Release notes – Overseer version 6.5.8

Contents

1. Introduction 2

2. Overall Impact on Modelled Results 2

3. Individual Fixes 3

3i. Digestibility for Grazing on Crop/Fodder Blocks 3

3ii. Inclusion of Imported Effluents in Nutrient Runoff Calculations 4

3iii. Adjustment of Nitrogen Leaching Risk Factors for Dairy Bulls 4

3iv. Refinement of Milk Solids (MS) Calculations 5

3v. Inclusion of Imported Effluent in Acidity Model 5

3vi. Correction of Dolomitic Lime Definition 5

3vii. S Net Immobilisation 5

3viii. Improved Calculation of Soil Labile Potassium 6

3ix. Enhanced Temperature Validation Criteria 6

3x. Validation Harvest Triggered by the Previous Planting 6

3xi. Update Calcium Slow-Release Function 6

1. Introduction

OverseerFM model release 6.5.8 addresses minor defects in model implementation identified through user feedback and internal reviews at Overseer Ltd during model refinement. These release notes outline the changes made and their impact on nitrogen (N), phosphorus (P), and greenhouse gas (GHG) results at the farm level.

Prior to release, each model update is independently assessed, with all changes reviewed and approved by subject matter experts at AgResearch. The impact of each change on modelled results is evaluated individually using the latest year-end analyses from each farm account in OverseerFM. The overall impact of all updates combined is then assessed across all analyses in the OverseerFM database.

The resulting impacts, individually and collectively, are summarized in these release notes.

2. Overall Impact on Modelled Results

The updates introduced in version 6.5.8 of Overseer have had a low impact on modelled results. The following graphs illustrate the impact of release 6.5.8 on N, P, and GHG results at the farm analysis level. For this comparison, we utilized the complete OverseerFM database, comprising nearly 160,000 analyses, with results available for almost 140,000 entries. This dataset covers predictive and scenario analyses, which may not always represent realistic farm systems.

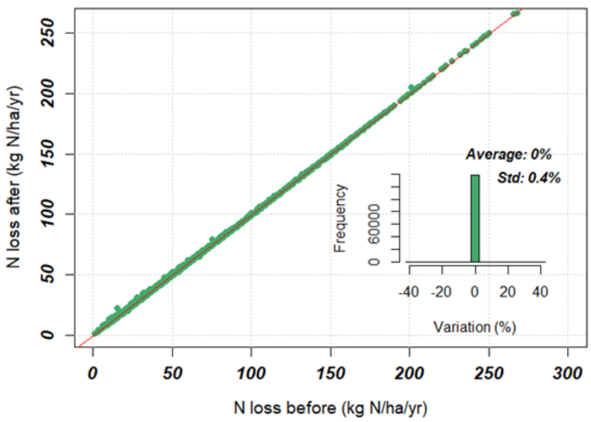


Figure 1: Comparison of N loss (kg N/ha) before and after version 6.5.8 update.

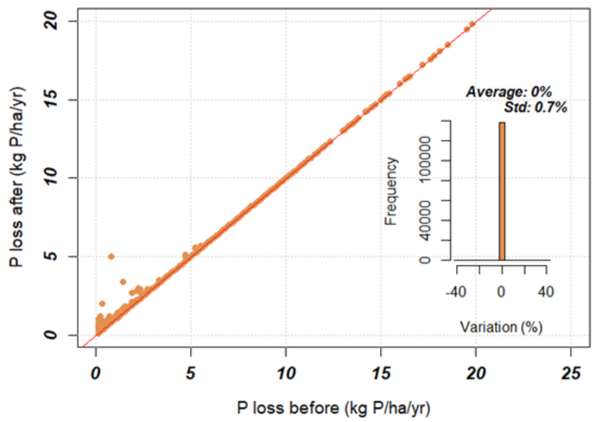


Figure 2: Comparison of P loss (kg P/ha) before and after version 6.5.8 update.

