



DEERresearch



# ANNUAL REPORT

2016 - 2017

# From the Chairman

Reflecting on the 2016/17 year, I'm pleased to report that consistent and sound progress has been made towards our objectives and this includes application of our fundamental research outputs in more applied projects. I'm confident that DEEResearch's investments have generated a significant knowledge base that is being tapped into by the deer industry to support its strategy. With that in mind, towards the end of the year, AgResearch made a commitment in principle to co-fund Hitting Targets for a further 5 years. This gives the deer industry confidence that the research pipeline will continue to flow, supported by maintenance of deer research capability and facilities.

## Significant focus on animal health

Animal health was at the forefront of developments last year.

*In response to high abortion rates on several farms where pregnant hinds had been winter grazed on swede crops, DEEResearch assessed whether the swedes were a direct cause of the foetal losses, either through toxins in the swedes (glucosinolates) or low protein levels. The study ruled out any impact of the swedes on foetal loss, but showed a variation in the crude protein content of the swedes in different paddocks. This has highlighted the need to test swede crops for crude protein content and to supplement with a more nutritionally-balanced diet if necessary.*

*In another study, a validated anthelmintic resistance (AR) test for cattle was evaluated for deer, using herds previously considered to be showing AR within gastro-intestinal parasites. Interestingly, the test was unable to detect any measurable level of AR in deer herds, indicating that either the test did not work for deer or that levels of AR in deer herds may have been over-estimated. Given that earlier Hitting Targets work (FY16) showed that deer need higher dose rates of drench active ingredients than sheep or cattle, deer may have been chronically underdosed rather than harbouring drench-resistant parasites.*

*Sticking with animal health theme, but linking it directly with performance, another study was initiated in FY17 investigating links between saliva CARLA antibody production, gastro-intestinal parasitism, and growth in young deer. The work builds on knowledge that the salivary CARLA response is heritable in deer; if a positive link between CARLA response and growth performance is demonstrated, breeders could select for host resistance to parasites by using CARLA breeding values in DEERselect.*

*Taking these studies together, DEEResearch is clear that the deer industry needs bespoke parasite management tools. DEEResearch has therefore welcomed the formation of a deer industry parasite group of farmers, scientists and vets to discuss field observations, share practice notes, consider research needs, advise on project design and provide guidance on likely uptake of new innovations and guidance.*

## Creating impacts from science

It's important to us that DEEResearch outputs, whether historic or new, don't sit on the shelf. We've spent a significant amount of time working with DINZ on closing the loop between expression of research needs, research itself and adoption of outputs to achieve outcomes. We're therefore hugely supportive of the Advance Party model, in which Advance Party members give each other confidence to trial practices or tools that have been around for a while. Advance Party feedback also guides the design of further research and Advance Party members are likely to consider adopting new DEEResearch outputs, so we welcome input from them and anyone else on how DEEResearch can support on-farm productivity through research.

## DEERESEARCH OBJECTIVES

I'll now touch on how DEEResearch is progressing towards its objectives, which are:

1. Ensure that the research and innovation pipeline is achieving impact and demonstrating value for industry and outcomes for New Zealand
2. Co-ordinate and efficiently manage research and innovation benefitting the deer industry
3. Align short- and long-term research and innovation with deer industry aspirations and, where applicable, government strategy

The intended outcomes for these objectives (agreed by DEEResearch in 2013) and our performance against them are set out in table 1. Success in meeting these (or responsibility for missing them) is not solely attributable to DEEResearch, so they're not perfect, but they are high-level indicators of things DEEResearch's work can influence.

