



Release notes for version 6.2.1

December 2015

Prepared by D M Wheeler, N Watkins and M Rollo

AgResearch Ltd.

DISCLAIMER: While all reasonable endeavours have been made to ensure the accuracy of the investigations and the information contained in this report, the OVERSEER® Owners give no warranties, representations or guarantees, express or implied, in relation to the quality, reliability, accuracy or fitness for any particular purpose, of the information, technologies, functionality, services or processes, described in this report, nor do they make any warranty or representation that this report or any information contained in this report is complete, accurate or not misleading. The OVERSEER® Owners expressly disclaim and assume no liability contingent or otherwise, that may arise from the use of, or reliance on, this report including as a result of but not limited to, any technical or typographical errors or omissions, or any discrepancies between this report and OVERSEER® Nutrient Budgets. The contents of this report may change from time to time without notice at the discretion of the OVERSEER® Owners.

COPYRIGHT: You may copy and use this report and the information contained in it so long as your use does not mislead or deceive anyone as to the information contained in the report and you do not use the report or its contents in connection with any promotion, sales or marketing of any goods or services. Any copies of this report must include this disclaimer in full.

Copyright © 2015 OVERSEER Management Services Limited

Published by:

OVERSEER Management Services Limited

<http://www.overseer.org.nz>

OVERSEER® is a registered trade mark owned by the OVERSEER® owners

The OVERSEER® owners are:

The Ministry for Primary Industries (MPI), the Fertiliser Association of New Zealand Inc. (FANZ) and AgResearch Ltd (AgResearch).

.

1. INTRODUCTION

The release of OVERSEER Nutrient Budgets version 6.2.1 (OVERSEER), in November 2015, focused on fixing bugs, improving the operation of the existing model, making minor enhancements to improve functionality, and reworking the allocation of crops and supplements to reduce the incidence of over-feeding error messages.

No new functions have been added to the OVERSEER engine in this version upgrade.

2. ENHANCEMENTS

2.1. Animal reports

Animal reports have been added to show where the animals are on a farm, and what they eat and excrete. The animal reports may be shown before a complete nutrient budget is obtained.

In this release, additional animal reports have been added to show total monthly dry matter (DM) intake (kg DM/month), metabolic energy (ME) requirements (MJ ME/month) and excreta nitrogen (N) (kg N/month) for each animal enterprise. These animal reports are in addition to the location, stocking rate and block pasture revised stock unit (RSU) reports already present in OVERSEER. Additional animal reports are being developed for a future release.

Additional information about the reports and how to use them is available on the website www.overseer.org.nz.

2.2. Feed allocation

In OVERSEER, supplements and crops are allocated to animals each month using a default procedure. At times, this default procedure has predicted over-feeding of animals in a particular month generating an over-feeding error message. A large number of enhancements have been made to the default procedure with the aim of reducing the occurrences of over-feeding error messages.

In general, the allocation of crops and supplements are initially based on data supplied by the user and default allocations as in the previous model. If the initial procedure produces an over-feeding error, the allocation of a given source of feed is then based on monthly animal energy requirements, and the contribution of ME from different sources (brought in and farm-grown supplements, and crops). The month during which feed is consumed as entered by the user is still used, but the proportion of the feed distributed to a given month, and to different animal enterprises if more than one is consuming the feed, varies with the new allocation routines.

Work is underway to add additional animal reports that will show the amount of feed, source of feed and location of feeding as a result of the allocation routines used. This will provide greater transparency to the user around the OVERSEER allocation routines used.

While reviewing the allocation procedure, several allocation maintenance issues were identified and these are listed in section 3.

3. BUG FIXES AND MODEL IMPROVEMENTS

3.1. Calculation errors

The following conditions that resulted in calculation errors have been fixed:

- When depth to non-standard layer less is than 5 cm.
- When the calculated amount of nutrients in the diet was zero, typically due to high supplement usage and using user-defined supplements with low or no nutrient content, this should result in an error message starting 'No nutrients in ...'. However, if this condition occurred and involved nitrogen (N) or sulphur (S), a calculation error occurred before the error condition was captured.
- The default estimation of stock present on blocks was not working all the time for dairy replacements.

