Derived attitudinal farmer segments: A method for understanding and working with the diversity of Australian dairy farmers

W Waters[1], D Thomson[2], R Nettle[3]

[1]Waters Consulting, [2]Landscape and Social Research [3]University of Melbourne
Email: watersw@internode.on.net

Abstract. When planning extension projects, do you aim for the 'average' farmer and treat everybody the same? Given the complex interaction of individual characteristics and their situational context, how can limited extension resources be efficiently and effectively allocated? The Client Stocktake Project was undertaken by Dairy Australia to help understand and work more effectively with the diversity of Australian dairy farmers. It involved the selection of a method that identified manageable segments of the farming population to better target technology development, extension and communication. The method (Derived Attitudinal Farmer Segments – or DAFS) was then trialled and assessed through a national study, involving follow-up interviews and focus groups with a range of farmers. This paper provides an outline of the DAFS method, describes the segments identified and the implications for research, development and extension in the Australian dairy industry. An assessment of the method with respect to its use, practicality and power for guiding RD&E investment to better meet the diversity of farms is also provided. The paper will be of relevance to extension designers and practitioners, RD&E managers and investors. The DAFS method was chosen over other methods because of its particular strengths in accounting for both individual and situational characteristics of farms and farmers as well as the derived rather than imposed approach to identifying segments through statistical analysis. The segments were identified through K-means clustering from an attitudinal survey and described by highlighting the significant differences between segments across a range of attitudinal, demographic and behavioural characteristics (e.g. actual and planned practice change). Six segments were identified and described. The main attitudinal characteristics that were important in differentiating segments included: the importance of providing for the next generation, the relative emphasis on self-reliance and personal knowledge, aversion to risk, and perceived financial pressure. The segments alone were not great predictors of actual practice change, but when combined with a region and enterprise scale, significant relationship were found with the number and type of changes implemented. We found that segmentation is possible without imposing pre-conceived types, and it is really difficult to describe segments in a way that acknowledges difference without implying 'good' or 'bad' management.

Keywords: Extension, segments, attitudes, dairy.

Introduction

Market segmentation, of varying forms, is commonly used across agricultural and non-agricultural industries to help understand the motives and drivers of change among people associated with that industry. The motives behind these segmentation exercises vary considerably, and therefore the methods are also diverse. Dairy Australia sought a segmentation approach that would enable a greater understanding of their client base (Australian Dairy farmers) and enable more effective, targeted research and development effort.

A literature review of segmentation approaches was conducted to identify the most appropriate method of segmentation to meet the needs of this project (see Waters et al. 2009). Some key requirements of the methodology were:

•   The ability to consider individual and contextual characteristics that affect decision-making and change.

•   To develop segments that were applicable to a wide range of technology and change.

•   To identify issues of motivation for and barriers to the adoption of new technology.

•   The ability to predict the likelihood of adoption by the identified segments.

Based on this review, the DAFS method was recommended to and accepted by Dairy Australia as the appropriate methodology for this project.

Overview of typology studies

Emtage et al. (2006) reviewed the Australian studies that sought to classify landholders into usable typologies. Whilst the intent of Emtage et al.'s review aimed to identify the possibility of a standardised, cross-regional and cross-industry landholder typology that would have

application in the natural resource management sector, it provides a useful overview of the various approaches used to segment landholders and the utility of these approaches.

Most of the studies reviewed by Emtage et al. (2006) seek to classify landholders on the basis of various combinations of attitudes, structural-demographic characteristics and farming practices of interest to the researcher. These are essentially 'market segmentation' exercises aimed at characterising each segment so to inform policy or to develop extension and change programs.

Whilst these segmentation methods can provide insights into the likelihood of future behaviours in respect to the particular behaviours or attitudes upon which the typology is based, their ability to explain or predict other behaviours is limited. The exceptions are Rogers (2003), Howden et al. (1998), Solutions (2003), and Thomson (2001). These are more general theoretical constructs that can be applied across industries, regions and times (although with some methodological constraints, which are discussed later).

The Derived Attitudinal Farmer Segmentation (DAFS) approach

Thomson's Farming Styles method (now called DAFS), segments landholders on the basis of their perceptions of a wide range of situational and individual characteristics and has been successful in explaining patterns in a wide range of behaviours across industries and geographic locations. For example, the method was used to explain differences in farmers' participation in Landcare, property management planning and various natural resource management initiatives in North Central Victoria (Thomson 2001a and Thomson and Pepperdine 2002). It was also used to distinguish segments of farmers that have higher or lower propensities to adopt 'current recommended practices' across three diverse regions of Australia – Upper Goulburn-Broken region in Victoria, Upper Billabong region in NSW and the Condamine/Central Downs region of QLD (Sinclair Knight Merz Pty Ltd 2003).