Table 1

KPI	WHETHER MET	COMMENTARY
<b>A profitable, productive (in terms of increased output per unit of input) and sustainable deer industry</b>	✓	The key DINZ indicators suggest that as of 30 June 2017, profitability and productivity (in terms of kg/head) were on the up. The DINZ annual report will cover this ground in more detail.
<b>More deer, heavier, earlier and better</b>	✓	While the national herd has been shrinking for the last decade, all the signs are pointing to it now having stabilised and being poised for slow expansion. So, while there probably weren't more deer, DINZ data does suggest that animals were coming on line heavier and earlier. As for better, more animals than ever before qualified for the Cervena appellation.
<b>Innovation being applied across industry</b>	?/✓	After results of a practice change survey commissioned by DINZ are available, we'll then be able to comment on whether innovation is being applied across industry. At this stage, we are aware that uptake of our Deer Select genetics platform is on a high, with more herds and animals coming on line than ever before. With wider uptake among stud breeders, better quality genetics will be flowing through to commercial herds.
<b>Relevant capability in research, development and practice change being sustained by growing sector demand</b>	✓	<p>The Hitting Targets project has drawn upon science capability throughout all four AgResearch campuses, particularly supporting capability growth in parasitology and environmental sciences. The project also draws upon capability in health/immunology at Otago University and ruminant nutrition at Lincoln University, including support for students to undertake post-graduate degrees.</p> <p>The DEEResearch board was delighted to hear that both DINZ and AgResearch recognised research excellence on the Deer Progeny Test study under Hitting Targets, by making, respectively, a team award and a prestigious individual award (to Jamie Ward). <a href="#">Click here</a> for further information on Jamie's award.</p>
<b>A regained presence of the deer industry in the agriculture sector</b>	✓	We're very confident that deer farming has a regained presence in the agriculture sector, helped by the awareness-raising programme led by DINZ and the market diversification undertaken by the processors. Those processors are investing heavily in new infrastructure, the Primary ITO is rolling out tertiary level deer farming qualifications and the training institutions continue to attract students onto deer courses.
<b>Strengthened freedom to operate</b>		Assessing performance isn't so straightforward in the freedom-to-operate space, where deer farming alongside the rest of the pastoral sector is facing increased regulatory burdens that tend to be crude in their application. However, DEEResearch is investing in research that will clarify the relationship between deer farming practices and water quality to support future restrictions being evidence-based and deer-specific.

Lastly, I thank all my fellow board members for their dedication to the Board's work as well as the farmers and processors who have volunteered their time, herds, staff, equipment and expertise in working on DEEResearch projects alongside dedicated and high-achieving scientists. This engagement gives the outputs the commercial validity that underpins our industry-good purpose.



Collier Isaacs



# Accounts

This report includes an extract from the financial statements of DEEResearch Limited for the year ending 30 June 2017 for general information purposes only. A full set of audited financial statements and the accompanying audit report are available on the DEEResearch Limited website ([www.deeresearch.org.nz](http://www.deeresearch.org.nz)).

The complete set of Financial Statements were approved and signed on 30 November 2017 on behalf of the Board of Directors by D Coup and I Walker (Directors).

# Research programme highlights

## HITTING TARGETS FOR DEER INDUSTRY PROFITABILITY

2016/17 was the fourth year of “Hitting Targets”, the largest project commissioned by DEEResearch by value. Hitting Targets is undertaken by AgResearch and its contractors, such as Lincoln University.

DEEResearch continued to significantly invest into research on the heritability of traits of interest to support quicker and more powerful improvement in the national herd. In particular, DEEResearch is examining the heritability of resilience to disease and stress to reduce industry resource put into disease or sub-optimal growth interventions.

As part of this strategy, DEEResearch increased its investment into deer-specific genomics research. For a trait predictable by genomic (DNA) information, the generation of breeding values avoids reliance on the time-consuming capture and entry into DEERSelect of ‘field’ trait data (e.g. conception dates, liveweights, meat yield). Genomic breeding values, which are of greater accuracy than phenotype-based genetic predictions, can therefore enable greater confidence to be placed in DEERSelect-led breeding decisions and increase the rate of herd improvement at the herd and national level. DEEResearch’s investments have so far enabled the use of genomics to identify an animal’s breed composition and parentage, and during the year, exploration started on whether genomic information could predict Johnes’ disease susceptibility.

The Deer Progeny Test project finished trait recording (except of maternal traits, which are being collected for development of a maternal and reproductive model in DEERSelect) and analysis of traits of priority industry interest was conducted. A huge matrix that assesses the heritability of each trait, its variation amongst the DPT animals and its relationship to each other trait was generated, this being a valuable industry resource. We can now identify the heritable traits that will achieve the largest and quickest improvements in our animals and their products without causing perverse effects.

