Client Report

Prepared for DEEResearch

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Overview of accelerated learning and technology transfer in the deer industry

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1 Executive Summary

This review focuses on the deer industry with the overall aim of examining learning and technology transfer. The review terms of reference were: to assesses the current state of knowledge about research on learning and technology transfer and the implementation of such research in the deer industry; to identify current research, relevant programs, and links to funding and other programmes; to identify research topics and knowledge gaps that are relevant to the deer industry needs for future growth; and to assess the capability to do this research in New Zealand.

The review identified that:

– There is no national strategy for research into or implementation of learning and technology transfer in the deer industry. Interviewees considered developing a coordinated industry wide strategy should be a priority.

– There has been little research into learning and technology transfer specific to the deer industry, however, one report on a series of trials was identified. The existing generic farmer technology transfer and learning research literature should be reviewed for applicability to the deer industry.

– Numerous methods by which deer farmers can or do access technological information were identified.

– Research needs to address which of these methods are most effective and most preferred by farmers, and what aspects of each method enhance successful transfer and which aspects detract from successful transfer so that existing methods may be improved.

– The Deer Search project (collating published material) is currently being funded by the Sustainable Farming Fund.

– An extended benchmarking programme has also been funded by the Sustainable Farming Fund.

– Numerous research topics and knowledge gaps relevant to the deer industry were identified. The review authors have prioritised the four most urgent research areas and these are listed in the Recommendation section of this review.

– Most interviewees agreed that the capacity and capability to do research and implementation of deer farmer learning and technology transfer exist within New Zealand.

– DEEResearch. has specific funds allocated for the dissemination of information from researchers to farmers. DEEResearch could provide a suitable vehicle for coordinating research strategy and ensuring mechanisms are built into research programmes to transfer resultant technologies and knowledge to end users.

– A national benchmarking scheme, identifying determinants of superior performance, may provide tools and techniques enabling and encouraging farmers to reach higher standards.

2 Introduction

How farmers learn and access scientific information is likely to have a significant impact on any agricultural industry. If the farmers receive technical information in a form that they can interpret and apply to their own particular circumstances, which they also perceive to be beneficial to them, then it is likely that the information will be utilised.

The brief required that the data for the review be obtained from interviews with relevant industry personnel and participants.

2.1   Aims

The review focuses on the deer industry, with the overall aims of examining learning and technology transfer.

The aims of the review were to:

1. Assess the current state of deer research knowledge and its implementation in terms of learning and technology transfer.

2. Identify current research and relevant programs in this area as well as links to FRST and other programmes

3. Identify and priorities, research topics and knowledge gaps that are relevant to deer industry needs and future growth.

4. Assess the NZ deer industry's capability to do research and implementation of deer farmer learning and technology transfer.

2.2   Background

Current industry strategy

In order to understand how technology transfer might occur in the deer industry it is helpful to understand the overall structure of the industry. This is shown in Figure 1. The New Zealand deer industry consists of a number of inter-linking organisations, namely the Deer Farmers Association (DFA), Deer Industry Association (DIA) and the New Zealand Game Industry Board (GIB) (Figure 1). The Game Industry Board is central to the links between the DFA and DIA, as board members of the Game Industry Board represent both the DFA and DIA. Currently, the GIB consists of three representatives from the DIA, four representatives from the DFA, and one individual is a representative of the crown.
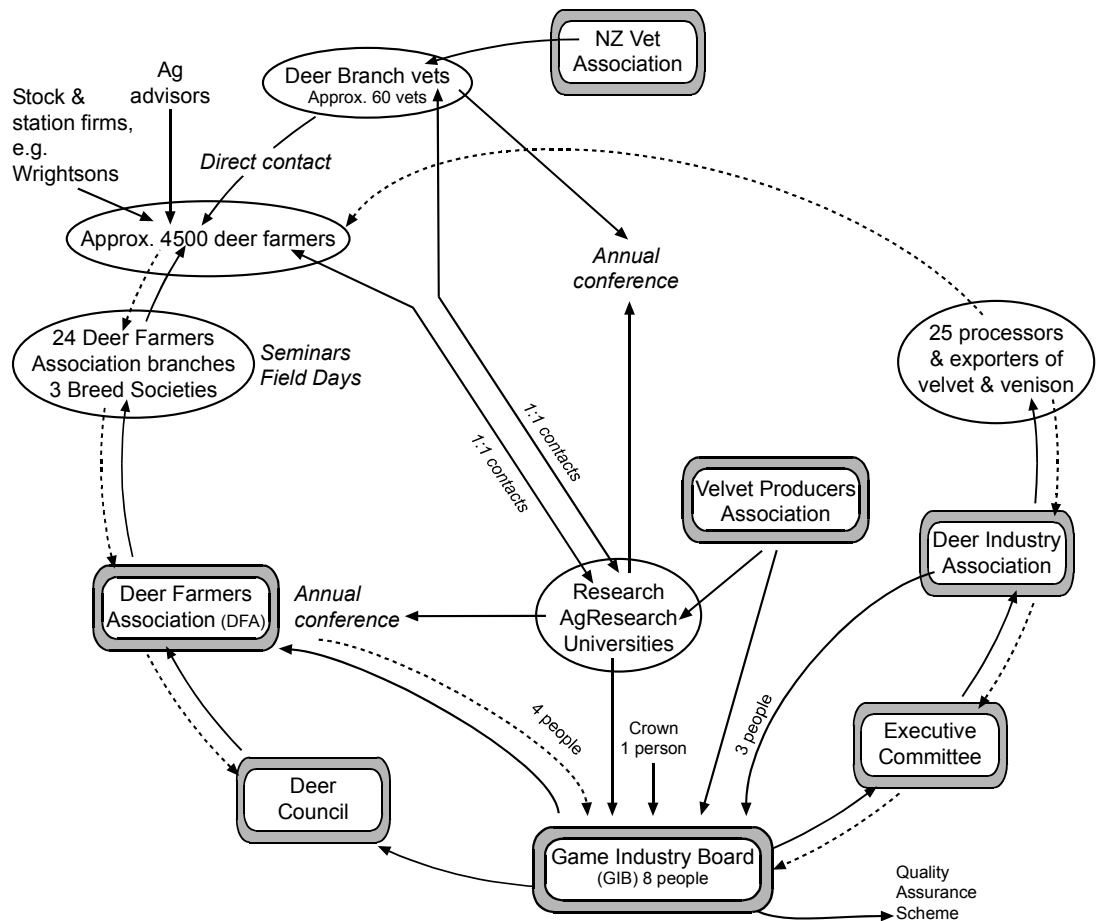

Figure 1. Structure and function of NZ deer industry

The Deer Farmers Association (DFA) consists of 24 branches throughout the country. There are also three breed societies (Wapiti, Red Deer and Fallow). Farmers that are members of these societies are also likely to be members of

their local DFA branch. Currently, there are approximately 4,500 deer farmers in New Zealand. The transfer of information through the GIB, DFA and DIA, and learning by farmers will be discussed below.   Figure 1 shows several other participants in the deer industry; their roles are described later in this report.

