DEEResearch

RESEARCH PROGRAMME 2015/16

5 YEAR SCIENCE STRATEGY

CHAIRMAN'S FOREWARD

This brochure outlines DEEResearch's research programme for 2015/16, but is also an opportunity for the Board to share with all those interested in deer farm productivity and venison research the 5 Year Science Strategy adopted by DEEResearch. While DEEResearch already had a list of research themes that its research projects had to focus on and detailed processes and policies used to assess research proposals, until now there was no statement giving clear direction on the priority and weight DEEResearch intended to give to its research themes. This was managed as part of the science consultation. The 5 Year Science Strategy has been drafted to support achievement of Deer Industry New Zealand's 2015-2020 Industry Strategy and fills that gap. Since the Industry Strategy looks to secure industry sustainability beyond 2020, DEEResearch's Science Strategy also recognises that some research investments should be directed towards longer term outcomes (which we refer to as 'discovery' research in this document). The deer industry, through DEEResearch, benefits from considerable co-funding from AgResearch, whose commitment to discovery research to sustain a diverse primary sector remains solid.

You may wonder how DEEResearch's investments fit with other deer industry investments, particularly the Passion2Profit primary growth partnership ('P2P') and small research projects done by Advance Parties. What distinguishes DEEResearch projects is their focus on generating new knowledge of potential industry-wide application or new ways of imparting knowledge, rather than projects seeking solutions to regional, farm-specific or processing-plant specific issues or encouraging adoption of existing knowledge. We acknowledge that the Focus Farm project within Hitting Targets has a strong regional flavour but it continues to be an effective channel for scientist-producer interaction and a way for testing the effectiveness of new practice change techniques and materials.

Aligned to the new Science Strategy, DEEResearch has agreed the direction – and content in the early years – of its major strategic investment, the Hitting Targets programme carried out by AgResearch. This brochure explains this year's Hitting Targets content, although note that another genomics-based selection for animal health project is still being carefully planned and will be released in due course. New programme content, using the outputs of this year's work, will commence in the next couple of years.

The majority of Hitting Targets budget is directed towards animal health and genetics research, and the major new direction for the next five years is reliance on genomic technologies. Considerable advances have been made by related sectors, particularly sheep, on their application to livestock production from which the deer industry can benefit and both R&D costs and per animal test costs, once rolled out, have reduced to affordable levels. DEEResearch now has enormous matching phenotypic and DNA datasets generated by the DPT project on which to perform powerful assessments of the genetics underscoring commercially important traits. Genomic technologies allow faster computation of breeding values than do studies looking at the phenotype of progeny from controlled breeding programmes, and can therefore, if used and adopted by industry, improve the genetic merit of the national herd quicker than ever before, thereby supporting a major P2P goal.

After a review of the Hitting Targets forerunner, the Venison Supply Systems Programme, DEEResearch is focusing more on extension and uptake within the science programme outputs by identifying the optimal implementation pathway at the start of projects and keeping DINZ informed on what will be delivered and when. In practice, this may mean that farmers learn about research outcomes through DINZ practice change initiatives, but for those interested in the underlying science in detail, DEEResearch will still put full research reports on its website and best management practice information onto the Deer Hub.

We look forward to another exciting year and continue to welcome input from farmers and processors on research needs.

COLLIER ISAACS

RESEARCH PROGRAMME 2015/16

CONTENTS

STRATEGIC INVESTMENTS

DEEResearch invests in or commissions medium-to-long term science projects where the objectives are broad in scope and the outputs can potentially be applied in a variety of ways. These projects typically last at least three years and involve multiple researchers and facilities.

RESEARCH PARTNERSHIPS

DEEResearch makes investments into projects that are not deer-specific (although they may incorporate deer-specific elements) in accordance with a DEEResearch policy on pan-sector investments, the main points of which are that-

- the aims of the research partly or fully meet a DEEResearch research objective;
- the deer industry would not otherwise be granted access to the research outputs or industry access would likely be more costly than the cost of investment;
- the investment sought is less than would be required to achieve the same output were DEEResearch to solely commission the project or be the sole partner with the Crown;
- DEEResearch has a share in any intellectual property arising commensurate with its investment; and
- outputs will be made available on reasonable terms for further development by DEEResearch and/or delivery, if development or delivery will not be made by the pan-sector group.

There are three research partnerships (formerly called 'Consortia') in which DEEResearch is a member. They are Johne's Disease Research Consortium, Pastoral Genomics Research Consortium and Pastoral Greenhouse Gas Research Consortium ('PGGRC'), although from this year contributions will only be made into PGGRC. Each of them also has the Crown as an investor (the Crown contribution matching the entirety of the industry investment), as Crown recognition that collective commitment by industry to tackle common issues will produce faster and better outcomes and impacts for New Zealand – and of course make more efficient use of New Zealand's research capability.

DEEResearch sees benefits in investing in pan-sector research since for many issues, the fundamentals are the same for different ruminant species. Specific deer research can be commissioned later if required.

PASTORAL GREENHOUSE GAS RESEARCH CONSORTIUM

Status	Duration	Research Phase
On-going	Current 5 year cycle ends 2019	Discovery-applied-technology transfer

Background

The Pastoral Greenhouse Gas Research Consortium (PGgRc) is a partnership between the livestock industry and the Crown. It aligns pastoral greenhouse gas reduction research with greenhouse gas research carried out by the NZAGRC and Ministry of Primary Industries. Industry-good body funds arematched by the Ministry for Business Innovation & Employment (MBIE). AgResearch is also a contributing partner and PGG Wrightson and the Fertiliser Association are equity partners in the venture. The total annual budget for this investment is $5.4m.

After 13 years of work, further to the findings reported in this brochure 2 years ago, the Consortium has identified several promising inhibitory compounds that in initial small-scale animal trials can reduce methane production from 20-30%. Rigorous testing and evaluation will be required to further develop these.

Objectives

There are several hypotheses being pursued across all research aims in pursuit of the goal of providing direct mitigation technologies that can lead to a reduction in GHG intensity (ghg /kg product) of 1.5% pa in the livestock industries additional to the 1% reduction achieved through increased efficiency by enhancing productivity.

Across all of the research aims further understanding is required to ensure that we have robust mitigation solutions that will not reduce animal production. The research programmes all will require new knowledge and the interaction with animal production and food quality to be understood before they will be suitable for release. Our research programmes are comprehensive in their design to ensure that we have these factors as well as the mitigation impacts fully addressed.

Project design

Since there are several objectives to the research programme, multiple projects with discrete designs are involved.

People and facilities

Breed low-CH4 emitting ruminants: Suzanne Rowe and Arjan Jonkers, AgResearch
Identify low-GHG feeds: David Pacheco, AgResearch
Develop a vaccine to reduce ruminant CH4 emissions: Neil Wedlock, AgResearch
Inhibitors that reduce ruminant CH4 emissions: Ron Ronimus, AgResearch

Outputs

Tools to identify low-methane sires; low-GHG feeds; Methane inhibitors; vaccines against methanogens

Specific work being undertaken in 2014/15

The programme involves work in-

- genetics, including determining whether some deer are genetically low methane emitters and can be selected for without compromising production traits, by evaluating rumen samples taken from DPT progeny at slaughter;
- determining forages and/or forage genes that lead to low animal GHG emissions and updating the emissions profiles of animal forageson the National Greenhouse Gas Inventory used to determine NZ's emissions, including those from the pastoral sector;
- methanogen vaccine development; and
- production of methanogen inhibitors.

The vaccine and inhibitor workstreams will look to embed commercial partners for development and delivery of the outputs.

