

# Using a participatory approach to refining and prioritising recommendations for future extension delivery in the Tasmanian dairy industry

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**Abstract.** Supporting dairy farmers to develop pasture management knowledge and skills through implementation of best practice recommendations has been a priority for research, development and extension in the Tasmanian dairy industry. Many farmers have not engaged with extension, and/or have not implemented recommended pasture management practices. The purpose of this study was to refine and prioritise recommendations for future extension and pasture management activities from a survey of 162 Tasmanian dairy farmers that identified current practices and extension engagement, and in-depth, qualitative interviews with 30 of these farmers that explored factors influencing adoption and engagement behaviours. Preliminary recommendations for developing future extension activities were drafted from these studies. A modified Delphi technique and survey invited these 30 farmers to prioritise the recommendations. Highest priority recommendations include: introducing different levels of pasture management training relative to experience; identifying and targeting farmers motivating values; and their requirement for ongoing, on-farm support to apply pasture management information and principles.

**Keywords:** Adoption, engagement, extension, pasture management, recommendations

## Introduction

Extension programs frequently aim to speed up adoption rates or diffusion of ideas or practices (Barr & Cary 2000). A key focus of extension in the Tasmanian dairy industry has been to increase implementation of pasture management practices and subsequent increase in pasture production, through supporting the development of farmer knowledge, skills and confidence. Despite this focus, average pasture utilisation on Tasmanian dairy farms is still well below potential (Dairy Australia 2015; Tasmanian Institute of Agriculture 2017).

Extension efforts are often based on communicating with innovators and early adopters, assuming information will diffuse through communication channels to the population of later adopters (Rogers 2003; Wauters & Mathijs 2010). However, Wauters & Mathijs (2010) have shown that this approach is not as effective at diffusing information as expected, with diffusion occurring at a very low rate or not at all. Such an approach fails to consider a range of social and innovation factors that influence adoption and implementation of practices (Vanclay & Lawrence 1994).

Continued, ongoing support is required for farmers to learn, implement and adapt recommended pasture management practices as they are knowledge intensive in nature (Turner & Irvine 2017). An extended, facilitative approach, such as ongoing farmer discussion groups, are more effective than single training sessions, as they encourage farmers to work collaboratively to develop skills, knowledge, adapt practices and solve problems (Ingram 2008; Turner & Irvine 2017).

There exists significant variation in adoption and adaptation of pasture management practices, and in the extent that farmers engage with extension activities (Hall et al. 2017). Measuring pasture with a tool as part of an extended, supported learning process offered through extension is important in increasing farmer knowledge, understanding and adoption of recommended pasture management practices (Turner & Irvine 2017). A previous survey of Tasmanian dairy farmers found that 61% are currently engaged with extension (attending at least once a year or more) (Hall et al. 2017), but only 20% attend activities on a regular basis (attending four times a year or more). Such variation in engagement with extension, use of pasture measurement tools and implementation of recommended practices results in a large variation in pasture utilisation being achieved. If the focus of research, development and extension (RD&E) in the Tasmanian dairy industry is to continue to encourage increased pasture utilisation through adoption or adaptation of recommended practices, understanding why this variation is occurring, and trying to reduce it, will be essential.

Adoption and practice change as an outcome of extension is a social process, influenced by personal, environmental and social factors (Pannell et al. 2006; Wauters & Mathijs 2010). Individual characteristics that impact extension engagement include education, social networks, farm business characteristics, and the nature of the activity and learning environment (Fulton et al. 2003). For extension programs to be successful in achieving practice change, a variety of delivery methods and training programs is necessary to cater for individual preferences (Kilpatrick

1996). It has been suggested that extension should encourage a participatory process, including farmers as an important player in informing research design and extension methods and outcomes (Pannell et al. 2006; Bruges & Smith 2008).

Understanding farmers' attitudes, beliefs and social environment through social research is essential for effective design and targeting of extension activities. This includes understanding farmer motivators for engaging with extension, and the social factors that underpin their decision about participating in activities, and decision making around implementing recommended practices. If extension activities can be targeted towards influencing perceptions and motivating factors known to be associated with adoption, investment in these activities is more likely to lead to a change in practice or management (Llewellyn et al. 2005). Social research is important in understanding these factors and informing future extension design and delivery. A participatory approach that recognises that farmers goals may differ to that of extension will assist in encouraging farmer engagement, adoption and practice change (Rhoades & Booth 1982).

This study aimed to refine and prioritise recommendations for the development of future extension activities in the Tasmanian dairy industry, particularly those on pasture management training.

### Research aims and methods

This study drew on the findings of two preceding studies. The first was a quantitative survey of 162 dairy farmers in Tasmania, which identified past and current use of pasture measurement tools, and extent of engagement with extension activities (Hall et al. 2017). In-depth, qualitative interviews were conducted with 30 of the surveyed farmers who voluntarily provided permission to be contacted about participating in follow-up interviews. These farmers were categorised into three sub-groups based on their past and current use of pasture measurement tools, and their level of engagement with extension activities (Table 1).

