Pasture Measurement Data Improves Timeliness and Confidence in Grazing Management Decisions

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Summary

Dairy farmers may be able to increase farm profitability by obtaining pasture measurement data. Four Tasmanian dairy farmers participated in an eighteen-month study investigating the value of accessing regular pasture measurements. The farmers reported an increased confidence in their visual observations of pasture covers by having access to the provided data and for three of the four farmers this has led to an estimated improvement in profitability ranging from $90/ha to $550/ha.

Abstract

Pasture consumption is a key driver of dairy farm profitability in temperate dairying regions, including New Zealand and Tasmania. Grazing management has been a focus of Tasmanian dairy extension activities for over four decades and during this time there has been significant improvements in pasture consumption. However, there are still large gaps between the upper limit of pasture consumption achieved through experimental research and modelling, and the maximum pasture consumption advanced Tasmanian dairy farmers achieve in practice. A Participatory Action Research (PAR) approach was applied to test whether it was possible to further increase pasture consumption on farm, and to identify key factors that would help decrease the gap between possible and currently achieved levels of pasture consumption. The PAR group included farmers, advisors, researchers and an extension officer. Regularly measuring pasture biomass was identified by the PAR group as the practice most likely to offer biggest gains in pasture consumption. Four advanced pasture managers, already achieving high pasture consumption on their farms, participated in an 18-month study to determine the impact of regularly receiving pasture measurement data upon their grazing management decisions and farm pasture consumption. The study aimed to evaluate the value and effect of access to regular individual paddock biomass and pasture growth rate data. For three of the four participating farmers, regularly receiving data was valued between $90/ha and $550/ha and led to more accurate and confident decision making.

Keywords

Pasture consumption, Tasmanian dairy industry, Monitoring

Introduction

Pasture consumption is a key driver of dairy farm profitability in pasture-based dairy systems (Moran 2000, Rawnsley et al 2007), and for the past 30-40 years research, development and extension in Tasmania has focused upon improving on-farm pasture consumption. From 2006-07 to 2016-17 average pasture consumption on benchmarking Tasmanian dairy farms has increased from 8.5 t DM/ha to 10.6 t DM/ha (Tasmanian Institute of Agriculture 2018). While this is a significant improvement, it is still well below what is theoretically possible (Rawnsley et al 2007). Recent Tasmanian dairy feedbase research projects (20.12; Beyond 20.12; More Milk From Forages) have successfully investigated how to lift the theoretical ceiling of pasture consumption. However, there is still a large gap between that achieved on-farm and what is currently theoretically possible. The highest level of pasture consumption recorded in Tasmania in 2016-17 was 15 t DM/ha (Dairy Australia Limited 2018).

The Dairy On PAR project used a Participatory Action Research (PAR) approach to address the challenge of increasing home-grown forage consumption. A PAR group was established which involved seven farmers, a milk supply officer, agronomist, consultant, extension officer, social researcher, feedbase researcher, feedbase technical officer, and the feedbase manager for the project funding body (Dairy
Each participant had a high level of expertise in crop and/or pasture management. This group reviewed their existing knowledge relating to home-grown forage consumption then identified and prioritised key opportunities for improving forage consumption levels. The greatest opportunity, identified by the PAR group, was regular measuring and monitoring of pasture biomass to aid in grazing management decisions. A research project was developed to investigate whether access to regular pasture biomass data could improve the grazing management decisions of farmers who already had a high level of grazing expertise and if so, to establish the value of these improved decisions.

**Methods**

Four farmers from the PAR group participated. One of these farmers had recently stopped regular pasture measurements because of equipment break-down. Two farmers had undertaken regular measurements in the past (> 5 years ago) but were no longer measuring pastures and were relying on accurate visual assessments. The fourth farmer had regularly measured pasture in the past but now measured pasture only at critical points in the season.

Qualitative data were collected from each farmer through face-to-face, semi-structured in-depth interviews at key intervals during the study. Interviews were conducted prior to project start, at the mid-point and at the project conclusion. Informal monitoring was conducted via phone in-between the more formal interviews.

