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UNDERSTANDING HOW FARMERS LEARN

H.T. Blair[1], A.M. Sewell[1], R.A. Corner-Thomas[1], P. Kemp[1], B.A. Wood[1], D.I. Gray[1], S.T. Morris[1], A.W. Greer[2], C.M. Logan[2], A.L. Ridler[1], R.E. Hickson[1] and P.R. Kenyon[1]

[1]Massey University, Palmerston North, New Zealand.
[2]Lincoln University, Lincoln, New Zealand.

SUMMARY

Changing the behaviour of people is challenging; changing farmer behaviour is possibly even more so. The evidence presented here suggests that a number of widely-used farmer communication methods are poorly thought of by farmers. Information received by farmers from other farmers was regarded as useful, and this information was regarded as being more useful than that from a number of rural professionals. Those wishing to change farmer behaviour need to: invest time to gain trust; involve farmers in the process of learning; use multiple methods to teach and encourage farmers to talk with each other and scientists in a learning community.

INTRODUCTION

The current New Zealand Government expects the New Zealand scientific community to improve the rate of uptake of new knowledge by businesses and thereby improve the New Zealand economy. Similarly, Centres of Research Excellence funded by the Tertiary Education Commission are expected to show how they will translate new knowledge into improved community benefit, and the recent Primary Growth Partnership granted to Beef + Lamb New Zealand (the farmer-owned industry organisation representing New Zealand's sheep and beef farmers) aims to improve access to information by farmers. However, the rate at which behaviour change by business owners is driven through the provision of new scientific evidence is variable and this is particularly so in the agricultural sector. Indeed, Leeuwis and Aarts (2011) suggested that much of agricultural extension falls well short of achieving lasting change in famer practice.

This paper reports on a pilot farmer learning project and a survey of New Zealand sheep farmer opinion with the intent to show how farmers go about learning new technologies, including how they like to receive information and who farmers perceive as providing useful information.

METHODS

An experimental farmer learning project has been underway at Massey University since 2011. The original group of 18 sheep and beef farmers was expanded to 26 in February 2013. The farmers work with an interdisciplinary group of 7 University experts (3 animal scientists, an agronomist, a farm management specialist, an educationalist and a sociologist). The project focused on a University farmlet trial that investigated lamb finishing on herb mix pastures (clover, chicory and plantain). The participants met 4 times per year at Massey University during a 24 hour period from noon to noon. Farmer participants were interviewed pre-project and after each meeting with specific questions about what activities and experiences had supported their learning.

A printed survey was sent to approximately 12,000 sheep and beef farmers whose addresses were on the Beef + Lamb New Zealand database. The survey was included within the 'Heartland Sheep (NZX Agri, Feilding New Zealand) magazine in October 2012. Farmers had the opportunity to either, fill in the survey and return it via a pre-paid envelope, or to fill it in electronically via a website "www.SurveyMonkey.com". A total of 971 surveys were returned (934 by post and 37 completed online).

Part A of the survey asked farmers to identify themselves based on their farm type (ram breeder or commercial farm) and the breed(s) of sheep on their farm. If a farmer indicated they

had both a ram breeding flock and a commercial flock on their farm they were classified as being a ram breeder (94 vs. 844 ram breeder and commercial farmers respectively). In Part B of the survey farmers were asked to indicate the usefulness of information providers and the usefulness of different forms of technology transfer. Scoring used a one to four scale (1 = no use at all, 2 = little use, 3 = useful, 4 = very useful).

The responses were analysed using the Genmod procedure using a binomial distribution and a log-transformation (SAS 2011) and included the fixed effect of farm type. Scores were analysed using the Genmod procedure using a Poisson distribution and a log-transformation and included the fixed effects of farmer age and farm type.

RESULTS AND DISCUSSION

Results from the farmer survey suggested that farmers place value on obtaining information from other farmers more than most other professions, with the exception of veterinarians (Table 1). It was surprising that farm consultants scored poorly. The farmer learning project showed a similar result albeit on a specific question about the use of herb pastures, whereby farmers were the second most useful group after seed merchants (Table 2). Given that the farmer learning project was focussed on the application of herb pastures, it is unsurprising that seed merchants were considered the most useful source of information.

Farmers placed greater emphasis on the print media (books / booklets, farming press, newspapers and fact sheets) than they did on most other means of technology transfer, the exception being field days (Table 3). The electronic media (CDs, DVDs, phone apps and texts) were considered of little use, although email updates and web-based information were considered useful. This may reflect a typically older age group amongst sheep farmers who are less confident with electronic media. They liked receiving a single page of “normal-people notes” written by scientists, but in language understandable by farmers.

The only significant differences in opinion between commercial farmers and ram breeders involved the usefulness of scientists as information providers (Table 1) and the usefulness of scientific seminars (Table 3), whereby ram breeders found ‘science’ more useful.