JOHNE'S DISEASE RESEARCH CONSORTIUM

Status	Duration	Research Phase
On-going	Finishing June 2016	Technology transfer (Deer Study only)

Background

The Johne's Disease Research Consortium (JDRC) was established in 2008 to undertake a coordinated programme of research to develop practical and cost-effective tools for the management of Johne's disease ('Jd'). DEEResearch Limited is a partner in the Consortium. The research budget was ~$11million over an 8 year period. The Consortium will draw to a close on 30 June 2016 having completed the planned programme of research contracted with science providers.

In years 5-8 the JDRC has supported 3 on-farm projects, one of which was in deer, each developing information to support on-farm management of Jd. A set of diagnostic tools was already available and in common use by deer farmers to assess the JD status of their herds and/or individual animals and good information about the performance of one laboratory-based diagnostic tool was already known.

The deer study is now substantially complete and the data is undergoing review before release to industry.

Objectives

1. Provide better understanding of-
    - the comparative performance of diagnostic tools;
    - how and when different diagnostic tools should be deployed;
    - how JML's database of JD-suspect lesions identified at slaughter (JDSLN), after 7 years of operation, relates to on-farm experience of disease; and
2. Provide farmers with case studies of successful on-farm Jd management using existing tools.

Project design

On-farm sampling, farmer surveys, laboratory analysis and data analysis

People and facilities

Project managed by Peter Fennessy and Neville Jopson of AbacusBio Limited; team members included AbacusBio staff, Solis Norton (JML) andJohne's Consultancy Network veterinarians. Diagnostic Services were provided by Otago University's Disease Research Laboratory, AgResearch and Canterbury Health.

Outputs

- Validation of the JDSLN rate against on-farm impacts of Jd: survey of 150 deer herd owners was completed and has shown that there is a strong link between JDSLN, on-farm impact of the disease and the level of concern a farmer has about Jd.
- Comparison of serum ELISA tests: the sensitivity and specificity of two serum ELISA tests (Paralisa™ and PARACHEK®2) for detecting deer shedding high levels of Jd's causative agent is similar. In both cases, ELISA sensitivity increases with increasing shedding rates.
- Case studies: outcomes from following a management plan for Jd control after Jd was diagnosed in the herd using the Paralisa™ have been recorded for 3 farms.

Planned deliverables 2015/16

- Best-practice diagnostic guidelines
- Farmer-facing case studies demonstrating outcomes from Jd management practices following identification of Jd on farm

Note that these, after JDRC-directed peer review and approval, will be incorporated by JML into updated best-practice guidelines for the control of JD in deer which JML will organise the promotion of, including at farmer or veterinarian workshops or in veterinarian publications.

HITTING TARGETS

Hitting Targets is DEEResearch's flagship 5 year research project. The project is carried out by AgResearch, Deer Industry New Zealand's partner in DEEResearch.

Through AgResearch, the project harnesses New Zealand's greatest pool of deer and multi-disciplinary science capability and facilities and also benefits from its willingness to draw on external resource where required. Researchers working on the programme are a mix of longstanding deer system experts (including physiologists and parasitologists), scientists who work on several systems (such as sheep and beef) and scientists from disciplines that are not species-focussed at all, such as environmental scientists, biostatisticians, quantitative geneticists, economic modellers and the like.

Another strength of Hitting Targets, like its predecessor Venison Supply Systems Programme (VSSP), is the partners' approach to flexibility; DEEResearch and AgResearch recognise that by their nature, research hypotheses are not always proven in which case they are willing to shift the focus of the work to other avenues that have potential impacts for the deer industry.
HITDIP is a project that builds on outputs – and continues some sub-projects - from the VSSP. It is strongly focussed on assisting venison producers, processors and marketers to achieve the aspirational 10-year and 20-year targets for improved profitability, as outlined in the deer industry's Passion2Profit transformational change programme.

The project structure is sub-project based, sub-projects being aligned to specific DEEResearch themes which are themselves prioritised in accordance with the 5 Year Science Strategy. In this first year, the sub-projects are aligned with six of the ten DEEResearch themes. As several of the starting sub-projects have a duration shorter than Hitting Targets, new sub-projects will be commenced later in the project and they may address the other DEEResearch themes (Venison Attributes, Environment (Greenhouse Gases), Animal Welfare, and Food Safety) depending on the deer industry's needs at the time.

Within this project there is a balanced portfolio of research types in relation to science horizon, ranging from discovery science through to technology transfer. All sub-projects have had to demonstrate to DEEResearch's satisfaction a clear implementation pathway to deliver impacts for the deer industry, even if intervening research is required.

THEME 1: EFFICIENT LAND USE

1.3 FOCUS ON FARMING

Status	Duration	Research Phase
On-going	3 years (2014/15 – 2016/17)	Technology transfer

Background

The link between science and farmers has been an integral part of the growth and development of the deer industry since its inception, and analyses have demonstrated the economic and environmental impacts flowing from that interaction. The industry is relatively small and benefits from the opportunity for many producers to be in direct contact with researchers. The DINZ Focus Farm programme is being redesigned to improve its impact on productivity gain and the dissemination of ideas and information within the industry. This includes the addition of one-day single or dual topic-focussed Focussed Farming workshops to be hosted by NZDFA branches.

Objectives

To improve deer farming profitability by facilitating the uptake and adoption of knowledge of deer farming systems.

Project design

Development of future science delivery approaches to aid the uptake of science on-farm; production of material to add to Learning Packageson improving weaner growth; training of Focus on Farming and Focussed Farming delivery agents, e.g. farm consultants, and AgResearch staff in revised model; monitoring (including through dialogue with recipients) and refining of Focus on Farming and Focussed Farming models to ensure delivery is meeting industry needs.

People and facilities

Team led by Dr David Stevens

Outputs

Fact sheets, web content, news articles and other potential tools for farmers

Planned deliverables 2015/16

AgResearch will provide steering group members to the Focus on Farming programmes running in Southland and Canterbury to support the technical requirements of the programme. AgResearch will help design and deliver the programmes of work and practice change mechanisms based on previous reports and experience. Science support as requested for up to 5 facilitated one-day Focussed Farming workshops led by NZDFA branches.

THEME 2: FEEDING

2.1: OVER-WINTERING OF HINDS ON SWEDE

Other Research Theme	Status	Duration	Research Phase
Animal Health	New	3 years (2015/16 – 2017/18)	Applied

Background

Swede crops are frequently used for over-wintering of farmed red deer hinds, particularly in more southern regions and deleterious health effects have been reported. Recent investigations into the health status of dairy cattle grazed for long durations (mainly over winter) on swede crops have centred on direct toxic effects of secondary plant compounds (glucosinolates) of recently developed varieties. However, indirect effects of protein insufficiency have also been of concern. A recent DEEResearch foetal loss project also revealed high abortion rates (>15%) amongst R2 hinds that had been over-wintered on brassicas, which rate declined substantially once pasture-based over-wintering was resumed.

Objectives

Determine effect of swede fodder systems on deer health and production and determine optimal systems for their integration into deer production systems.

Project design

Overwinter R2 hinds on either swede forage systems or pasture-based systems and compare key health and reproductive productivity output parameters.

People and facilities

Co-led by Dr Geoff Asher and Dr David Stevens. Trial will be conducted on the AgResearch Invermay deer farm.

Outputs

Knowledge on the impacts of swede-based forage systems on deer health and reproduction.

Planned deliverables 2015/16

Trial planned and initial stages (crop establishment; start of winter grazing) implemented.