Fieldwork was completed (and reported on shortly after year end) in a “dose titration” study to identify the relative efficacies in deer of different doses of oral drench from the main drench families. Until now, with only single-active or pour-on products registered for deer, when it comes to adjusting cattle or sheep doses of other products to make a multi-active combination product for deer, veterinarians have relied on educated guesswork. The lack of comparative deer-specific field data also put off commercial companies from product development targeted at our niche sector. This data will therefore help the deer industry in its push for new tools farmers can use to combat parasites affecting the lungs and the abomasa that should be as resilient as possible to the onset of drug resistance. Mindful of keeping options open in this space, proof-of-concept for a mini-bolus drench delivery system was established and research to engineer a mini-bolus and test its efficacy was commenced.

## OTHER PROJECTS

### Climate change

The Pastoral Greenhouse Gas Research Consortium ('PGGRC') made headway into the identification of candidate methanogen inhibitors by undertaking 16-day shed trials in sheep on several molecules that had appeared promising at the laboratory bench. The objective was to identify substances that reduce methane production without interfering with normal biological function. The next phase involves working out a delivery mechanism for extensive grazing systems and partnering with commercial parties for manufacture and distribution.

The PGGRC also commenced its first deer-specific project. Owing to the relative ease of trial work on sheep, PGGRC had no prior knowledge of the microflora of the deer rumen and thus did not know whether candidate methane inhibitors or vaccines in sheep had the potential to work in deer. In a collaboration with Hitting Targets researchers, rumens were recovered from DPT slaughter events for analysis. The benefit of using DPT carcasses is that their genetic pedigree is known, hence the genetic basis of any observed variation in rumen composition can be assessed.



## Directors

As at 30 June 2017 the Board of DEEResearch Ltd. comprised:

- Collier Isaacs** (independent Chairperson appointed by the other directors)
- Dan Coup** (Deer Industry New Zealand)
- Andrew Greer** (Tertiary Education Institutions) (**Tim Carpenter** until 4 January 2017)
- Glyn Francis** (AgResearch)
- Danny Hailes** (Venison Processors, Exporters and Marketers)
- Mark O'Connor** (AgResearch) (**Rebecca Redmond** until 21 March 2017)
- Ian Walker** (Deer Industry New Zealand)

# Summary of DEEResearch's 2016/17 audited accounts

## DEERESEARCH LIMITED

### Summary Statement of Comprehensive Revenue and Expense For the year ending 30 June 2017

	2017 \$,000	2016 \$,000
Total Revenue	1,892	1,998
<b>Less Expenditure</b>		
Research Expenditure	1,860	2,036
Administration Expenditure	26	63
<b>Total Expenditure</b>	<b>1,898</b>	<b>2,099</b>
Total Comprehensive Revenue and Expenses Before Taxation and Interests in Joint Ventures	4	(101)
Change in Proportionate Share in Consortium Net Assets	(3)	3
Total Comprehensive Revenue and Expenses Before Taxation	1	(98)
Taxation	-	-
Total Comprehensive Revenue and Expenses After Taxation	<b>1</b>	<b>(98)</b>

## DEERESEARCH LIMITED

### Summary Statement of Changes in Equity For the year ending 30 June 2017

	2017 \$,000	2016 \$,000
Opening Accumulated Funds	24	122
Total Comprehensive Revenue and Expenses after Taxation	1	(98)
Closing Accumulated Funds	<b>25</b>	<b>24</b>

**DEERESEARCH LIMITED****Summary Statement of Financial Position  
As at 30 June 2017**

	<b>2017</b> <b>\$,000</b>	<b>2016</b> <b>\$,000</b>
Share Capital	0	0
Retained Earnings	25	24
<b>Accumulated Funds</b>	<b>25</b>	<b>24</b>
Represented by:		
Current Assets	251	351
<b>Current Liabilities</b>	<b>226</b>	<b>327</b>
<b>Net Assets</b>	<b>25</b>	<b>24</b>