The DFA was formerly funded by membership fee of $180, which was paid for by about half of the deer farmers.   There was resistance to paying this fee as all deer farmers benefitted from the political lobbying by the DFA. DFA now use the Commodity Levy Bill to gain funding i.e., all deer farmers contribute. However, the DFA is unable to use the commodity levy for political lobbying which is a major activity of the DFA. Hence, they now charge farmers $30 p.a., $15 dollars of which goes to funding regional branch association activities, and $15 dollars of which goes to DFA for political lobbying.

Proposed Industry Structure 2002

Recently, deer farmers were polled to assess their support for a new industry structure (Figure 2). A decision on this will be made at the next DFA annual general meeting (May 2002).

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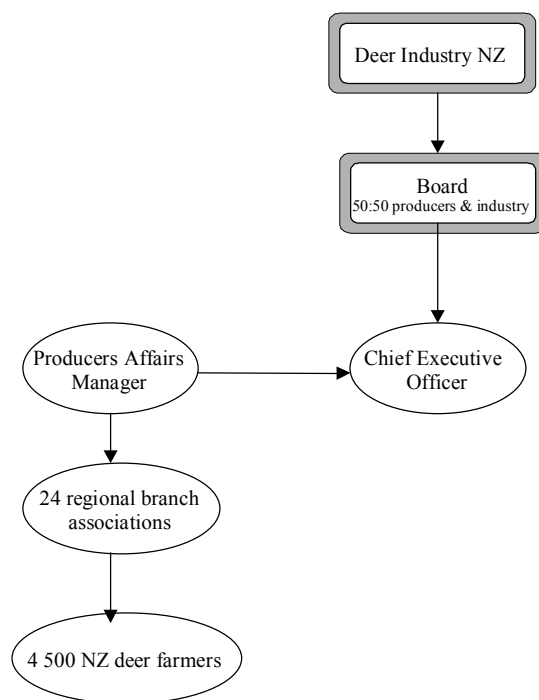Figure 2. Proposed industry structure

3 Methods

This review used a questionnaire to gather qualitative and quantitative data on learning and technology transfer to deer farmers in New Zealand. One to one interviews, either in person or on the telephone, were used to collect the data. Fifteen informants considered to be knowledgeable about the deer industry were interviewed (Appendix II). The interviewees represented veterinarians; scientists/researchers; consultants; DFA representatives; GIB representatives; Meat NZ representatives. A semi-structured interview with open-ended questions was used to collect the qualitative data (Appendix I). Quantitative data were obtained by asking the interviewees to rate their responses to questions on a scale of 1 to 7, where 1 was very poor and 7 was very good. These questions are included in Appendix I.

4 Results and Discussion

The responses of the interviewees were collated and interpreted. The results are presented here with researchers' summary and comments appearing in boxes.

4.1 Current state of deer research knowledge and its implementation

In response to the question: Is there an industry strategy for learning and technology transfer in the deer industry for 1) research and 2) implementation? all of the interviewee agreed that currently, there is no strategy for research into learning and technology transfer in the deer industry. In addition, there is no national strategy for the implementation of research on learning and technology transfer, although there are mechanisms by which deer farmers can obtain information. Interviewees considered a national strategy to be important

> **Currently, there is no nationally co-ordinated strategy for research and implementation of technology transfer and learning in the NZ deer industry. Interviewees considered such a strategy is important and should receive immediate attention.**

The GIB initiates research on specific technologies, or pre-emptive issues, and transmits this information (where the research is not sensitive to the industries

objectives) via the DFA to deer farmers. In addition, the GIB will disseminate appropriate information to the exporters and processors via the DIA (Figure 1). The GIB also runs quality assurance schemes within the industry for the transport of deer, velveting procedures for deer farmers, livestock agents and processing plants (this will be discussed in the training courses section).

New Zealand Deer Farmers Association (NZDFA) branches organise local seminars and field days. Many branches invite speakers such as veterinarians, scientists, and farm consultants, to give deer farmers the opportunity to access information and network with other deer farmers and speakers. The frequency of meetings at NZDFA branches tends to depend on individuals on the committee of local NZDFA branches. Anon, (1998) estimated that approximately half of all deer farmers participate in local NZDFA, and it therefore appears to be a good vehicle for the dissemination of information.

One person said that currently, the Game Industry Board tends to support the dissemination of information more than research and development, but that the DFA are equally involved in the dissemination of information and research and development. Another participant indicated that the transfer of technological information to deer farmers is not carried out in a structured manner.

> **There are a number of different ad hoc methods being used for the transfer of technology and learning to deer farmers in NZ. Some are claimed to be more effective than others. It seems that in cases where the principles of achieving effective learning outcomes were used, the impact on participants was greater than where the same principles were ignored. This needs to be investigated and the lessons learnt should be given to the deer industry.**

It was suggested that the above organisations are only vaguely linked with little co-ordination of activities. There is a strong need for feedback loops between the various organisations involved in the deer industry. One interviewee pointed out that there has been considerable research into new technologies for the deer industry, but the uptake of this research has been poor. A few interviewees suggested that implementation has occurred in some small pockets within the industry such as the areas close to the three benchmarking programmes and in some NZDFA branches (discussed in the bench-marking section).

DEEResearch has been recently formed and has a board consisting of representatives from AgResearch (2 people), DFA (1 person), GIB (1 person), DIA

(1 person), Tertiary Institution (1 person) and an independent chairperson. It was suggested by a few interviewees that this was the current strategy for the implementation of the transfer of technologies, and learning to deer farmers. DEEResearch has specific funds allocated for the dissemination of information. Therefore, in the future contracts will stipulate that research results will be transferred to deer farmers (provided the information is not sensitive to the deer industry). One interviewee indicated that researchers should also consider how best to get the technical information to deer farmers.

