BRIEF COMMUNICATION: The use of farm-management tools by New Zealand sheep farmers: changes with time

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Introduction

The utilisation of farm-management tools by New Zealand sheep farmers can support on-farm decision making, thus facilitating improvements in productivity and profitability of the farming enterprise. There are numerous management tools available to farmers, for example, a recent report identified 127 tools that were available to New Zealand farmers (Allen & Wolfert 2011). Although a large number of tools are accessible to farmers, a survey of sheep farmers conducted in 2012 by Corner-Thomas et al. (2015) identified many that were utilised by only a small percentage of farmers. This indicates that there is the potential for increased uptake of management tools which, if relevant, may lead to benefits in on-farm productivity.

The aim of the current study was to determine for sheep farmers in New Zealand, if use of farm-management tools had changed over a two-year period.

Methods

A printed survey was distributed to ~12,000 sheep farmers within the 'Heartland Sheep magazine' (NZX Agri, Feilding New Zealand) firstly in October 2012 (Greer et al. 2015) and then again in October 2014. The surveys firstly contained a section which asked the farmer for demographic information on the sheep-farming enterprise, such as farm size, stock numbers and farmer age, gender and highest education level. The second section of the survey asked the question "Which of the following (if any) management tools have you used in the last three years on your farm?" For the management tools that were included in both surveys (n=30) the proportion of respondents that indicated they had used the tool was compared.

Statistical analyses

All statistical analyses were conducted using SAS (SAS Institute, Cary, NC, USA). The analyses included only those farmers that had used at least one tool and that had provided their age category, highest education level, farm size and gender (2012 n = 962; 2014 n=1373). Descriptive statistics for the above demographics were generated for each survey and reported in Table 1.

The change in the percentage of respondents that indicated they had used a particular tool was analysed using a generalised model with a binomial distribution using logit transformation and which included the fixed effect of tool and year, and their interaction. The back-transformed means and their 95% confidence intervals are presented in Table 2.

Results and Discussion

In 2014, a larger number of usable surveys was received compared with 2012 (Table 1). Although the reasons for this are unclear, this possibly reflects the smaller size of the survey (12 questions and 6 sides in 2014 vs. 23 questions and 8 sides in 2012). Despite this, farmer demographics were similar for a number of variables. The lambing percentage reported in 2012 and 2014 was similar, as was age, education and gender. There was a slight deviation between the two survey respondent profiles in farmer age categories with a greater percentage between 40 and 49 years of age, and fewer between 50 and 59 years, in 2014 than in 2012. The average farm size, and the estimated total number of sheep farmed, was greater in 2014 than in 2012. The 2014 survey did not ask whether the respondent had completed the survey in 2012, however, similarities in the demographics of respondents for both surveys suggest that the respondents were from a similar population of farmers. In the 2012 survey, the use of many

Table 1 Summary of the demographics of the survey respondents between each year that the surveys were distributed (2012 vs. 2014)

	Year survey was distributed	
Demographics	2012	2014
n usable surveys received	962	1373
Estimated total sheep farmed	2.64 million	3.72 million
Mean effective farm area	607 ha	862 ha
Mean lambing percentage	139%	136%
Age		
Less than 40 years	14.4%	12.4%
40 to 49 years of age	20.5%	34.4%
50 to 59 years of age	33.5%	20.2%
Greater than 60 years	31.6%	33.1%
Highest level of education		
High school	46.8%	44.9%
Certificate/Diploma	31.0%	32.9%
Degree/post graduate degree	22.3%	20.3%
Gender		
Female	9.5%	9.3%
Male	90.5%	90.7%

Table 2 The percentage (back-transformed logit mean with the 95% confidence interval given in parentheses) of farmers that indicated that they had used each management tool in the previous three years in the surveys distributed in 2012 and 2014 and the change in the percentage between years.