THEME 3: ANIMAL HEALTH

3.3: ANTHELMINTIC RESISTANCE IN FARMED DEER (ASSAY)

Status	Duration	Research Phase
On-going	2 years (2014/15 - 2015/16)	Applied

Background

There is growing awareness that resistance of deer parasites to commonly used anthelmintics may be present on a high proportion of deer farms. It is necessary to understand the incidence of anthelmintic resistance (AR) in order to develop better parasite mitigation tools. However, diagnostic tools used for the sheep industry (faecal egg count reduction test) are largely ineffective for deer. A new in-vitro larval migration assay has been developed for cattle and is undergoing final testing for efficacy in detecting AR in cattle. This type of test may be suitable to detect AR in deer.

After one year of work the assay appears to be ineffective at identifying resistant worm populations in deer, but is showing considerable potential to do so in cattle. This is surprising given that the major worm species involved are very closely related (the same genus) and can cross-infect between host species (i.e. the deer species can infect cattle and the cattle species can infect deer). There are three possible reasons for this inconsistency; (1) the assay just doesn't work against deer parasites; (2) there is a mix of resistant and susceptible worms in deer that mask the assay's ability to detect resistance; and (3) the worms are not actually resistant to anthelmintic, but sheep-suitable doses of anthelmintic with which deer have been treated are insufficient to kill them (in which case the assay may in fact be effective at determining true resistance).

Objectives

Understand whether and which Osteragia sub-species are resistance to macrocyclic lactones and whether a test to identify resistance in cattle can be adapted for use in deer.

Project design

Field trial in 3 farms in the summer of 2016 using naturally parasitized animals and involving subsequent drench treatments of different types whereby Ostertagia-type parasites are recovered and identified at each stage to determine whether-

- some Ostertagia sub-species survive all forms of drench; and
- some species survive some but not all forms of drench.

People and facilities

Team led by Dr Dave Leathwick (AgResearch Grasslands). Field work will be conducted on commercial deer farms in the main deer farming regions of New Zealand.

Outputs

Improved diagnostics for resistance targeted at the science community through publication in refereed science journals. Advice on anthelmintic use on-farm based on knowledge of the existing resistance status and at farmers through the availability of screening for anthelmintic resistance in their herds. If true resistance does not appear to be a significant problem, advice to the deer industry to completely re-evaluate the recommended use of anthelmintics in deer.

Planned deliverables 2015/16

Proof-of-concept of application of a newly-developed drench resistance test for red deer.

3.5: ANTHELMINTIC DOSE EFFICACY AGAINST OSTERTAGIA

Status	Duration	Research Phase
New	One year (2015/16)	Applied

Background

Most commonly used anthelmintics (pour-on formulations of endectocide actives) appear to be largely ineffective on every deer farm on which they have been tested, while the alternatives (oral and injectable formulations) are not registered for deer. As such, these alternatives have had no regulator-acceptable efficacy, pharmacokinetic, toxicology or residues studies done on deer and so come with a default meat-withhold of over 90 days. Without efficacious and safe dose rates having been established, the industry is at risk of encouraging the development of drug resistance by under-dosing.

Objectives

Determine appropriate dose rates for single-active oral formulations of two classes of anthelmintics (the macrocyclic lactones and benzimidazoles) against Ostertagia-type nematodes in deer.

Project design

Two field studies (drench, slaughter then worm count) to establish a dose-titration efficacy profile for commonly used macrocyclic lactone and benzimidazole anthelmintics in deer

People and facilities

The sub-project will be managed by Dr David Leathwick (AgR Grasslands); field work will be conducted on deer farms with a low resistance status.

Outputs

Deer dose-titration data for commonly available single-active oral formulations, suitable for use by the commercial entities marketing those products when (1) conducting the additional trials e.g. safety when registering them for deer and (2) undertaking further dual-active efficacy studies.

Planned deliverables 2015/16

Determination of effective dose for commonly used oral liquid anthelmintics in deer.

Image: Gene Marker Assays – Dr Rory O'Brien.

3.6: EFFECTIVE ANTHELMINTIC FOR DEER

Status	Duration	Research Phase
New	One year (2015/16)	Applied

Background

In the long term, a solution will need to be found to the issue of both effectiveness and meat with-hold intervals for anthelmintics in deer. This will require an effective product to be registered for use in deer. The effectiveness of some anthelmintic classes in deer is unclear, a problem which is confounded by uncertainty around appropriate dose rates.

Rapid development of new liquid oral or injectable formulations is difficult or expensive as the technology for enabling active constituents to exist in liquid form is patented. Therefore AgResearch has explored whether dry combinations of off-patent actives, in a pellet or bullet form result in an effective product that can be slowly released in the gut over a 5 day period. Work on a prototype bullet indicates that its constituents would be fully soluble in the stomach and it is effective in both sheep and cattle. Further, it results in higher efficacy against resistant worms than is achievable with conventional products. In terms of its contents, however, information on the optimal active ingredients and their dose rates for use in deer (from project 9), would be required. Once this information is at hand, the dry formulation can be made up inside the bullet for a comparison of effectiveness against the optimal liquid oral formulations, with a view to determining which option is worth proceeding with.

Objectives

1. Establish proof-of-concept that a combination degradable bullet will achieve higher efficacy against Ostertagia-type nematodes in deer than other routes of administration.

2. Produce a suitably gated (i.e. with built-in stop-go points) plan to develop and register an anthelmintic product for deer that will resolve issues related to anthelmintic inefficacy (including resistance) and meat withholding periods.

Project design

1. Leverage off efficacy studies (in sub-project 3.5) to-

    - Evaluate potential alternate actives (more potent and less toxic than abamectin) for use in the degradable bullet (e.g. eprinomectin or doramectin)
    - Demonstrate 'proof-of-concept' of the degradable bullet approach, i.e. that extending the duration of exposure to drug results in increased efficacy against Ostertagia-type parasites in deer;
    - Evaluate the best (oral v degradable bullet) option for registration.

2. If the degradable bullet is the best option, determine the requirements for a registration package to register the degradable bullet for use in deer in New Zealand. Based on this develop a work plan and budget for the following 2-3 years, including identification of marketing/distribution pathway.

3. Engage with the AgResearch engineering team regarding formulation and manufacturing of degradable bullets for testing and use in formal registration trials and, in the longer term, regarding the development of an application device (e.g. drench-gun).

4. If an oral combination using patentable technology is the best option, provide science support (based on dose titration trials to date) to DEEResearch'sdialogue with potential third party commercial partner.

People and facilities

The sub-project will be managed by Dr David Leathwick (AgR Grasslands) but field work will be conducted mainly on the Invermay deer farm.

Outputs

- Information on best alternative to abamectin for use in the degradable bullet
- Concept proven that the degradable bullet will work in deer and be more efficacious than any existing sheep or cattle products – **stop-go point**
- A plan and budget for preparing a registration package for degradable bullet in deer
- Engineering wherewithal to build degradable bullets for use in formal registration trials
- Defined pathway to market

Planned deliverables 2015/16

Proof-of-concept of degradable bullet mode of delivery in deer, requirements for content of a registration package determined and a pathway to market identified.

3.7: DOES CARLA INFLUENCE PARASITISM IN DEER?

Other DEEResearch Themes	Status	Duration	Research Phase
Genetics	New	3 years (2015/16-2017/18	Discovery

Background

Initial analyses of CarLA results for DPT progeny indicate moderate heritability of the antigen, indicating the potential to select deer for genetic resistance to parasitism. However, since all progeny in the study were subjected to a routine anthelmintic regimen to minimise parasitism, the relationship between the ability to mount a CarLA response to ingested parasite larvae and subsequent clinical effect of parasitism cannot be determined from the DPT study alone. Although these relationships have been verified in young sheep, further studies in young deer are required to understand the effects of CarLA on actual parasitism and parasitism's clinical effects (particularly on growth).