**DEERESEARCH LIMITED****Summary Statement of Cash Flows  
For the year ending 30 June 2017**

	<b>2017</b> <b>\$,000</b>	<b>2016</b> <b>\$,000</b>
Net cash outflow from Operating Activities	(81)	(37)
Net cashflows from Investing Activities	-	-
Net cashflows from Financing Activities	-	-
<b>Net decrease in cash and cash equivalents</b>	<b>(81)</b>	<b>(37)</b>

**NOTES TO SUMMARY FINANCIAL STATEMENTS**

The specific disclosures included in this summary financial report have been extracted from the full financial report which was authorised for issue on 30 November 2017.

The financial statements have been prepared in accordance with Tier 2 PBE accounting standards. The full financial statements have been audited and an unmodified audit opinion has been issued. These summary financial statements comply with PBE FRS 43. Figures are in New Zealand dollars. All summary financial information has been rounded to the nearest thousand dollars.

The summary financial report cannot be expected to provide as complete an understanding as provided by the full financial report of the Company.

If you require a full set of accounts, please contact Catharine Sayer at Deer Industry New Zealand and we will forward a copy to you.



# Summary of DEEResearch investments in 2016/17

INVESTMENT TYPE	PROJECT'S SHORT TITLE	PERIOD OF PROJECT	TOTAL	FUNDING P.A. (\$K)		
				DINZ FUNDING	AGR	CONTINUING IN 2017/18
Pan-sector consortia	Methane mitigation through <i>Pastoral Greenhouse Gas Research Consortium</i>	2002 - 2019	6,300	35	800	YES
Industry-led productivity	Hitting Targets	2013-2018	1,791 <sup>1</sup>	408	1,333	YES
<b>Total</b>			<b>8,091</b>	<b>443</b>	<b>2,133</b>	

## Progress on Hitting Targets in 2016/17

THEME <sup>2</sup>	SUB-PROJECT TITLE	ACTUAL OR ANTICIPATED YEAR OF COMPLETION	ACHIEVEMENTS BY YEAR END
Efficient land use	<b>1.3: Focus on Farming</b>	2017	Scientist support provided to range of DINZ and NZDFA events, such as South Canterbury Focus Farm, P2P Regional Workshops and Advance Parties. <a href="#">Click here</a> to see examples.
Feeding	<b>2.1: Over-Wintering Hinds on Swede</b>	2017	Work completed and reported on at farmer events. No linkage found between over-wintering hinds on swede and sub-optimal fawning rates or liveweight gain. <a href="#">Click here</a> for more information.
	<b>2.5: Relationship between behaviour, stress and productivity</b>	2019	Research tool (an 'accelerometer') to remotely monitor activity versus inactivity was validated in deer. Study to assess relationship between undisturbed behaviour in paddock and behaviour under a mild challenge (yarding and weighing) confounded by insufficient variation in yard temperament in experimental cohort. Review of protocol recommended use of progeny from more sires than previously used in further fieldwork. Development of temperament scoring system commenced. Data collected on effect of parasitism on stress indicators.
Animal health	<b>3.3: Anthelmintic Resistance in Farmed Deer (Assay)</b>	2017	Work completed. Lab-based assay for drench resistance not delivered as deer parasites did not appear to behave in resistant manner. Deer parasites also appeared to be more drench tolerant after introduction into cattle followed by lab culture than after introduction into deer followed by lab culture, therefore further understanding of parasite behaviour in deer required before live animal tests to identify resistance or infectivity can be developed.
	<b>3.5: Anthelmintic Dose Efficacy Against Ostertagia</b>	2017	Effective dose rates for main drench families ascertained and pending formal write-up (completed after year end). <a href="#">Click here</a> for more information.

<sup>1</sup> Includes \$50K from Landcorp Farming Ltd

<sup>2</sup> DEEResearch research themes were changed after year end; this table shows the operative research themes during the 2016/17 year.