Thomson (2001a) takes a process-oriented (or dialectic) approach to understanding the emergence of common patterns of farmer attitudes (perceptions) and behaviour. His approach is based on an underlying acceptance, even celebration, of diversity. From a sociological perspective, he contends that farmers are motivated by a diverse range of drivers and constrained (and enabled) by a range of social, cultural, economic and physical factors. Farmers will therefore react in different ways to external drivers of change and will respond differently to encouragement, incentives and legislation aimed at influencing their farming practice (Thomson, 2008).

Thomson envisaged farming styles as groups of farmers who have a similar pattern of responses to social, cultural, political, economic, historical and farm management 'forces'. Drawing on Kelly's (1955) 'Personal Construct Theory' he conceptualised that farmers' ideas about what constitutes 'good' farming is a function of their personal constructs, which are developed through their life experiences and interactions with other people (including other farmers, extension officers, agribusiness). Each farmer has a different behavioural environment, and is therefore potentially exposed to a different range of influences. In addition to influencing perception, personal constructs influence the type of people we relate to (Kelly, 1955). Personal constructs also affect the way information is interpreted. When exposed to information, people tend to accept that information that conforms to their personal constructs, and shed the rest (Abel et al. 1998, citing Salmon 1981).

The Derived Attitudinal Farmer Segmentation (DAFS) method was developed in 2000 as a means of identifying groups of farmers with similar world-views and preferences. It is not a 'pigeon-holing' exercise: we are not interested in classifying farmers into groups for the sake of branding them as type X, Y or Z. Rather, the approach is a means of identify 'styles' of farming or general approaches to farming. It is similar in concept to personality tests (e.g. 'Myer-Briggs'), which identify attitudinal preferences, recognising that attitudes are variable over time and as circumstances change.

'Styles', 'world-views' or preferences about farming are not absolutes and are subject to change over time. This means that the DAFS approach is only accurate in determining the 'style' of farmers at the time the data is collected. However, by repeating the process over time it is possible to track individuals' movements between 'styles' as their perceptions, attitudes and motivations change. This could be useful in monitoring the impact of particular interventions, technologies or events in changing farmers' approach to farming.

The DAFS approach reveals groups that are likely to be quite stable across the population even though individuals might shift between groups. In other words, the number of groups and the relative size of each group as a proportion of the population are likely to remain stable. Other

applications of the method have revealed a similar number of groups, when applied across agricultural industries (e.g. Thomson & Pepperdine 2002, Sinclair Knight Merz 2003, McCarthy & Thomson 2007).

The DAFS approach is also useful for targeting communications and R&D extension activities to particular groups of farmers, ensuring more effective communications and in monitoring the participation of farmers in events, monitoring the adoption of technology and fine-tuning communications targeting.

Method

Methodologically, Thomson's approach groups farmers according to their responses to 35 statements that capture their perceptions about a wide range of aspects of farming. The 35 attitudinal statements were collated and tested by Thomson from Australian and international research into styles of farming (Thomson 2001a, p. 141). Each of the 35 statements can be edited to suit the context of a range of research topics, a practice adopted by Thomson in his applications of the method in different contexts.

Using a non-hierarchical clustering method (K-Means clustering) cases (farmers) are grouped according to their patterns of response. This, in essence, is capturing their 'world view' or perceptions of a wide range of factors that influence their farming practice. Importantly, Thomson's approach ensures that the resultant segments are derived from the data, not imposed from a theoretical perspective of farmers' attitudinal profiles. A key to the apparent success of the method in exposing different segments of farmers is that a very wide range of issues related to the social, economic and environmental aspects of farming are covered by the statements (Thomson 2001b).

The literature review component of the Dairy Client Stocktake project concluded that Thomson's DAFS method was the most appropriate for the purposes of the study. However, by collecting a range of situational, behavioural and demographic data, this project would compare the DAFS method to other segmentation schema. In addition, the qualitative aspects of the project would be used to validate the resultant segments.

