

Successful adoption of new guidelines for the nutritional management of ewes is dependent on the development of appropriate tools and information

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Abstract. Low rates of adoption of innovations in sheep management have been blamed on the poor targeting of messages, low relative advantage of the innovation, a focus on awareness-raising activities rather than adoption activities, poor ‘packaging’ of information and few effective tools to aid decision making. Lifetimewool, a national project that developed management guidelines for Merino ewes specific to regions and different times of lambing, used a ‘review and improve’ process to identify areas of interest, level of knowledge and the skills required by different sectors of the audience to adopt the new recommendations for ewe management. To match these needs and to effectively communicate information from Lifetimewool, a combination of simple and complex tools were produced which were practical, effective, regionally specific and credible. All of the products were designed as a ‘family’ in terms of design and content, allowing a recognition by the producer that they complemented each other and led producers through logical steps for making decisions on managing and feeding ewes. The average awareness of all tools by consultants and extensionists was almost 90% and average usage rates were above 50%. However, the usage rates varied dramatically between tools and users, for example, 46% of consultants used the feed budget tables compared with 76% of extensionists for a similar awareness. Of 1353 producers surveyed more than 55% were aware of the Lifetimewool tools and average usage within this group was 19% and related to the length of time the tool had been available. An estimated 14 000 producers were aware of tools produced by Lifetimewool. The uptake and use of these tools by the target audiences support our hypothesis that tools of differing complexities are required to cater for individual needs.

Introduction

Sheep management is particularly challenging due to the complex nature of the grazing system and many research and adoption programs aimed at increasing productivity and profitability for sheep producers have failed to result in significant change in farming practices. Pasture utilisation and stocking rates remain well below the optimum for most enterprises (Saul and Kearney 2002), weaning rates have not improved in the last 30 years (Barnett 2007) and only 5% of producers routinely weigh or condition score their sheep to assist management decisions (Rose *et al.* 2005).

Dealing with the complexity of decisions is improved by breaking down the decision into its parts so that it can be better understood (McGuckien 2008). The complexity of the

decision to adopt or reject an innovation is further increased by variation between farmers in their attitude to risk, their knowledge and skill level and their confidence under close peer review by neighbours. Low rates of adoption of innovations have also been blamed on the poor targeting of messages, low relative advantage of the innovation, a focus on awareness-raising activities rather than adoption activities, poor ‘packaging’ of information and few effective tools to aid decision making (Barnett 2007; Curnow 2008). Vanclay (2004) identified the lack of credibility or legitimacy of the science and its low profitability or flexibility in the producers’ environment as further barriers to adoption. Hence, sheep producers may need to understand, test and trust more fully the value of an innovation before it can be successfully used

and it is not surprising that rates of adoption of new innovations are low.

Lifetimewool was a national project that integrated new and existing knowledge about the effect of the nutrition of the ewe on the production and profitability of the whole farm and developed management guidelines specific to regions and different times of lambing (Young *et al.* 2011). These guidelines are based on achieving condition score targets for ewes at key times during the reproduction cycle. In this paper, we discuss, in particular, the approach used in developing the recommendations and decision tools for sheep producers and the uptake of those tools by the target audiences, which included producers and 'next users' (Dart *et al.* 2011). It also discusses the role of tools of differing complexity in providing multiple entry points, and tools to meet each of the components – knowledge, attitude, skills and awareness leading to practice change (Bennett 1975). We reasoned that to achieve widespread adoption of these guidelines it was necessary to design an approach that took into account the needs of individuals, used a range of entry points, and generated a set of tools of varying complexity tested by the target audience.

The process for developing messages and adoption approaches

The aim of Lifetimewool was to develop and demonstrate profitable ewe feeding and management guidelines for wool producers across southern Australia. The project consisted of six distinct phases: plot-scale research; paddock-scale validation; on-farm demonstration sites; whole-farm systems modelling; communication and adoption; and evaluation of impact. The communication and adoption phase concentrated on developing guidelines and tools to support and demonstrate profitable systems for ewe management.