3.2. Balancing error

The following conditions that resulted in balancing errors have been fixed:

- Feeding supplements on multiple cropping blocks. See allocation changes (section 3.3).
- Potassium (K) and magnesium (Mg) balancing errors occurring on a crop block. These occurred when a pasture based crop was defoliated (e.g. ryegrass seed crop), then cut and carried before being fed out on one or more pastoral blocks on which either irrigation or effluent were applied. See crop maintenance (section 3.4).
- Feeding supplements on a block when animals were not present. This is now captured by an error message.
- When supplement timing was specified, the transfer of nutrients to the receiving block was not accounted for.
- When effluent to be spread on blocks is not specified as having been applied to a block. This is now captured by an error message.
- When anion storage capacity (ASC) is greater than 100. This is now captured by an error message.

- On crop blocks with annual ryegrass or regrowth seed crops, depending on the crop sequence, a calculation or balancing error could occur.

3.3. Feed allocation bug fixes and improvements

Changes were made to the default feed allocation procedures when fixing the following issues:

- The allocation routine was only allocating supplements to one cropping block even if multiple cropping blocks were specified. This resulted in a balancing error.
- Supplement ME from farm-grown supplements was overestimated. On low supplement blocks, this may have resulted in underestimation of pasture yield, but will only have had a small effect on N leaching. In high supplement input systems, it may have resulted in over-feeding error messages.
- For fodder based crops fed to animals, the ME content fed to animals was based on the ME content of the previous crop. If the ME content of different crops varied greatly, this may have altered the pasture yield and could have resulted in over-feeding error messages.
- When supplements were specified using wet weight and the timing of feeding out was specified, the amounts fed to dairy goats were overestimated.
- When estimating ME intake, the contribution of feed from crops that were cut and carried and then fed out on pastoral blocks was overestimated. This sometimes caused an over-feeding issue. It also resulted in increased leaching of N on the receiving pastoral block. This issue was often associated with a maize silage crop fed out over time.
- When a supplement was distributed to several specific blocks and one of those blocks was a crop block, the time that supplements were fed out did not account for those months the animals were grazing on the block (as specified in the crop rotation table).
- When supplements were fed on a specified crop block, then supplements were being fed on other blocks where there was an animal enterprise in common.
- When the timing of supplement feeding on blocks was specified, then any feeding that occurred on the crop blocks was not accounted for.
- When supplement timing was specified, the transfer of nutrients to the receiving block was not accounted for. This resulted in a balancing error.

In addition, the following improvements to the allocation procedures were made:

- The allocation of farm grown supplements fed on blocks was improved. The allocation now expands feeding from winter months (May, June, July) out to all months as the amount of supplement in the diet increases.

- The order used to display feeding messages has been changed so that when crop ME supply exceeded annual animal ME requirements, the general overfeeding message is triggered; rather, than a monthly level error message.
- In multi-animal farm systems with supplements and crops, if there was a month when only crops were fed, then insufficient feed was being allocated from crops for that month. In the crop allocation procedure, no account was taken of the feed supply from other crop blocks. This has been corrected.
- If 100% of animals in an enterprise were on wintering pads, then supplements are preferentially allocated to the months the animals are on the wintering pad.

3.4. Crops specific

Changes were made in the crop model to fix the following issues:

- The imported nutrient content of a supplement was being estimated using the first initialising calculations (before irrigation or effluent additions were added), whereas the crop removal is based on the final calculation (after irrigation or effluent additions were added). This resulted in a balancing error.
- Acidity was not estimated for annual ryegrass or regrowth seed crops, and could have caused a balancing error or calculation error. If the crop was cut and carried and then fed on pastoral blocks, this may have affected maintenance lime requirements for the receiving pastoral block.
- When cultivation is triggered by either a cultivation or sowing event, this occurs at the beginning of the month. Residue properties should be based on the previous crop, not the crop sown later that month. When cultivation followed a fallow period, the residue from roots was not being released. This potentially caused an anomalous result indicating that N leaching was less when cultivating out of fallow.
- The cut and carried crop that was consumed on pastoral blocks was not included in the distribution ratios of dung, urine or products between blocks. This may have affected between block comparisons, but would have had less effect on whole farm N losses unless there were major differences in soil properties between blocks.
- Incorrect calculation of a crop leaching parameter when an impeded layer is entered. This may have resulted in leaching from crop and background models being lower on heavy soils or soils with high clay content.
- When defoliating a cut and carry pasture phase in a crop sequence, standing nutrient was not reducing. This resulted in high nutrient removal and low N leaching rates.

