

Preferred technologies and strategies for intensified pastoral production in New Zealand: are there human resource implications?

Bruce Small¹ and Hein Roth²

¹ AgResearch Ltd., Ruakura Research Centre, PB 3123, Hamilton, New Zealand.

² Omega Consulting Ltd, PB 4699, Mount Maunganui South, 3149, New Zealand.

Email bruce.small@agresearch.co.nz

• **Abstract.** Focus groups were held with high achieving New Zealand Farmers in four pastoral sectors: sheep, dairy, deer and beef. First, data were gathered regarding the reasons for farmers looking to adopt new technology and strategies for intensification of production. Next, potential technologies for adoption in each sector were identified. Finally, farmers' views on the likely impact of adoption of preferred technologies on labour needs were canvassed. The focus group results were used to develop a quantitative telephone survey, which was administered to random samples of approximately 100 farmers in each sector.

• For all sectors the main reasons driving the adoption of new technologies were desire to increase profits and personal satisfaction from maximising returns from their land. In the sheep sector the two technologies/strategies most likely to be adopted in the next five to 10 years were low-input, maximum-return strategies and improved feed budgeting. In the dairy industry, the two strategies most favoured for adoption were the production of high value milk products (e.g., nutraceuticals) and improved animals and grasses through genetic engineering. The deer industry favoured selecting for the most efficient hind size to suit their farm and improved breeding to maximise growth rate to 10 months of age. Beef farmers favoured improved farm management practices and improved grass species. Farmers from all sectors believed adoption of these strategies and technologies would not increase labour requirements. Currently, all sectors viewed the availability of labour as being from poor to adequate and likely to become worse in the next five to 10 years.

• **Key words:** Intensification, technologies, adoption, labour, dairy, sheep, deer, beef

Introduction

Modern farming practice, as a complex business, frequently calls for pastoral intensification strategies to ensure productivity increase and the industry's long-term economic sustainability. Various technologies and management strategies are available to help pastoral farmers to achieve their objectives. An earlier AgResearch report (Small et al. 2005a) and conference paper (Small et al. 2005b) investigated the drivers of intensification, and the types of technologies and strategies that farmers in four pastoral sectors (sheep, dairy, deer and beef) could use to increase productivity. This paper is a summary of findings presented in another AgResearch report (Roth et al. 2007) and covers research findings regarding the primary goal motivations for farmers to adopt intensification strategies, the likelihood of adoption of each of a number of selected strategies in each of these four pastoral sectors, the perceived impacts of their adoption on human resource requirements on-farm, and farmers' general views of the labour market situation and training opportunities within agriculture in New Zealand.

Focus groups (Krueger and Casey, 2000) were held with farmers and other relevant industry participants in each of the four pastoral sectors. Farmers' reasons for wanting to intensify production were identified as were a variety of broadly defined intensification strategies or technologies available to each sector (i.e., any technologies or farm practices or combinations of technologies and practices that could be adopted for the specific purpose of increasing on-farm productivity). The Nominal Group Technique (Delbecq et al., 1975) was used to generate as many technologies/strategies as possible and then to rank them in order of importance or preference for adoption reasons. From this data the top five to seven adoption reasons and technologies/strategies were identified for inclusion in the quantitative research phase, which examined on farm attitudes to these issues via a national telephone survey.

From the sheep sector strategies selected for the study were: balancing maximising returns against using minimum cost inputs, improved feed budgeting, high fecundity sheep for producing twins and triplets, improved animal genetics through DNA typing or marker assisted selection, and increased nitrogen use to increase stocking rate. In the dairy sector strategies included: production of high value milk products (e.g., nutraceuticals), improved animals and grasses through genetic engineering (GE), improved animal and grass genetics through DNA typing or marker assisted selection (not GE), once-a-day milking, and robotic milking. Strategies in the deer sector included: selecting for most efficient hind size to suit the farm, improved breeding to maximise growth rate to 10 months of age, 100kg weaner by 1st June (current industry strategy), technologies to achieve

earlier fawning, intensive summer cropping, and indoor wintering and pad feeding. In the beef sector: improved farm management practices, improved grass species, the use of beef breeding cows, improved animal genetics through the use of records of genetic origin, dairy/beef progeny strategy (i.e., the use of beef bull semen over dairy herds for the production of beef cattle), intensive feedlot systems, and sex selection of dairy and beef cattle using sexed artificial insemination semen, were selected.