Objectives

Determine the utility of genetically selecting deer for resistance to parasitism based on the CarLA phenotypes.

Project design

1. Generate extreme CarLA phenotype progeny (under Tomorrow's Deer sub-project)by inseminating hinds in 2015/16 with semen from 'high' and 'low' CarLA sires as identified by the DPT.
2. Natural and/or artificial challenge of the young progeny with lungworm and GI parasite larvae
3. Monitor growth and determine CarLA phenotypes
4. Slaughter and undertake gut analyses of parasite burdens.

People and facilities

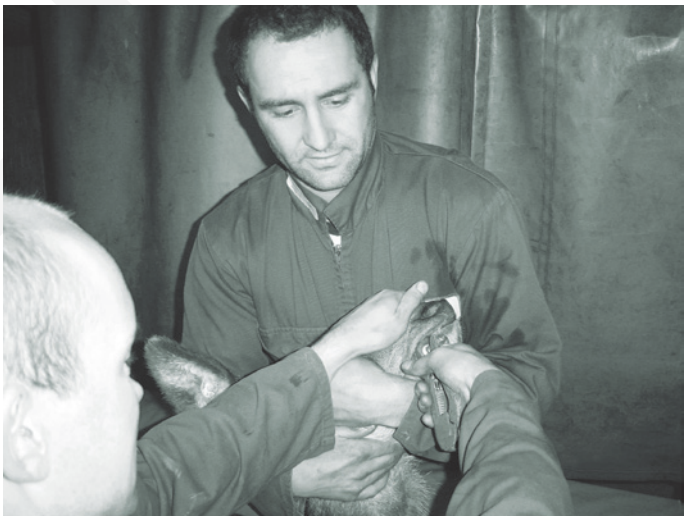
Project managed by Dr Geoff Asher and overseen by team at AgResearch's Hopkirk Institute. The study will be conducted on the Invermay deer farm.

Outputs

Deer dose-titration data for commonly available single-active oral formulations, suitable for use by the commercial entities marketing those products when (1) conducting the additional trials e.g. safety when registering them for deer and (2) undertaking further dual-active efficacy studies.

Planned deliverables 2015/16

AI of hinds to generate High and Low CarLA progeny for further study in later years.



THEME 4: GENETICS

4.1: DEER PROGENY TEST (DPT)

Status	Duration	Research Phase
On-going	Terminating in 2017/18	Applied

Background

Genetic selection of farmed deer for improved biological and economic performance is pivotal to industry achieving its productivity targets, since genetic gains are permanent and cumulative. So far, the DPT has delivered improved herd linkage (this objective continued by the DEERLink sub-project) and identified the need for accurate assessment of breed to enable across herd evaluation and across breed evaluation for weight, growth, meat and co-product traits. The DPT's final AI programme took place in April 2013 and phenotype recording of terminal progeny (i.e. male red deer and male/female wapiti crossbreds) was completed in December 2014 when the final cohort of progeny were slaughtered for assessment of carcass traits. It has also delivered a major dataset of animals phenotyped for a wide range of traits, each of whom have samples of DNA stored for future genomic work.

Objectives

Use DPT database for assessment of heritability of novel industry-relevant phenotypes suitable for module development in DEERSelect; add, in respect of maternal progeny, to the well-phenotyped DPT database for future genomic work relating to maternal traits.

Project design

On-going recording of maternal traits of maternal lines (i.e. female red progeny) until March 2018 when the hinds reach R4 age.

Data analysis of complete DPT database to investigate the association of breed, stag, environment and management on a range of commercially-relevant traits such as growth, meat yield, meat quality and animal health. Genetic analysis of trait data.

People and facilities

A team of led by Dr Geoff Asher of quantitative geneticists, research assistants, statisticians, bioinformatics specialists, animal physiologists, meat science experts and economic modellers.

Outputs

1. Data that can be directly incorporated into DEERSelect's existing breeding values and indices.

2. Recommendations to DEERSelect for Module development for determination of BVs and indices in in respect of novel traits, e.g. temperament or parasite resistance/resilience based on the CarLA production.

Planned deliverables 2015/16

Genetic analyses of temperament traits and CarLA data; carcass trait analysis that includes data recorded independently by Deer Improvement Ltd.; genetic analysis of venison sensory data; records of maternal traits.

4.2: DEERSELECT

Deer Select
Deer Industry Genetics

Status	Duration	Research Phase
On-going	Whole term of project	Technology transfer

Background

Genetic evaluation of stags and hinds is necessary to enable cumulative economic genetic gain across the national herd. The deer industry's vision is that commercial farmers select their breeding stock based on objective, profitability-designed breeding values and/or indices. DEERSelect is a national deer recording database that stores animal performance data, calculates genetic merit and provides indices used for breeding programmes. DEERSelect has evolved from being a research tool to be an industry tool, with DINZ taking an active role in encouraging its adoption. The project will offer greater functionality and accuracy that will make its adoption more compelling.

DEERSelect is a dynamic platform that must be continually adapted to the changing needs of the deer industry and emerging opportunities from research that relates to traits of economic performance and technologies being developed. To date, AgResearch has undertaken index development, breed evaluation, problem diagnosis, design of data recording protocols, industry reporting and problem solving and enabled the recording of performance data for new traits. This project will continue to do those things.

Objectives

Operate, maintain and develop the platform by which genetics information is stored, analysed and reported to the deer industry to ensure that it provides relevant, accurate and timely information to breeders and producers making genetics-based deer selection and culling decisions.

Project design

Developmental tasks will include maintaining awareness of developments proposed to be made to the genetic engine on which DEERSelect is run, advising the deer industry of the opportunities to leverage from other data recording systems such as NAIT to streamline data recording processes for DEERSelect users and/or improve genetics information available to the deer industry, and implementing changes where appropriate. Modules in DEERSelect will be developed or revised as appropriate to ensure that genetics information aligns with industry profitability targets.

Operational work entails regular reporting of breeding values, indices and linkage values and development of monitoring/auditing tools for these strands. Development of quality control processes and automated formal reporting to avoid inclusion of erroneous data in data evaluation is involved. Troubleshooting of problems that cannot be dealt with solely by the DEERSelect manager will occur as they arise.

People and facilities

Team of quantitative geneticists, research assistants, statisticians, bioinformatics specialists, animal physiologists and economic modellers led by AgResearch's expert livestock geneticist Dr Sheryl-Anne Newman. This is done in close consultation with DINZ's DEERSelect Manager.

Outputs

Quantitative genetic analyses and software development; regular reports of breeding values and indices; new trait breeding values and indices incorporating them; revised genetic parameters, economic weights and models underpinning existing genetic evaluation indices; improved or streamlined systems for monitoring and recording herd data; formal and automated data monitoring tools.

Planned deliverables 2015/16

Regular generation of breeding values, indices and linkage data; review of maternal traits in DEERSelect and development of new modules around meat yield and maternal traits.

4.4: DEERLINK

Status	Duration	Research Phase
On-going	Whole of project	Discovery - Applied

Background

One of the DPT's primary aims was to facilitate improved linkage between sires and herds. The DPT ran 3 artificial insemination cycles from 2011 and the final progeny kill was completed in late 2014 for the 2013-born progeny. However, as linkage was likely to deteriorate following the completion of the DPT, DEERLink was established (for a maximum of 3 AI cycles) to ensure maintenance of linkage beyond completion of the DPT.

DEERLink has two components: (1) a science-driven central progeny test based at AgResearch Invermay targetting the industry sires capable of most widely linking breeding herds and (2) an industry-driven, co-ordinated sire exchange programme between key deer breeders based on continuous assessment of the strength of current linkage compared with optimum linkage needs.

DEERLink is primarily focussed on linkage for growth and meat traits but also evaluates maternal reproduction/survival traits.