> **There is little co-ordination and feedback between the various industry organisations. This has to be addressed by the industry, which is currently restructuring. DEEResearch, a relatively new body, could provide a vehicle for the co-ordination of research and implementation of technology transfer and learning.**

4.2   The overall effectiveness of learning and technology transfer

Respondents' opinions of the overall effectiveness of technology transfer and learning in the deer industry were canvassed. Opinions ranged widely. However, in general, they felt that this had been moderately successful, although relatively patchy and with clear room for improvement. Some respondents considered that some areas of technology and knowledge had been more effectively transferred than others. Another respondent considered that technology transfer had been better in the past than currently. Table 1 indicates how effective respondents considered the transfer of technology and learning to farmers in the deer industry to be.

Table 1. Count of respondents' rating of effectiveness of transfer of technologies and learning to farmers in the NZ deer industry (n=15)

Rating*	1	2	3	4	5	6	7
Respondent count	0	1	3	5	4	2	0

* 1 = very poor, 7 = very good

Responses ranged from 2 to 7, with a mean of 4.2, which is close to the neutral point of 4.0. Note that, one of the interviewees preferred to separately rate the transfer of different technologies. These were: Nutrition-feed supply rating 7; Reproduction and management of breeding rating 5; Farm management and

animal behaviour rating 3; Environmental management rating 2. This respondent's data were averaged for inclusion in Table 1. Another interviewee preferred to rate the effectiveness of transfer of information now as poorer (rating 4) compared to in the past (rating 6), when the industry began. Again the respondent's ratings were averaged for inclusion in Table 1.

> **Despite opinions ranging widely, effectiveness of technology transfer was considered moderately successful, geographically patchy, and better in regard to some technologies than others. There clearly is a need to optimise the learning opportunities in the deer industry.**

4.3 Research on learning and technology transfer in the deer industry

Respondents were asked: what research has been done in NZ regarding the technology transfer and learning of deer farmers? Respondents unanimously claimed that there has been very little research specifically designed to consider how deer farmers learn and access scientific information. Most of interviewees were unaware of any systematic research into learning and technology transfer strategies for deer farmers.

A few interviewees were aware of a confidential MAF policy report "Identifying strategies to facilitate transfer and uptake of knowledge on velveting best practice" (Matthews, 1999). The report is a summary of a considerable amount of work carried out at the Animal Behaviour and Welfare Research Center (ABWRC), AgResearch. During a survey of velveting practice by deer farmers, they found that a proportion of deer farmers failed to reach appropriate standards, despite being audited annually by veterinarians. In follow-up research, veterinarians were found to have sufficient expertise to audit farmers. Therefore, it was thought that ineffective information transfer might be the major issue. Information that needed to be transferred to ensure compliance with the AWAC code was collated.

In another study, Matthews, Loveridge, & Guerin, (1994) had found that the most effective method for transferring information to farmers was via veterinarians. The best way to provide the veterinarians with up to date knowledge was found to be through a series of national seminars in the major velveting farming regions of New Zealand, immediately prior to the velveting season. Farmers complying with the annual audit of velveting procedures assessed the effectiveness of the

transfer of scientific information via the veterinarian to the farmer (Matthews, 1999). Matthews, (1999) found that there were high levels of compliance with the auditing scheme, thus the transfer of technical information and farmer learning had been successful. This research on technology transfer was used in subsequent study (Morrow & Matthews, 1998 reported by Matthews, 1999), where an innovative technology was introduced to farmers via the supervising veterinarian. They found that the uptake by the farmers of this novel procedure via the veterinarians was low. The reasons for this are unclear, as it is not known whether the veterinarians did not pass on the information, or if farmers chose not to use the novel procedure due.

> **There has been little research into technology transfer and learning specific to the deer industry in NZ. The research that has been conducted found conflicting results regarding the effectiveness of veterinarians as intermediaries for learning and the transfer of technology. Research into how deer supply chain participants manage multiple goals and their perceived relationship to innovative technologies or knowledge sets would help to understand and hence increase the uptake of useful technologies.**

Morris, Loveridge, & Fairweather, (1995) found that the extent to which an innovation allows them to achieve certain goals (particularly relating to production or efficiency), will be a determinant of whether the innovation will be adopted by farmers. Because of the low uptake of some useful technologies (e.g. Matthews, 1999), research into farmer learning and transfer of knowledge of novel technologies would be useful in understanding and assisting the uptake of information.

There have been a number of generic studies relating to learning and technology transfer with farmers, and in particular why farmers change their farming practices (Morris, Loveridge, & Fairweather, 1995; Jangu, 1997; Matthews, Loveridge, & Guerin, 1994; Stantiall, 1999; and Stantiall, 2000). Morris, Loveridge, & Fairweather, (1995) found that farmers in general prefer information about changing practices to be channelled through other farmers. They may meet other farmers through personal contacts, at field days, held on local farms and discussion groups. Matthews, Loveridge, & Guerin, (1994) also found that farmers received information (regarding animal welfare) from discussions with other farmers, along with friends and family, news reports and their local veterinarian. One of the interviewees in the present study suggested that

research into the area of learning and technology transfer is generic to all farmers. This participant thought it likely that such research had already been done in other farming industries, and therefore no further research in this area was necessary, but simply the application of the knowledge to the deer industry.

> **Generic studies of farmer technology transfer and learning showed that preferred methods are: other farmers, friends and family, news reports and veterinarians. These generic studies should be analysed for their applicability to the deer farming industry.**

The respondents rated the effectiveness of research into learning and technology transfer (Table 2). Seven out of fifteen of the interviewees were unable to answer this question because they were unaware of any research that had taken place. Three out of fifteen of the interviewees were aware of research and rated it highly (5 or 6). The remainder rated this question from 1 to 4, even though they did not know of any such research. The mean for those responding was 3.8, which is close to neutral point of 4 on the scale of 1 to 7.

Table 2. Count of respondents' rating of the effectiveness of research on technology transfer and learning in the NZ deer industry (n=8)

Rating*	1	2	3	4	5	6	7
Respondent count	1	1	2	1	1	2	0

* 1 = very poor, 7 = very good

4.4 Effectiveness of implementation of research into learning and technology transfer methods

Respondents were queried regarding the effectiveness of implementation of research on technology transfer and learning in the NZ deer industry. It was widely thought by the interviewees that deer farmers learn through a variety of methods: contact with their veterinarian; bench marking programmes; field days; publications; conferences; one to one contact with experts; training courses; formal education; workshops; farm consultants; and the internet. Each of these methods will be discussed below.