To provide the data set of attitudes, demographics, behaviour change and information preferences required to run the DAFS process, a telephone survey of 450 dairy farmers was conducted. The survey was developed in conjunction with key managers within Dairy Australia to ensure it covered the areas of practice change of most interest to Dairy Australia. The data set was biased toward higher production farms by attempting to exclude farms with less than 100 milking cows. Due to inaccuracies in farmer records, some smaller farmers were interviewed and included in the data set.

The data set included data in four areas: a) the 35 DAFS attitude statements, b) their situational (farming systems) context, c) their demographic characteristics, and d) their past and intended future behaviours. Figure 1 outlines how the data were used to identify and interpret the farmer segments. Responses to the 35 attitudinal statements were analysed through the non-hierarchical clustering method described by Thomson (2001a), and six segments were identified. A principal components analysis was undertaken to derive a set of eight 'attitudinal indices' to help interpret the attitudinal profiles of the segments. The profiles of each segment were developed using the results of the analysis of the eight attitudinal indices (see also Table 1). Situational, demographic and behavioural data were then analysed to compare and contrast each of the farmer segments. This analysis exposed significant differences between the segments across the majority of the factors analysed. These results were then used to complete the segment profiles by describing the each segments demographic, situational and behavioural characteristics.

As a form of data triangulation, focus groups were held to provide feedback on the segment descriptions and the practicality of applying the output of DAFS to real scenarios. The groups were formed by local community groups with the motivation being a contribution to that community. This was done to reach a cross section of farmers rather than those who are regularly involved in industry activities. A focus group including government and factory field officers was also run to get feedback from individuals who have contact with a larger number of farmers.

Group profiles

The attitudinal characteristics of DAFS groups are interpreted across eight diverse 'indices', as indicated in Table 1. Although there are highly significant differences in the group averages across all DAFS groups, not every group will score significantly differently to another group on individual indices. For example, both groups two and six have higher than average scores on the

'aversion to risk' index, but they differ on many other indices and are therefore quite different in their attitudinal profile overall. Thomson (2001a) does not recommend that segments be named, to avoid making value-judgements about each group. However, because Dairy Australia wanted to start establishing dialogue within key industry players, it was felt that names should be used.

Figure 1: Schematic diagram explaining how DAFS are identified and interpreted

The Derived Attitudinal Farmer Segmentation (DAFS) method groups people according to their responses to 35 attitude statements. This grouping process uses a non-hierarchical statistical clustering called 'K-Means clustering'.
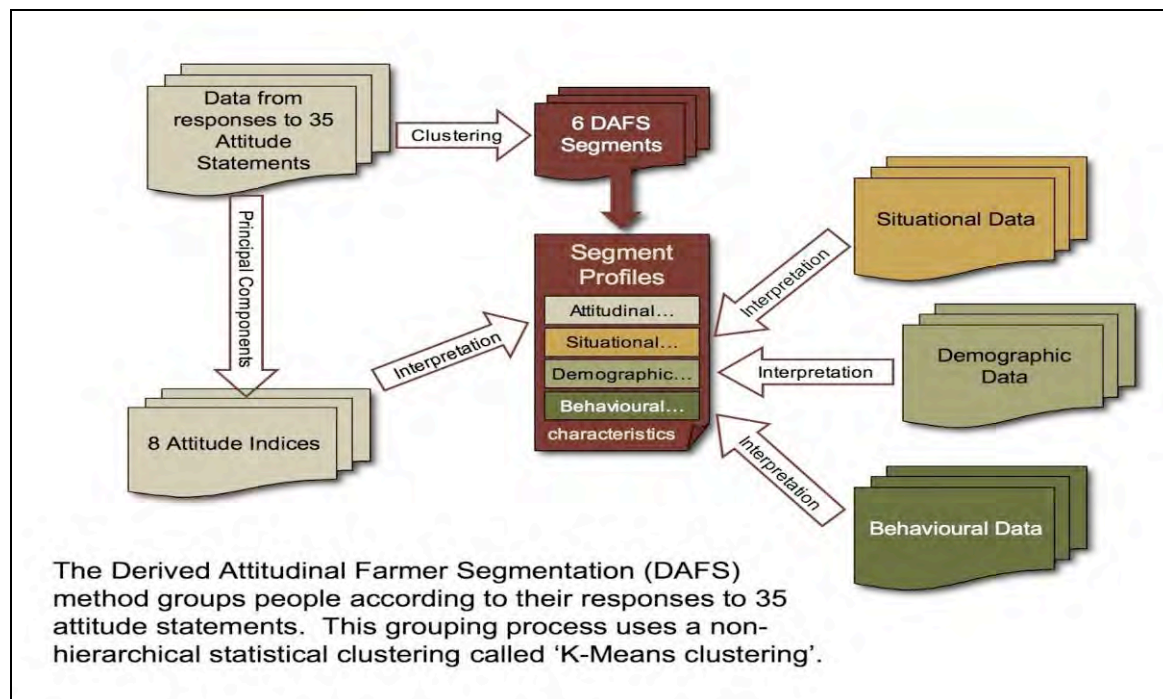
Table 1: Overview of attitudinal characteristics of each DAFS group. Cells indicate if the group is higher, lower or close to the sample average on each attitudinal index