After consideration of industry practice to ensure linkage is maintained, as managed by the DEERSelect Manager, the third and final year of central progeny test at Invermay is no longer required in 2015/16. The project will be completed following final recording of maternal progeny generated from Year 2 (2014/15) progeny.

Objectives

1. Through a combination of scientifically-robust central progeny testing and coordinated exchange of genetic material between breeders, ensure that DEERSelect maintains an acceptable standard of sire linkage between large enough numbers of deer to form a database capable of supporting industry-wide genetic improvement.

2. Provide a population of parentage- and phenotype-recorded animals from which new traits of interest can be recorded and analysed for genetic heritability, but only where this does not compromise the first objective.

Project design

(remaining years, following completion of the AI programme): recording and assessment of growth (all progeny), carcass (male maternal and all terminal progeny) and maternal (female maternal progeny) traits

People and facilities

See DPT and DEERSelect sub-project descriptions

Outputs

Breeding values; herd linkage estimates

Planned deliverables 2015/16

Data on progeny pedigree and growth traits uploaded on DEERSelect and incorporated into linkage estimations for 2016

4.6: CT SCANNING OF CARCASS TRAITS

Status	Duration	Research Phase
On-going	Three years (2014/15 to 2017/18)	Applied

Background

Determining traits measurable in a live animal that correspond closely to primal yields at slaughter enables a sire's potential to be assessed in the live sire without waiting for its progeny to be evaluated by dissection at slaughter. The use of CT Scanning of rams for accurate live estimation of carcass traits has doubled the rate of genetic gain for carcass (meat) quality in New Zealand sheep flocks. CT Scanning is available for deer but is an expensive tool and lack of quantification of the value that accurate CT Scanning can bring to carcass trait gains limits its uptake

Over the last 3 years a standardised CT Scanning protocol has been applied to deer to measure carcass traits and initial analysis of the relationship between CT data and actual carcass breakdown data for DPT progeny has shown positive yet weak correlations. However, due to the physical dimensions of the CT Scanner, it has only been able to scan deer 5 months before slaughter.

A new CT Scanner at Invermay is capable of scanning larger deer. 10 progeny per Year 3 DPT sire were scanned within 2 weeks of slaughter, an age at which potential venison sires could be sent by stud farms for evaluation. Initial analysis of correlations between the scan data and actual carcass traits has shown stronger correlations.

Objectives

Improve the value proposition of CT Scanning as an in vivo yield prediction tool for adoption by studs.

Project design

Correlated CT Scan measurements taken from 130 2013-born DPT progeny within 2 weeks of slaughter with their corresponding carcass traits to determine accuracy of CT Scan prediction of muscle/carcass yields. From this analysis optimise the CT Scan protocol to be applied to 2014-born progeny in 2015/16 to provide the most cost-effective tool for stud breeders seeking to improve carcass traits. Carry out quantitative and qualitative genetics of carcass traits.

People and facilities

The project will be led by Jamie Ward and carried out by a PhD student (quantitative and qualitative analysis of in vivo carcass traits) a biostatistician, AbacusBio staff (CT Scanning) and Alliance Group Ltd (Carcass trait measurements),

Outputs

An optimised protocol for CT Scanning of young deer; accurate correlations between CT scanning data taken in accordance with the protocols and primal yields at slaughter; DEERSelect meat yield modules that integrate CT scanning data with other forms of carcass trait measurement (ultra-sound EMA; slaughter data); an adoption plan (to be developed in conjunction with the DEERSelect Stakeholder Reference Group).

Planned deliverables 2015/16

Correlations between CT Scan traits that best predict carcass quality and actual carcass yield traits; revised deer CT Scanning protocol for in vivo carcass measurements.

4.7: TOMORROW'S DEER: GENETICS FOR THE FUTURE

Other DEEResearch Themes	Status	Duration	Research Phase
Feeding, Animal Health, Welfare, Efficient Land Use	New	5+ years	Discovery

Background

The deer industry's scope for genetic improvement is presently very narrow, by DEERSelect indices placing greatest emphasis on growth traits. While the DPT has started opening up new horizons around carcass, parasite resistance (CarLA) and temperament traits (and maternal traits somewhat), the opportunity to select for a wider range of commercially relevant traits is significant, especially considering that the red deer stud industry's genetic base is a small gene pool of imported breeding sires and dams selected largely by their antler phenotype and only recently for the *venison* phenotype.

All major livestock production systems have rapidly moved away from single-trait selection. Although there has been rapid genetic progress, many systems have become victims of their own success with health and fertility adversely affected and often negatively correlated with growth. This was exacerbated by a black box approach to genetics without the precision tools that genomic and index selection now offers. The deer industry can learn lessons from these experiences and use these modern techniques to take a more holistic approach i.e. evaluating sires not only for production potential but also for health and seasonal productivity attributes. Alignment with AgResearch's sheep genomics approach provides a unique opportunity to access the very latest low cost genotyping techniques long before they become commercially available in deer.

Lower costs than undertaking multiple individual trials will be achieved by maintaining one research herd at Invermay whose overall genetic base is consistent with that of commercial breeding herds yet which contains sires of polarised phenotypes for selected traits, whose progeny are available for phenotypic and genetic evaluation. Early traits to target would be seasonality and disease resilience and a future opportunity would include maternal behaviour. A further economic benefit would be the addition of a core set of phenotypes and genotypes routinely recorded on DEERSelect increasing the accuracy of current breeding values and paving the way for genomic and index selection in the future. The resource will create a national and international standard in modern deer selection and enable us to select a robust healthy animal that is sustainable in the commercial environment.

By integrating genetics with nutrition, health and welfare in a precision research approach, this and related projects can deliver Hitting Targets' biggest impact on the deer industry's profitablity targets over the next 5 years.

Objectives

1. Discover novel traits for genetic selection of high performing red deer within a range of pastoral ecosystems
2. Assess the utility of selection for specific traits for implementation within DEERSelect
3. Correlate specific traits with regions and/or genes within the genome
4. Develop a genomic selection tool for specific traits

Project design

1. Generation of progeny from specified phenotypic extremes using a 500 hind base at Invermay
2. Genotype progeny using low cost sequencing method (GBS)
3. Multi-trait phenotype recording of progeny in a range of environments
4. Determination (through dedicated sub-projects) of the physiological modes of action behind trait expression
5. Correlation of phenotype with genomic genotype
6. Identify phenotypic predictors, i.e. genotype

People and facilities

Multi-disciplinary capability across AgResearch (quantitative genetics, genomics, physiology, parasitology, farm systems, etc.) led by Jamie Ward, who has extensive experience of the DPT and DEERSelect. Collaboration with the universities is likely (e.g. Otago University for studies on health biomarkers). The dedicated core breeding herd will be maintained at Invermay.

Outputs

Development of modules to calculate breeding values/ indices within DEERSelect for new traits whose selection improves deer productivity/profitability

Planned deliverables 2015/16

First AI programme completed by April 2016 for generation of High and Low CarLA and Jd-resilient and Jd-susceptible progeny.

4.8: GENOTYPING BY SEQUENCING & GENOMIC PREDICTION

Status	Duration	Research Phase
New	3 years	Discovery-applied

Background

Previous work showed that parentage and breed assignment could be assigned using 100 and 1000 SNPs respectively. While reliable and accurate, SNP arrays are expensive and their utility in other livestock sectors is being superseded by low cost genotyping by sequencing (GBS) methods in any event. GBS methods-

- are more flexible than analytical platforms such as fixed marker arrays;
- more powerful (tens to hundreds of thousands of SNP variants spanning the genome can be assessed for close to the same cost as parentage from 15 microsatellite markers);
- enable gene discovery and genotyping to be carried out simultaneously; and
- allow high throughput of samples, thereby enabling economies of scale.