In addition to farmers' views on the adoptability of these intensification strategies within each of the pastoral sectors, the study also included an exploration of their primary goal motivations to adopt any strategy to improve productivity, the probable impacts intensification would have on human requirements within each of the sectors and their general views of the current labour market for each sector.

Method

A structured quantitative questionnaire for each of the four pastoral sectors was developed and constructed from the focus group research. The survey data were collected through the use of a national telephone survey involving random samples within each of the pastoral sectors across both main islands of New Zealand.

The means of each sector's respondents' ratings of their primary goal motivations for adopting identified intensification strategies and the likelihood of their future adoption were calculated and goal importance and adoption likelihood rank-ordered according to their perceived importance. Respondents also rated the probable impacts adoption of intensification strategies would have on human resource requirements (response categories: Decreased labour demand, No change, Increased labour demand, and Unsure), the current labour market and training resources available to the industry in terms of both availability and quality (response categories for these four questions: Very poor, Poor, Adequate, Good, Very good, and Unsure), the future (5-10 years) availability of labour for the market (response categories: Much worse, A little worse, The same, A little better, Much better, and unsure), and the degree to which they would encourage their own children to pursue a career in their industry sector (response categories: Definitely not, Unlikely, Maybe, Probably, Definitely, and Unsure).

Results

Sheep industry

The sheep industry survey had 95 respondents, which comprised a variety of enterprises and management structures (private, family trusts, and corporate). Effective farm sizes varied from 4ha to 15,040ha, with stock units ranging between 86 and 11,000. Some were mixed farming enterprises, with a secondary, but strong beef production focus. Participants included farm owners, operations managers, farm managers, stock managers, head shepherds, shepherds, shepherd generals, and farmhands/labourers.

Similar to results from the qualitative study by Small et al. (2005c), adoption of intensification strategies in this sector was financially driven; achieving maximum returns from the land and increasing profit (see Table 1). Balancing maximising returns against using minimum cost inputs and improved feed budgeting were the two principal intensification strategies having the greatest likelihood of adoption in the next five to 10 years. High fecundity sheep for producing twins and triplets was viewed as a viable option in the longer-term (see Table 2).

Table 1. Mean and SD for ratings of sheep farmers' reasons to adopt intensification strategies

Reason for intensification	Mean	SD
Personal satisfaction – achieving maximum returns from the land	4.6	0.63
Desire to increase profits	4.6	0.72
Market competition	4.2	0.83
Higher land values – need for return on capital	3.9	1.02
Competing alternative land uses	3.7	0.77

Scale: 1 = Not important, 3 = Moderately important, 5 = Very important

Table 2. Mean and SD for likelihood of sheep farmers adopting an intensification strategy in next 5-10 years

Intensification strategy	Mean	SD
Balancing maximising returns against minimum inputs	4.6	0.66
Improved feed budgeting	4.1	0.72
High fecundity sheep producing twins & triplets	3.6	1.23
Improved animal genetics via DNA typing or marker assisted selection	3.3	1.37
Increased nitrogen to increase stocking rate	2.2	1.35

Scale: 1= Very unlikely, 3 = Unsure, 5 = Very likely

Most sheep industry respondents did not expect the adoption of these intensification strategies to affect labour demand, with less than 25% of respondents expecting an increase in demand. Current availability of a suitable labour force for the industry was an issue (poor or very poor) for almost half (44%) of the sheep industry respondents, while the quality (i.e., skills, knowledge, and attitude) of the potential labour force available to the sector was considered adequate to very good by most (65%). The availability of a suitable labour force in the next five to ten years was indicated as a concern (much worse or a little worse) by half of the group (50%). Most respondents indicated that they would encourage their own children to make their career in the sheep sector. However, 23% were unlikely or definitely would not. The national availability and quality of training courses and resources for the sector was described as ranging between adequate to good (88% and 86% of respondents respectively), and the relationship between training providers and the sector was described in a similar fashion by 80% of respondents.

Deer industry

The deer industry survey involved 99 respondents (farm owners, investors, farm managers, family members involved in the operation, and farmhands/labourers). Effective farm sizes varied from relatively small enterprises comprising 17ha having a herd size of 70 and managed as a private concern, to complex family trusts managing enterprises comprising 14,500ha with a herd size of 6,000 farmed in conjunction with 12,000 sheep, and 1,000 beef units.