The first step in producing guidelines and tools was to develop robust and practical key messages that were valuable to sheep producers. The project team followed a process that distilled information from the plot- and paddock-scale experiments into key messages that were consistent across all systems and situations. These key messages formed the basis for presentations used extensively by the team at local workshops and field days, of which were attended by ~5000 producers in 2004 and 2005 and feedback from the audience was used to further refine the key messages and develop recommendations for producers.

The applicability of the recommendations was tested in detail in the demonstration phase by 200 sheep producers across southern Australia. Different models of engagement were used in each state.

- Victoria: facilitated groups of four producers monitored a flock of ewes throughout a year on their farm. The group visited each property on five occasions and conducted assessments on pasture, condition score of ewes and feed budgeting. This model of engagement evolved into the short course training program reported by Trompf *et al.* (2011).
- Western Australia: six producers monitored pastures and the condition score of their ewe flock and met at a 'focus farm' to discuss the implications for their flock.

- South Australia: a demonstration farm was used as a focus for activities with a group of sheep producers who observed the management using the recommendations as reported by Hocking Edwards *et al.* (2011).

- New South Wales: a similar approach to South Australia was used based around three demonstration farms.

Observations of producers involved in the demonstration sites were incorporated into the project team's annual review of key messages and recommendations. In addition, prototype decision tools and information products were tested by these producers and their feedback was used to determine the final design for wider application.

The communication and adoption strategy was developed using feedback from these producers. In addition, next users including government extensionists and private consultants were surveyed to identify the information and types of tools they required to assist the adoption of the key messages and recommendations by their clients. The survey identified gaps in existing information and a need for regionally specific recommendations and tools. These included simple paper-based tools for feed budgeting, condition scoring and economics, plus web access to all research data. Collectively, this feedback reshaped the adoption strategy and emphasised that successful delivery of Lifetimewool information to producers by extensionists and consultants was dependent on developing their acceptance and confidence in the Lifetimewool recommendations.

To ensure that any products and tools developed met the needs of the audience we adapted the 'new product development process' used by the manufacturing industry (Clark and Fujimoto 1991). This process has a strong focus on market testing at all stages which are summarised below:

- Identify the target audience – these were the 'early adopter' and 'early majority' producers, and the extensionist and consultant next users, as described by Dart *et al.* (2011).
- Identify the levels of complexity of the tools required with the target audience. In other words, were the tools needed, simple or complex, for use in the paddock or yards, and 'stand-alone' or requiring training?
- Small-scale testing of prototypes with peers and users to develop the shape and feel of the tools.
- Engage designer and editor to develop the product with appropriate branding to identify the product with the project and its scientific credibility.
- Review by peers to ensure accuracy of technical content and their endorsement of the final product.
- Final product testing with the target audience.
- Distribution and promotion using producer networks and next users.
- Evaluation of the success of the product.

Two major surveys were conducted at the end of the project in 2008 to evaluate the tools. Eighty-four consultants and extensionists responded to an on-line survey to provide feedback on the use and value of the tools to their business. In addition, other information about respondents' agreement with the key messages and their preparedness to recommend the guidelines and tools to clients was collected and is reported by Jones *et al.* (2011). A telephone survey of 1353 producers from

across Australia was also conducted to assess the use of tools. This sample was selected at random and weighted to fit the proportion of growers in each region. This represents 5% of the 25 729 levy payers in the Australian Wool Innovation database with greater than 500 sheep (Curtis 2008).

The characteristics of the decision tools

The 'review and improve' process identified wide variation in areas of interest, level of knowledge and skill required by different sectors of the audience. To match these needs and to effectively communicate the package of information from Lifetimewool, a combination of simple and complex tools were designed to work together as a 'family'. The tools were designed to be as stand-alone as possible with minimal training required and to lead producers through logical steps for making decisions on managing and feeding ewes. For example, the simple recommendation to 'monitor your flock using condition scoring' not only requires the sheep producer to learn the skill of condition scoring but also to know the target condition score for optimum production, the implications for being above or below this target, and the principles and practice of feed budgeting to achieve the target. To support these steps, we produced the following tools; ewe condition score profiles; condition score models and yard charts; feed budget tables for both green and dry phases of pasture; a pasture photo gallery; and handbooks on ewe management.