These factors and the availability of GBS as a parentage assignment tool is a significant opportunity to achieve the deer industry's genetic improvement strategies. Breed and parentage assignment of progeny increases the accuracy of breeding values, and other benefits of differentiation (by GBS) amongst individuals include-

1. production of genomic breeding values which are more reliable and available earlier than phenotype-led breeding values
2. identification of potential disease susceptible/ resistant animals
3. it being a tool to market and promote superior selection candidates
4. a potential tool to differentiate NZ product in the global marketplace
5. it being a tool for individual traceability

Objectives

The overall objective is to provide parentage, breed and genomic breeding values for traits of commercial importance to the deer industry using modern technologies at low risk of obsolescence with no additional genotyping costs beyond the current costs of parentage assignment.

Project design

1. Genotype highly phenotyped and well-linked deer (sires and dams involved in the Tomorrow's Deer program, 30-50 other key industry sires per year and 500-1000 selected commercial/DPT animals) to inform breeding value prediction in un-phenotyped selection candidates. Genotype stags at a greater resolution than progeny. These genotyped animals will form a 'training population' used to improve accuracy of prediction.
2. Development through collaboration with GenomNZ and Landcorp of the underpinning resources required to take full advantage of genomic technology by validating GBS and enabling smooth transition from current microsatellite platforms for parentage and breed assignment.
3. Using a combination of animals from the Tomorrow's Deer project and commercial herds, identify regions on the deer genome of importance, either for specific variants of interest or for groups of related markers, to form genomic predictions and deliver molecular breeding values.

People and facilities

Animal genomics team led by Dr Suzanne Rowe using HiSeq and MiSeq apparatus.

Outputs

At least 3000 animals genotyped by GBS. Where phenotypes are available, genomic scans of trait data. Commencement of beta test for genomic prediction; genomic solutions from genotyped and phenotyped individuals; development of a 'training population' and dissemination of research breeding values.

Planned deliverables 2015/16

- Method for using parentage assignments done on deer by microsatellite analysis going forward, without requiring re-testing for parentage by GBS
- GBS genotyping to high coverage a minimum of 30 industry sires
- GBS genotyping of Tomorrow's Deer sires and dams and a minimum of 1000 DPT or commercial animals with suitable phenotypes recorded
- Genome-wide association scans for potential regions/genes of importance (live-weight, commercial production traits, CarLA, etc)

THEME 7: ENVIRONMENT (WATER)

7.3: ENVIRONMENT FOCUS FARM

Other DEEResearch theme	Duration	Status	Research Phase
Efficient Land Use	5 years (2014/15 – 2019/20)	On-going	Applied

Background

The deer industry faces regional council regulation around environmental protection, particularly in relation to water quality (diffuse nutrient discharge management, E. coli contamination and sedimentation). The Otago Regional Council (ORC) has identified many areas of the AgResearch Invermay farm's non-compliance with Rule 6a of the regional plan at Invermay. Given Invermay's complex hill topography, multiple stream catchments, high profile in the deer industry and location within a key deer farming region, the opportunity exists to address these non-compliant areas by operating it as a focus farm for best-practice mitigation options over the next 5 years.

The Focus Farm approach recognises that there are many different ways to practically achieve compliance with regulatory requirements so it is important to canvass views of a range of farmers.

Notwithstanding the Landcare Manual and the Ballance Environmental Awards, the deer industry lacks cohesive farmer-driven leadership and engagement on environmental matters. The project presents an opportunity to engage all producers on the process and techniques of Land and Environment Planning and establish an environment-focussed Advance Party whose members can implement and assess the impact of various mitigations in different environments and disseminate their outcomes more widely in the industry.

Objectives

1. Determine the most cost-effective means to achieve compliance with ORC Rule 6a concerning water quality (extend to include consideration of other regional council plans and policies if considered appropriate).

2. Explore the range of emerging water quality mitigation and deer production techniques for improving environmental outcomes.

3. Engage producers, through clear and regular communication and demonstration (using Invermay and other Advance Party farms as examples), on how to achieve best management practices for water quality and, where applicable, how to meet regional regulatory requirements, through development and implementation of a Land and Environment Plan.

Planned deliverables 2015/16

At least 2 meetings of stakeholder group and one public field-day. Project information clearly accessible on DINZ website.

Project design

1. Establishment of a stakeholder group for interested party and expert input into Invermay farm management to improve environmental outcomes to meet ORC standards.

2. Development by AgResearch, in consultation with the stakeholder group, of a Land and Environment Plan for Invermay that identifies current practices adversely affecting water quality and sets targets for improvement.

3. Assessments of costs, risks and benefits (from the perspective of a commercial deer operation) of mitigation options to facilitate the making of stakeholder group recommendations.

4. Establishment of an Environment Advance Party.

5. Trialling, from a research perspective, of a range of environmental mitigation practices to assess their relative costs and benefits.

6. Trialling of the same mitigation practices on different farms (those of Advance Party members).

7. Monitoring of nutrients and sediments in key Invermay waterways and attribution, where possible, of changes in amounts and concentrations to particular trialled mitigations.

8. Publication of key processes and decisions to all interested deer farmers.

People and facilities

AgResearch team led by Dr Geoff Asher and including Dr Richard McDowell, Dr Jen Robson and other soil/water scientists and stakeholders. Environment Advance Party members. Invermay farm and the farms of Advance Party members. Water quality monitoring apparatus.

Outputs

Practical demonstrations of various mitigation options for reducing water contamination and waterway damage; assessments of relative merits of a range of mitigations to meet same water quality issue; commentary on how water quality best practice was achieved; templates for simple cost/benefit analyses of options; documented process for meeting best management practices and regulatory requirements within 5 year timeframe.

TACTICAL INVESTMENTS

In addition to long-term investments and research partnerships, DEEResearch sees value in investing in projects with a narrow focus so long as they meet a DEEResearch research objective. DEEResearch's investment may either be as a co-funder alongside other interested parties or it may solely commission the research project. Generally, for DEEResearch to make a one-off tactical investment,-

- a significant focus of the work must be on deer or venison;
- relevant foundation research that would be common to other ruminant species should already have been done; and
- there should be a clear pathway from the best-case outputs to on-farm or in-plant practice change, even if some further intervening research and/or development may be required.

HEALTH AND SAFETY COMPLIANCE

In light of reforms made to workplace health and safety legislation by the Health and Safety at Work Act 2015, implications were identified for DEEResearch, Deer Industry New Zealand ('DINZ') and Velvet Antler Research New Zealand ('VARNZ').

DEEResearch officers must take a pro-active approach to identifying and managing risk (as must its contractors) so DEEResearch, together with DINZ and VARNZ, has engaged a health and safety specialist to devise simple systems - and provide training on them - by which the three entities can discharge their forthcoming obligations in this sphere. At the very least, it appears that the DEEResearch board will require greater awareness of its contractors' day-to-day activities, whether large organisations such as AgResearch or individuals.

SFF SUBTERRANEAN CLOVER AND JOHNE'S ADVISORY GROUP

At this stage budget has potentially been set aside for investment into a pan-sector research trial led by Prof. Derrick Moot of Lincoln University into optimal techniques for growing subterranean clover on drought-affected hill country. This project is also supported by the Sustainable Farming Fund and other industry-good bodies. However before determining whether and, if so, how much to invest, a full research proposal identifying its fit with the 5 Year Science Strategy needs to be submitted.