**Table 1. Sub-group characteristics and number of farmers in each sub-group**

Sub-groups	No. farmers interviewed	No. farmers surveyed	Engaged in extension	Been through intensive period of measuring pasture	Use recommended pasture management practices
Unengaged	8	8	X	X	X
Triallers	12	11	✓	X	X
Adapters	10	8	✓	✓	✓

Farmers who were categorised as Unengaged do not currently attend extension activities and have not been through an intensive pasture management learning process, which is an important component in adoption or adaptation of recommended pasture management practices. Trialler farmers are currently engaged with extension and have trialled a tool but not continued through an intensive learning process for pasture management. Adapter farmers are currently engaged with extension and have used a tool to measure pasture as part of an intensive learning process. Interviews with these farmers were used to identify what and explore and understand how factors influence the use of pasture measurement tools and practices, farmer involvement with a pasture management learning process, and farmers' decisions to engage or otherwise with extension activities. Identifying and understanding how attitudes, social influences and perceived control factors have influenced farmers pasture management and extension engagement decision making and behaviour enabled the development of preliminary recommendations for future extension activities, including marking, targeting, content and delivery. These recommendations were developed from in-depth analysis of interviewed farmers' responses, and improved understanding of what and how factors have influenced farmers decision making and behaviour. The aim of this study was to further develop these recommendations, inviting the same interviewed farmers to refine and prioritise recommendations for future extension and pasture management training activities.

This study used a modified Delphi technique. The Delphi technique is a method designed to obtain consensus of opinions of groups of experts by using a series of questionnaires (Dalkey & Helmer 1963). The Delphi process includes at least two, and typically three, rounds of questionnaires, with the first round consisting of an open-ended questionnaire designed to solicit information on a content area (Hsu & Sandford 2007). Subsequent rounds consist of questionnaires based on the responses of the previous round (von Ruschkowski et al. 2013). Advantages of the Delphi method include the ability to maintain subject anonymity and control feedback, replace the need to meet physically in the same location, and also reduce bias and influence of responses that can occur in a group setting (Dalkey & Helmer 1963).

One of the main criticisms of the Delphi technique include the introduction of potential researcher bias in development and analysis of responses (Linstone & Turoff 2002). Oversampling to ensure saturation of messages in the initial survey and the interview stages, along with using a consistent and detailed analytical approach, assisted in eliminating bias throughout this study.

Typically, designs are either 'Delphi' or 'Modified Delphi' (Avella 2016). In a modified Delphi design, answers to one of the initial phases are usually collected by some other means rather than from an expert panel, such as from interviews, review of literature, or an external group (Avella 2016).

A modified Delphi method was used in that the preceding survey and interviews took the place of the first two questionnaires used in a traditional Delphi technique. The initial survey gathered information and data on pasture management practices and engagement behaviour, which then informed development of the follow up interviews. The interview findings were developed into focus areas and preliminary recommendations for future extension activities. Based on these focus areas and recommendations, 15 questions were developed into a survey, with farmers asked to respond on a 5-point Likert scale of 'strongly disagree' to 'strongly agree'. The questions corresponded to recommendations, with the responses indicating the level of support for the recommendations and priority for extension development. Responses to questions were graphed using the statistical program R (v 3.5.0), organised by sub-group, with the 15 questions separated into three main groups of five according to the recommendation topic. The survey was mailed to the 30 farmers who had participated in the preceding interviews, with a response rate of 90%. Surveys were coded so responses could be allocated to sub-groups.

Due to the small sample size, 'strongly agree' and 'agree' responses were aggregated, and 'strongly disagree' and 'disagree' were aggregated. The response 'neither disagree or agree' was left as 'neutral'. While complete statistical analysis was unable to be conducted due to sample size, analysis of responses was able to produce agree, disagree or neutral trends for each question for the three farmer sub-groups. These then indicated the level of support for the associated recommendations.