Condition score profile

The condition score profile provides condition score and pasture targets for ewe flocks in specific regions and for different times of lambing (Fig. 1). The optimum condition score profile was underpinned by economic modelling and was largely unaffected by changes in wool, meat and grain prices, annual dry matter production and flock structure. This was the first time producers had been given specific targets for ewes throughout the reproductive year that took account of ewe and progeny production and welfare outcomes in the context of whole farm profit (Young *et al.* 2011). By contrast, previous recommendations were generally based on ewe production outcomes only and therefore may have had limited practical value. The condition score profile, distributed as a magnetic 'fridge chart' encouraged producers to compare the condition score of their ewe flock throughout the year to the optimum

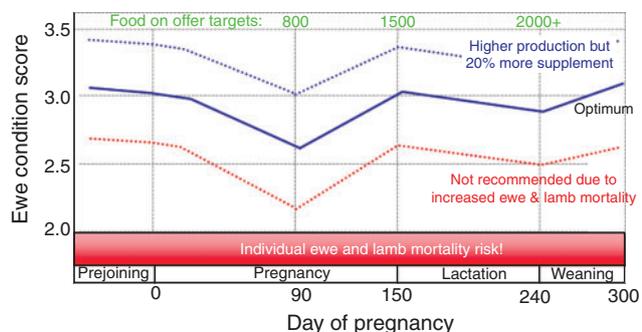


Fig. 1. An example of a recommended condition score profile for a flock of Merino ewes lambing in winter to spring and feed-on-offer targets (kg DM/ha) at key times.

profile, and to relate this to the production achieved. The condition score profile was used as the basis for flock management in the Lifetime Ewe Management course (Trompf *et al.* 2011), was provided in the ewe management handbook and downloadable from the website. We also believe that providing specific targets, such as 'condition score 3 by lambing' and/or '1500 kg DM/ha by lambing', aided the adoption of practice of condition scoring and pasture assessment as it simplified the process of determining the critical steps to action.

Ewe management handbooks

The handbooks, which included the optimum condition score profile, production and economic impacts and a quick reference guide, were designed to provide a simple but comprehensive guide of the key information required and background that supported the skills and knowledge required by producers to manage and monitor their ewe flocks. Differing enterprise, time of lambing and pasture systems affected the economic impacts of the recommendations and different editions were developed to support these variations and included the high rainfall zone, the medium rainfall zone (annual pastures), the cereal–sheep zone, the southern slopes of New South Wales and central north Victoria zones. By the end of 2008 over 12 000 copies had been distributed to producers and next users. Vanclay (2004) identified that having tools and recommendations that relate to the producers' view of the business and are specific to his or her situation and enterprise aids in uptake and popularity. The success of the different editions confirmed that the focus on the region and time of lambings in each regional edition gave confidence to the producers that the information suited their situation and would be reliable for their enterprise.

Condition score models

Lifetimewool research had shown that monitoring condition score (Jefferies 1961) was a key method in achieving ewe productivity targets. Condition scoring, however, is a subjective assessment and from the early stages of the research phase it was apparent that there were consistent differences in the assessment of condition score between assessors. A series of calibration tests were undertaken where assessors from each state were scored for repeatability and relativity to other assessors and calibration equations were developed for normalising the condition of flocks assessed by different operators (van Burgel *et al.* 2004). The development of a set of condition score models (score 1–5) made from sheep vertebrae with layers of padding to simulate the area over the short ribs and their use as the reference point subsequently eliminated the need to correct data for different assessors. The models proved to be an effective tool for communicating the condition score of ewes to sheep producers at field days and workshops and in 2007 a display was developed for each state. The display models were supported by a condition score worksheet used as a handout, which gave simple descriptors of each score and how to monitor with minimum input using the method. The tactile nature of the models allowed the audience to immediately get a 'feel' for condition scoring without the need for real sheep and the provision of a handout served to consolidate the take-home message on how easy it was to score sheep.