The 3-year pilot farmer learning project provided an on-going and up-to-date science focus for scientists to share evidence-based ideas about how herb pastures grow and are utilised by animals. This participatory experience not only provided the most up-to-date and unbiased information, it also provided comparative data such as lamb live-weight gains, botanical composition and weed control. While this engagement in science is labour intensive, it is likely that it is also the most effective method of changing farmer behaviour (Rogoff 2003). This need for engagement is likely to explain the low rating given by farmers for some forms of technology transfer in the farmer survey.

Farmers and scientists were both positioned as experts with different skills to share about herb pasture management. When expertise is distributed across a group and different research-based findings shared, new ideas ‘seed’ and can ‘migrate’ to other members of the community who transform them into new understandings (Brown and Campione 1998). The farmer learning project deliberately built responsive, respectful and trusting relationships between farmers and scientists and between farmers and farmers. Sinnema and Aitken (2012) in a meta-analysis of research, found respectful and reciprocal relationships in learning communities to be an effective determinant of learning. The mutual trust, respect, openness and honesty highlighted the importance of farmers and scientists knowing each other and of understanding their farming systems. The relatively low rating achieved by farm consultants in the survey would suggest they might benefit from devoting time to building trusting and respectful relationships with their farmer clients. Indeed, those consultants who achieve repeat visits, and are therefore likely to be

considered "more useful", are known to invest effort in developing relationships (Gray *et al.* 1999).

In the farmer learning project, a wide variety of multi-sensorial experiences replicating reality, were designed to motivate farmers and to provide repeated opportunities to participate in their learning, instead of simply telling them the key ideas. These learning experiences included: observations, listening, talking, tasting, reading, interpreting data, questioning, comparing ideas, challenging ideas, using calculators, transects and visiting different farms. These varied experiences led to engagement, which in turn should lead to learning. There is convincing educational research pointing to the importance of designing experiences that increase engagement, interest and motivation. Learners should experience at least three different sets of complete information about a concept before it becomes embedded in their network of knowledge, doing so provides the opportunity to revisit concepts (Nuthall 2007).

The farmer learning project intentionally positioned farmers as learners. There were no recipes for herb pasture management, hence the importance of farmers learning how to learn. Farmers came to see themselves as learners, indeed as co-learners and inquirers alongside the scientists. They became producers of knowledge with others, rather than as consumers of researchers' knowledge. They saw the gaps in scientific knowledge and were motivated to join with them in on-going research. This joint participation of farmers and scientists moves past the acquisition metaphor of learning that requires an expert to transmit a body of knowledge (e.g. when farmers listen passively to a speaker), to an emphasis on participation where farmers can observe and get involved in new technologies (Sfard 1998). More recently, Paavola *et al.* (2004) identified a knowledge-creation metaphor to emphasise how original ideas are transformed, expanded or "hatched" in an exchange of views, or dialogue, in 'innovative knowledge communities'.

It would seem likely that if those wishing to change farmer behaviour were better versed in how farmers learn, and what works to support their learning, then greater rates of adoption of, for example, animal breeding and genetic technologies might occur.

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Table 1. Farmer responses to the question: "Please indicate using a 1 to 4 scale the relative usefulness for you of each of the following information providers"

Provider	Commercial[1]	Ram Breeder[1]	Commercial vs. Breeder
Accountants	1.10 ± 0.02 (3.0) ^{h}	1.05 ± 0.06 (2.9) ^{defg}	ns
Agricultural contractors	1.03 ± 0.02 (2.8) ^{fg}	1.06 ± 0.06 (2.9) ^{defg}	ns
Agricultural retailers	1.06 ± 0.02 (2.9) ^{gh}	1.08 ± 0.06 (2.9) ^{defg}	ns
Agronomists	0.92 ± 0.02 (2.5) ^{cd}	0.92 ± 0.07 (2.5) ^{cde}	ns
Banking	1.02 ± 0.02 (2.8) ^{fg}	1.00 ± 0.06 (2.7) ^{def}	ns
Beef + Lamb NZ	0.93 ± 0.02 (2.5) ^{de}	0.92 ± 0.07 (2.5) ^{cde}	ns
Farming consultants	0.67 ± 0.03 (2.0) ^{b}	0.65 ± 0.08 (1.9) ^{ab}	ns
Fertiliser reps	0.98 ± 0.02 (2.7) ^{ef}	0.90 ± 0.07 (2.5) ^{cd}	ns
Meat companies	1.00 ± 0.02 (2.7) ^{f}	0.95 ± 0.06 (2.6) ^{def}	ns
Other farmers	1.10 ± 0.02 (3.0) ^{h}	1.11 ± 0.06 (3.0) ^{fg}	ns
Ram breeders	1.03 ± 0.02 (2.8) ^{fg}	1.09 ± 0.06 (3.0) ^{fg}	ns
Regional council	0.43 ± 0.03 (1.5) ^{a}	0.50 ± 0.08 (1.6) ^{a}	ns
Scientists	0.85 ± 0.02 (2.4) ^{c}	1.01 ± 0.06 (2.8) ^{defg}	*
Stock agents	1.03 ± 0.02 (2.8) ^{fg}	0.96 ± 0.06 (2.6) ^{def}	ns
Veterinarians	1.16 ± 0.02 (3.2) ^{i}	1.17 ± 0.06 (3.2) ^{g}	ns
Wool buyers	0.87 ± 0.02 (2.4) ^{cd}	0.75 ± 0.07 (2.1) ^{bc}	ns