DAFS group: Index:	Group 1 5.5%	Group 2 3.6%	Group 3 17.0%	Group 4 24.9%	Group 5 21.5%	Group 6 27.4%
Business Orientation	Low	Low	Average	Average	High	High
Aversion to Risk	High	High	Low	High	Low	Average
Sustainable Improvement	Low	Low	Average	Average	High	Average
Knowledge & Self-Reliance	Low	Low	Low	Average	High	High
Intergenerational orientation	High	Low	High	Low	Low	High
The 'Dairy Way of Life'	Average	Low	Average	Average	Average	High
Financial Pressure	High	Low	Low	High	Low	High
Farming Tradition	Low	Average	High	Average	Low	High

'Low' = Lower than sample average. High = 'Higher than sample average'.

In presenting the following group profiles it is important for the reader to be cognisant of the fact that each segment is derived through the clustering of data on the 35 attitude statements only. The situational, demographic and behavioural characteristics used to describe the segments are drawn from the statistical analysis of the data across the segments. For example, where age is described as a defining characteristic, this is because significant differences in the average age of respondents were found between segments.

Family first (Group 1) – 5.5%

This group of dairy farmers are likely to be driven by the desire to maintain their farms so that their families can continue to enjoy the dairy way of life. They are 'established' farmers that are 'stable' in terms of their growth speed.

Their risk-averse nature, combined with their lower than average business orientation and their lower than average score on the sustainable improvement index combine to make these a challenging group in which to encourage change. However, this group does not tend to feel constrained by financial pressures, mainly because they have a low debt level and so may be willing adopters of change if they can see a benefit for the farm or their family in the long term. They are likely to only consider changes that are well proven in the industry and/or carry a low level of risk, and that will contribute to the ability of the next generation to continue in the farm business.

Their attitudinal profile is confirmed in their recent reported behaviours. This group has a low level of adoption of practice changes in the past two years and were less likely to report having undertaken major capital works programs.

They do not view themselves as innovative or see the value in high levels of education or training to be a good dairy farmer. They are less interested than most in new ideas or alternative management practices for dairying. Continuing to increase milk production is not a priority for Group 1, although they are currently performing at the industry average for production efficiency.

In terms of potential communications mechanisms to reach this group of dairy farmers, again this group will be quite difficult to reach. They tend to be self-reliant in terms of their information-seeking behaviours. They have lower than average reported use of consultants and they tend not to attend discussion groups.

Winding down (Group 2) – 3.6%

Whilst they tend to value the tradition of dairy farming, this group of dairy farmers are not necessarily motivated towards sustaining or improving their businesses for the future. They are very risk-averse and whilst they do not tend to perceive that they are under financial pressure, this group will be difficult to motivate to make changes in their enterprises. They tend to be older than the average dairy farmer and have a lower than average level of formal education.

Their milk production figures reflect the high proportion of farmers in this group who are 'winding down' and their per-cow milk production figures are well below average. Those that are 'winding down' tend not to have a succession plan in place, which suggests the family will be exiting the industry completely. This is consistent with their low average scores on the 'intergenerational orientation' index.

Whilst they are more concerned than most other dairy farmers about the ability of their current farming systems to recover from changes and shocks, they appear to not be carrying out changes to their farming system to address this. Their rate of adoption of practice changes in the last two years is the lowest of all of the 6 groups. None had made changes in relation to their business management and few had made any capital equipment purchases.

They are the least likely to be innovative in their management and feel strongly that they prefer to let others try new ideas first.

Love farming (Group 3) – 17%

These farmers are very positive about the future of dairying and are motivated to ensure the next generation can continue to enjoy the tradition of farming as much as they do. This is reflected in their willingness to make improvements to their farm businesses to ensure its sustainability. They do not feel under financial pressure to the extent that most other dairy farmers do, and are quite open to taking some risks.