Feed budgeting tables

A series of feed budget tables were developed to support the supplementary feeding decisions needed to follow the optimum profile for ewe management. Four versions of the tables were developed for differing pasture systems and times of the year (Fig. 2). These tools proved to be particularly popular with producers, both those who had attended events run by Lifetimewool and producers who were looking for more detailed feed budget information who had not directly been exposed to the project. Feed budgeting is a difficult subject to communicate to producers in that either very general recommendations of feeding levels or complex multi-stepped tools, such as Grazfeed (Donnelly *et al.* 2002), can be offered. These tables used a five-step approach, such as ‘what does she need?’ and ‘what can she eat?’, and provided outputs for likely scenarios a producer would face. This tailoring of the information allowed producers to have more confidence in the validity of the feeding rates calculated but did not require intimate knowledge of the theory of feed budgeting to use. This approach was reflected by its popularity with more than 13 000 copies being distributed over 3 years in the southern states with direct requests from sheep producers, stock agents, consultants, extensionists, field day organisers, veterinarians and teaching institutions.

Pasture photo gallery

The pasture photo gallery is a series of photos showing pastures of differing composition and food on offer to aid sheep producers in estimating feed on offer (Curnow 2007). The photo gallery was originally developed in Western Australia for annual pasture systems and when it was first proposed the standard approach used by pasture experts was that producers do calibration cuts and multiple assessments before working out an estimate of food on offer. From past experience with Pastures from Space (Gherardi and Oldham 2003) and general grazing extension work we knew that producers would rarely do calibration cuts and all were looking for a quick and easy way to assess pastures to the level of accuracy that made sense at a farm level. However,

pasture experts were not convinced of the validity of the assessment using photo standards so a prototype photo guide was tested with groups of farmers and consultants experienced in pasture assessment. The estimates using the photo guide were within 10% of the measured food on offer amounts, convincing experts that the approach was valid for in-paddock assessments at a farm level. Those tested also provided feedback on the design of the product which led to the provision of additional photos with paddock views and targets for optimum grazing at various times of the year. The final product was then tested again with groups and individuals before production. Positive feedback from producers and consultants who used the guide over the next 12 months gave us the confidence to develop another edition that was suited to the mixed perennial and annual pasture systems for eastern Australia.

Lifetimewool website

In order to provide producers and next users instant access to the most up-to-date recommendations and tools a website (<http://www.lifetimewool.com.au>, verified 30 March 2010) was established that gave regional recommendations and local contacts as well as access to tools and fact sheets. Next user consultants and extensionists had also identified that they would like an electronic version of all of the scientific results and analysis from the project. Website traffic reports show that the use of the website, as measured in pages accessed, grew from 1000 pages per month to more than 2500 pages per month by June 2008, which was considerable given that it focuses just on Merino ewe management.

Adoption of the tools by the target audience

Extensionists and consultants

Interaction with producers and next users over the early stages of project was considerable and researchers engaged with producers and consultants regularly to communicate results as they were obtained. This interaction resulted in 40% of producers across Australia recognising the Lifetimewool ‘brand’ by 2004

Maintenance energy (MJ/d) for ewes under drought paddock conditions								Confinement Fed	
Day of pregnancy	small frame (45 kg) maintain @ CS 3		medium frame (50 kg) maintain @ CS 3		large frame (60 kg) maintain @ CS 3		medium frame maintain @ CS 3		
	Single	Twin	Single	Twin	Single	Twin	Single	Twin	
dry	7.4	7.4	8.0	8.0	9.3	9.3	6.7	6.7	
50	7.6	7.8	8.4	8.6	9.7	9.9	7.0	7.2	
70	8.0	8.4	8.7	9.1	10.1	10.7	7.4	7.9	
100	9.0	10.2	9.9	11.1	11.5	12.9	8.6	9.8	
130	11.3	14.1	12.3	15.4	14.4	17.7	10.9	14.1	
Days lactating	maintain @ CS 3		maintain @ CS 3		maintain @ CS 3		Ewes and lambs		
	Single	Twin	Single	Twin	Single	Twin			
10	17.3	21.7	18.7	23.4	21.5	26.9	ask for advice on confinement feeding ewes and lambs		
30	18.7	23.9	20.2	25.8	23.2	29.6			
50	15.5	19.1	16.7	20.6	19.2	23.7			

Fig. 2. Example of the format of the feed budget tables (for full tables see <http://www.lifetimewool.com.au>).