The Johne's Advisory Group is a horizon-scanning science-focussed group providing advice to JDRC on research worthy of pan-sector investment; it is proposed that once JDRC disestablishes (having fulfilled its mandate) on 30 June 2016, former investors continue to support this group in order to optimise – by collaboration and coordination – any future Jd research investments. However a detailed investment proposal needs to be brought to DEEResearch and in any event, funding may not be required until 2016/17.

DISCRETIONARY PROJECTS

DINZ has approved provision of a small amount of levy funds ($30k) for urgent tactical projects that DEEResearch formally approves in accordance with its investment policies in-year.

DEEResearch

5 YEAR SCIENCE STRATEGY

CONTENTS

1. OWNERSHIP, VERSION CONTROL AND DURATION

This document has been prepared and adopted by the Board of DEEResearch Ltd. It is intended to be reviewed annually by the Board.

		First application date
Current version	1.0	27 August 2015
Previous versions	n/a	n/a

2. PURPOSE

The purpose of this document is to provide the link between-

- the high level-
  - DINZ strategies; and
  - DEEResearch's statement of purpose, objectives and research objectives; and
- the specific science project investments made by DEEResearch.

3. SUPPORTING INFORMATION

3.1. Deer Industry New Zealand Strategy Summary

The relevant strategic objective from the Deer Industry New Zealand ('DINZ') strategy summary (contained in full in Annex 1) is

Sustainable on-farm efficiency growth

Subsidiary goals for this strategic objective are:

Create an environment in which deer farmers continuously improve their farm operations to increase efficiency of production; and

Ensure deer farmers can succeed while operating in an environmental and ethically sustainable way.

3.2. DEEResearch Statement of Purpose and Research Objectives

The DEEResearch statement of purpose is

Co-ordinate and invest in research and innovation to enable a more profitable and sustainable New Zealand deer industry.

DEEResearch's current research objectives (described fully in Annex 2) concern the following themes:

1. Efficient land use
2. Feeding
3. Animal health
4. Genetics
5. Venison attributes (intrinsic and extrinsic)
6. Environment (greenhouse gas emissions)
7. Environment (water quality)
8. Animal welfare
9. Food safety (emerging regulatory requirements)
10. Traceability (adding value)

DEEResearch science projects: current investment

The DEEResearch budget for FY14/15 includes investment in strategic and tactical areas. Major investments are described in the previous year's DEEResearch Research Programme 2013-2014 and the size and duration of these funding investments are summarised in Table 1.

Table 1: DEEResearch budget FY14/15

	Project	Funding ($K) by source			Project Duration
		DINZ	AgResearch	Landcorp	
Strategic Investments	Hitting Targets	458	1,333	100	FY14-18
	Pastoral Greenhouse Gas Research Consortium	35	0	0	FY13-17
	Pastoral Genomics	6	0	0	FY03-15
	PG+	34	0	0	FY15-17
Tactical Investments	Molecular markers for resistance and susceptibility to Jd	80	0	0	FY15-17
	Cervine anthelmintic residue studies	16	0	0	FY13-15

4. DEERESEARCH RESEARCH STRATEGY

Research investment decisions are focussed on projects that create on-going industry impacts through sustained practice change across the majority of NZ venison producers. These impacts include improved profitability (through both increased product quality and quantity) as well as maintaining freedom to operate and market access.

Research investments are classified as either strategic or tactical in nature. Strategic investments are those where the objectives are broad in scope and the outputs can potentially be applied in a variety of ways. Tactical investments have a narrow, and often short term focus, that are funded in response to contemporary industry needs.

Most research funds are invested in the Hitting Targets project and the rationale for the breakdown of investment in each DEEResearch research objective is described in the annual project plan that is approved each year by the DEEResearch board.

Other DEEResearch strategic investments are very minor components of major research projects, with these investments primarily made to maintain access to research that is of benefit to the larger pastoral sector. This research may not have immediate benefit to the deer industry in the short term, but has potential for gain longer term.

The recommended investment profile in each DEEResearch research objective for the next 5 years is summarised in Figure 1 and the rationale provided in Table 2.

Figure 1: Total investment profile in DEEResearch research objectives FY15/16-FY19/20

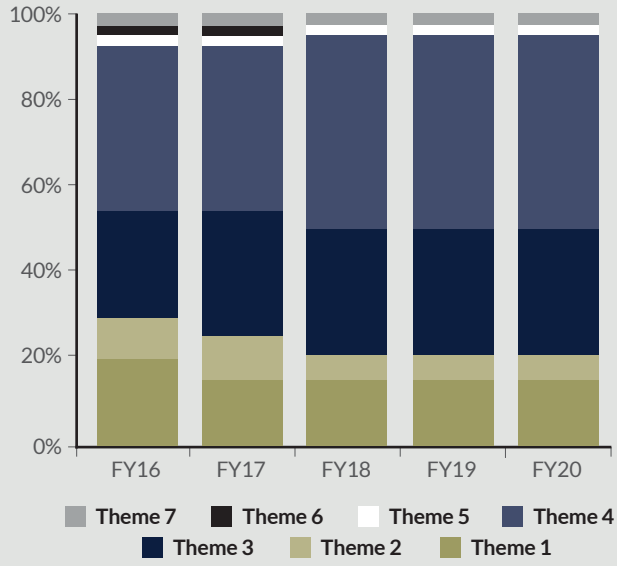


Table 2: Strategic reasons for investment in each DEEResearch research objective

Research objective	Strategic reasons for investment or non-investment
1. Efficient Land Use	• Diverse range of programmes that have generalised outcomes including adoption & practice change, farm systems modelling, remote sensing, decision support tools for farmers
2. Feeding	• On-going need for specific deer feeding issues as farming systems continue to evolve.
3. Animal Health	• Management of impact of parasitism in deer is the most important health issue for deer farmers. Specific issues to address include: o Withholding periods for anthelmintic use (market access / farm slaughter flexibility) o Drug resistance (long term profitability) o Focus on breeding disease-resistant animals
4. Genetics	• Provides permanent increase in animal productivity and other factors that will influence farmer profitability
5. Venison attributes	• Covered to some extent through research objective 4 • Greater industry incentive required for additional resources to be invested
6. Environment (greenhouse gas emissions)	• Minor issue for industry currently • Investment in PGGRC provides access to science in long term
7. Environment (water quality)	• Minor issue for industry currently • In the longer term, may be market access & freedom to operate issues
8. Animal welfare	• No current pressing needs – large historical investments have enabled good farmer positioning on animal welfare
9. Food safety (emerging regulatory requirements)	• Needs being addressed through other funding mechanisms (eg through MIA partnership)
10. Traceability (adding value)	• No current specific research demand

4.1. Commentary

Research investments for the next five years are mainly in Research Objectives 4 (Genetics), 3 (Animal Health) and 1 (Efficient Land Use). Research in Genetics is the most significant area of science delivery that will assist the NZ deer industry meet its medium to long term targets, by producing a permanent gain in productivity. The management of parasitism in deer is the single most important health issue facing the NZ deer industry, with an urgent need for deer-specific solutions to prevent parasitism becoming a major production-limiting disease. Research on farm systems modelling and activities in adoption/uptake are classified in Efficient Land Use, with these investments essential in delivering the benefits of component research in a farm systems context.

Minor investments are also recommended in Research Objectives 2 (Feeding), 5 (Venison Attributes – intrinsic and extrinsic), 6 (Environment – greenhouse gas mitigations) and 7 (Environment – water quality) as these are currently all research areas of medium to high priority. Due to the limited amounts of funds that are available, it is recommended that there be no investment in Research Objectives 8 (Animal Welfare), 9 (Food Safety) or 10 (Traceability), which are currently regarded as the lowest priority areas.