These characteristics make this group of dairy farmers very responsive audiences to research and development outcomes and they are likely to be very open to new ideas and alternatives. It has higher than average levels of formal education.

They are more likely to run larger enterprises. About 11% of this group run enterprises of more than 500 cows. On average, this group has maintained a year-on-year increase in milk production for the 2003 to 2008 period. The majority of this group are 'established' in terms of their business development stage and are most likely to be in a 'expanding slowly' business growth trajectory. This group of dairy farmers is mostly very comfortable with the ability of their

farm businesses to recover from shocks and sudden changes in the industry, and they are also more likely to report that their businesses would recover quickly from such changes.

It members had undertaken fewer changes, on average, in the past two years, but this may be because they had already made changes. The areas in which they had made changes – such as in the areas of business management, animal health and capital improvements – suggest that they are fine-tuning their enterprises rather than making significant changes. This would be consistent with their business development stage and speed of change reported earlier.

In terms of communications and extension of R&D outcomes, this group is less likely than average to use consultants/advisors, but have a high participation rate in discussion groups and field days. They are less likely than average to think that education and training are needed to manage their farm, which indicates that change needs to be communicated in very practical ways by people with relevant farming experience rather than academic or research credentials.

Established and stable (Group 4) – 24.9%

These are self-reliant, risk-averse dairy farmers who value the dairy farming tradition but are not particularly concerned about the future of their farms in terms of intergenerational transfer. They feel that they are under financial pressure, which combined with their high aversion to risk, make them likely to be difficult audiences to 'sell' R&D outcomes to.

They are close to the average age of dairy farmers, but are more likely to have started dairying later in life. They have relatively low average levels of formal education. This group of farmers are more likely to run smaller enterprises. None are associated with 'extra large' enterprises. In terms of business development stage these farmers tend to be established businesses that are stable or contracting in terms of their development trajectory.

This is reflected in their recent practice change: this group had lower than average adoption of practice changes, and are planning fewer changes than the sample average. They are significantly less likely than average to have invested in capital equipment in the past two years.

Use of consultants/advisors among this group is very low, and they appear to have an aversion to other farmers and discussion groups as information sources.

Open to change (Group 5) – 21.5%

This group of farmers enjoy running a dairy business and are motivated to develop a sustainable and successful business. They are prepared to take some calculated risks. They are not particularly concerned about the tradition of farming and are less likely to be motivated by ensuring the next generation continue on with the farming business. However, they do enjoy the dairy way of life.

They do not feel under particular financial pressure, and this characteristic, combined with their attitudinal profile in the other areas, makes them willing listeners who are likely to be early adopters of new ideas and technologies. This group are younger than average, at an average age of 49 and have higher than average levels of formal education.

They are more likely to run 'extra large' and 'large' enterprises and most are 'established' businesses. A higher than average proportion of this group of farmers said that their businesses were expanding quickly. This is reflected in their milk production figures: both their per-cow milk production and growth rates in annual milk production change are significantly higher than average.

The positive attitudes of this group are reflected in the behavioural data collected. This group had the highest level of practice change over the past two years, and are planning more changes in the next two years. They have a significantly higher frequency of changes in relation to animal health and welfare, capital equipment purchase and business management than the sample average.

This group has a very high rate of use of consultants and advisors. They tend to consult a broader range of information sources and have a higher rate of participation in training. This group had the highest rate of reported 'daily' use of the internet to manage their businesses: 43% (compared to the sample average of 29%) said they used the internet daily. They are information-hungry farmers that are likely to be willing participants in a range of R&D extension initiatives. Increasing milk production is only of average importance to them, but ensuring the farm makes money is, suggesting they are more profit driven than production driven. They are finding it harder than average to get good labour, probably because they use more of it and require a higher level of skills and experience.

Growing for the kids (Group 6) – 27.4%

This group of dairy farmers are enjoying running and developing a sustainable dairy business, keeping up the tradition and looking to the future of the family farm. They are self-confident, risk aware and moderately constrained by financial pressures. This group are likely to be willing listeners to R&D outcomes and will be motivated to adopt innovations that improve their profits, improve their lifestyle and/or ensure intergenerational success.