<u>Veterinarians</u>

Most of the interviewees suggested that farmers could access much technical information directly through their veterinarian. Some interviewees were of the

opinion that the local veterinarian is an excellent medium for technology transfer as he/she is able to assimilate scientific information well, and relay this information to farmers in way that they understand. Matthews, Loveridge, & Guerin, (1994) found that the local veterinarian was the preferred source of technical information. Despite this, one interviewee said the veterinarian is "often used as the ambulance at the bottom of the cliff", as vets cost farmers money. One person felt that the use of vets varied regionally, with some deer farmers using vets proactively to get specific information.

Veterinarians seem to be a preferred source of technical information, however, their fees limit farmers' desire to use them. Anecdotal evidence suggests that veterinarians generally are not fully equipped to address all farmers' problems. They are being regarded as professionals.

Benchmarking programmes

Farmers learn from on farm research and better do problem solving, because of benchmarking programmes e.g. Deer Master. In addition, where farmers are involved directly in research (Anon, 1998), it has been found that this is a very effective method of transferring technical information to them.

Over the last few years there have been three benchmarking programmes operating on a group of farms in Canterbury (Deer Master), Hawks Bay (Richmond/Wrightsons' deer performance project) and Southland (Deer South). The first one initiated was the Deer Master programme, which was considered by one interviewee to be a great success (the programme won the Deer Industry Award for 2001). The other two programmes were subsequently developed. Benchmarking projects are particularly valuable when they determine the causes of performance variation rather than just measuring and comparing different farmers performance.

Benchmarking projects have generally been considered very successful by interviewees. Involvement of farmers in research has been found to facilitate technology transfer and learning. It is important to determine the causes of different levels of performance when using benchmarking projects. This will help to understand performance differences and thus to effect behaviour change of under performers. Further, adult learning principles, e.g. involvement and engagement are important and need to be taken into account in all technology transfer and learning activities.

The Deer Master project was well funded and the organisers of the programme were able to make a good start at transferring information about deer farming via a free "deer farmer manual" However, learning and technology transfer was not a primary objective. Once the funding ran out there was very little follow-up on information transfer.

Several of those interviewed felt that deer farmers had had much of the information handed to them on a plate, in the form of manuals, conference proceedings, and articles in magazines and newsletters. Consequently, it was thought that the farmers did not appreciate or use the information very effectively. For example, the deer industry manual distributed to farmers free was thought by some of those interviewed to be read by perhaps 30% of deer farmers. In contrast, one interviewee thought that 60 to 70% of deer farmers would read the information in the deer industry manual and then apply it to their situation. Research is required to determine the use of the manual by farmers, and to determine whether manuals, conference proceedings, magazine articles and newsletters are a desired form of technology transfer and learning for deer farmers.

> **Some respondents considered free information (e.g., Deer Master Manual), because it involved little commitment by farmers, was under-valued and under-utilised. The usefulness and utilisation of the Deer Master Manual should be investigated. In the deer industry, just as is the case in other agricultural industries, it has been reported that small investments by participants into learning opportunities furthered their commitment and learning. This should be investigated.**

Subsequent groups (Richmond/Wrightsons deer performance project in the Hawks Bay and Deer South) have had a specific objective of their programme to actively promote technology transfer both within the programme and to the wider deer community. In the Richmond/Wrightsons programme, a stated objective is for individuals on the programme to be involved in technology transfer. This has been carried out through field days for farmers involved in the programme, and open days for the wider farming community. These technology transfer days may include a farm visit, and/or seminars by some of the people involved in the Richmond/Wrightsons programme. In addition, an interchange of information between the three benchmarking programmes has occurred through representatives from each of the three programmes visiting each other's groups

for 2 to 3 days.   Information gathered has been fed back to their own programmes.

Benchmarking, when used appropriately, could be an important technology transfer method. It could also be used as a very effective learning tool. This also applies to deer research and technology development projects. However, research is required to identify the drivers of deer farmers' learning and decision-making, so that the use of these activities as learning events could be optimised. Those responsible for and who lead technology transfer need to be trained how to use benchmarking, research and technology development projects as learning opportunities for farmers and themselves.

One of the interviewees suggested that the presenters at these meetings might not necessarily have been the best people to present the information. There were different opinions regarding who ought to be transferring technical information from benchmarking programmes to farmers. It has been suggested that scientists are good at producing the information that farmers need, but they are not good at passing that information on to farmers. Another considered "The resources put out there are huge but effectiveness is poor". One respondent suggested that, in a group situation, an expert in extension work should present the information to farmers. These considerations suggest the need to determine whom farmers prefer to present them with technical information in such situations.

Learning is optimised when experienced and trained learning facilitators are used. These skills can be acquired. Research is needed to determine deer farmers' learning needs and preferences.

However, it was noted that these meetings provide a forum for farmers to interact with technical experts on a one to one basis, enabling them to receive the information they require.

Another method believed to get farmers interested in new information is through competition between farmers. One interviewee suggested that, competition had been generated through the involvement of farmers in the benchmarking programmes (e.g. Deer Master). As another interviewee said "There is no

shortage of information, however, there is a need to create in farmers a need for information so that they will then seek out and find the information they want". A few of the interviewees suggested that perhaps, if there was a national benchmarking programme enabling farmers to compare themselves with others, that this may drive them to seek more information.

It was suggested that those farmers involved in the Deer South programme already had a "motivation and desire to improve themselves". Another interviewee suggested that the deer industry has a group of people who are innovative and receptive to new technologies. However, he also mentioned that there were others in the industry that are "happy with their lot" and do not want to change their farming practices.

Not all deer farmers learn or prefer to learn in the same manner. To assist deer farmers to learn more effectively, research is required: 1) to identify the drivers of learning of deer farmers; 2) to be able to segment the deer farmer population. This will help the deer industry to focus resources and optimise deer farmers' learning.

One of the interviewees believed that all those involved in the benchmarking programmes had learned much about technology transfer and learning of deer farmers. However, there had been no specific research into learning and technology transfer. Despite its overall success, it was suggested that some meetings of the Deer Master programme had been frustrating for all concerned and actually inhibited technology transfer. Further, it was thought that future programmes of this nature would benefit from understanding why some meetings were successful while others were not.