	Year survey was distributed		Change	P
	2012	2014	in mean	value [a]
Animal measures				
Electronic identification tags	5.9 (4.6 - 7.5)	23.5 (21.4 - 25.9)	17.1	***
Breeding values	25.2 (22.6 - 27.9)	48.4 (46.8 - 52.1)	23.2	***
Ram mating harness	26.3 (23.6 - 29.1)	32.5 (30.1 - 35.0)	6.2	***
Individual visual ear tags	28.1 (25.4 - 31.0)	60.2 (57.5 - 62.7)	32.1	***
Weigh ewes	36.0 (33.1 - 39.1)	50.2 (47.5 - 52.8)	14.2	***
Body condition scoring ewes	43.1 (40.1 - 46.2)	59.9 (57.3 - 62.5)	16.8	***
Examine ewe feet	56.3 (53.2 - 59.3)	69.1 (66.6 - 71.5)	12.8	***
Pregnancy scanning	70.9 (68.0 - 73.7)	75.3 (72.9 - 77.5)	4.4	*
Weigh sale lambs	73.4 (70.5 - 76.0)	76.8 (74.5 - 78.9)	3.4	+
Examine ewe udder	77.0 (74.2 - 79.5)	87.6 (85.8 - 89.3)	10.6	***
Examine ewe teeth	85.7 (83.4 - 87.8)	92.8 (91.3 - 94.0)	7.1	***
Animal health				
Fecundity vaccine	5.1 (3.9 - 6.6)	11.7 (10.1 - 13.6)	6.6	***
Facial eczema spore count	9.1 (7.5 - 11.0)	10.4 (8.9 - 12.2)	1.3	ns
Salmonella vaccine	19.8 (17.4 - 22.3)	26.4 (24.3 - 28.7)	6.6	***
Faecal egg count reduction test	21.1 (18.6 - 23.7)	34.1 (31.6 - 36.6)	13.0	***
Faecal egg counts	36.2 (33.3 - 39.3)	51.1 (48. 5 - 53.7)	14.9	***
Campylobacter vaccine	57.2 (54.1 - 60.2)	62.4 (59.8 - 64.9)	5.2	*
Toxoplasma vaccine	65.5 (62.5 - 68.4)	70.6 (68.2 - 73.0)	5.1	**
Pre-lamb clostridia vaccine	76.6 (73.8 - 79.1)	82.8 (80.7 - 84.7)	6.2	***
Pasture measures				
Pasture probe	4.9 (3.8 - 6.4)	8.0 (6.6 - 9.5)	3.1	**
Plate meter	6.9 (5.5 - 8.6)	9.9 (8.4 - 11.5)	3.0	*
Sward stick	13.9 (11.9 - 16.2)	27.1 (24.8 - 29.5)	13.2	***
Herbage quality test	19.3 (16.9 - 21.8)	31.2 (28.8 - 33.7)	11.9	***
Visual pasture assessment	67.9 (64.9 - 70.7)	82.2 (80.1 - 84.2)	14.3	***
Environmental measures				
Soil moisture monitoring	7.7 (6.2 - 9.5)	22.6 (20.5 - 24.9)	14.9	***
Soil temperature monitoring	27.8 (25.2 - 30.7)	48.3 (45.6 - 50.9)	20.5	***
Rainfall monitoring	63.3 (60.2 - 66.2)	80.1 (77.9 - 82.1)	16.8	***
Soil fertility test	79.9 (77.4 - 82.3)	87.2 (85.4 - 88.9)	7.3	***
Software				
Feed budget software	11.0 (9.2 - 13.1)	44.2 (41.6 - 46.9)	33.2	***
Financial budget software	37.3 (34.4 - 40.4)	63.8 (61.2 - 66.3)	26.5	***

[a]ns = not significant (P > 0.05); + = P<0.1; * = P < 0.05; ** = P < 0.01; *** = P < 0.001

farm-management tools was lower than expected, with only six tools used by more than 70% of farmers. In 2014, this number had increased to nine tools, although this was less than a third of the tools listed. There was, however, a decrease in the number of tools used by less than 30% of farmers from 14 in 2012 to eight in 2014.