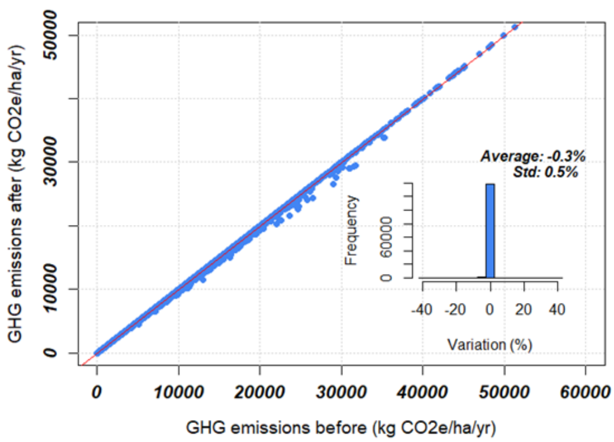


Figure 3: Comparison of total GHG emissions (kg CO2e/ha) before and after version 6.5.8 update.

3. Individual Fixes

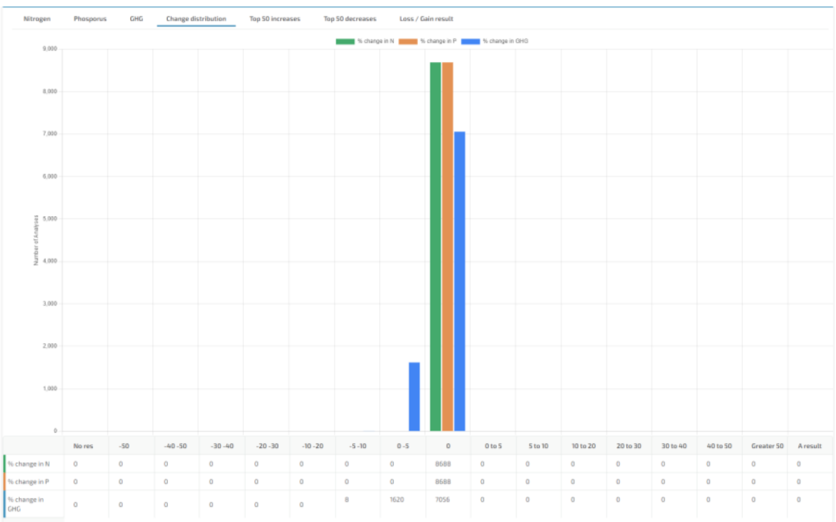
To ensure that model changes are working as expected and to detect potential unintended impacts, we perform impact testing using a production copy of our database. This approach allows us to observe the effects of targeted model changes and evaluate their cumulative impact on modelled results when multiple changes are made. Testing with production data, which reflects real farm data, provides valuable insight into how these changes affect real-world scenarios.

The following individual fixes were tested and validated using data from 11,554 latest year-ends in our centralized database.

3i. Digestibility for Grazing on Crop/Fodder Blocks

Dung Calculation on Crop Blocks: Resolved an issue where all dry matter (DM) consumed by animals on crop blocks was incorrectly assigned a digestibility value of zero. This error resulted in all consumed DM on crop blocks being calculated as dung, which impacted the overall calculations for DM in dung, effluent, and consequently methane emissions. Note that enteric emissions remain unaffected, as they are based on the total DM consumed and do not depend on digestibility.

Impact of change: Low impact. Nutrient loss estimates were not impacted, as they are calculated through a separate method. The correction resulted in a slight reduction in CH4 emissions from dung and effluent therefore a very low (0.3% on average) decrease in GHG emissions for 54% of the tested year end analyses. Analyses that would be impacted are those where a large portion of the feed is consumed through grazing directly on the crop blocks, and where in-situ grazed crops constitute a significant part of the diet.