Different kinds of meetings are popular means of involving deer farmers and are often used to "transfer technology from those who know to those who don't". This is superficial and an erroneous belief, for all participants learn through group interactions. Group interaction and participation could be powerful ways for researchers and deer farmers to influence and learn from each other. This is called co-learning. Research is needed to determine what factors improve the quality and effectiveness of deer farmer meetings and what factors detract from their effectiveness.

<u>Field days</u>

Field days are organised for deer farmers at AgResearch (interviewees mentioned the Invermay group and Ruakura), DFA branches, Universities (Massey, Lincoln and Otago), and benchmarking programmes. A few of the interviewees thought that the Invermay group were excellent at giving information out to farmers in publications and at field days. Despite this one interviewee thought that there was not a lot of "grassroots" in the Invermay team. Contrary to this, another interviewee thought that the reason the Invermay group were so good at transferring technical information to farmers, was due to the expertise of key people involved in the Invermay group.

One person mentioned that discussions with deer farmers at DFA branch meetings or field days, where the farmers are often there for general interest rather than with any specific goal to get particular information, are excellent forums for low key conversations about their ideas. Another of the interviewee's comment on field days was that they decided how to get the information to farmers by: "Gut feeling on what is required next, field days are reasonably effective as far as it goes!"

<u>Publications</u>

Deer farmers can get access to technical information through publications such as "The Deer Farmer" an independent monthly subscription magazine, and "Stagline" a free newsletter publication prepared by the DFA and DFA branch newsletters. One of the interviewees wondered if publicity of new technologies in the Deer Farmer and Stagline was really an effective method of exposing farmers to novel information, as currently there is only an assumption that this is effective.

> **Publications and other forms of any written material may be great for raising awareness and to supply information, but not to achieve behaviour change.**
>
> **The usefulness of the different types of deer publications for the transfer of technology and learning needs to be measured.**

<u>Conferences</u>

Several participants mentioned that research results on new technologies may be obtained directly by farmers through attending the annual conferences of the DFA and the deer branch of the New Zealand Veterinary Association. Alternatively, this information may be obtained indirectly through discussions with their local

deer veterinarian who has attended the conferences. The proceedings of both conferences are not refereed, however, most of those interviewed agreed that they have a high standard of production based deer research. The three day DFA conference has the GIB and DFA annual general meetings on separate days, followed by a day specifically for the dissemination of information through seminars and workshops. The technical sessions are often well attended with approximately 300 delegates. However, a few of the interviewees pointed out that the numbers of deer farmers at the DFA conferences has not increased substantially over the years of expansion of the industry. In the early years of the industry (about 20 years ago) there were approximately 1000 deer farmers, 300 of whom would attend the DFA conference. Now there are approximately 4,500 deer farms and still only 300 of them attend the annual conference. It was suggested that in the early days there was "a vacuum of information and a great need to know".

A few of the interviewees hypothesised that the proportional reduction in numbers attending the conference may be due in part to the change in "personality type" of farmers currently entering the deer industry. It was suggested that when the deer industry began, most deer farmers tended to have "an entrepreneurial, outgoing character", as deer farming was a new enterprise with an animal few knew much about. Therefore, it would not have been surprising to have a large turn out of these farmers at the conference. The deer industry now appears to have a buoyant future and it is not as much of a risk to farm deer as it was at the start of the industry. Farmers entering the industry today tend to be sheep and beef farmers who want to diversify part of their farm into deer. These people may have less outgoing personalities, be more conservative or have different motivations for farming deer compared to those starting the industry and, consequently, may be less likely to attend conferences. However, there have been no scientific studies on deer farmer personality and the effect of this on the uptake of information. Deer farmers may also access the information from conferences by obtaining copies of the proceedings. Recently there was a conference on "achieving change through improved knowledge systems" at Massey University (Stantiall, 2000), however, there were no papers specifically related to the deer industry.

> **Conferences should be held for specific purposes and have to form part of a strategy to achieve those purposes. However, conferences are important means to raise awareness in any industry of issues and other relevant industry matters. They provide a great opportunity for all deer industry supply chain stakeholders and role players to mix, interact and discuss issues relevant to the industry. Research is needed to determine how deer conferences can be made more attractive to all supply chain participants (farmers and the wider industry), in order to increase their attendance at such events.**

One to one advice from experts (scientists/researchers)

Some respondents mentioned how both deer veterinarians and deer farmers receive informal advice directly from researchers (AgResearch and Universities). Similar results were found in a previous study (Anon, 1998). It was suggested that one of the best ways to get information across to farmers was by informal conversation. Firstly, establishing a good relationship with them, then in the course of conversation, exchanging information.

> **One-on-one contact is good to achieve behaviour change. It may be expensive. Little is known about whom deer farmers would trust to provide reliable, quality information to them – this is another area where research would be helpful.**

Training courses

The GIB has four industry training programmes or quality assurance (QA) schemes, for transport operators, velveting techniques for farmers, livestock agents and processing operators. The transport companies are accredited under the deer QA scheme. In order to get this accreditation, transport operators must attend the QA course run by the GIB and have approved transport crates on their trucks. The course consists of information on driving skills; animal handling; animal behaviour and welfare; legal considerations and customer service. Much of the information used on this course had been gained from researchers at Animal Behaviour and Welfare group at AgResearch.

Stock and station agents are accredited in the deer QA programme. To maintain their accreditation, livestock agents must attend and pass the QA course. Much of the information used on this course had been gained from researchers in various institutions around New Zealand. The farmer velveting QA scheme is run by local deer veterinarians, who train farmers and assess their velveting competence annually. The GIB runs short courses (two-day seminars) for processing plant personnel. These seminars often include presentations from MAF.

There are six councillors in the DFA who have an education and training portfolio. The industry used to have industry training organisation (ITO) funding for education and training, which they used to train young people coming into the deer industry. This funding was cut four years ago.

Formal education

Some deer farmers may have learned about deer farming at a University (e.g. Massey), or Polytechnic (e.g. Telford). Telford Polytechnic currently runs a certificate in Agriculture Knowledge which is a correspondence course for 2 years. Within the certificate there are 5 modules on deer breeding and 2 modules related to the deer industry. They also run a full time Certificate in Agriculture based at Telford, which has modules on deer farming. Currently, they do not run any courses specifically for deer farmers. One of the interviewees thought that the polytechnic ought to be running some courses for deer farmers. Others interviewed where unsure what Telford offered deer farmers, if anything.

