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INTERPRETING PASTURE EATEN AND PASTURE GROWTH ESTIMATES FROM OVERSEER AND WHAT TO LOOK FOR WHEN COMPARING THEM WITH OTHER MEASURED AND MODELLED ESTIMATES

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Abstract

When Overseer users find instances where differences in pasture eaten/ha are more than one tonne DM/ha different from other estimates, they should investigate the assumptions used for each estimate rather than assuming a particular estimate is superior to any other.

In this paper we discuss why Overseer nutrient budgets for DairyNZ farmlet trials produced predicted pasture eaten/ha and pasture growth/ha estimates that differed from the measured estimates. We investigate factors important for generating these differences, and what assumptions and information need to be checked to improve and verify estimates.

Background

Nutrient loss predictions from Overseer are strongly linked to the volume of pasture and other feeds eaten. In addition to the estimates from Overseer of pasture grown and eaten, users may also obtain various other estimates of pasture use for an individual farm, e.g. individual paddock yields measured on farm, DairyBase, and Farmax modelling. Consequently, Overseer users need to know how much difference between these estimates and Overseer is tolerable, and which estimates can be used reliably for farm management.

Our interest in this topic was stimulated when Overseer nutrient budgets for DairyNZ farmlet trials (Glasse et al., 2013) initially produced pasture eaten/ha and pasture growth/ha estimates that differed from other estimates by 21 and 17% respectively (3.4 and 3.1 t DM/ha respectively). Subsequently we refined these estimates to those reported here (Table 1 & 2), by checking assumptions and information used. Also an updated version of Overseer was used. We investigated which factors were important for generating these differences between estimates, and which assumptions and information need to be checked to improve and verify estimates.

More recently, estimates of pasture eaten for the 2013-2014 financial year for 142 Waikato farms were obtained by separately applying two models (Overseer and DairyBase) to data collected by the same person for each farm. A reasonable alignment was expected, as a recent stocktake of the feed intake assumptions used in decision support tools, including Overseer, suggested that many models use energy equations from the same source (Frater et al., 2015). As an example, only minor discrepancies between models were found between estimates of feed intake for sheep. While DairyBase was not included in the comparison, it also uses energy equations from sources identical to those used in Overseer (Nicol & Brookes, 2007). This raises the question if differences exist what are the contributing factors?

Results

DairyNZ Farmlets: Pasture eaten estimates.

In a comparison between two trial farmlets on DairyNZ's Scott Farm near Hamilton, with differing rates of N fertiliser use (Glasse et al., 2013), Overseer version 6.2.1 predicted a 33% difference in N leaching between the farmlets for a typical year, compared with a measured N leaching difference averaging 62% for two years (Beukes et al., 2012). Overseer also predicted a 4.2% reduction (602 kg DM/ha) in pasture eaten/ha compared with a reduction of 7.3% (1100 kg DM/ha, Table 1) estimated by using industry standards for energy requirements based on milksolids production and stocking rate (DairyNZ, 2010). Estimates of pasture eaten in the DairyNZ report include 6% wastage of pasture offered but not eaten at a single grazing. We excluded this 6% wastage in the estimates given in Table 1, for a better comparison with Overseer estimates: Overseer calculates pasture eaten from estimates of energy consumed using annual animal energy requirements and does not include wastage in the estimated pasture eaten.

The Overseer estimates of pasture intake were taken from the pasture production report, included under scenario reports. This figure estimates pasture intake from grazing and does not include pasture grown that was made into silage and subsequently fed to the cows in the same year. In the case of the trial Control farmlet this amounted to 857 kg DM/ha and for the Zero N farmlet 444 kg DM/ha. When these amounts were added to the Overseer pasture eaten estimates, the estimates of pasture eaten/ha became much closer (15 and 14.2 t DM/ha) to the estimates from energetics-based standards (first column Table 1).

Table 1: Estimates of pasture eaten/ha for DairyNZ trial farmlets using industry standards, compared with estimates from Overseer 6.2.1

	Pasture eaten (t DM/ha) based on published requirements (DairyNZ, 2010). (6% wastage removed)	Overseer estimated pasture eaten (t DM/ha)	Difference measured versus Overseer estimate (t DM/ha)
Control farmlet (181 kg N fertiliser/ha)	15.0	14.2	0.8
Zero N farmlet	13.9	13.6	0.3
Difference between farmlets	1.1	0.6	

DairyNZ farmlets: Pasture production and utilisation estimates

Overseer calculates pasture production by dividing the estimated pasture intake by pasture utilisation. Overseer uses a default utilisation of 85% for dairy farms. Using this default, Overseer estimates of pasture production were 1.1 t DM/ha above or 0.8 t DM/ha below the measured pasture production of each farmlet (Table 2).

Table 2. Measured pasture growth and utilisation (%) compared with Overseer (6.2.1) estimates for the two DairyNZ research farmlets (Glasse et al., 2013).