## Results and discussion

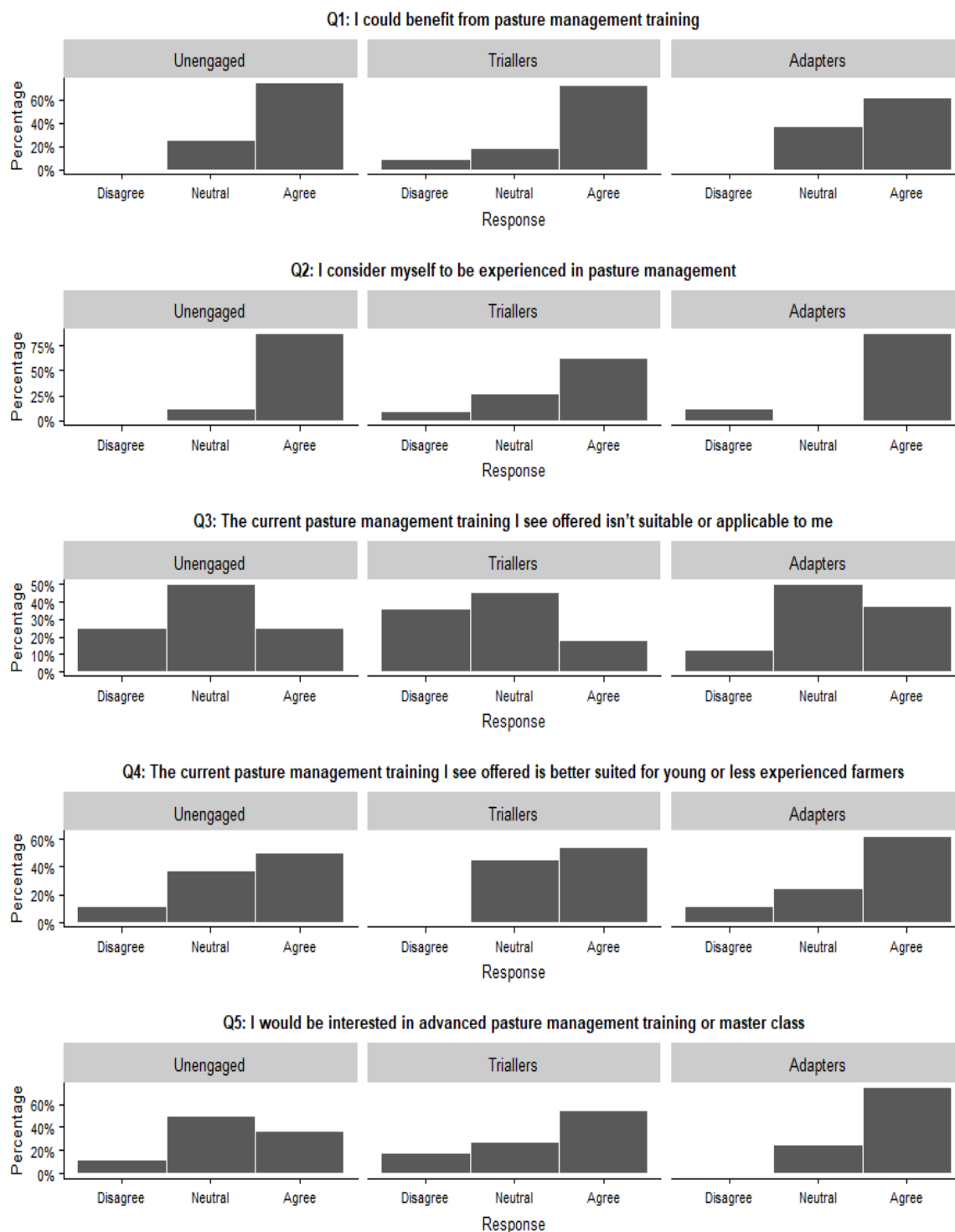
Figures 1, 2 and 3 are a graphical representation of the aggregated responses, showing the level of support according to the response trends. Most farmers see themselves as experienced in pasture management, with 90% of Unengaged, 64% of Triallers and 90% of Adapters agreeing with this statement (Figure 1, Question 2). Seventy-five percent of Unengaged, 73% of Triallers and 63% of Adapters agreed that they could benefit from additional pasture management training (Figure 1, Question 1). Fifty percent of Unengaged, 54% of Triallers and 63% of Adapters agreed that they thought the current pasture management training offered was better suited to younger or less experienced farmers (Figure 1, Question 4).

These trends support the recommendation that there is a need for different levels of pasture management training, along with the need for pasture management training to be developed for and targeted to experienced farmers. This is further supported by 55% of Triallers and 75% of Adapters indicating that they would be interested in advanced pasture management training or 'master class' (Figure 1, Question 5).

However, there is a need for different levels of pasture management training for these sub-groups. Unlike the Adapters, the Triallers have not continued through a pasture management learning process involving an intensive period of measuring and monitoring pasture using a tool. Continuing through a supported pasture management learning process, involving measuring and monitoring, enables farmers to develop their skills and knowledge to be able to visually assess pasture with increased accuracy (Stockdale 1984). As these skills are developed and combined with experience and existing farm knowledge, the need to continue using a pasture measurement tool may decrease (Turner & Irvine 2017).