As the focus of tactical research is difficult to predict, tactical research beyond FY15 has not been included in the overall five-year investment profile of DEEResearch funds, although it would be prudent to set aside a small budget allowance from DINZ funds (approx. $50-100k pa) to allow for ongoing tactical research.

It is recommended that the amount of investment in Research Objective 1 (Efficient Land Use) reduces with time, with additional resourcing provided from the P2P programme (Figure 2).

Figure 2: Changing investment profile in the DEEResearch Efficient Land Use research objective

ANNEX 1: DINZ STRATEGY SUMMARY

A Confident and Growing Deer Industry				
Strategic: Objectives	*Premium positioning for our Products*	*Market Development and Diversification*	*Sustainable on-farm value creation*	*Cohesive and Respectable Industry*
	Maintain systems that provide robust assurance of the integrity and quality of New Zealand deer products mitigate market concentration risk	Develop demand for deer products outside of their traditional geographic and use-type markets to efficiency of production and confidence	Create and environment in which deer farmers continuously improve their farm operations to increase ideas, information, support	Ensure sufficient communication between industry participants to allow effective sharing of
Subsidiary Goals:	Communicate the quality and integrity and benefits of our deer products to customers and consumers	Encourage building of relationships with in-market partners who respect our products and add value	Ensure deer farmers can succeed while operating within their communities' environmentally and ethical expectations	Ensure that the deer industry continues to be considered an innovative and attractive but mainstream industry
2020 Targets: Venison	• Venison pricing relative to equivalent beef, lamb ++ • Venison pricing relative to other game items ++ • Consumer/customer recall/preference ++	• Proportion of venison sold chilled (>20%) • Proportion of venison sold to Eurozone (<50%) • Proportion of venison sold in N. America and Asia (>40%)	• P2P programme participation (>25%) of industry • Survival to sale (+5%) • Kill date (-16 days) • Carcass weight (+2kg)	• Industry event attendance ++ • Media and website readership (+100%) • Deer farmer satisfaction survey (+50%) • Survey attitudes to industry of non-deer farmers (+50%)
2020 Targets: Velvet and co-products	• NZ velvet pricing relative to competitors ++ • Preference of OMD sector for NZ velvet ++ • Preference of healthy food sector for NZ velvet ++ • Co-products FOB price ++	• Proportion of velvet sold into healthy food applications (>40%) • (>30%) of velvet exported processed, not frozen • No country imports >50% of New Zealand's velvet	• (>50%) industry has environmental plan • (>50%) industry has Health & safety plan • NVSB compliance (>95%) • Animal welfare prosecutions involving deer (<5PA)	• Deer specific training attendance (+50%) • Deer industry media mentions (+50%)

ANNEX 2: DEERESEARCH RESEARCH OBJECTIVES

All research will be designed to meet at least one of the following research objectives. Research objectives that must be included in DEEResearch's research programme are **highlighted in bold**. Remaining objectives may be included in the research programme.

Where a target is specified, projects to meet the objective in question must be designed to produce an output whose uptake (assumed at 65% of all venison producers after ten years, where the end point is 30 June 2023) will meet or significantly contribute towards meeting the target and project success will be evaluated against the industry's achievement of the target recognising that other factors besides the project alone are relevant to achievement of the target.

1. Efficient land use

Existing and potential deer farmers can readily identify-

- circumstances in which farming deer (whether solely or in an integrated system) is an economic land-use option over the medium-to-long term; and
- **in the case of deer being economic only in an integrated system, the key features (including targets) for optimal production (e.g. species mix, feed requirements, feed production, paddock rotations, stocking rates, growth targets).**

2. Feeding

Optimal feed production or feeding regimens or tools are identified to-	**Targets**
• **produce venison at the size and time required by the market;**	A. national average carcase weight increases annually by 1.5% from 55kg to 64kg over ten years B. national average hind output efficiency increases annually by 2% from 0.36kg output/kg hind to 0.44kg output/kg hind over ten years C. national average age at slaughter brought forward annually by 0.36% over ten years (i.e. 16 days earlier) (16.19 months (492 days) to 15.65 months (476 days) for hinds and 12.93 months (393 days) to 12.4 months (377 days) for stags
• **make efficient use of land, new pasture and cropping technologies and cultivars or**	D. national average feed conversion rate increases annually by 0.7% from 58kg DM to produce 1kg useable output to 54kg DM to produce 1kg useable output over ten years
• **improve reproductive efficiency of deer.**	E. national average breeding hind liveweight increases annually by 0.45% from 110kg to 115kg over ten years

3. Animal health

Optimal healthcare regimens or tools are identified or developed for deer to-	**Targets**
• **improve their reproductive efficiency;**	E. national average breeding hind liveweight increases annually by 0.45% from 110kg to 115kg over ten years
• **facilitate their meeting of growth targets; or**	C. national average age at slaughter brought forward annually by 0.36% over ten years (i.e. 16 days earlier) (16.19 months (492 days) to 15.65 months (476 days) for hinds and 12.93 months (393 days) to 12.4 months (377 days) for stags
• **reduce their vulnerability to production-limiting diseases.**	F. national herd survival to sale increases annually by 1.05% from 72% to 80% over 10 year

4. Genetics

	Targets
Accurate genetic parameters are determined to support appropriate indexes covering the traits identified by the deer industry's National Breeding Objective.	A. national average carcase weight increases annually by 1.5% from 55kg to 64kg over ten years B. national average hind output efficiency increases annually by 2% from 0.36kg output/kg hind to 0.44kg output/kg hind over ten years C. national average age at slaughter brought forward annually by 0.36% over ten years (i.e. 16 days earlier) (16.19 months (492 days) to 15.65 months (476 days) for hinds and 12.93 months (393 days) to 12.4 months (377 days) for stags

5. Venison attributes (intrinsic and extrinsic)

Elements of production and processing systems that–

- affect the taste, appearance, safety or quality of venison; or
- produce the types of products preferred by customers,

are optimised.

6. Environment (greenhouse gas emissions)

On-farm, in-plant or transport systems employed in the deer industry are optimised to reduce their greenhouse-gas emissions intensity.

7. Environment (water quality)

Diffuse nitrogen and phosphorus losses from a deer production system that contaminate waterways may be minimised through availability of-

- a fit-for-purpose tool to estimate the quantum and sources of such losses; and
- best practice management advice.

8. Animal welfare

Venison production and slaughter systems are optimised to meet-

- New Zealanders' and consumers' animal welfare expectations; and
- new regulatory requirements domestically and in overseas venison markets.

9. Food safety (emerging regulatory requirements)

Best management practices pertaining to-

- production systems (including veterinary medicine or vaccine administration and pesticide use);
- processing;
- packaging;
- storage; or
- transport,

are identified to meet new food safety regulatory requirements domestically or in overseas venison markets.

10. Traceability (adding value)

Technologies available to producers or processors enabling consumers to identify the origin of venison are developed.

DEERESEARCH BUDGET 2015/16

DEEResearch Budget 2015/16

(DINZ-derived funds only)	Project Code	Budget 2015/16 $
Hitting Targets for Deer Industry Profitability (1)	14.01	445,667
Pastoral Greenhouse Gas Research Consortium	1.03	35,000
Health and Safety compliance		5,000
Discretionary projects (pending dR approval)		45,000
SFF sub-terranean dover		10,000
Johne's advisory group		5,000
Unallocated (as required)		30,000
Administration		15,000
	TOTAL	**545,667**

(1) 2015/16 budget includes $37,667 carried over from 2014/15 Hitting Targets milestones

DEEResearch

Website www.DEEResearch.org.nz

Email info@deeresearch.org.nz

Phone (04) 473 4500
Fax (04) 472 5549

Postal address c/o PO Box 10702, WELLINGTON