(Behrendt 2009). As awareness levels were already high, the main focus for communication activities in the final 3 years was promotion of new tools and information to the industry to support adoption. On average 3500 producers and service providers per year participated in field days, workshops and seminars between 2004 and 2008, resulting in increased confidence in the project's recommendations.

The average awareness of all tools to the next users at the end of project was almost 90% with no obvious differences between consultants and extensionists (Table 1). Average usage rate was 50% but varied between tools and users. For example the feed budget tables were highly regarded by extensionists and this may be due to their increased exposure to the tool through training sessions and visits to experimental sites or due to a better match to the information needs of their client groups. Consultants were less exposed to these training sessions and may have already developed their own methodology for feed budgeting. By contrast, the condition score models were both novel and simple to use and for these reasons appealed equally to extensionists and consultants.

Qualitative feedback also showed that the feed budgeting tables were highly valued with comments such as:

'I use the feed budgeting tables to develop rations for drought feeding and have also used the figures to input maintenance requirements (and predict weight gain/loss) for a feed budget spreadsheet which I use with my clients'.

Table 1. Use of Lifetimewool products by consultants and extensionists as surveyed in June 2008

Product	Extensionists		Consultants	
	% heard	% used	% heard	% used
Feed budget tables	98	76	92	46
Feed-on-offer photo gallery	93	54	91	49
Condition score models	97	56	98	54
Lifetimewool website	97	56	87	37
Condition score sheet	90	66	92	46
Condition score profile	75	41	80	24
Ewe management handbook	83	63	90	41
Decision support tool	71	10	72	5

Table 2. Awareness and usage of tools among sheep producers
n.a., not applicable

Tool	Awareness	Used	
	(%; n = 1353)	% of those aware	No. of producers ^A
Feed budget tables	25	25	1608
Pasture photo gallery	18	17	787
Condition score models	37	20	1903
Website	20	12	617
Ewe handbook	25	21	1351
Condition score sheet	38	21	2053
Awareness of at least one tool	55	n.a.	14 151

^AThe number of producers is calculated using 25 729 as the number of producers in the Australian Wool Innovation database with more than 500 sheep (Curtis 2008).

The condition scoring card and models were also popular with respondents who commented on the importance of using the condition scoring tools to monitor and plan. For example:

'At drought workshops we have used the condition score card and the profile targets';

'The condition score models have been used extensively to train farmers to accurately condition score'; and

'Condition score models are effective 'hands-on' tools that provide a concrete learning experience, more so than chalk-and-talk events'.

The decision support tool was the least used (71–72% awareness and 10–5% usage); however, this tool was only available to consultants and extensionists who had attended a training workshop. They indicated that they used the tool both for their own information and as a resource for their clients but found it more complex and took time to understand. Overall, the awareness and use of the package of tools was high considering most had only been in the market place for less than a year at the time of surveying. These results support our hypothesis that tools of differing complexities are required to cater for individual needs.

Producers

More than 14 000 producers recognised tools produced by Lifetimewool. This undoubtedly contributed to over 3000 producers attributing changed practice to Lifetimewool (Jones *et al.* 2011). The condition score models and worksheets were the most recognised tools (Table 2). This probably reflected their wide use at field days and seminars and in addition their hands-on design may have meant that they were more easily remembered. The levels of awareness and usage of tools was high given that many of the products had been distributed for less than 12 months and some tools had not been distributed in some regions before the survey. Hence, we expect that usage will increase as the tools continue to be promoted in extension programs such as that reported by Trompf *et al.* (2011).

Unexpectedly, educators and teachers at the secondary, tertiary and adult education level became important users and distributors of the tools with many incorporating the tools and recommendations into their teaching programs. Lifetimewool kits were provided on request to colleges of agriculture and were seen by teachers as valuable tools that were simple enough to use for training at secondary level. Universities used the handbooks and recommendations as part of their teaching program and TAFE institutions provided copies of the tools to their students. The widespread use of these tools reflects their versatility and broader appeal.

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