As Triallers have not continued through such an intensive learning process, they are unlikely to have developed the same level of knowledge, skills and experience as the Adapter farmers, though they both consider themselves experienced in pasture management. While it is possible that some farmers have developed accurate visual assessment quickly, anecdotal evidence suggests that further supported learning may be necessary for farmers to gain full benefit from using pasture measurement tools along with understanding the associated biological principles underlying recommended management practices. There is a requirement for different levels of training for these sub-groups to address the gaps in knowledge and skills, based on their past involvement with a pasture management learning process. Targeting these activities to the different sub-groups, and marketing them as for experienced farmers, is important to encourage Triallers to re-engage with the pasture management learning process.

**Figure 1. Questions 1 to 5 on pasture management experience, with proportion of survey respondents agreeing, disagreeing or neutral for each sub-group**



Regardless of the extent they measured pasture previously, 63% of Unengaged, 100% of Triallers, and 90% of Adapters agreed that it is important to understand how to do pasture management calculations rather than just being provided with the data (Figure 2, Question 6). However, 100% of Unengaged and 82% of Triallers agreed that they were more likely to visually assess pasture than use figures or calculations (Figure 2, Question 7). Seventy-five percent of Adapters tended to disagree or remain neutral. These trends support the suggestion of Hall et al. (in press-a) that the Unengaged and Triallers are 'unconsciously incompetent' (Burch 1970; Howell 1982), in that they are unaware they lack knowledge or skills, in this case in pasture

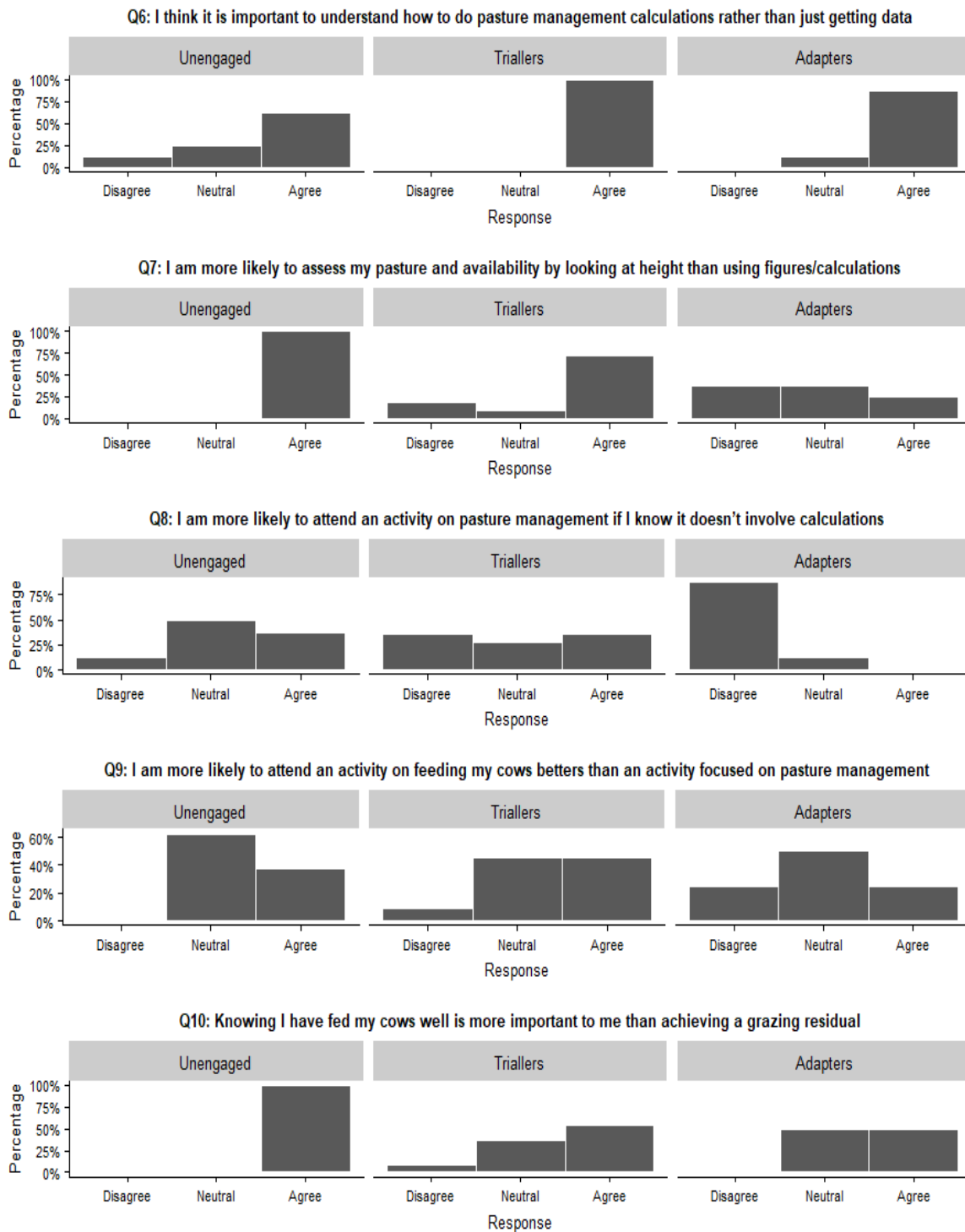
management. They see themselves as experienced, but they have not been through a period of intensive pasture measurement and learning, and therefore are unlikely to have gained an in-depth knowledge of pasture calculations and be able to apply the associated principles to the same extent and thus receive the same benefit as the Adapters. The Unengaged and Triallers also indicated that the current pasture management training is not suitable for them, supporting the recommendation that a variety of approaches is needed if they are to re-engage with extension activities focused on pasture management. Such approaches may include focusing on or targeting motivating values through different topics, and different levels of pasture management training from less advanced to more advanced. Re-engaging these farmers and encouraging them to continue through a pasture management learning process is important if they are to gain the knowledge and skills required to improve pasture management and production.