> **Some industry training, quality assurance courses and formal education courses are available for people working in the deer industry. A co-ordinated training and education strategy and increased publicity regarding what is available may be beneficial for technology transfer and learning in the industry. Giving more of the same training is usually not of much help. The applicability of current training for industry needs would have to be assessed.**

Workshops

The Applied Nutrition Group (at Invermay) holds 3 to 4 workshops each year in the North and South Islands of New Zealand. Farmers who are members of the Applied Nutrition Group, which has an annual fee of $30, attend the workshops. There is usually a group of 20-25 farmers at each workshop. Workshops are

interactive and timed according to industry activities (e.g. velveting). The Applied Nutrition Group also publishes three newsletters per annum with new information relevant to deer farming

Farm consultants

Deer farmers may access information through consultants such as "Agribusiness". In one of the DFA branches it was reported that twelve of the farmers have pooled together to contribute to the fee of a farm consultant. They meet with the consultant approximately every two months on a different farm (one of their own, or one related to a benchmarking scheme e.g. Richmond/Wrightsons programme), to discuss ideas, difficulties and solutions.

Internet

There is free information available for deer farmers through the DFA website and AgResearch web site, such as AgFacts which are bullet point information sheets and in the future they will have DeerSearch. DeerSearch is a project currently underway to develop a database of information for deer farmers. The database will consist of scientific papers (900 of which have been generated by scientists at AgResearch, and 90 by researchers at Massey University), and popular articles. There are concerns relating to copyright issues regarding DeerSearch and these are currently being investigated. Concern was also expressed about New Zealand giving away competitive advantage by making this data freely available on the internet. Thus, one suggestion is that farmers be able to access DeerSearch via the internet provided they have a security code and password. The security for this database is likely to be controlled by the DFA or the like.

> **The Internet could offer great possibility for the dissemination of information. However, little is known about how deer farmers use the Internet, what kinds of information they prefer to receive via this medium, and the best ways to present information on the Internet for easy understanding and uptake by farmers. Some research has been done in this regard and needs to be investigated for its applicability to the deer sector.**

Deer farmers can access and receive information about the industry in many different modes. In the opinion of many of the interviewees, groups representing the deer industry (e.g. DFA and its branches) and research providers (e.g. AgResearch and Universities) currently transfer information to farmers in an ad

hoc, uncoordinated manner. Respondents considered that the industry would benefit from a coordinated nationwide strategy.

Respondents were asked to rate how effectively research on learning and technology transfer has been implemented by the deer industry. Table 3 shows the rating of effectiveness for each interviewee. The interviewees' responses ranged widely from 2 to 6, with a mean of 4.4, which is slightly above the neutral point of 4.0. Seven out of fifteen of the interviewees were unable to rate how effectively research on learning and technology transfer has been implemented by the deer industry, as they were unaware of any research in this area. Three out of fifteen of the interviewees were aware of research and rated its implementation from 4 to 6. The remainder rated this question from 2 to 6, even though they did not know of any such research.

Table 3. Count of respondents' rating of the effectiveness of the implementation of research on technology transfer and learning in the NZ deer industry (n=8)

Rating*	1	2	3	4	5	6	7
Respondent count	0	1	1	2	2	2	0

* 1 = very poor, 7 = very good

4.5   Current research and links to FRST and other programs

The Deer Master project was primarily funded by FRST although, it did have other contributors. The Richmonds/Wrightsons deer performance project was funded by FRST, GIB, DFA, Richmonds, Wrightsons, AgVac and a few other contributors. Currently, there is a three-year project to extend the three initial benchmarking schemes to 4 or 5 other districts in NZ. This project will not only develop the benchmarking scheme but will also examine reasons for performance differences. In addition, the project is funded to develop performance indexes for deer farming production. This extended benchmarking project has been funded by the Sustainable Farming Fund.

The construction of the Deer Search database (AgResearch) is also currently being funded by the Sustainable Farming Fund. Although not directly concerned with deer farming, of generic interest is a current AgResearch FSRT contract, C10X0001, of which Objective 2, learning processes and tools, is investigating the effectiveness of group and distant learning processes (including the Internet) and learning preferences of farm decision-makers through activity theory.

Another FRST project of generic interest is a current Massey University contract, MAUX0009, which is investigating how to successfully increase engagement of individuals in the dairy industry in technology transfer and learning.

A proposed FRST contract, currently being negotiated with AgResearch, directly addresses issues in the deer industry. Objective 4 of this project directly addresses accelerated industry transformation through enhanced technological learning and technological uptake by producers and processors.

In recent times a company has been established, DEEResearch, to co-ordinate and fund deer research in NZ. Currently, DEEResearch has a small budget of $250K per annum, which is proposed to increase to $750K within 5 years.

> **There are a few FRST funded projects which may have direct or indirect relevance to technology transfer and learning in the deer industry. They have to be assessed in terms of their applicability for the deer sector.**

4.6 Knowledge gaps and future research topics regarding technology transfer and learning in the deer industry

A number of knowledge gaps have been identified in the preceding sections. Interviewees gave many suggestions on what they thought were future research topics addressing these knowledge gaps regarding technology transfer and learning in the deer industry. It was not possible for interviewees to prioritise these suggestions, either because they only gave one suggestion, or due to the interviewee being unable to prioritise their own suggestions. The topics are not listed in any particular priority order, although related topics are clustered together.

1. Research that investigates what the key drivers for changing farmer behaviour are.

Some interviewees expected that there would be different drivers for different practices. For example, animal welfare and environmental information, although very important in terms of market requirements, may have less economic advantages for the farmers. Consequently, farmers may be less likely to implement these kinds of changes and improvements in their management practices. Whereas, with production and health information, which often have direct economic benefits to the farmer, a few interviewees thought that it would be

much easier to observe changes in farmer behaviour. This reasoning is based on the hypothesis that production and profit are higher priority goals for farmers than animal welfare or environmental protection. One interviewee concluded that where farmers are less driven to make changes in their behaviour it would be more important to do research in learning and technology transfer in these areas (i.e. animal welfare and environmental issues). Relevant key research questions identified were:

– Do the different sets of information/technologies hold different degrees of value in farmers' eyes? For what reasons might this be? Are these reasons accurate or true?

– Is there deer farmer resistance to change due to perceived value or cost of innovative techniques or technology?

– Are the different sets of information/technologies perceived by deer farmers as relevant to different farming goals? Does the importance of the goal to the farmer influence the uptake of different sets of information/technologies?

– How can the generic literature about technology transfer and learning be relevantly applied to the deer industry?