In addition, the following improvements to the crop model were made:

- Pre-crop options have been changed from 'Vegetable crop' to 'Crops' and 'Pasture' to 'Grazed pasture'. The default settings were updated to give an uptake profile as close to the next operation as possible. If the uptake profile is not correct, this can be modified by using the stop growth and stop uptake options.
- Note that cut and carry pasture systems can be entered as grazed pasture if this extends no later than the first six months of the previous year (so that there are no residual urine effects). If cut and carry continues into the reporting year, it can probably be entered as second year seed crop, with the defoliations entered.

3.5. Hydrology

Following reviews of the soil properties in OVERSEER and the Hydrology Technical Manual chapter, the following changes were made to the hydrology model:

- Standardised initialization of soil water content at wilting point (SMwp). In most cases, this would have had no direct effect on soil moisture contents in the reporting year, but could have had a small effect on those crop blocks where residue from pasture-based systems was carried into the reporting year (section 3.1, Hydrology Technical Manual chapter).
- Initialization of profile available water (PAW) at rooting depth should have been based on field capacity, not the soil moisture (SM) content. The effect of this change on outputs from the hydrology model is usually minimal (section 2.1.2 Hydrology Technical Manual chapter).
- Included the maximum rooting depth in the calculation of PAW on fruit, cut and carry and pastoral blocks. This can affect transpiration rates, actual evapotranspiration (AET) and hence drainage from these systems.
- Transpiration was overestimated:
 - When PET was greater than the soil moisture content to the rooting depth.
 - Because the condition for soil moisture in the top 10 cm should have been based on PAW in the top 10 cm.

The net effect of changes required to fix the above two points is a decrease in AET and an increase in drainage, particularly on medium rainfall sites (those where water is limiting transpiration for some of the time), e.g., 30-40 mm change when rainfall was 1,100 mm. (section 3.4.1 Hydrology Technical Manual chapter).

As outlined in the Hydrology Technical Manual chapter, N leaching and hence drainage is estimated to 600 mm for all pastures and crops. However, transpiration is based on water available to the rooting depth.

3.6. Animal model

More work has been undertaken to reduce differences between the different inputs methods for animals (peak cow, monthly data input and the generate option to add monthly data). This has resulted in an additional option for dairy replacements in the “peak cow” and “generate” options. Dairy replacements can now be taken off farm at birth, at weaning or 9 months, or left on farm permanently.

In addition, weights for the monthly numbers, generate and peak cow numbers input methods have been standardised. Definitions are as defined below:

- Average mob weight is entered for mixed age animals, and is the maximum average weight of the mob during the year, excluding conceptus (i.e. the embryo, chorionic sac, placenta, and foetal membranes in the uterus). The Average mob weight is used for mixed age animals, because live weight gain over the year is small and maintenance requirements are driven by the mob weight.
- Mature weight is entered for all other classes; this is the weight of animals at maturity (aged 4 or 5+ years depending on enterprise). The mature weight may not necessarily be attained on the farm; animals may be sold to the works before the mature weight is attained. Mature weight is used to estimate live weight gain, fat and protein levels in that live weight gain, and hence the energy requirements for live weight gain and the live weight for maintenance energy requirements.

Changes were made in the animal model to fix the following issues:

- The amount of live weight sold, reared and brought for dairy herds (milking cows and replacements) should be such that live weight reared (calves, replacements, mature animals) plus live weight brought (replacements to top up numbers) is close to live weight sold (when replacements leave or culls are sold).
- For the RSU input model, live weight for sold to store, sold to works and for mutton and lamb were underestimated.
- In the RSU input model, live weights used in the greenhouse gas emissions model were not accumulating.
- When multiple calving dates are entered, replacements may be on farm over a wider range of months compared to an operation with a single herd. This resulted in an error message reporting there was insufficient feed in a given month.
- In the location report, the presence of dairy replacement animals on farm was not always showing properly.

3.7. General

In addition, the following changes were made to fix identified issues:

- Wetlands flows were adjusted for drainage effectiveness.
- Wallows are only allowed on flat land to align (based on McDowell *et al.*, 2008).
- The pasture quality data for C4's was changed to correspond to those reported in the Technical Manual chapter 'Characteristics of Pasture'.
- N volatilisation for imported pig effluent was carried across to other nutrients.
- The reduction in plant growth due to dryness was underestimated. This usually only had a small effect on total pasture growth, but sometimes there was a small shift in the timing of pasture growth.

