THE IMPORTANCE OF FARMER BELIEFS AND ATTITUDES TO THE DEVELOPMENT AND ADOPTION OF NEW FARM TECHNOLOGIES: A CASE STUDY

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Introduction

Models of technology transfer based upon farmer ignorance or inferior knowledge do not encourage scientists to appreciate the considerable knowledge held by farmers collectively from their wealth of experience in understanding and manipulating a very complex system (Roling 1988). Classical science experiments have reduced farm systems to component experiments in order that scientists can develop a specialist understanding of practical problems and suggest technical solutions. However it is only when the technical "solutions" have been integrated again into complete farming systems and established to meet a range of farming goals that they can be judged to be successful or not. Farmers' experiences may lack the controls of classical science but they can provide useful indicators of how to integrate interactions across a complex range of system components. Each farmer will have a different mix of indicators that monitor their system's performance. It is farmers' perceptions about the effects of these that form their beliefs and attitudes towards technologies.

Previous studies have shown that farmers beliefs and attitudes towards new technologies are the most important determinants of adoption. This was highlighted in recent research carried out into King Country beef farmers' use of crossbred beef dairy cows, mating yearling heifers, and terminal sires. Variables associated with farmer demographics, farm business standards, and their operational activities were all compared to the farmer's use of the technologies (Parminter 1994). Farmers were also asked about their beliefs about the technologies. In regression analyses used to evaluate the association, it may have been expected that farm business variables or farm performance standards would have been the most important determinants of technology use. Instead using only the farmer beliefs about the technologies improved the precision of estimating adoption behaviour from less than 50% to more than 70%. These results are consistent with a model for human behaviour proposed by Fishbein and Ajzen (1975) and shown in Figure1. In the model it is not just the objective attributes of technologies described in scientific publications that determine their likely use, but more importantly the beliefs and attitudes that farmers form and hold. The next sections apply this model to the case study technologies being developed for the beef breeding industry.

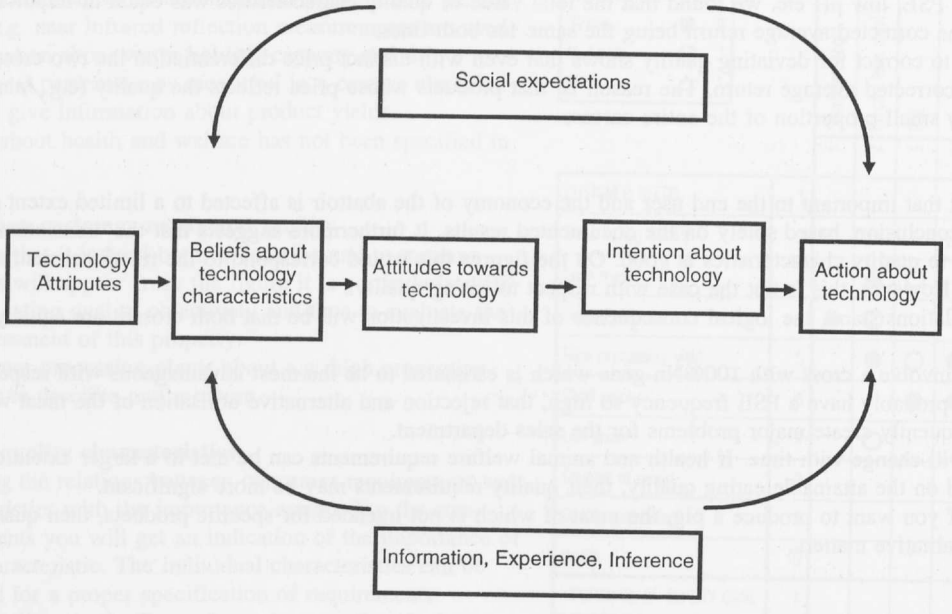
Technology Attributes

Biophysical scientists began developing crossbred beef dairy cows, yearling heifer mating, and terminal sire technology in the early 1970s and identified a number of attributes about them that were considered to justify their widespread use by beef farmers (Table1).In general, farmers recognised the same productivity advantages as the scientists developing the technologies. However, they had also identified a large number of additional advantages and disadvantages that were not reported on in scientific articles. Early attributes reported about the technologies did not include measure of pasture management labour requirements or fit with existing skills. All these have been shown to be important in farmer evaluations of new technologies (Parminter et al, in press).