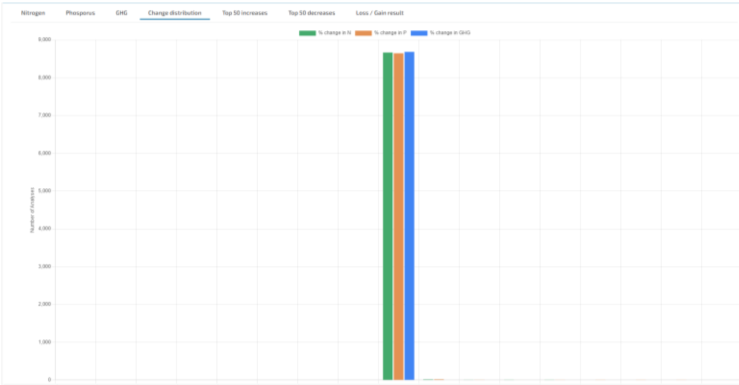
	No res	-50	-40 -50	-30 -40	-20 -30	-10 -20	-5 -10	0 -5	0	0 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	Greater 50	A result
% change in N	0	0	0	0	0	0	0	0	8688	0	0	0	0	0	0	0	0
% change in P	0	0	0	0	0	0	0	0	8688	0	0	0	0	0	0	0	0
% change in GHG	0	0	0	0	0	0	8	1620	7056	0	0	0	0	0	0	0	0

Figure 4: Impact (%) on N and P losses and GHG emissions resulting from the correction of crop digestibility.

3ii. Inclusion of Imported Effluents in Nutrient Runoff Calculations

Previously, effluent imported as organic fertilizers were excluded from nutrient runoff calculations, resulting in incomplete nutrient runoff estimates. This update ensures these inputs are now accurately reflected in nutrient runoff estimates.

Impact of change: Low impact. While the overall impact on nutrient budgets may be minimal, farms applying large quantities of imported effluent, particularly during the drainage season, may observe a more significant effect. No impact on GHG emissions.



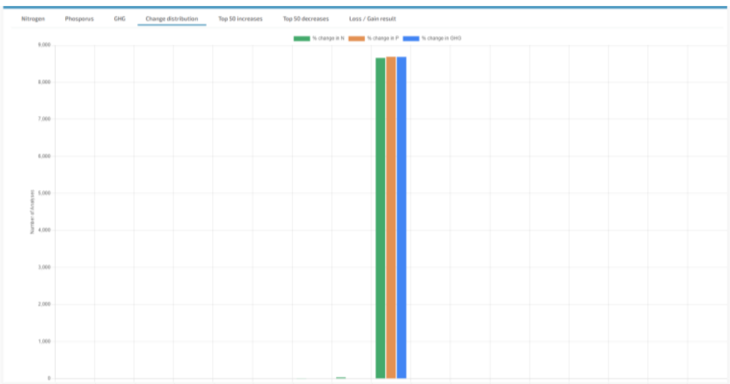
	No res	-50	-40 -50	-30 -40	-20 -30	-10 -20	-5 -10	0 -5	0	0 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	Greater 50	A result
% change in N	0	0	0	0	0	0	0	0	8667	17	2	1	1	0	0	0	0
% change in P	0	0	0	0	0	0	0	0	8647	20	9	6	2	1	1	2	0
% change in GHG	0	0	0	0	0	0	0	0	8684	0	0	0	0	0	0	0	0

Figure 5: Impact (%) of including imported effluents in nutrient runoff calculations (%) on N and P losses and GHG emissions.

3iii. Adjustment of Nitrogen Leaching Risk Factors for Dairy Bulls

Research by Hoogendoorn et al. (2011) indicates differences in urinary patterns between male and female cattle, with male cattle generally moving while urinating, resulting in narrower and potentially less concentrated urine patches. This behaviour suggests that male cattle, including bulls, pose a lower N leaching risk than female cattle. Previously, dairy bulls in dairy enterprises were assigned the same leaching risk factor as dairy cows. This update now applies the reduced leaching risk factor used for beef males to dairy bulls, better reflecting their lower impact.

Impact of change: Minimal impact on N and GHG results. No impact on P results.



	No res	-50	-40 -50	-30 -40	-20 -30	-10 -20	-5 -10	0 -5	0	0 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	Greater 50	A result
% change in N	0	0	0	0	0	0	1	31	8656	0	0	0	0	0	0	0	0
% change in P	0	0	0	0	0	0	0	0	8688	0	0	0	0	0	0	0	0
% change in GHG	0	0	0	0	0	0	0	0	8684	0	0	0	0	0	0	0	0

Figure 6: Impact (%) on N and P losses and GHG emissions resulting from the adjustment of N leaching factor for dairy bulls.