Motivation to adopt an intensification strategy was financially driven, with increasing profit, achieving maximum returns from the land, and the need for return on capital investment cited as the primary drivers for intensification (see Table 3). Selecting for most efficient hind size and improved breeding to maximise growth rate to 10 months of age were viewed as the two principal intensification strategies most likely to be adopted in the next five to 10 years (see Table 4). Adoption of these strategies was not expected to significantly impact labour demand; only 9% of respondents believed that labour demand would be increased while 66% believed there would be no change.

Table 3. Mean and SD for ratings of deer farmers' reasons to adopt intensification strategies

Reason for intensification	Mean	SD
Desire to increase profit	4.4	0.87
Personal satisfaction of achieving maximum returns from the land	4.2	1.04
Higher land values – need for return on capital	3.9	1.03
Rising input costs	3.5	1.23
Low market prices	3.4	1.33

Scale: 1= Not important, 3 = Moderately important, 5 = Very important

Table 4. Mean and SD for likelihood of deer farmers adopting an intensification strategy in next 5-10 years

Intensification strategy	Mean	SD
Selecting for most efficient hind size to suit farm	3.4	1.31
Improved breeding to maximise growth rate to 10 months of age	3.3	1.33
100kg weaner by 1 st June (current industry strategy)	2.7	1.45
Technologies to achieve earlier fawning	2.7	1.33
Intensive summer cropping	2.5	1.36

Scale: 1= Very unlikely, 3 = Unsure, 5 = Very likely

The current availability and quality of the potential suitable labour supply was described as adequate (54% and 57% respectively rated availability and quality as adequate to very good). However, the longer-term view was that it would become more difficult finding suitable staff in future, with 50% rating it much worse or a little worse and 34% rating it the same as the current situation. Most participants indicated they would not encourage their own children to pursue a career in the deer sector (16% answering maybe, 16% unlikely and 36% definitely not). The availability of training courses and resources was cited as being adequate, as also was the quality, however, with 51% responding they were unsure there was considerable uncertainty regarding course quality. The current relationship between training providers and the sector was described as adequate to very good by 34% of respondents with a further 38% being unsure.

Dairy industry

The dairy industry group included 91 respondents, which comprised farms managed as a private concern, family trusts, corporations, partnerships and two companies. Effective farm sizes varied from 4.9ha to 622ha with herds ranging from 5 to 2,100 stock units. Participants included farm owners (or equity share partners), 50/50 share milkers, lower order sharemilkers (variable order milker or contract milker), operations managers, farm managers, unit or block managers, herd managers, herd/farm assistants or farmhands/labourers).

Achieving maximum returns from the land and profit increase were the principal drivers cited for adopting intensification strategies (see Table 5). Production of high value milk products (e.g., nutraceuticals) was perceived as the principal intensification strategy to be adopted in future (see Table 6). Most dairy farmers thought this strategy would result in no change to the labour demand (62%) or would decrease demand (12%). Once-a-day milking and robotic milking were viewed as the least likely strategies to be adopted. In the earlier focus group study, the cost involved in setting up the necessary physical farm structure to accommodate the robotic milking strategy proved to be the major barrier to its adoption (Small et al., 2005c).

Table 5. Mean and SD for ratings of dairy farmers' reasons to adopt intensification strategies

Reason for intensification	Mean	SD
Personal satisfaction of achieving maximum returns from the land`	4.5	0.78
Desire to increase profit	4.4	0.83
Higher land values –need for return on capital	3.9	1.03
Market competition	3.7	0.81
Competing alternative land uses	3.7	0.91

Scale: 1 = Not important, 3 = Moderately important, 5 = Very important

Table 6. Mean and SD for likelihood of dairy farmers adopting an intensification strategy in next 5-10 years

Intensification strategy	Mean	SD
Production of high value milk products (e.g., nutraceuticals)	3.8	1.26
Improving animals and grass through genetic engineering (GE)	3.1	1.52
Improved animal and grass genetics through DNA typing or marker assisted selection (i.e., not GE)	3.1	1.41
Once a day milking	2.3	1.40
Robotic milking	1.7	1.06

Scale: 1 = Very unlikely, 3 = Unsure, 5 = Very likely

Current labour availability was judged to be poor (34%) to adequate (34%) with a further 15% considering it very poor. The quality of the available labour supply to the sector was considered poor by 29%, adequate by 37% and good by 16%. Availability of a suitable labour pool was viewed as a future concern with 18% believing it would become much worse, 40% a little worse and 24% considering it would remain the same. Most respondents indicated that they would encourage their children to make a career in the dairy industry (50% definitely, 17% probably and 12% maybe). The national availability and quality of training courses in the sector, as well as the relationship between training providers and the sector, was considered adequate to good.

