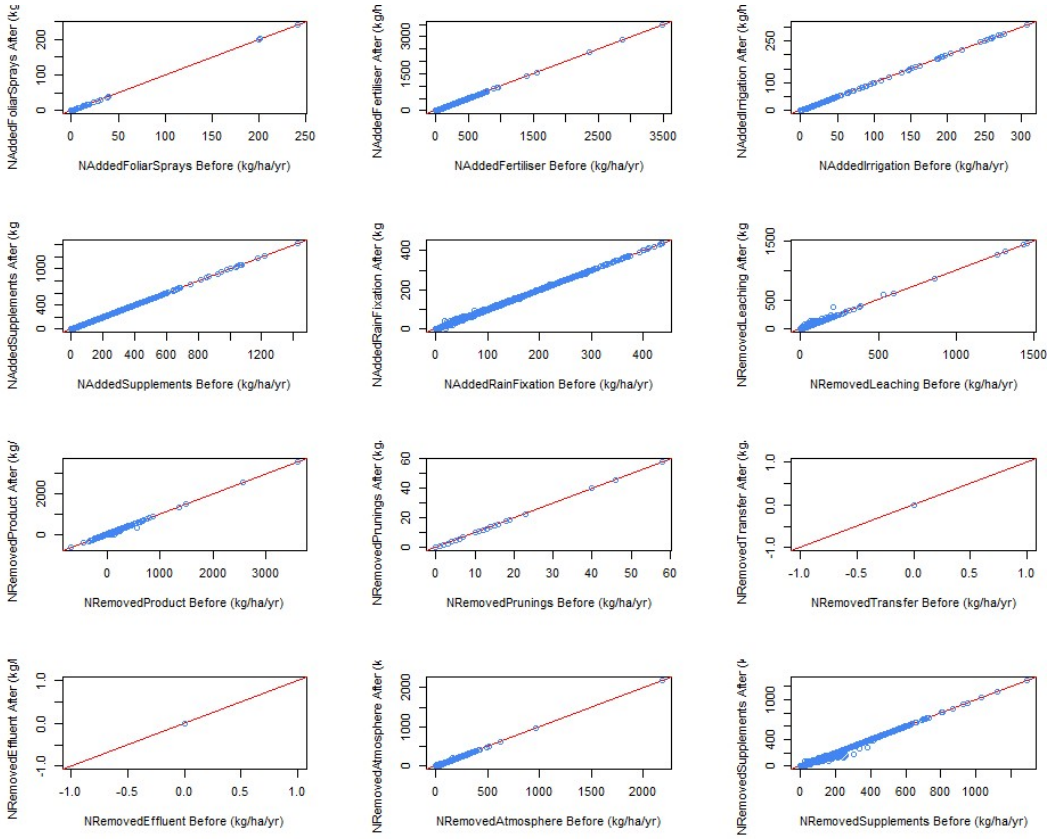

Figure 11: nutrient budget

Variations in:

- N leaching as expected
- N removed Product as expected
- and in supplement as expected.

Nitrogen Pools

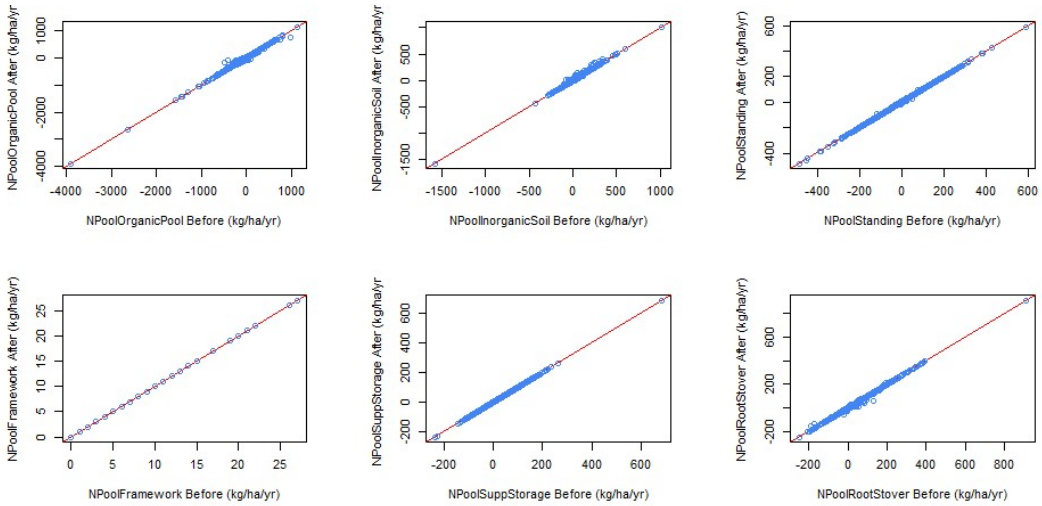

Figure 12: pools

Very small variations.

Conclusions

The release of OverseerFM version 6.5.12 delivers a series of targeted model corrections that substantially improve the accuracy, consistency, and transparency of nutrient and greenhouse gas (GHG) predictions across all system types. The impact analysis, conducted on more than 179,000 farm analyses, confirms that these corrections collectively yield negligible change at the national scale, while addressing specific model inconsistencies that previously caused localized inaccuracies.

Nutrient Losses

Across the dataset, average variations are +0.3 % for N loss and −0.2 % for P loss. Significant deviations (> 20 %) are rare and fully explained by identifiable logic corrections:

- Defoliation and regrowth in oats and feed wheat now avoid double-counting, producing more realistic N uptake and leaching patterns.
- “End Crop” event handling correctly retains crop residues, enhancing soil nutrient return and nutrient budgets.
- Organic fertiliser logic now accounts for both inorganic and organic N fractions, improving the representation of mineralisation dynamics.

- Soil-order and group averaging are now based on dominant area, rather than alphabetic or numeric weighting. This stabilises soil-based outputs and produces logical shifts from lower to higher phosphorus retention soils (e.g., Recent → Brown, Pallic → Allophanic), leading to small, systematic decreases in modelled P loss.

Greenhouse Gas Emissions

Modelled GHG emissions remain highly stable, with an overall mean variation of 0 % and fewer than 0.05 % of analyses showing a difference greater than ±10 %. Observed variations correspond to three well-defined mechanisms:

- Feed digestibility correction reduces CH_4 from effluent where digestibility was previously zero.
- Defoliation correction reduces enteric CH_4 for non-farm animals and crop-residue N_2O through realistic yield and feed intake.
- "End Crop" correction slightly increases direct and indirect N_2O where residue N mineralisation and leaching rise.
- CO_2 emissions show no measurable change, confirming full stability of energy and material balance processes.

Model Stability

Regression testing confirms that all corrections perform as intended, resolving previously logged nutrient-balance and feed-allocation errors (notably for dairy replacements) without introducing new systemic issues. The distribution graphs across N, P, and GHG components (pages 7 – 25) illustrate near-perfect one-to-one alignment between pre- and post-update results for > 99 % of cases.