3iv. Refinement of Milk Solids (MS) Calculations

Previously, the calculation of minimum and maximum milk solids (MS) included all herds, regardless of whether they were actively milking, resulting in some inaccuracies by counting non-dairy herds. This update corrects MS calculations by considering only milking herds.

While the adjustments did not change overall values as expected, analyses were flagged due to MS values falling outside the allowed range of 100 to 1000 kg MS per cow. This wide range is intended to accommodate diverse testing scenarios but is notably higher than typical DairyNZ averages, where MS per cow typically ranges from 233 kg to 415 kg. These flagged values (outside the range of 100 to 1000) likely represent outliers and will be reviewed to ensure accurate data capture.

Impact of change: No impact on N, P and GHG results. Three analyses now do not have a result.

3v. Inclusion of Imported Effluent in Acidity Model

The model now includes effluent imported as organic fertilizer as a N source in the acidity model, providing a more accurate representation of N inputs. This inclusion means that farms utilizing imported effluent may observe a slight change in lime requirement recommendations.

Impact of change: No impact on N, P and GHG results.

3vi. Correction of Dolomitic Lime Definition

The Technical Manual Chapter (TMC) defines dolomitic lime as containing over 10% magnesium (Mg), but the code currently misinterprets this threshold as 0.1%. This update corrects the code to accurately define dolomitic lime with a threshold of 10% Mg, aligning with the TMC specification. Adjustments in Mg maintenance were observed, which showed an average decrease of approximately 0.4%.

Impact of change: No impact on N, P and GHG results.

3vii. S Net Immobilisation

Sulfur (S) immobilisation in soil refers to the process where S becomes temporarily unavailable to plants due to its incorporation into the organic matter by soil microorganisms. As a result, the availability of S for plant uptake is reduced. The equation for S immobilisation was found to be incorrect and has been corrected.

Minor adjustments in S maintenance were observed.

Impact of change: No impact on N, P and GHG results.

3viii. Improved Calculation of Soil Labile Potassium

This update improves the calculation of soil labile potassium (proportional to QT K, potassium quick test) by ensuring that effluent potassium (K) is consistently included. Previously, Ksoil (potassium available in the soil for plant uptake) calculations combined other nutrient sources and fertilizers but did not consistently apply this approach across all calculations. The new change incorporates effluent K into the QT K calculation and applies a standardized formula across the code to ensure consistent results.
The incorporation of effluent K resulted in increased overall soil K levels, which in turn resulted in higher rates of K leaching. To counteract this increased leaching, higher maintenance applications of K are now required, +3% on average to maintain soil K levels.

Impact of change: No change in N, P or GHG results.

3ix. Enhanced Temperature Validation Criteria

The validation process has been updated to ensure that estimated temperatures fall within an acceptable range by comparing annual averages for specific geographical regions. Previously, an error would trigger if the temperature ratio exceeded 2 or fell below 0.5, but this method was too restrictive for low temperatures, especially where regional averages were around 1°C, as the allowed range (0.5 to 2°C) was too narrow. The new validation criteria now allow for a broader tolerance, permitting deviations of ±10°C around the regional average.

Impact of change: No change in N, P or GHG results.

3x. Validation Harvest Triggered by the Previous Planting

This update aims to avoid overlaps between crop sowing and harvesting processes in crop management. Previously, there was no mechanism to ensure that the “seed harvest month” did not coincide with the sowing month of the next crop, which could lead to process conflicts, especially in analyses involving “pasture seeds”. With the new update, sowing and harvesting cannot overlap.

Impact of change: No significant changes were observed overall, analyses with overlapping pasture seed crops may show a slight decrease in N and P losses. This is because animals will spend less time grazing, as feed will be available earlier on the crop blocks. In addition, there may be a risk of overfeeding, as feed availability on these blocks was not considered before the change.

3xi. Update Calcium Slow-Release Function

This addresses the slow cation release process, highlighting that the slow-release factor value for calcium (Ca) was incorrectly set to 12, instead of 20, as specified in the TMC. Minor adjustments in Ca maintenance were observed, which showed an average decrease of approximately 7% in maintenance requirements.

Impact of change: No change in N, P or GHG results.