Thirty-seven percent of Unengaged and 37% of Triallers agreed that they were more likely to attend an activity on pasture management if it did not involve calculations (Figure 2, Question 8). However, 50% of the Unengaged and 27% of the Triallers also gave a neutral response. In comparison, the Adapters had a strong disagree trend. Though removing the focus on calculations, and adding a more practical component, is likely attract some farmers in the Unengaged and Triallers sub-groups, the overall neutral trend indicates that introducing activities with this reduced focus is not a high priority for future extension.

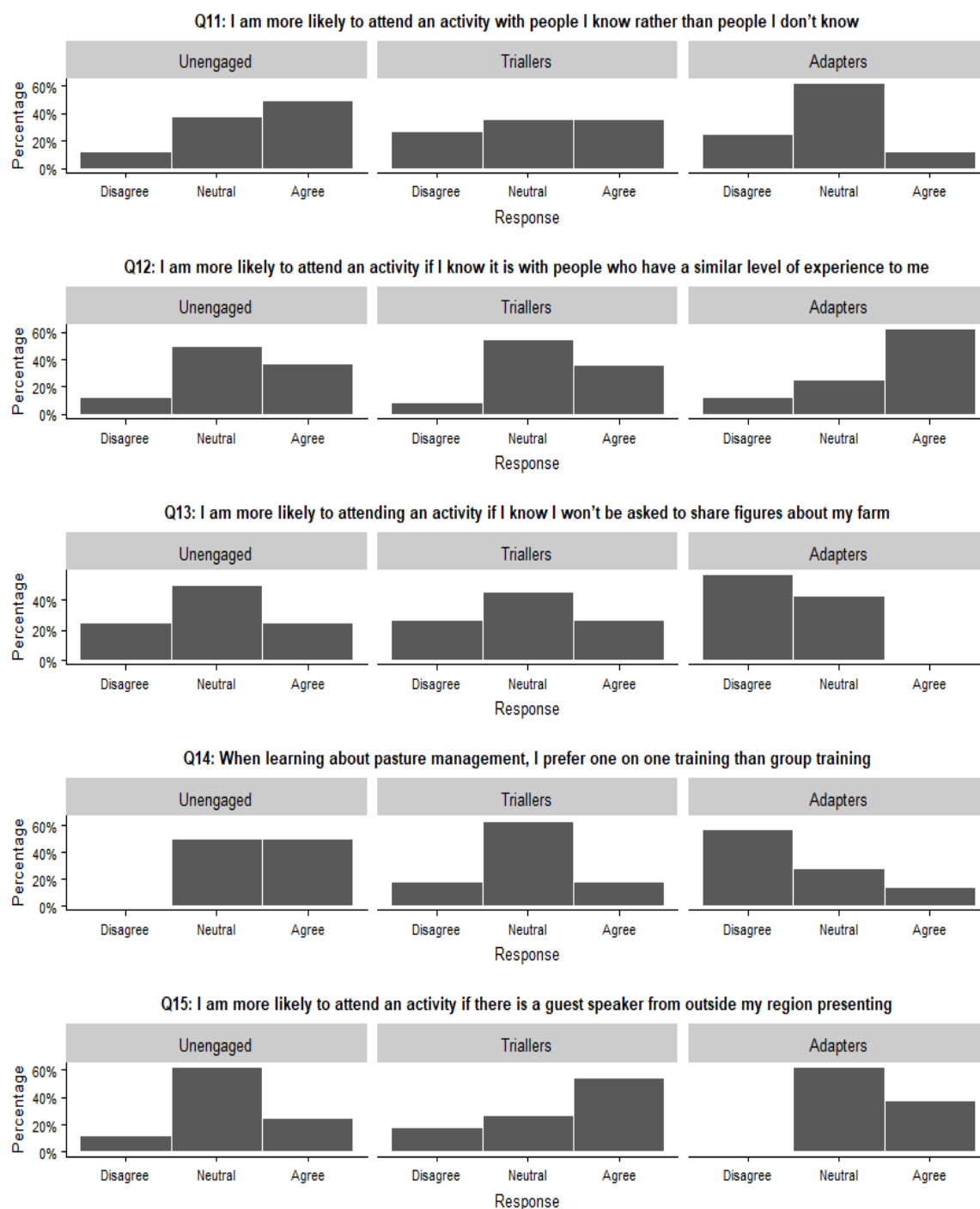
Thirty-eight percent of Unengaged and 45% of Triallers agreed that they were more likely to attend an activity on feeding their cows better than an activity focused on pasture management, with the overall trend being neutral (Figure 2, Question 9). However, 100% of Unengaged and 55% of Triallers agreed that feeding their cows well was more important than achieving a grazing residual (Figure 2, Question 10). The Adapters were less supportive of this statement, with 50% agreeing. This suggests that as farmers become more experienced in pasture management, they develop a greater understanding of the link between improved pasture management and cow production. This strong agree trend for the Unengaged indicates that a key recommendation to encourage the Unengaged sub-group to participate in extension is identifying and targeting their motivating values, such as focusing on the benefits of improved pasture management on cow health and performance. Designing, targeting and marketing activities accordingly is important if extension is to be more effective at engaging these farmers. These farmers have indicated they would benefit from additional pasture management training, but do not engage with the training options currently offered. Further social research to increase understanding of these values that influence farmer decision making would provide valuable information to guide this extension development. These trends support the suggestion that Unengaged and Triallers would gain additional benefit from re-engaging with the pasture management learning process, and revisit measuring pastures for an extended period (Hall et al. in press-a).