2. Research investigating deer farmers' perceptions of effective and ineffective methods of technology transfer and learning. This report has canvassed the opinions of knowledgeable people in the deer industry. However, clearly the opinion of the end users (i.e., farmers) of technology and knowledge are extremely important in this regard. Therefore, research needs to be conducted with farmers to determine their preferences for technology transfer and learning. The following research questions address previously identified knowledge gaps:

– How do users of technology transfer and learning in the deer industry currently receive information? (This review project goes someway towards this research question but the research also needs to canvass the users i.e., deer farmers in greater depth than the remit of this review project). Which methods are effective and which are not? Why?

– How do users of technology transfer and learning (i.e., farmers) want to receive information? What are their preferred ways of obtaining information?

– Who do deer farmers have confidence and trust in as sources of reliable quality information? Who do they prefer to get this information from in a particular learning situation?

3. Research investigating deer farmers' technology and knowledge needs. The perceived relevance of new technology and knowledge to the farmers needs is likely to be crucial for rapid uptake. Likewise, farmer involvement in research processes has been shown to increase uptake. Involving farmers in the prioritisation of research projects and research agenda setting is likely to enhance farmers' commitment to the research process, increase the relevance of research results to farmers, enhance the value that they place on the resultant technologies, and accelerate uptake. Research questions include:

– What kinds of information/technology do deer farmers want/need from the research community?

– What priority do farmers give to their identified needs?

– What knowledge and technologies do new entrants into the deer industry require? What strategies could assist new entrants to systematically convert from their current business (e.g., sheep and beef, dairying) to the deer industry?

4. More general suggestions for research questions about the methodologies involved in technology transfer in the deer industry included:

– Why is it that some aspects of technology transfer and learning have been very effectively utilised by the deer farming community and other areas have not? Have different mechanisms been used to transfer the different sets of information? How much impact does the methodology of technology transfer have on farmer behaviour?

– Review the generic literature on technology transfer and learning and assess its relevance to deer farmers circumstances

– Research on the management of technology transfer and learning in NZ for the deer industry (i.e., how to organise coherently, planning, structure and funding).

– Development of a strategy for technology transfer and learning in the deer industry

– Why have conferences attendance dropped in proportion to the size of the deer industry since its inception? How might more farmers be encouraged to attend?

– Research investigating the potential for the Internet to be used as a method of technology transfer and learning in the deer industry.

– Why are some meetings successful while others are not? What characteristics enhance a meetings success and what characteristics detract from success?

5. Some other miscellaneous research suggestions were:

– How can New Zealand retain post-graduate students who conduct research in the deer industry upon completion of their degrees? (e.g., scholarships, post-grad support). Strategies need to be developed.

– Development of a deer farmer competency description in terms of necessary skills and knowledge.

– One of the interviewees suggested that being involved with Land Corp. (largest group of deer farmers) might provide a unique opportunity to do research into learning and technology transfer in the deer industry.

> **The above list of relevant research topics were generated by respondents. Although they did not prioritise them, some will rationally precede others. Priorities have been spelled out in the recommendations section of this review.**

4.7 Assessment of NZ deer industry's capability regarding technology transfer and learning

Most of the interviewees thought that there was capability to do research in learning and technology transfer within the various New Zealand research institutes, as opposed to the deer industry itself. One of the interviewees commented that there is the capability to do learning and technology transfer research in New Zealand and he suggested AgResearch by saying: "Ruakura if you throw enough money at them!"

All of the following research providers (as listed in order of interviewee preference) were suggested as having the capability to do this type of research: AgResearch, Massey University, Canterbury University, Lincoln University, Auckland University and Landcare Research.

In addition, most of the interviewees thought that there was the capability in NZ to implement learning and technology strategies. A few of the interviewees suggested that scientists are not the best extension people, and that this capability ought to be undertaken by people who are better qualified in learning and technology transfer. Contrary to this, some interviewees suggested that perhaps a particular personality type, with particular skills is necessary to implement learning and technology transfer strategies. One of the interviewees suggested: "A Ken Drew type person, grass roots person with the ability to put the information in perspective, a mentor".

Respondents were asked to rate the capability of people in NZ to conduct research into technology transfer and learning in the deer industry. Table 4 shows the results. Interviewees rated the capability of people in NZ to do research in learning and technology transfer from 1 to 6 with a mean of 4.2. Thus, opinion varied widely amongst respondents, however, the modal response was high with just under half of the respondents rating it at 6. Note that, one of the interviewees felt unable to rate the capability of people in NZ to conduct research in learning and technology transfer because he was unaware of any research that had been undertaken.

Table 4. Count of respondents' rating of the capability of people in NZ to conduct research on technology transfer and learning in the NZ deer industry (n=14)

Rating*	1	2	3	4	5	6	7
Respondent count	2	1	2	2	1	6	0

* 1 = very poor, 7 = very good

The participants rated the capability of people in NZ to implement learning and technology transfer strategies from 3 to 7 with a mean of 5.2 (Table 5). One of the respondents rated the transfer of information to the GIB highly (6), while he considered that the implementation of learning and the transfer of technical information from the GIB as about average (4), an average rating of 5 was used for the data in Table 5.

Table 5. Count of respondents' rating of the capability of people in NZ to implement technology transfer and learning in the NZ deer industry (n=15)

Rating*	1	2	3	4	5	6	7
Respondent count	0	1	1	2	2	2	0

* 1 = very poor, 7 = very good

In general, respondents considered that the skills to both conduct research on and implement technology transfer and learning in the deer industry were available in NZ. Ways have to be found for the deer industry to tap into those resources.

5 Recommendations

1. That the deer industry develops a coordinated strategy to address both the research needs of the industry and the most appropriate means of transferring technology and knowledge to industry participants. The new proposed industry structure may help to address the identified deficiencies in communication and feedback between the various industry players. The new body DEEResearch should provide a suitable vehicle for coordinating research strategy and ensuring mechanisms are built into research programmes to transfer resultant technologies and knowledge to end users.

2. That a stock take of generic research into technology transfer and learning of farmers, to assess applicability to the deer industry and identify gaps unique to the industry, be conducted. Generic learning theory from the field of psychology is also potentially relevant e.g., behavioural theory – reinforcers, punishers, immediacy of feedback. Other relevant psychological theories might include goal setting theory, motivational theory, trust theory, group dynamics and group cohesion theory, leadership theory, and theories regarding gaining and maintaining commitment –e.g., the role of payment in engendering belief in value and commitment to projects.