Interviews, prior to project commencement, collected information relating to existing pasture management practices and included: how rotation length was determined, how feed was allocated and how decisions were made in relation to the timing of nitrogen applications, closure of silage and hay paddocks and irrigation start-up. Follow-up interviews investigated how farmers had used the data, how they viewed the reliability of the data, which (if any) pasture management decisions were impacted as a result of ready access to data and the estimated value of the data to their farm operations. The formal interviews were digitally recorded and transcribed. Notes from the informal phone interviews were made by the interviewer. The research was approved by the University of Tasmania Social Science Ethics Committee (H0015305).

Technical officers employed by the Tasmanian Institute of Agriculture visited each farm on a weekly basis during spring, summer and autumn and fortnightly during the winter period when cows were not lactating. This occurred over an 18-month period, with the technical officers measuring the pasture biomass using a rising plate meter (Farmworks Systems, Feilding, New Zealand). The time taken on each occasion, and hence cost, of undertaking the farm walk to collect the pasture biomass depended on the farm size and topography. It ranged from 3 hours to 5 hours (approximate cost of $0.60 to $1.20/ha). The pasture biomass (kg DM/ha) and growth rate (kg DM/ha.day) for each paddock on the milking platform of each farm was provided to the farmer via email as both an Excel spreadsheet and a feed wedge in the online pasture management tool Pasture.io (https://pasture.io).

**Results**

All four farmers reported checking and reviewing the data when it arrived, with each farmer then using the data in a different manner (Table 1). After the initial period of measuring, Farmer 1 developed a preference for monitoring his farm’s average pasture cover and growth rate and did not use the individual paddock data provided. Farmer 2 used individual paddock data to rank paddocks in a feed wedge using a homemade Excel spreadsheet. Data supplied was then used to calculate potential cow intakes, determine supplement required and develop the weekly grazing plan. Farmer 3 looked at individual paddock data to confirm the validity of decisions currently being made and based on visual assessment of pasture covers. Farmer 4 used an online commercial program (Pasture.io) to calculate cow intake and to adjust supplementary feeding as required.

Despite the differences in how the data was being used, all the farmers reported using the data in conjunction with visual assessments of their pasture; none solely relied on the data supplied. As Farmer 2 explained “So I get that information, put together – you know look at the grazing rotation, where they’ve
been, where they’re due to go, look at the amount of feed that’s on the feed wedge, put a bit of a plan together. And then hop on the bike and go and ride around and make sure that’s right. Then I’ll come back and change it if need be.”

Table 1. Pasture measurement data usage and value of data for each of the four farmers in the study.

<table>
<thead>
<tr>
<th></th>
<th>Farmer 1</th>
<th>Farmer 2</th>
<th>Farmer 3</th>
<th>Farmer 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herd size</td>
<td>725</td>
<td>500</td>
<td>1020</td>
<td>430</td>
</tr>
<tr>
<td>Milking area</td>
<td>260</td>
<td>124</td>
<td>260</td>
<td>123</td>
</tr>
<tr>
<td>Regular measurement of pasture at some point in the past</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Regular measurement of pasture within 6 months of project start</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Looked at the data when it was sent through each week</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Used individual paddock data to set grazing order of paddocks for the upcoming week</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Used individual paddock data to allocate feed for the milking herd</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Having access to data changed decisions relating to nitrogen applications</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Having access to data changed decisions relating to silage production</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Having access to data changed decisions relating to grazing residual management</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Having access to data changed decisions relating to irrigation management</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Planned to continue regular pasture measurements after project concluded</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Improved confidence in decisions made</td>
<td>YES</td>
<td>-</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Estimated financial value of regular pasture measurement data to their business</td>
<td>NONE</td>
<td>$90/ha</td>
<td>$180/ha</td>
<td>$550/ha</td>
</tr>
</tbody>
</table>

Three of the four farmers reported there was financial value to their business in having access to regular pasture biomass and growth rate data. Each of these three farmers valued the information to the extent that they would pay someone outside of their farm team to physically collect the data. As Farmer 4 explained “It’s not a very big cost to do it really, and it’s hard to put a price on making a decision earlier… So if you make your decisions earlier and with more surety that 60 bucks a week could make you $60 or $80,000 a year, with ease… if you drop a few paddocks at the right time you’re getting better regrowth, the cows milk better, plus you don’t have to buy so much bought in feed. You get a double win.”

Farmers 2-4 estimated the (gross) return they would receive from investing in measuring and monitoring their pasture ranged from $90/ha to $550/ha. The individual farmers estimates were based on the decisions they made by having access to regular pasture biomass and growth rate data. In their estimate, the farmers focused particularly on the extra pasture consumption they attributed to improved management from using the data. Farmer 4 used the data more intensively than the other participants and was able to account for savings made on purchased feed by increasing pasture consumption and improved pasture quality.