Fifty percent of Unengaged and 36% of Triallers agreed that they would be more likely to attend an extension activity if it is with people they know (Figure 3, Question 11). Sixty-three percent of Adapters had a neutral response. Thirty-eight percent of Unengaged, 36% of Triallers and 63% of Adapters agreed with the statement that they were more likely to attend an extension activity if it was with people who had a similar level of experience to them (Figure 3, Question 12). Farmers vary in the ways they prefer to learn, including one-on-one learning and learning from peers (Kilpatrick & Johns 2003). Less experienced farmers, or farmers with less knowledge or skills, can benefit from learning from more experienced peers, and how they have implemented practices (Kilpatrick & Johns 1999; Kilpatrick & Johns 2003). For this to occur, some of the more experienced farmers, such as the Adapters, need to be motivated to attend for altruistic reasons as they have potentially less to gain, but rather are sharing their knowledge with less experienced farmers. A study by Hall et al. (in press-b) found this to be the case for some Adapters, in that they choose to attend extension activities to help less experienced farmers. Though introducing a range of group options that cater for individual preferences may be effective in encouraging some farmers to engage with extension, the overall neutral trend indicates that this is a lower priority recommendation for future extension. However, The Adapters are more likely to engage with extension if it is with farmers of a similar experience level, suggesting that this recommendation would be beneficial for activities targeted to this sub-group.

**Figure 2. Questions 6 to 10 on content of pasture management activities and motivating values, with proportion of survey respondents agreeing, disagreeing or neutral for each sub-group**



**Figure 3. Questions 10 to 15 on general extension activity design, with proportion of survey respondents agreeing, disagreeing or neutral for each sub-group**



In addition, the range of responses when farmers were asked if they preferred one-on-one training when learning about pasture management supports the recommendation for the provision of a variety of training options (particularly for pasture management specific activities). Fifty percent of Unengaged farmers agreed that they prefer learning about pasture management one-on-one, with 45% of Triallers responding neutral. Fifty percent of the Adapters did not agree with this statement, indicating they prefer learning about pasture management in a group setting (Figure 3, Question 14). One-on-one learning through coaching, particularly when learning about pasture management, has been shown to be the most effective model for many farmers, particularly those with low levels of existing knowledge (Davey & Maynard 2007; Turner & Irvine 2017). These farmers are likely to include the Unengaged and Triallers who have not previously been through

an extended pasture management learning process involving measuring pasture with a tool. Continued, one-on-one, supported learning is also more effective when it comes to implementing knowledge intensive practices, as farmers can work through challenges and adapt practices to their farm (Turner & Irvine 2017). However, one-on-one is resource intensive, and its use is often limited for public extension due to both time and resource constraints.