Beef industry

The beef sector included 99 respondents with enterprises comprising privately owned farms, family trusts, corporations, partnerships, companies, and deceased estates. Effective farm sizes varied

between 6.9ha with as little as 12 stock units, to 1,834ha with 2,500 stock units farmed in conjunction with a flock of 4,500 sheep units. Respondents interviewed included beef breeders, rearer-owners, finisher-owners, farm managers, stock and herd managers and farmhands/labourers.

Satisfaction with achieving maximum returns and the desire to increase profit were cited as the major drivers for adoption of intensification strategies (see Table 7). Improved farm management practices and improved grass species were cited as the two most likely strategies to be adopted in future (see Table 8). These strategies were not expected to have any impact on the future labour demand.

Table 7. Mean and SD for rating of beef farmers' reasons to adopt intensification strategies

Reason for intensification	Mean	SD
Personal satisfaction of achieving maximum returns from the land`	4.3	1.04
Desire to increase profit	4.1	1.20
Market competition	3.7	1.28
Higher land values –need for return on capital	3.6	1.33
Competing alternative land uses	3.2	1.28

Scale: 1= Not important, 3 = Moderately important, 5 = Very important

Table 8. Mean and SD for likelihood of beef farmers adopting an intensification strategy in next 5-10 years

Intensification strategy	Mean	SD
Improved farm management practices	4.2	1.10
Improved grass species	3.9	1.34
The use of beef breeding cows	2.7	1.66
Improved animal genetics via the use of records of origin	2.6	1.64
Dairy/beef progeny strategy (i.e., use of beef bull semen over dairy herds for production of beef cattle	2.4	1.59

Scale: 1= Very unlikely, 3 = Unsure, 5 = Very likely

The current availability of a suitable labour pool was considered poor (25%) to adequate (34%) with a further 14% considering it very poor. Quality of available labour supply was reported as adequate (the mode at 36%, 20% poor or very poor and 19% good or very good). In general, the respondents (40%) expected that supply of suitable labour would worsen (much worse 10%, a little worse 30%) in future, while 21% thought it would remain the same and 17% that it would get better. Most respondents indicated that they would still encourage their own children to pursue a career in the beef sector (21% maybe, 17% probably and 27% definitely). The national availability and quality of training courses, as well as the perceived relationship between training providers and the sector, was viewed as adequate to good.

Discussion

Previous qualitative research indicated pastoral intensification to be primarily driven by high land values, the need to maintain or increase profit and return on investment, competing alternative land uses and increasing international market competition (Small et al., 2005a, 2005b). Quantitative results from this study supported these findings, with achieving maximum returns from the land, the desire to increase profit, and the need for return on capital investment cited as the major drivers for adopting intensification strategies in all four pastoral sectors.

Intensification strategies most likely to be adopted in future in the sheep industry included balancing maximising returns against using minimum cost inputs and improved feed budgeting. Favoured strategies in the deer industry included selecting for most efficient hind size and improved breeding to maximise growth rate to 10 months of age. The major strategy identified as most likely to be adopted in the dairy industry was the production of high value milk products

(e.g., nutraceuticals), while future strategies in the beef industry included improved farm management practices and improved grass species. None of these intensification strategies in any of the sectors were expected to significantly impact labour demand.

Although participants in the four pastoral sectors viewed the current availability and quality of a potential labour force for their sectors to be mostly adequate, views as to the future availability of labour were less optimistic. With the exception of the deer industry, study participants in the

pastoral sectors indicated that they would encourage their own children to pursue a career in their industries. We interpret encouragement of their own children into their industry sector as meaning that they hold an optimistic view of their industry into the medium to long term future.

The majority of participants across each of the pastoral sectors indicated the national availability of training courses and resources within their industries as adequate to very good. However, the quality of the training courses and resources appeared to be just adequate or unknown to the deer sector respondents, while those in the other sectors considered it to be adequate to good. In general, the existing relationships between training providers and the various industries were also described as adequate to good.

Key learnings

- The adoption of intensification strategies was primarily economically driven.
- None of the industry sector intensification strategies cited as being likely to be adopted in future, were expected to significantly impact labour demands.
- While current availability and quality of labour was considered adequate (less so in the dairy sector), labour availability was expected to decrease in future.
- Industry training resources were regarded as relatively plentiful across all four sectors and, with the exception of the deer industry, quality of training was considered adequate to good.
- With the exception of the deer industry, participants in the other pastoral sectors indicated that they would still encourage their own children to pursue a career in their specific industries.

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