Farmer 1 did not find having access to regular pasture biomass and growth rate data of financial value and found his approach to decision-making did not change. However, the data did reinforce what he
was seeing: “...what it does, it does help gut feeling; like it confirms what you’re feeling and what you’re seeing on the farm.”

Farmer 3 also used the data in conjunction with his visual assessment and reported that it increased his confidence in those observations: “You know the first thing I do is look at the cover and the growth rate, and then I sort of glance through the paddocks. ...it’s a really good indicator of what’s going on. It backs up what we feel is happening. ...it meant I’ve got more confidence in what I’m seeing on a paddock. And sometimes I think, oh that’s exactly what I think. Sometimes I think, oh that seems a bit low or a bit high. But it’s still being useful.”

Having greater confidence led Farmer 4 to be more proactive with decision-making, in particular silage conservation: “...the earlier you can cut it and get it off the better it is... So in that regard it [the data] helps a lot. And I was always way too conservative in making that decision because I always wanted to fully feed the cows. So I was ultra-conservative in dropping paddocks.” And this led to improvements in milk production: “But definitely making better decisions [using the data] with cutting silage earlier to keep quality and that makes a difference in the vat.”

Discussion

The Dairy On PAR project recognised the need for farmers to participate in the research process to further increase pasture consumption on Tasmanian dairy farms. In this participatory approach, hypotheses and research questions were developed jointly between farmers, industry service providers and scientists and as the PAR process progressed, results from the research were jointly interpreted to develop actions for further investigation and/or implementation on-farm (Ashby and Lilja 2004). The PAR group prioritised investigating the value of measuring and monitoring pasture, agreeing this offered the greatest potential to increase the amount of home-grown forage consumed. Despite the participating farmers already being expert pasture managers, fine tuning grazing management was the first practice chosen to decrease the gap between on-farm pasture consumption and the theoretical ceiling of pasture consumption.

The farmers participating in the measuring and monitoring study had previously been through a period of intensive learning (12 month pasture coaching program) involving the extended, deliberate practice required to deliver expert performance (Ericsson and Lehmann 1996). The intensive learning was undertaken within a coaching program involving farmers using pasture measuring tools during a 12-month period, since then tool use had decreased significantly. Instead, grazing management decisions were being made based on observation and informed intuition. As Prietula and Simon’s (1989) point out, ‘intuition is not the opposite of rationality, nor is it a random process of guessing. It is a sophisticated form of reasoning...that an expert hones over years of job-specific experience.’

Even with highly developed expertise and the use of intuitive decision making, all four farmers participating in the project found receiving pasture biomass and growth rate data on a regular basis improved confidence in the decisions they were making about grazing management. Improved confidence led to timely decisions being made, particularly in fodder conservation with flow-on effects of improved silage quality, pasture re-growth, milk production and reduced need for purchased supplements. It is important to note, data did not replace observations. Each of the four farmers continued to make visual observations of pasture biomass and growth and used this in conjunction with provided data. Eastwood and Kenny (2009) reported a similar result in their pilot study, where pasture biomass and growth rate data from satellites was provided to dairy farmers and rather than relying only on the provided data, farmers used the data to reinforce their own method of decision-making.

Three of the four farmers involved in the study believed having access to pasture measurement data improved financial returns of their business. There was a large range in the estimated value of the provided data, from $90/ha to $550/ha, but even the lowest value would be a return 2-3 times greater than the cost of obtaining the measurements. These estimates are similar to those found in a farm-scale simulation exercise conducted by Beukes et al (2018). In their study, ‘imperfect knowledge’ of pasture
biomass increased farm operating profit by $NZ385/ha above ‘low knowledge’. ‘Perfect knowledge’ increased farm operating profit a further $NZ155/ha.

This study demonstrated the value of regularly obtaining and using pasture biomass and growth rate data – even for expert farmers. With increasing ease of access to this data (SPACE™, Pasture.io) there is a large potential for further increases in pasture consumption in the Tasmanian dairy industry. However, just providing access to data will not ensure it will be used or perhaps even understood (Turner et al, submitted).

Conflicts Of Interest

The authors declare no conflicts of interest.

Acknowledgements

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References