When asked if they were more likely to attend an activity where they would not be asked to share farm figures, 50% of Unengaged and 45% of Triallers were neutral (Figure 3, Question 13). Fifty percent of Adapters did not support this statement. It is likely that the Adapter farmers have been involved to some extent with benchmarking programs and associated business management groups offered through extension, as they have indicated a higher incidence of measuring and monitoring and extension engagement as reported in (Hall et al. in press-a). Fifty-five percent of Triallers agreed they were more likely to attend an activity with a guest speaker from outside their region, while 63% of Unengaged and 64% of Adapters were neutral (Figure 3, Question 15). This suggests that the recommendation of using an expert guest speaker should be a lower priority for future extension targeting a wide range of farmers, as while it might encourage farmers in the Triallers sub-group to engage with extension, it is less likely to encourage others.

The Adapters' general neutral response to questions focused on extension activity design (except for preferring to attend activities with farmers of similar experience), indicates that they are more flexible regarding activity type and content. These farmers are currently engaged with extension, indicating that less focus is required on changing current activities to suit their needs. Adapters are likely to remain engaged with extension activities, as they currently engage and many see value in continuing to do so (Hall et al. in press-b). These farmers are likely to be more confident in their knowledge and skills, particularly those relating to pasture management, as they have been through an intensive pasture management learning process where focus is placed on understanding and applying figures and calculations. A previous study found that farmers who have been through such a process are more confident in their management ability (Turner & Irvine 2017). Hall et al. (2017) also reported that farmers who had been through an intensive period of measuring and monitoring pasture with a tool were more confident in their pasture management ability. Activities with specific recommendations are often more effective in encouraging farmer engagement (Greene et al. 1995), particularly for farmers such as the Adapters who may have a greater level of existing knowledge and skills.

### **Conclusion and recommendations**

For future extension activities to facilitate greater adoption and practice change, it is essential to understand the social factors influencing farmer engagement. Using a modified Delphi technique that builds on previous social research is an effective method to assist in the development of successful research and extension programs as it places emphasis on developing an understanding of the social factors that influence behaviour and decision making and understanding the social context within which farming occurs. Time pressures of planning RD&E programs can be challenging for building in such participatory approaches. However, it is important for RD&E experts to plan and use participatory approaches where possible, as they allow projects to connect with and build on existing farmer knowledge, leading to improved adoption outcomes.

Using a modified Delphi technique in this study enabled identification of key recommendations for each farmer sub-group, and was an effective means of validating and prioritising recommendations for future extension design by inviting farmers to have input, supporting previous studies that have found it a useful and valuable method of reaching group consensus on recommendations (Hsu & Sandford 2007). Using this type of approach over others, such as focus groups, was more effective as it enabled open and unbiased input from each farmer participant. This technique enabled farmers equal opportunity and ability to voluntarily provide input, with independent and unbiased views, and equal representation and weighting of responses.

The modified Delphi survey built on the previous rounds consisting of an initial survey and in-depth follow up interviews. Each round built on the farmers responses to the previous, leading to development of recommendations for future extension and pasture management training activities. By inviting the same farmers to respond to a final survey enabled further development, refinement and prioritisation of these recommendations. A summary of these recommendations and level of priority are as follow:

- Introducing different levels of pasture management training that caters for experience level and past training – high priority
- Introducing 'master classes' or activities with an advanced management component for farmers who consider themselves as experienced – high priority



- Requirement for ongoing, on-farm support to understand and apply pasture measurement information, and not just providing data – high priority
- Identify and target motivating values to engage the Unengaged sub-group – high priority
- Introduce a range of extension activities and group types, including some with a reduced focus on farm data and calculations – low priority
- Using an expert speaker from outside the region – low priority

Prioritising recommendations for sub-groups enables more specific design and targeting of activities for farmers, increasing the likelihood of influencing adoption and practice change outcomes. Motivating and influencing factors for sub-groups can be identified, which assists in targeting, designing and marketing of extension activities. Using a participatory approach enables farmers to have input into informing design of future extension content and delivery that will attract and engage a wider range of farmers.