Although nearly a third of this group said they are in the process of 'winding down' their enterprises, they don't exhibit the attitudinal characteristics of the 'Winding Down' segment. The reason such a large proportion is preparing to leave the industry is that tis group are significantly older than the sample average. Those who are not exiting the industry are on a slow to fast expansion trajectory. They run larger farms than average. Their milk production has grown steadily since 2003, but their per-cow milk production is close to the sample average. Their confidence in the ability of their enterprises to recover from sudden change is not as high as the sample average. They are more likely to report that their enterprises would recover 'slowly' from sudden changes.

The high proportion of this group exiting the industry is reflected in the average number of planned practice changes over the next two years – this group is below average on planned changes. However, this group was more likely than average to have made a number of practice changes in the past two years, particularly those associated with the purchase of capital equipment and animal health and welfare improvement.

This group is more likely than average to be prepared to pay for advice. They have a high rate of use of consultants/advisors. However, they are less likely than average to participate in discussion groups/farm walks. They want specific advice for specific problems rather than group discussions. They are open to new ideas, but not always wanting to do the trial work, suggesting they would prefer to be fast followers. Labour is more of an issue for them than the average respondent.

Implications for research and extension

Once segments are identified, how might they be used? The Douthwaite (2001) model of learning selection provides some insights into the potential application of DAFS as an extension tool. He suggests that the development of a new technology can be compared to the metaphor of natural selection. The three critical phases of the process of natural selection are novelty generation, selection of beneficial novelties and finally diffusion. The DAFS process has developed a novel set of descriptive segments that need practical application to critically test our current understanding and generate new ideas. The adoption process will occur if those with resources see a value proposition in the application of DAFS to meet their needs. Publishing the segments and potential application of DAFS in this journal is part of the 'natural selection' process.

While we can postulate on the potential value of DAFS to enhance our understanding of behaviour change in a population, the application of this knowledge to more efficiently and effectively help industries to realise change is dependent on the whole extension and communication process. To provide a practical example, the issue of communicating Climate Change (CC) issues to the dairy industry is proposed as a case study. Although DAFS can provide guidance for the communications process, it sits within a broader context that is informed by a theory of persuasion and understanding such as Petty and Casioppo's (1986) Elaboration Likelihood Model (ELM).

Case study: Climate change

The objective of Dairy Australia's (DA's) Climate Change program is to assist the dairy industry make sense of Climate Change. Confidence to Grow Module 9 concluded that 'if non-dairy channels of information are the only avenue of commentary and insight about Climate Change (CC) for dairy stakeholders then confidence will continue to be eroded.' Confusion is widespread, and while the web toolkit is a key resource, a wider communications strategy that accesses dairy channels and that links Climate Change with the other challenges facing the industry is essential.

This case study examines how the outputs of the Client Stocktake, particularly the segmentation schema, can help form a CC communications strategy. An objective of CC communications strategy is to reach all farmers, so different approaches for different segments need to be considered. Based on the Elaboration Likelihood Model of persuasive communication (Petty and Cacioppo 1986) we need to consider the message factors, source and the receivers' motivation and ability to process the information.

Message factors

Consideration should be given to message structure and message content. Green et al. (1995) found that messages with more specific recommendations are more persuasive than those with general, non-specific recommendations. This may be due to the recipient's perception of their ability to do something about the issue. Where there is conflicting information on an issue, both sides of the argument should be presented, and one side clearly refuted.

Topics to address in a CC communications strategy could include:

- Climate Variability (CV) is the immediate issue, Climate Change trend will be largely invisible within that variability.
- It is critical that industry has input into the development of a workable carbon reduction scheme.
- There is a lot of confusion and conflicting information about climate change, and the story is moving quickly so it is hard to keep up. Dairy Australia is working to clarify information for farmers and provide it in a timely manner.
- Making farms more resilient to CV might include: a) systems that require less water or are less reliant on day-by-day pasture production, b) systems that can rapidly respond to positive and negative changes in input and milk prices and c) systems that reduce some of the risks associated with the price and supply of external inputs.

Table 2: Message content factors in relation to the DAFS groups

Group	How to reduce the risk of CV	Sustainable systems with CV	CV systems for the next generation	Making money from CV	CV and the dairy lifestyle
1 Family First	✓	✗	✓✓	✗	✓
2 Winding Down	✓✓	✗	✗	✗	✗
3 Love farming	✗	✓	✓✓	✓	✓
4 Established and Stable	✓	✓	✗	✓	✓
5 Open to Change	✗	✓✓	✗	✓✓	✓
6 Growing for the Kids	✗	✓	✓✓	✓✓	✓✓

✗ = Unlikely to respond/be interested ✓ = Likely to respond/be interested ✓✓ =very likely to respond/be interested

If the objective is to ensure that messages on CV are relevant to all farmers, the DAFS segments provide some context for targeting communication to ensure it is meaningful to the whole population. Table 2 identifies different aspects of the CV message and the corresponding level of interest for each segment, based on their attitudinal preferences.