	Measured pasture growth (t DM/ha)	Overseer estimated pasture growth (t DM/ha)	Difference measured versus Overseer estimates t DM/ha
Control farmlet, 181 kg N/ha	18.7	17.5	1.1
Zero N farmlet	15.8	16.6	-0.8
Difference between farmlets	2.9	0.9	
Calculated pasture utilisation pasture eaten (Table1)/pasture grown (Table 2)	Measured	Overseer	Overseer (adjusted for conserved pasture)
Control farmlet	80%	81%	86%
Zero N farmlet	88%	82%	85%

Since Overseer pasture growth estimates are not used anywhere else in the model, these differences are unimportant in relation to the main purpose of Overseer which is estimating nutrient loss. However, these pasture growth estimates highlight the need to determine the reliability of estimates provided by Overseer.

The difference in pasture growth between farmlets was 2.9 t DM/ha and 0.9 t DM/ha for the measured and Overseer estimates respectively. This questions if the Overseer estimate of differences between farmlets was large enough to allow for an additional 180 kg N fertiliser/ha applied to the control farmlet. The Overseer estimates imply that the response to N fertiliser applied was poor (5 kg DM/kg N applied), compared with 16 kg DM/kg N applied for the measured estimate.

An explanation for the poor apparent response to N fertiliser using the Overseer estimates of pasture growth is likely to be in the default 85% utilisation setting in Overseer. Indications are that in reality the use of N fertiliser on the Control farmlet lowered pasture utilisation to 80%, compared with 88% for the Zero N farmlet. This meant a higher proportion of the assumed extra pasture grown on the control farmlet was not eaten (wasted) compared with when the Overseer default was applied, with the opposite being the case for the Zero N farmlet.

Lessons for Overseer users: Estimating pasture eaten and pasture grown

Step One: Pasture Metabolisable energy (ME) intake = animal ME requirements for milksolids production and other energy requirements, **less the ME that is supplied from supplements and crops.**

The equations used to estimate the animal ME requirement are very similar between models (Frater et al., 2015). Therefore, the differences are more likely to occur between estimates as a result of the records and assumptions used to estimate ME supplied from supplements and crops.

Step Two: Pasture DM intake = Pasture ME intake/ Pasture ME (MJ/kg DM)

Many estimates of the ME content of pasture are standardised at 11 MJME/kg DM. This may not always be appropriate. For irrigated South Island pastures this will be an under estimate. If the pasture quality is higher than the standards used, pasture DM intake will be overestimated.

Step Three: Pasture DM grown/ha = Pasture DM intake/ estimated % utilisation

If concerned about the Overseer pasture growth estimates, and with good evidence of pasture utilisation changes resulting from changes in farm systems (e.g. N used/ha), altering the default value for utilisation may result in figures that make more sense and better align with measured estimates.

Annual pasture grown/ha is very difficult to measure accurately. There is an error in any estimate of pasture grown, even in DairyNZ trials where considerable effort is made to measure frequently and consistently.

Conclusion

In closely monitored Dairy NZ farmlets, estimates of pasture growth and pasture eaten from Overseer differed by up to 10% from measured values. Differences are not unexpected due to the assumptions used and the errors associated with measuring pasture growth and pasture eaten in field measurements.

If there are concerns about the differences between estimates and measurements then the following factors could be influencing the results.

- 1) The actual quality of feed and/or pasture may differ from the values used to calculate the feed demand (feed eaten).
- 2) The Overseer defaults for pasture utilisation may be different to the actual pasture utilisation on the farm. Differences in pasture growth estimates are less important to the Overseer outputs, than differences in pasture eaten/ha.
- 3) Supplements made from pasture on farm and fed back out within that year may account for some of the difference in pasture eaten and grown depending on which figure is reported from Overseer.