Beliefs about Technology Attributes

Whether they used the technologies or not, the farmers had both negative and positive beliefs about them. Beliefs can be formed by people even before they have had direct experience with technologies. These beliefs may be based upon other experiences that they associate the technologies with. For instance, even if they have had no experience with herds of twinning beef cattle, farmers have been shown to already have beliefs about that technology. In some cases based upon their experience of twinning in sheep flocks (Parminter et al in press). The salient beliefs that farmers hold about the technologies in the 1994 study are listed in Table 1, along with the proportion of farmers holding those beliefs.

FIGURE 1: Proposed Model Of How Farmer Beliefs And Attitudes Are Influenced And In Turn Affect Farmer Adoption Behaviour *(From Parminter et al in press).*



Attitudes Towards Technology

Both farmers who were using a technology and those not using a technology may have had similar beliefs in common. However, if the strength of the beliefs that individuals linked to positive outcomes were greater than the strength of the beliefs they associated with negative outcomes, those individuals were likely to have favourable attitudes towards technology use. If the reverse held true they had negative attitudes.

Attitudes were formed from beliefs which could be influenced by information and social pressures, as well as personal experience and the inferences made from these.

Generally beliefs about expected financial returns were the most common reason given by farmers for using a new technology. It was beliefs about the non-financial negative interactions between technologies and farming systems that were the most common reasons given by farmers for not using a new technology (Parminter 1994, Parminter et al, in press).

Table 1: Attributes used by scientists and beliefs of farmers evaluating three beef breeding cow technologies. *(From Parminter 1994).*

Scientists Technology Attributes	Farmer's Technology Beliefs	Average proportion (%) of farmers who held these beliefs	
		(a) Rejecting a technology	(b)Adopting a technology
	Beliefs with Positive Associations		
Greater calf production[1]	Greater herd productivity	36	60
Increased calf growth[2]	Increased calf growth	34	56
	Increased genetic gain	5	15
	Greater hardiness	3	8
	Improved temperament	3	14
	Easier feed management	2	4
	Greater compatibility with existing farm operation	4	11
Greater profitability[3]	Greater profitability	21	51
	Greater market demand for calves	17	28
	Positive peer pressure	2	7
	Beliefs with Negative Associations		
	Reduced herd productivity	30	12
	Smaller calves	8	2
	Reduced genetic gain	5	2
Greater calving difficulty[4]	Greater animal health problems	50	31
	Greater behaviour problems	6	5
Lower Body condition[5]	Increased feed requirements	52	33
	Unsuitability with existing farm operation	51	18
	Reduced profitability	19	4
	Calves less suitable for market requirements	28	9
	Negative peer pressure	9	0

[1] Morris, 1982
[2] Baker and Morris, 1981; Morris, 1982
[3] McMillan, 1989
[4] Baker and Morris, 1981
[5] Thomson, 1989

Intentions About Technology Use

In many cases farmers have positive attitudes towards using technologies but they need to invest in new plant and equipment, change their management, and / or obtain new skills, before their situation is ready to utilise the technology. The farmers positive attitudes give them positive intentions but they may need extra planning and resources before their intentions are implemented.

In the case of the beef technologies being studied, many farmers not using the technologies said that they would need extra grazing management skills to manage their more stringent spring feeding requirements. These farmers had experienced poorly fed two year old cows not getting into calf again the following year.

Interventions to Develop New Technology and Modify Farmer Behaviour

An understanding of farmer beliefs and attitudes and the ability to utilise their experiences of managing farm systems can enhance research programmes for technology development.

1. Workshops with farmers for system analyses can be held at the beginning of a research programme to identify the key inputs and outputs that need to be studied and reported on by scientists. In a project on new beef breeding cow technologies (Parminter et al, in press), such workshops identified that research for technology development should account for their effects upon:
   - other complimentary enterprises such as sheep production on mixed livestock farms
   - the performance of herd female replacements and growing finishing stock
   - access to improved genotypes
   - existing farming circumstances, eg, labour limitations.
2. During the process of technology development a mentor group of farmers can be formed to meet regularly with the researchers and assist with research design and feed back about implementation. A systems trial at Whatawhata Research Centre on beef cattle twinning is currently benefiting from a mentor group.
3. Once the scientific research for a technology has been completed, farmers can again assist with:
   - further modifications that may be required to make a technology adaptable to their farming systems.
   - identifying the extra resources and skills required for a successful implementation
   - the information required in a technology transfer programme.

Group Farm Monitoring and Study Groups have been an excellent forum for these processes. In these groups farmers and technologists meet together to monitor and improve the performance of selected forms as a catalyst for group learning and education (Webby and Paine, in press).

References

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