The following general improvements have been made:

- Added the ability to enter monthly P concentrations for pasture, to align with the ability to add monthly N concentrations and ME content.
- The initial value of the soil N pool used to estimate the background pasture N pool has been adjusted to account for the amount of DM produced. On some blocks, particularly those with low productivity, background N leaching was high, sometimes 2 to 3 times greater than leaching from urine patches. This was a result of the soil N pool not reaching equilibrium (i.e. initial and final soil N levels were similar) because removal was low. Setting the initial soil N pool proportional to DM production resulted in equilibrium occurring more frequently and resulted in lower background N leaching.

4. USER INTERFACE CHANGES

Changes were made to the user interface to fix the following issues:

- When describing the dairy enterprise using the peak cow number option, selecting replacement grazing as 'Calves reared on farm' resulted in a 'Save was unsuccessful because some of the data is invalid' message. This has been fixed so that it does save.
- On the Dairy – Numbers – Milking Mob page, when calving date was set to default, i.e. the Default flag is displayed, any value entered into the Drying off field was not saved. On returning to the page after saving it, the field was blank. Now as expected, if Calving date is not default, i.e., the flag is reset, even if the field value is the same as the default value, the value entered for Drying off is saved.
- If supplement description was direct feeding, the option to place in storage was shown. This option has been removed.
- Fertiliser applications were not always saving when they were copied.

The following general improvements have been made:

- Currently when a file has been corrupted and generates the "Something has gone wrong" error, the user cannot download the file. The ability to download the file has been improved so it can be sent to the Help Desk for analysis.
- The lists of fertiliser products available from the internal database has been revised and extended.
- The problem with the order of files in folders changing has been resolved. The files are shown in order of the date created.

5. KNOWN ISSUES

While we have fixed many of the issues identified by users, some are still in the process of being incorporated into the application and have not made it into this update. There are others that we need to investigate further and don't have a solution for at this stage. Existing known issues are described in the support area of MyOVERSEER (www.support.overseer.org.nz), which is updated as new ones are identified.

Recent additions include:

- Newly identified reasons for balancing errors are:
 - When there is a mix of defoliation and grazing of crops.
 - For supplements fed on a specified crop block, the model is not recognizing animals that are on the grazed pasture phase.
 - On crop blocks, due to cut and carry distribution to pastoral blocks not excluding the crop block.
 - On crop and fodder crop blocks, if the Stop uptake option is selected and there are 2 or defoliations. This is due to no allocation of yield to the second defoliation.
- Newly identified reasons for calculation errors are:
 - When a wintering pad is present but no feed is fed out (feed pad + grazing option).
- When soil series data is selected, the default structural integrity, ASC and TBK number is using the soil order value, not the soil series value.
- In the Block pasture RSU report, the RSU for crops and fodder are not displayed correctly.
- The embodied costs of feeding P as an animal health supplement has not been included in the embodied CO₂ emissions. This would have minimal impact on total greenhouse gas emissions.
- If 'Leaching – urine patches' from a block report is noted as zero, then please send your OVERSEER file through to the OVERSEER helpdesk to be reviewed.