Means within columns with differing letter superscripts are significantly different $P<0.05$
Differences between commercial and ram breeder responses, p-values of $P>0.05$ are indicated by ns, $p<0.05$ by *
[1] Back-transformed %

Table 2. Farmer responses to the question: "Please identify the three people that you've found it most useful to talk to or use so far about herb pastures"

Role	Number	%
Accountant	0	0.0
Banker	0	0.0
Consultant	3	7.7
Contractors	1	2.6
Farmer	11	28.2
Industry good	1	2.6
Merchant (fertiliser)	2	5.1
Merchant (seed)	18	46.2
Other	0	0.0
Scientist	2	5.1
Veterinarian	1	2.6
TOTAL	**39**	**100**

Table 3. Farmer responses to the question: "Indicate using a 1 to 4 scale the relative usefulness for you, for each of the following forms of technology transfer"

Technology Transfer	Commercial[1]	Ram Breeder[1]	Commercial vs. Breeder
Books / Booklets	1.12 ± 0.02 (3.1) [l]	1.06 ± 0.06 (2.9) [gh]	ns
CDs	0.51 ± 0.03 (1.7) [c]	0.50 ± 0.09 (1.6) [a]	ns
Certificate level courses	0.42 ± 0.03 (1.5) [ab]	0.50 ± 0.09 (1.6) [a]	ns
DVDs	0.60 ± 0.03 (1.8) [d]	0.61 ± 0.08 (1.8) [ab]	ns
Demonstration farms	0.84 ± 0.02 (2.3) [fg]	0.84 ± 0.07 (2.3) [cdef]	ns
Diploma level courses	0.46 ± 0.03 (1.6) [bc]	0.48 ± 0.09 (1.6) [a]	ns
Email updates	0.94 ± 0.02 (2.6) [ij]	0.93 ± 0.07 (2.5) [cdefg]	ns
FITT programme	0.72 ± 0.03 (2.1) [e]	0.78 ± 0.07 (2.2) [bc]	ns
Fact sheets (1-2 pages)	0.96 ± 0.02 (2.6) [ij]	0.99 ± 0.07 (2.7) [defg]	ns
Farmer discussion groups	0.97 ± 0.02 (2.7) [j]	1.02 ± 0.06 (2.8) [fgh]	ns
Farming press	1.15 ± 0.02 (3.1) [l]	1.17 ± 0.06 (3.2) [h]	ns
Field days	1.05 ± 0.02 (2.9) [k]	1.08 ± 0.06 (2.9) [gh]	ns
Industry workshops	0.91 ± 0.02 (2.5) [hi]	0.95 ± 0.07 (2.6) [cdefg]	ns
Monitor farms	0.86 ± 0.02 (2.4) [gh]	0.83 ± 0.07 (2.3) [cde]	ns
Newspapers	1.00 ± 0.02 (2.7) [jk]	1.01 ± 0.06 (2.7) [efgh]	ns
Phone apps	0.37 ± 0.03 (1.4) [a]	0.40 ± 0.09 (1.5) [a]	ns
Radio	0.85 ± 0.02 (2.3) [gh]	0.92 ± 0.07 (2.5) [cdefg]	ns
Scientific literature	0.83 ± 0.02 (2.3) [fg]	0.83 ± 0.07 (2.3) [cde]	ns
Scientific seminars	0.60 ± 0.03 (1.8) [d]	0.77 ± 0.07 (2.2) [bc]	*
Television	0.78 ± 0.02 (2.2) [ef]	0.81 ± 0.07 (2.2) [cd]	ns
Tertiary level courses	0.47 ± 0.03 (1.6) [bc]	0.51 ± 0.09 (1.7) [a]	ns
Text updates	0.34 ± 0.03 (1.4) [a]	0.46 ± 0.09 (1.6) [a]	ns
Web based information	0.88 ± 0.02 (2.4) [gh]	0.85 ± 0.07 (2.3) [cdef]	ns

Means within columns with differing letter superscripts are significantly different P<0.05
Differences between commercial and ram breeder responses, p-values of P>0.05 are indicated by ns, p<0.05 by *
[1] Back-transformed %