Source factors

The key source factor is the level of trust the receiver has in the source. An example is that there may be a significant difference between the effectiveness of government and factory advisors. Government advisors may be required to promote government policy, which may be at odds with farmer objectives. Factory advisors may be perceived as more balanced in their interpretation and communication of CC issues.

We know from the Client Stocktake research that segments have different preferences in relation to their information sources, which is likely to be influenced by the level of trust they place in different sources. Table 3 provides a matrix of the information-source preferences of each segment, indicating the degree to which each segment is likely to respond to, or trust, each source.

There are two other issues presented in Table 3. Firstly, the potential target audience for each of the sources. We know that message factors and source factors will also influence the potential target audience, so these figures are likely to be optimistic and dependent on good quality delivery of the message. Actor Network Theory would suggest that actors only pass on messages in a network if there is some personal benefit to be gained. Before assuming that consultants are going to discuss CC issues on farm, some consideration need to be given to whether there is any relative advantage to them, or even if they may benefit from presenting a conflicting message.

Table 3: Message source impact on potential audience and influence

| Group	Size	Printed Media	Factory Advisors	Government Advisors	Workshops or groups	Paid Consultants	Farmer Networks
1	6%	✓	✓	✗	✗	✗	✓
2	4%	✓	✓	✗	✗	✗	✓
3	17%	✓✓	✓✓✓	✓	✓✓✓	✓✓	✓✓✓
4	25%	✓	✓	✗	✗	✗	✓✓
5	21%	✓✓	✓✓	✓	✓	✓✓✓	✓✓
6	27%	✓✓	✓✓✓	✓	✓✓✓	✓✓	✓✓
Target Reached		100%	90%	44%	<44%	<65%	100%

✓ =lower priority information source, ✓✓ =important information source, ✓✓✓ = very important information source

Receiver factors

As mentioned, two important receiver factors are individual motivation and the ability to process the information. To get some indication of the motivation to understand climate change issues better, we looked for significant relationships between the mention of climate change as an issue in the telephone survey and demographic and contextual characteristics of the respondent (including age, education, business development stage and business development speed). The only significant relationship found was by region.

There is a highly significant difference in the reporting of climate change as an issue of concern (derived from Q12 of the survey) and dairy region (chi-squared=29.9, df=8, p<0.000). Murray Dairy, Dairy SA and DIDCO all reported significantly more concern with CC (Figure 2). In the other regions, the lack of personal motivation to process information on climate change may influence the effectiveness of any communication plan.

Figure 2: Proportion of respondents mentioning Climate Change as a significant
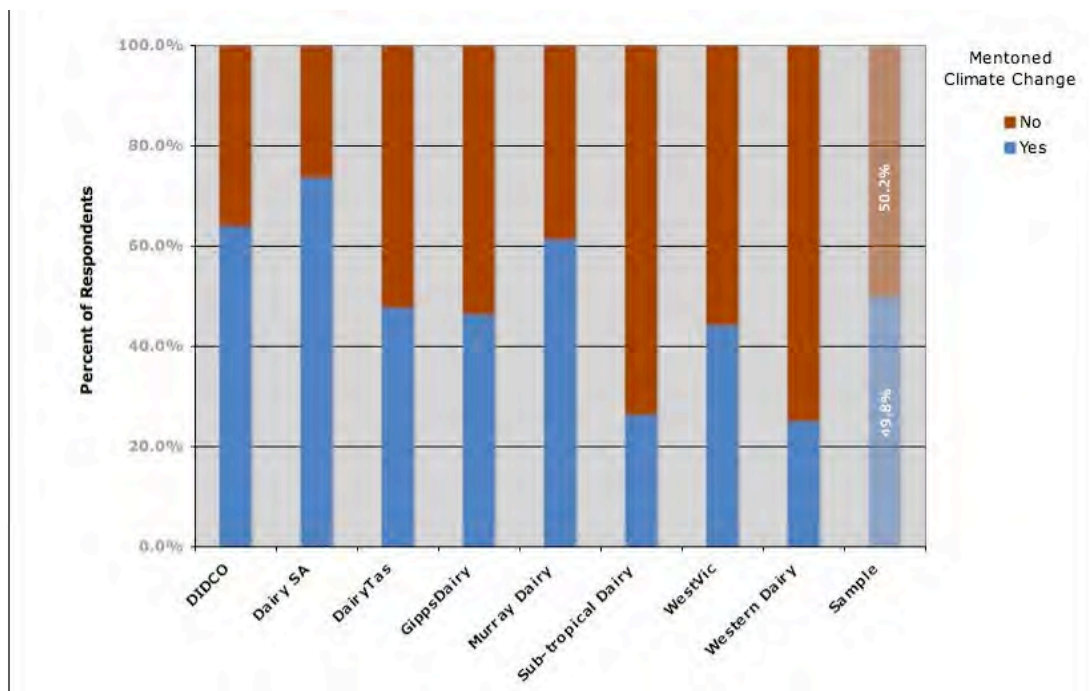
concern, by region.