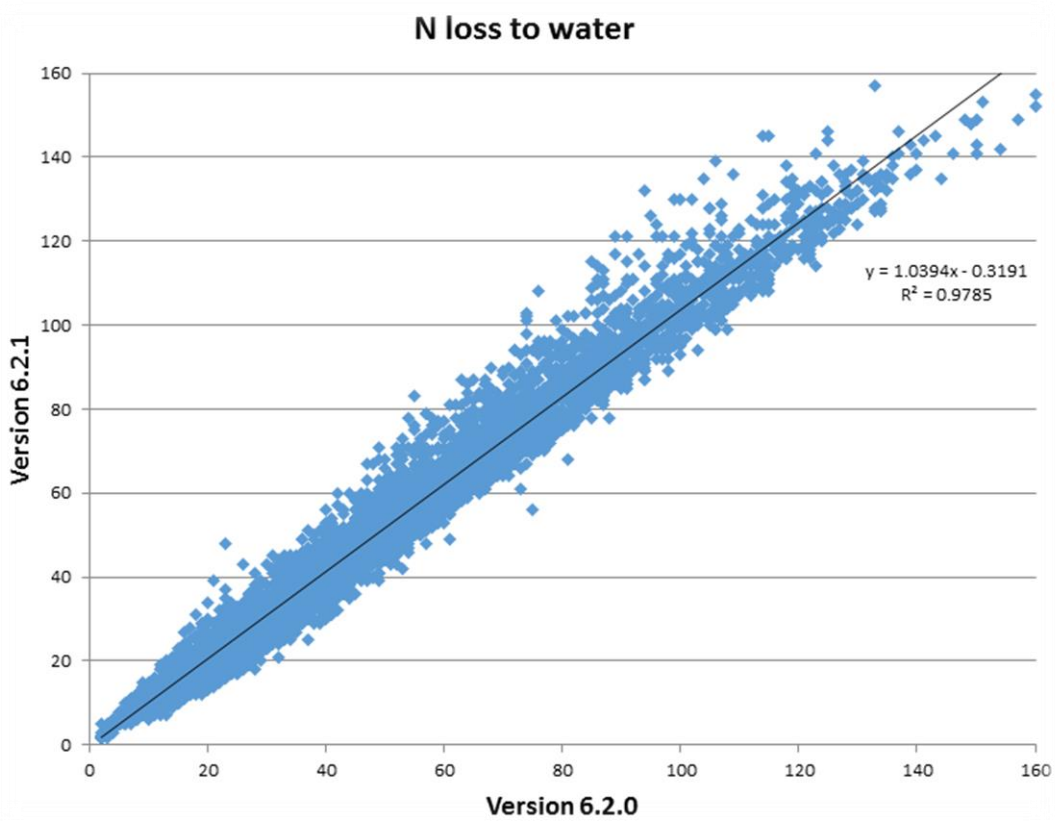
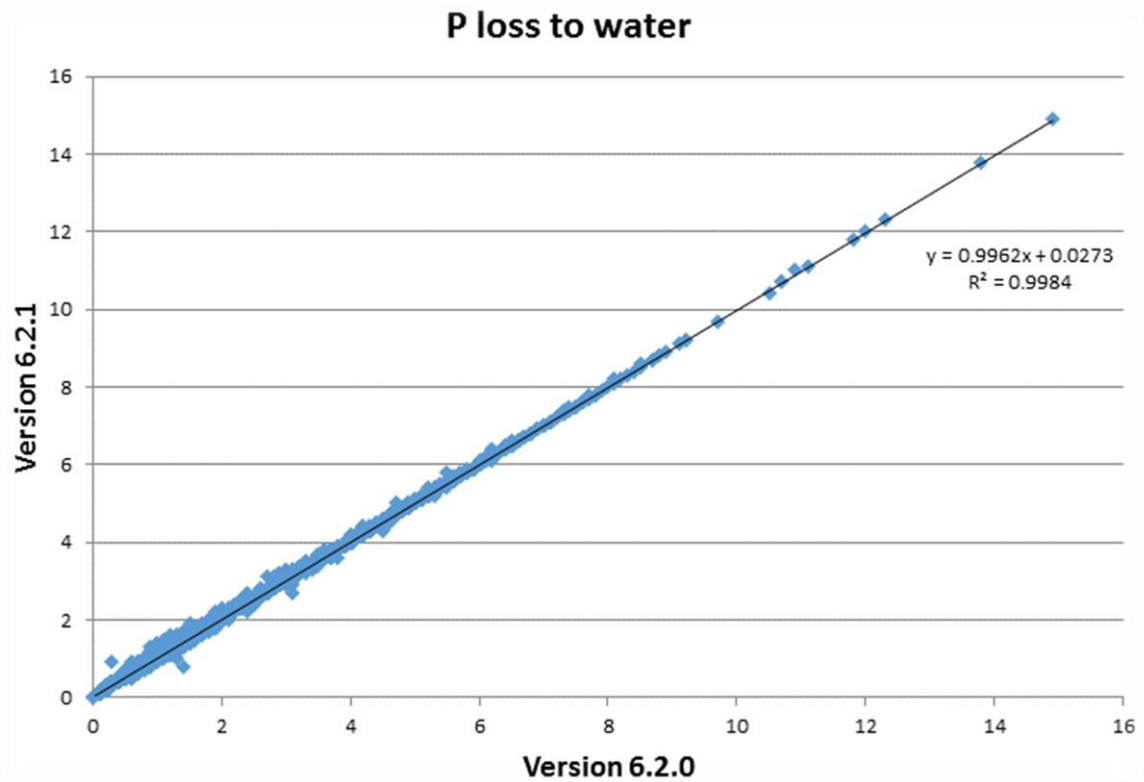
6. IMPACT OF CHANGES