3. That the technology transfer and learning research needs identified in this review be prioritised as part of a coordinated research strategy for the industry and that the strategy be implemented under the oversight of DEEResearch and in cooperation with the other industry players. In order of priority we consider the following four research needs the most urgent:

   – The technology and learning needs of deer farmers i.e., what technologies, methods and knowledge do farmers want and prefer. If research addresses the needs that farmers perceive then uptake is likely to be enhanced. It should also address which of the various technology transfer and learning methods identified in this review are considered most effective and are most preferred by deer farmers

including what type of presenters/information sources are most preferred and trusted by them.

- What makes deer farmers tick, e.g., how do the farming goals of deer farmers affect their motivation to adopt new technologies and knowledge sets. If this relationship is understood then we believe that elucidating the links between technologies and knowledge sets and farmer goal priorities will help enhance uptake.

- How can the existing methods of technology transfer and learning be improved, and what are the benefits of farmers paying to be part of technology transfer activities.

- While the interviewees suggested numerous research topics and knowledge gaps that are relevant to the deer industry, we believe it is essential to prioritise these topics according to deer farmer needs. Some of the more innovative approaches and the drivers of their success need to be investigated and if appropriate extrapolated to the rest of the industry.

4. That the existing research capacity within NZ be tapped and enhanced within the deer industry e.g., strategies to encourage post-graduate students with research relevant to the deer industry be developed. Research institutions around the country were identified as having researchers with the appropriate skills. Joint projects between the institutions would be judicious in making best use of available expertise. To further learning in the deer industry, post graduate students have to be encouraged to get trained in the principles of adult learning.

5. That a paradigm shift in industry thinking is required and that this should be acknowledged in the industry strategy. Even the terminology of the research brief for this project "technology transfer and learning" indicates a mode of thinking in which scientists/researchers discover valuable information and develop technologies which then need to be extended to and adopted by farmers. We believe that a new relationship between end users and technologists needs to be forged – a relationship of dialogue and co-learning. Such a relationship will help focus research into areas considered valuable by farmers and will help to increase trust between the research community and the farming community. Scientists and farmers are partners in the development of the industry. Thus, the research and technology transfer strategies need to be participatively developed in conjunction with the end users. Action research techniques that focus on directed evolution of the

industry towards the desired end goals are considered appropriate. There are some indications that this is beginning to happen in the research community.

6 References

Anon (1998). *Technological learning and knowledge application review* (Technological learning group summaries No. Annex 6, Vol 1). Foundation for Research, Science and Technology.

Anon (1998) *The role of on-farm quality assurance and environmental management systems (QA/EMS) in achieving sustainable agriculture and sustainable land management outcomes.* MAF Policy Technical paper (98/2). July.

Jangu, N.A. (1997). *Decision processes of adopters and non-adopters of an innovation*. PhD, Lincoln University, New Zealand.

Matthews, L.R. (1999). *Identifying strategies to facilitate transfer and uptake of knowledge on velveting best practice* (confidential report to MAF Policy No. MAF Project code EOI/207). Animal Behaviour and Welfare Research Centre, AgResearch.

Matthews, L.R., Loveridge, A., & Guerin, B. (1994). *Animal Welfare Issues and attitudes in New Zealand*. Animal Behaviour and Welfare Research Centre, AgResearch.

Morris, C., Loveridge, A., & Fairweather, J.R. (1995). *Understanding why farmers change their farming practices: The role of orienting principles in technology transfer* (Research report No. 232). Agribusiness and economics research unit, Lincoln University.

Morrow, C.J., & Matthews, L.R. (1998). *Determining best practice for inducing analgesia in Red Deer prior to velveting by non-veterinarian operators*. MAF Policy.

Stantiall, J. (1999). *Facilitating learning : enhancing dairy farmer competence through workshops*. Masters, Massey.

Stantiall, J. (2000). Paper presented at the Achieving change through improved knowledge systems, Massey University.

7 Appendices

7.1 Appendix I

<u>Questionnaire</u>

<u>Knowledge</u>

(1) What do you know about learning and Technology Transfer (TT) regarding deer farmers in New Zealand?

Research

(2) What research has been done in NZ regarding learning and TT of deer farmers?

(3) Who has done this research?

(4) Could you please send/give me references relevant information and/or names of contact people.

<u>Implementation</u>

If research is has been done, please answer the questions below (A). If you are unaware of any research in this area please go to the next set of 3 questions (B).

(A)

(5) How has this research in learning and TT been implemented by the deer industry? Is this linked to FRST or other (science) programmes?

(6) Who has/is doing this research?

(7) Please may I have references of relevant information and/or names of contact people.

(B)

(5) How is learning and TT currently done in the deer industry?

(6) Who has/is doing this?

(7) Please may I have references to relevant information and/or names of contact people.

(8)   Are there any research topics in the learning and TT area that need to be done now or in the future?

(9)   If you have mentioned more than one topic, please would you prioritise them into those, which are the most important to least important.

(10)   Who do you think has the capability to do TT and learning research in New Zealand?

(11)   On a scale from 1 to 7 where 7 equals very good and 1 very poor, please rate the capability of people in NZ deer industry to:

     i)   Do research in learning and TT.

     ii)   Implement learning and TT strategies.

(12)   In general, on a scale from 1 to 7, how effective do you think the transfer of technologies and learning has been in the deer industry in NZ?

(13)   On a scale from 1 to 7, how effective has research in this area (learning and TT) been in the deer industry in NZ?

(14)   On a scale from 1 to 7, how effectively has the research on learning and TT been implemented by the deer industry in NZ?

(15)   Is there an industry strategy for learning and TT in the deer industry

     (i)   Research?

     (ii)   Implementation?

7.2   Appendix II

The authors gratefully acknowledge the willing and invaluable contributions of the following persons in the production of this review.

<u>List of interviewees</u>

Noel Beatson (Cantebury –DeerMaster, veterinarian), John Cusdin (DFA, director in charge of research), Ken Drew (AgResearch, scientist), Collier Issacs (Meat NZ, general manager – market services), Ian Tarbotton (AgResearch, scientist), David Stevens (AgResearch, scientist), David Lawerence (Deer South - veterinarian), Tony Pearse (AgResearch, scientist), Mike Harbord (author), John Tacon (GIB), Geoff Burton (farmer, consultant), Peter Wilson (Massey University, veterinarian, scientist), John Scurr (DFA chairman) Lindsay Matthews (AgResearch, scientist) and one other interviewee who did wish not to be named.