O'Keefe (2002) also mentions the importance of self esteem and intelligence on the persuasiveness of messages. Those with higher self esteem are less likely to pay attention to a message as they have more confidence in their own opinion. Those with greater intelligence and

recall ability are more likely to critically scrutinise a message, and better recall previous opinions, so they are less influenced by peripheral cues such as the expertise or likability of the source. Indications of higher levels of education and confidence in their own ability would suggest that Group 5 would fall into this higher self esteem and intelligence category.

Recommendations for a Climate Change communication strategy include:

- Present messages that address the different priorities of the segments identified, such as impact in risk, lifestyle, profit and the next generation.
- Work to develop message sources that are already perceived as expert and trustworthy. These could include factory field staff and "within group" sources of farmer leaders.
- Use a range of communication techniques, and structure the message to suit the most likely target audience. This would include a consideration of regional variability in receiver motivation concerning Climate Change. For each group, ensure a combination of message content and source exists to meet their needs.
- When third parties such as private consultants are included in the strategy, consider their motivation to interpret messages to meet their own needs. This may not be a problem, but it should not be assumed that anyone will pass on a message without gaining some personal benefit.
- Build in feedback mechanisms where possible (such as at group meetings or from target messengers such as factory staff) focus the awareness needs and ensure the message content is being persuasive.

Conclusions

Our recommendations regarding how DAFS could be used by Dairy Australia are presented below, under the three contexts within which we believe they will have greatest application, namely, RD&E, communications and future research.

RD&E

On the supply-side of RD&E, we recommend DAFS be used:

- To estimate likely adoption rates (based on knowledge about the likely 'acceptance' and need for technologies, perceived need, by each segment).
- To influence the design technologies that are likely to meet the needs of key audiences/segments. Attributes such as risk, profit, complexity, impact on lifestyle and sustainability of the system should be considered for each segment.
- To monitor the effectiveness of R&D outcomes in a) reaching target audiences and b) resulting in change.

On the demand-side, we recommend DAFS be used:

- To understand the likely extent of need among the broader dairy farming community of concerns/issues/needs raised by dairy farmers.
- Communication pathways and message content
- To design message content and source based on knowledge of the receiver preferences and motivation.
- To monitor the effectiveness of communications in reaching target audiences.

Future research:

- Improving the efficiency of identifying/classifying farmers into groups. Narrowing down the 35 attitude statements to eight or ten statements that can be used as indicators for each area of perception/motivation would make the DAFS process more efficient and enable it to be incorporated into other data collection processes (such as NDFS, project reviews, monitoring and evaluation processes).
- National Dairy Farmer Survey (NDFS) – including a consistent set of attitudinal questions in the NDFS would enable time-series data to be collected and the capacity to see how stable the segments are over time, within and between regions, and how individuals might shift between regions.
- The degree to which members of one dairy farming family or key decision-makers within corporate dairy farms differ in their perceptions and motives will have an influence on the operating efficiency and likelihood of success and sustainability of the business. A greater understanding of the within-farm diversity among business-owners and operators would enable a greater understanding of which groups are complementary and those that are not conducive to a successful, sustainable business.
- In terms of information-source preferences, an in-depth understanding of the value derived from different information source by different DAFS groups would be very

informative for future communications strategies. For example, many groups seem to use farm discussion groups as information sources, but each probably varies in their motive for attending such events. Some will go to learn new things, others to confirm prior knowledge, others to socialise or 'check out' what others are doing.

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