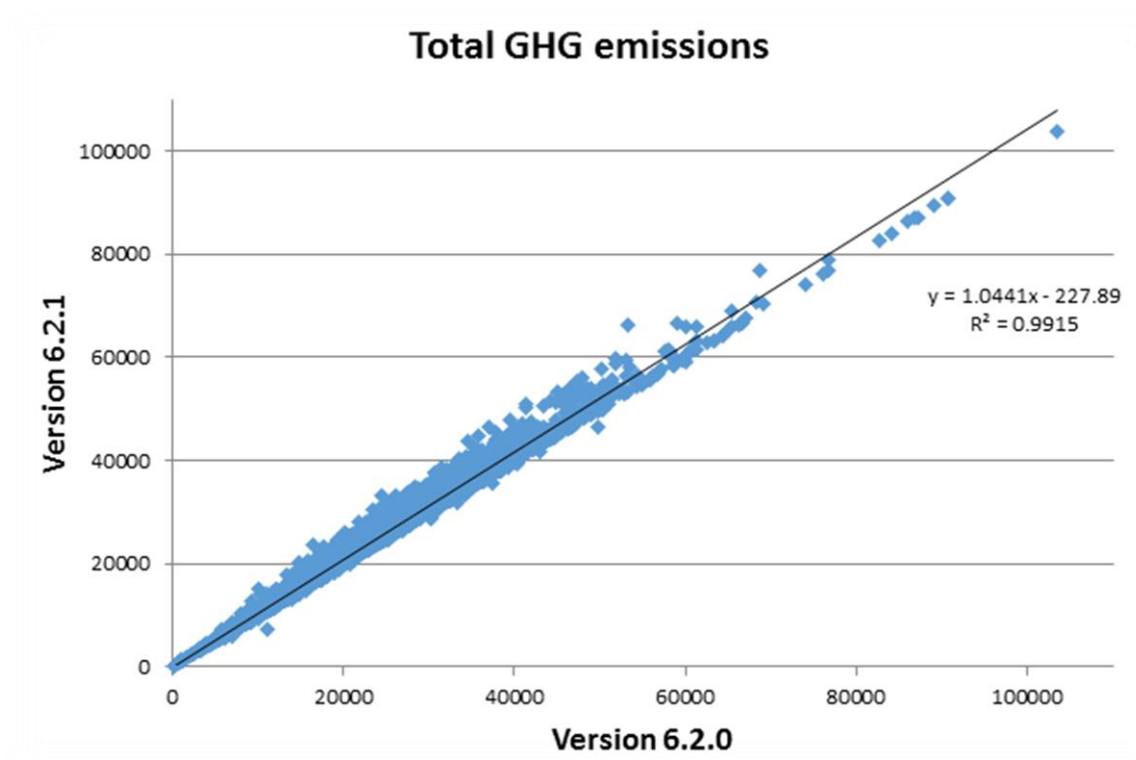
To provide users with an indication of the impact on outputs of the version change we have analysed the results from a range of farm files. The farms used in this analysis were largely dairy farms. The analysis was undertaken of the difference in N and phosphorus (P) losses to water, and greenhouse gas emissions between version 6.2.0 and version 6.2.1. On average, N losses to water increased by 2.9%, average estimated P losses to water increased by 2.4%, and greenhouse emission estimates increased by about 2.8%. For N loss to water, the largest percentage changes occur at low (< 20 kg N/ha/year) N loss to water rates.

The range of percentage differences is shown in the following tables and figures. These highlight that in many cases the impact of the changes are small, but occasionally, a large change can occur on an individual farm.

Percentage changes in N loss to water, P loss to water, and greenhouse gas emissions between version 6.2.0 and version 6.2.1.

	N loss to water	P loss to water	Greenhouse gas emissions
Average change	2.9	2.4	2.8
Minimum change	-46.2	-42.9	-16.6
Maximum change	150.0	100.0	48.7
25th percentile	-2.9	0.0	0.4
75th percentile	8.0	0.0	3.8
% with no change	17.4	80.1	0.2





REFERENCES

McDowell, R.W., Wheeler, D.M., DeKlein, C.A.M., and Rutherford, A. J. (2008). Deer and environment: Overseer[®] upgrade. Grasslands Association 70: 95-99.
<http://www.grassland.org.nz/proceedings.php>