The use of tools related to animal measures in both 2012 and 2014 showed that the majority of farmers (>75%) examined ewe teeth and udders, and to a lesser extent feet (69%), presumably to make culling decisions (Table 2). In addition, 77% of farmers weighed their sale lambs, likely reflecting the importance of lamb sales to farm income (Beef + Lamb NZ 2015). The survey did not collect information on why a tool was not used, therefore, it was not known for example whether farmers that did not weigh their lambs chose not to, or lacked the necessary equipment. The use of visual ear tags more than doubled while the use of electronic identification tags (EID) increased by almost four-fold between 2012 and 2014 (Table 2). The increase in the use of visual and EID tags may be the result of greater recording of individual animal performance. Breeding values were used by a quarter of farmers in 2012, however, this almost doubled to just under half of farmers in 2014. The increase in use of breeding values may suggest more farmers understand the potential value of using recorded data when selecting rams rather than solely relying on appearance.

In 2012, the use of campylobacter and toxoplasma vaccines was relatively low at 57% and 66%, respectively, and only increased by 5% for both of these in 2014. Given that both campylobacter and toxoplasma organisms are widespread in the environment and lamb losses due to abortion can readily be reduced through vaccination (West et al. 2009), there is potential for productivity gains to be made from an increase in the use of these vaccines (Menzies 2011). Similarly, for faecal egg counts (FEC) and faecal egg count reduction tests (FECRT), despite increasing in use by 13 and 15%, respectively, each tool was used by less than half of those surveyed. Internal parasites are a major health impediment for grazing animals (Sykes & Coop 1977) and despite the limitations of FEC and FECRT (Greer & Sykes, 2012) there are few options currently available for farmers to monitor parasite status or efficacy of anthelmintic treatment.

In 2014, as seen in 2012, less than 10% of farmers used quantitative pasture-mass measures such as pasture probes or plate meters, and less than 30% used a sward stick (Table 2). More than 80% of farmers had used the more-subjective visual pasture assessment. Although visual pasture assessment is a more-rapid method compared with quantitative pasture-mass measures, there can be considerable day-to-day variation (Piggot & Morgan 1986) and masses can be greatly influenced by poor training or lack of calibration (Thomson et al. 1997).

When asked about monitoring environmental conditions in 2014 more than 80% of farmers had monitored rainfall and conducted soil-fertility tests in the previous three years. This is an increase of almost 17% in the percentage of farmers that monitored rainfall from the 2012 survey. Less-commonly used was soil-moisture monitoring which was used by less than a quarter of farmers in 2014 and soil-temperature monitoring which was used by less than half. It should be noted, however, that the use of soil-temperature monitoring had increased by more than 1.5-fold between 2012 and 2014 (Table 2). The reasons for the increase in soil temperature monitoring are unclear. Soil temperature influences the leaf production and leaf appearance rates of ryegrass pastures (Chapman et al 1983) thus allowing farmers to predict feed growth and future availability.

The use of both feed-budgeting and financial-budgeting software increased substantially between 2012 and 2014 with increases of 33 and 27%, respectively. It is unclear why these increases were observed but may reflect the increasing ownership of computers by farmers and access to broadband (Statistics New Zealand 2015). It is widely agreed that profitability is one of the key factors that affects the adoption of new farm-management tools (see review by Pierpaoli et al. 2013). The increased use of financial-budgeting software may also be partially due to reduced accountancy costs as reported by farmers that used financial software (Nuthall 2004).

Conclusion

The aim of the current study was to investigate the use of farm-management tools by New Zealand sheep farmers and identify changes in their use with time. A small number of tools were used by more than 80% of farmers, however, many tools were used by relatively few famers. For the majority of the farm-management tools, the percentage of farmers that used the tool increased between 2012 and 2014, although, only a small number increased by 20% or more.

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