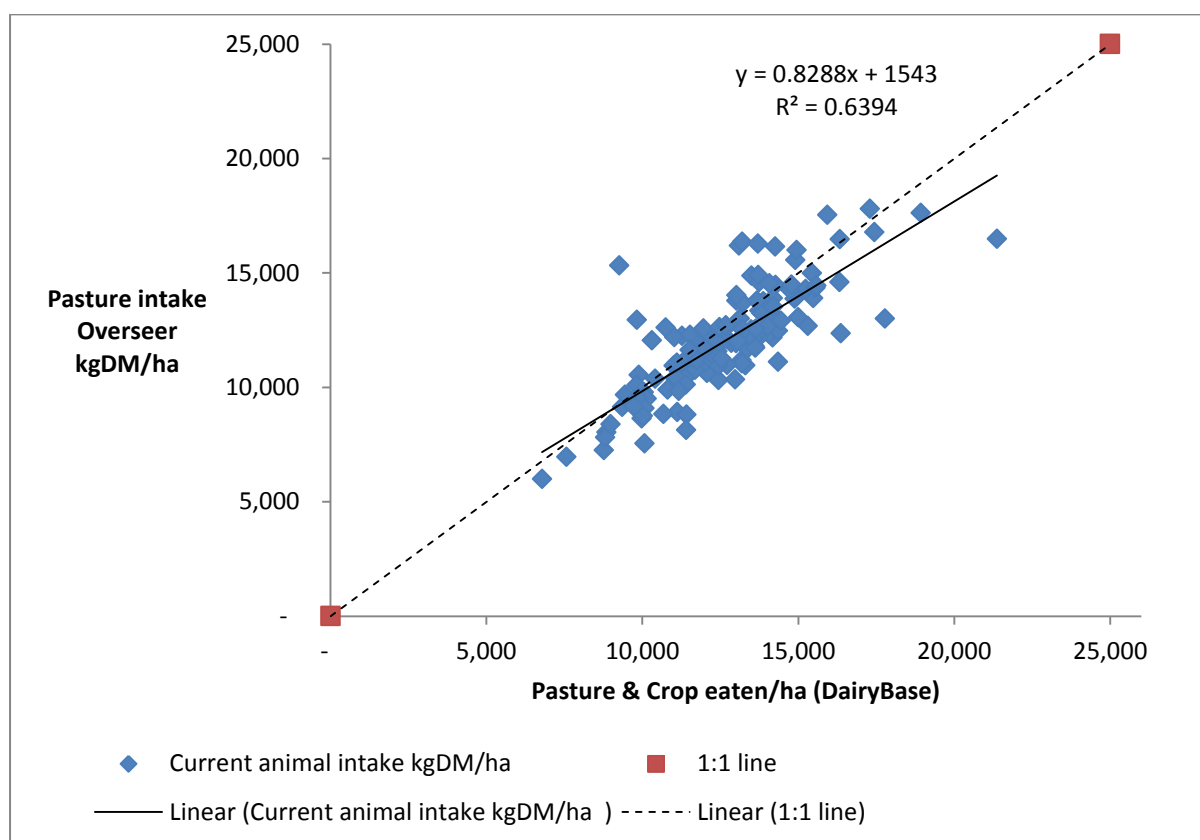
Comparing DairyBase and Overseer estimates of pasture eaten on the same farms

DairyNZ's Baseline project has collected information from dairy farms across New Zealand in order to investigate the economic consequences of farm system change aimed at reducing nutrient loss. As a result, physical information of farm performance from 142 Waikato dairy farms (Owner-operated) was available, usually collected by one person, and then entered into both DairyBase and Overseer, by two different people. Both DairyBase and Overseer contain similar models for estimating pasture eaten/ha based on energy demand for the metabolic energy requirements for maintenance, growth and milksolids production. Estimated mean pasture eaten/ha for these farms differed by 0.63 t DM/ha (or 4.9%, Table 3) between the two methods, with Overseer usually providing a lower estimate than DairyBase (correlation coefficient of 0.64, Figure 1).

Table 3: A comparison of mean estimates of pasture eaten/ha for 142 Waikato dairy farms using DairyBase and Overseer.

	Pasture and crop eaten (DairyBase) (kg DM/ha)	Current animal intake (Overseer) (kg DM/ha)
Mean	12,671	12,045
Standard deviation	2,179	2,259

Figure 1: Relationship between pasture intake (animal intake kg DM/ha, Overseer) and pasture and crop eaten/ha (DairyBase) for 142 Waikato dairy farms. (Source DairyNZ Economics Group)



Of the 142 farms, Overseer estimates for 69 differed by more than 1 tonne DM/ha from the DairyBase estimates. For the majority of these farms the estimates were less than the DairyBase estimates (Fig. 1). The other 73 farms had values that were within one tonne DM/ha eaten for both estimates.

One reason for Overseer estimates generally being lower than DairyBase is that DairyBase includes any feed grown on farm including crop that is fed back to the herd within the production year, e.g. maize and pasture silage. The Overseer figure used in this comparison is for pasture intake only from the pasture production report. This does not include any crop eaten on farm or any pasture that was conserved and fed back to the herd. This highlights the opportunity to align the parameters reported between the two models so that there is more certainty that the comparisons are actually accounting for the same sources of feed. The new

animal reports in Overseer includes DM intake for all sources (pasture, crop and farm grown supplements). This figure could provide an improved estimate relative to DairyBase, but at this stage the relationship with DairyBase estimates has not been tested.

The comparison in Figure 1 also highlights that, for some farms, the estimates are not well aligned. On one farm the difference was more than 6 t DM/ha between estimates. It is most likely that such results are the result of differing interpretations of input figures, and some different assumptions used around feed quality and utilisation in each estimate of the same farm.

Conclusions

The comparison of estimates of pasture eaten/ha between DairyBase and Overseer for 142 Waikato Dairy farms showed that the estimates for DairyBase are often higher, and this is most likely due to the inclusion of home grown pasture and crop harvested (e.g. for silage) and fed to the herd. This is not included in the Overseer estimate of pasture intake.

The comparison also highlighted that for some farms the estimates diverged markedly. In instances where this occurs it is most likely that input data differed between models, and it is unlikely that any particular model was responsible for generating these differences.

Where Overseer users find instances where differences in pasture eaten/ha are more than 1 tonne DM/ha different from other estimates, they should investigate where the data used for the calculation of energy intake differs between the various estimates rather than assuming any one model provides a superior estimate.

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