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**Ranking paddock performance using data automatically collected in a New Zealand dairy
farm milking system**

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James Haultain

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Abstract

Knowledge of individual paddock performance can assist management decisions and contribute to improved productivity and profitability of dairy farms. Annual paddock performance is typically assessed by estimating the net herbage accumulation through regular ‘farm walks,’ but this is not a routine practice on many dairy farms. The aim of this research was to test the hypothesis that automated daily records of milk production could be used in conjunction with the number of cow grazing events to rank paddocks according to their annual net herbage accumulation. This required the assignment of herd milk yield values at AM and PM milkings to the corresponding paddock grazed, along with records of the number of cows present.

Automated recording of grazing events was required and achieved using GPS devices on a small number of cows per herd. The minimum requirement of GPS devices was tested by a simulation process to determine suitability for this task. The simulation process identified that three GPS units were required per herd of cows, with each fixing one position per paddock entered. The units needed have a 95% circular error probable of 6m (+/- 6m) or better.

Prior to field trials, the DairyNZ Whole Farm Model was used to collect two seasons of data. Milk yield data, number of cows in the herd and paddock grazed were used to test the hypothesis. The number of grazing events for each paddock was a good predictor of the ranking of net herbage accumulation per paddock, with an r value of 0.92. Prediction using milk yield was also reliable ($r = 0.82$).

Following the modelling results, a year-long field trial was conducted on a commercial dairy farm between December 2011 and 2012 to further test the hypothesis. All measures of performance had similar spreads of data (>100%); however no measures ranked paddocks in a similar order to that of herbage accumulation. Consequently no association was evident between the ranking order of paddocks by grazing events and herbage accumulation, likewise no

association between milk production and herbage accumulation. There was a significant association between calculated pasture eaten and herbage accumulation however this method failed to identify the poorest performing paddocks.

Two probable reasons that no method accurately ranked paddock performance in terms of herbage accumulation were; the accuracy of estimated herbage accumulation figures and the accuracy of the estimated figures of supplements fed in the paddock and the level of wastage occurring. The extent that pasture management practices and preferences have on dictating the measured performance is also unknown and may have also been a leading factor in the poor correlation. Furthermore, ambiguity surrounds the relationship between daily intake and daily milk production and how long it takes for feed eaten to be harvested as milk. A clearer understanding of why the performance measures do not match is required before they can be used as a proxy for herbage accumulation.

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List of Abbreviations

DGPS	Differential correction global positioning system
GPS	Global positioning system
Fix	Location fix by GPS, whereby the GPS finds its location
R95/CEP	Radius 95%/Circular error probable
SA	Selective availability
EID	Electronic Identification
ha	Hectare
HA	Herbage accumulation
kg	Kilograms
t	Tonnes
DM	Dry matter
MS	Milksolids (Fat + Protein)
MJ ME	Mega Joules of Metabolisable Energy
SCC	Somatic cell count
BW	Breeding worth
PW	Production worth
NDVI	Normalised difference vegetation indices
PGSUS	Pasture growth simulation using smalltalk
WFM	Whole farm model
RPM	Rising Plate Meter
Main herd	Cows that produce milk towards the milk vat
Dry cows	Cows that are in the main herd but are not lactating
Herd 3	Cows that are producing colostrum milk or require special treatment