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### **References**

- Avella JR 2016, 'Delphi panels: Research design, procedures, advantages, and challenges', *International Journal of Doctoral Studies*, vol. 11, no. 1, pp. 305-321.
- Barr N & Cary J 2000, *Influencing improved natural resource management on farms*, Bureau of Rural Sciences, Canberra.
- Bruges M & Smith W 2008, 'Participatory approaches for sustainable agriculture: A contradiction in terms?', *Agriculture and Human Values*, vol. 25, no. 1, pp. 13-23.
- Burch N 1970, *The four stages for learning any new skill*, Gordon Training International, California, USA.
- Dairy Australia, *Australian Dairy Industry in Focus*, Available from: <<http://www.dairyaustralia.com.au/>> [11/03/2016].
- Dalkey N & Helmer O 1963, 'An experimental application of the Delphi method to the use of experts', *Management Science*, vol. 9, no. 3, pp. 458-467.
- Davey & Maynard Consulting 2007, *20/12 Pasture Business Project Evaluation 2005-2007*, Final Report prepared for Department of Primary Industries, Water and Environment, Hobart, Tas.
- Fulton A, Fulton D, Tabart T, Ball B, Champion S, J W & Heinjus D 2003, *Agricultural extension, learning and change*, No. 03/032, Rural Industries Research and Development Corporation, Barton, ACT.
- Greene K, Rubin DL & Hale JL 1995, 'Egocentrism, message explicitness, and AIDS messages directed toward adolescents: An application of the theory of reasoned action', *Journal of Social Behavior and Personality*, vol. 10, no. 3, p. 547-570.
- Hall A, Turner L, Irvine L & Kilpatrick S 2017, 'Pasture management and extension on Tasmanian dairy farms-who measures up?', *Rural Extension and Innovation Systems Journal*, vol. 13, no. 2, p. 32-40.
- Hall A, Turner L & Kilpatrick S in press-a, 'Using the Theory of Planned Behaviour framework to understand Tasmanian dairy farmer adoption of pasture management practices', *Animal Production Science*.
- Hall A, Turner L & Kilpatrick S in press-b, 'Using the Theory of Planned Behaviour framework to understand Tasmanian dairy farmer engagement with extension activities to inform future delivery', *The Journal of Agricultural Education and Extension*.
- Howell WS 1982, *The empathic communicator*, Wadsworth Pub Co, California, USA.
- Hsu C-C & Sandford BA 2007, 'The Delphi technique: making sense of consensus', *Practical Assessment, Research & Evaluation*, vol. 12, no. 10, pp. 1-8.
- Ingram J 2008, 'Agronomist-farmer knowledge encounters: an analysis of knowledge exchange in the context of best management practices in England', *Agriculture and Human Values*, vol. 25, no. 3, pp. 405-418.
- Kilpatrick S 1996, 'Change, training and farm profitability, A National Farmers Federation Discussion Paper', *National Focus*, vol. 10, pp. 73-76.
- Kilpatrick S & Johns S 1999, *Managing farming: how farmers learn*, No. 99/74, Rural Industries Research and Development Corporation, Barton, ACT.
- Kilpatrick S & Johns S 2003, 'How farmers learn: different approaches to change', *The Journal of Agricultural Education and Extension*, vol. 9, no. 4, pp. 151-164.
- Linstone H & Turoff M 2002, *The Delphi Method: techniques and applications*, Available from: <<https://web.njit.edu/~turoff/pubs/delphibook/delphibook.pdf>> [18/12/2018].
- Llewellyn RS, Pannell DJ, Lindner RK & Powles SB 2005, 'Targeting key perceptions when planning and evaluating extension', *Australian Journal of Experimental Agriculture*, vol. 45, no. 12, pp. 1627-1633, <http://dx.doi.org/10.1071/ea04102>.
- Pannell DJ, Marshall GR, Barr N, Curtis A, Vanclay F & Wilkinson R 2006, 'Understanding and promoting adoption of conservation practices by rural landholders', *Australian Journal of Experimental Agriculture*, vol. 46, no. 11, pp. 1407-1424.
- Rhoades RE & Booth RH 1982, 'Farmer-back-to-farmer: a model for generating acceptable agricultural technology', *Agricultural Administration*, vol. 11, no. 2, pp. 127-137.
- Rogers EM 2003, *Diffusion of innovations*, 5th edn, The Free Press, New York, USA.

- Stockdale C 1984, 'Evaluation of techniques for estimating the yield of irrigated pastures intensively grazed by dairy cows. 2. The rising plate meter', *Australian Journal of Experimental Agriculture*, vol. 24, no. 126, pp. 305-311.
- Tasmanian Institute of Agriculture 2017, *Tasmanian Dairy Business of the Year Awards*, Burnie, Tasmania.
- Turner L & Irvine L 2017, 'Tasmanian dairy farmers and the pasture management process: Case study findings on the role of coaching in achieving practice change', *Rural Extension & Innovations Systems Journal*, vol. 13, no. 1, pp. 31-40.
- Vanclay F & Lawrence G 1994, 'Farmer rationality and the adoption of environmentally sound practices; a critique of the assumptions of traditional agricultural extension', *European Journal of Agricultural Education and Extension*, vol. 1, no. 1, pp. 59-90.
- von Ruschkowski E, Burns R, Arnberger A, Smaldone D & Meybin J 2013, 'Recreation management in parks and protected areas: A comparative study of resource managers' perceptions in Austria, Germany, and the United States', *Journal of Park and Recreation Administration*, vol. 31, no. 2, pp. 95-114.
- Wauters E & Mathijs E 2010, *A behavioural model for the adoption of soil conservation practices* Institute for Agricultural and Fisheries Research—Social Sciences Unit, Mellebeke, Belgium, Available from <<https://tucson.ars.ag.gov/>> [15/11/2016].