THEME	SUB-PROJECT TITLE	ACTUAL OR ANTICIPATED YEAR OF COMPLETION	ACHIEVEMENTS BY YEAR END
	<b>3.6: Effective Anthelmintic for Deer</b>	2017	Efficacies of two double drench formulations administered in mini-bolus format ascertained and pending formal write-up (completed after year end). <a href="#">Click here</a> for more information.
	<b>3.7: Does Carla Influence Parasitism in Deer?</b>	2018	Fieldwork underway to assess whether genetic selection for animals expressing Carla confers productivity benefits (reduced parasitism and better growth rates). <a href="#">Click here</a> for more information.
Genetics	<b>4.1 Deer Progeny Test</b>	2018	Extensive reporting to stakeholders on findings of DPT project. <a href="#">Click here</a> for more information. Annual programme of fieldwork for maternal traits complete.
	<b>4.2: DEERSelect</b>	2018	Regular generation of breeding values, indices and linkage data. Genetic evaluation modules revised to run on different software in line with changes to parent genetic engine owned by Beef+LambNZ. Extensive work on ensuring fitness of meat module prior to implementation (new genetic parameters from DPT made significant changes to carcass-weight adjusted breeding values). Worked with industry to define parameters for Reproductive/ Maternal Trait module. Prepared Wapiti module for regular, public release. Undertook preliminary work on genetic groups to facilitate across-breed evaluation of genetic merit on one index (finalisation is pending GenomNZ genomic data on all relevant animals). For more information, <a href="#">click here</a> .
	<b>4.4: Deerlink</b>	2021	Continued production of progeny necessary to maintain sufficient linkage for reliable breeding values on DEERSelect; all pedigree and trait data relating to progeny uploaded onto DEERSelect. <a href="#">Click here</a> for more information.
	<b>4.6: CT Scanning of Carcass Traits</b>	2017	Recommendations made on improvements to CT scanning protocol.
	<b>4.7: Tomorrow's Deer: Genetics for the Future</b>	2020	Annual AI programme completed to breed progeny for assessment of novel, potentially valuable traits in other sub-projects of Hitting Targets (sires selected had variation in seasonal growth profiles or variation in resistance/susceptibility to Johne's disease ('Jd')); DNA profiles on all progeny obtained.
	<b>4.8: Genotyping by Sequencing &amp; Genomic Prediction</b>	2018	'Training set' of genotyped and phenotyped animals continued to be compiled. Investigations made into correlations between some DNA markers and key traits. Techniques developed to apply different methods of genomic selection to the deer industry and identify DNA markers exerting large phenotypic effects. For example, for yearling weight, a marker was identified that inferred a 3% advantage and was associated with a gene mutation affecting processes such as appetite, fat deposition and energy balance (although validity of results depends on analysis of a different set of animals). Improved method of identifying relationships between deer taking account of presence of different sub-species in the national herd. New methods for scanning the genome for genes, using new marker technology. Work done into ensuring accuracy in relationship between the actual phenotypic measure and the predicted genomic breeding value. Influential industry sires identified, re-genotyped using genotyping-by-sequencing, parentage assigned. Achieved genotyping of at least 1000 phenotyped DPT or commercial animals. <a href="#">Click here</a> for more information.

THEME	SUB-PROJECT TITLE	ACTUAL OR ANTICIPATED YEAR OF COMPLETION	ACHIEVEMENTS BY YEAR END
	<b>4.9: Genomic Solutions for Health and Wellbeing</b>	2018	Fieldwork undertaken to assess whether predicted Jd resistant or susceptible sire genotypes result in phenotypically Jd resistant or susceptible progeny where sires taken from general population rather than the closed herd from which the predictive test developed. Trial pending analysis at year end (reported on after year end).
	<b>4.10: Seasonal Growth Pathways</b>	2018	AI for production of progeny from sires of interest completed.
Environment (water quality)	<b>7.3: Environment Focus Farm</b>	2018	Implementation of Land and Environment Plan at Invermay continued and field day held. <a href="#">Click here</a> for more information. Website developed (hosted on Deer Hub section of DINZ website) for AgResearch communication on LEP development and implementation and environmental research projects.

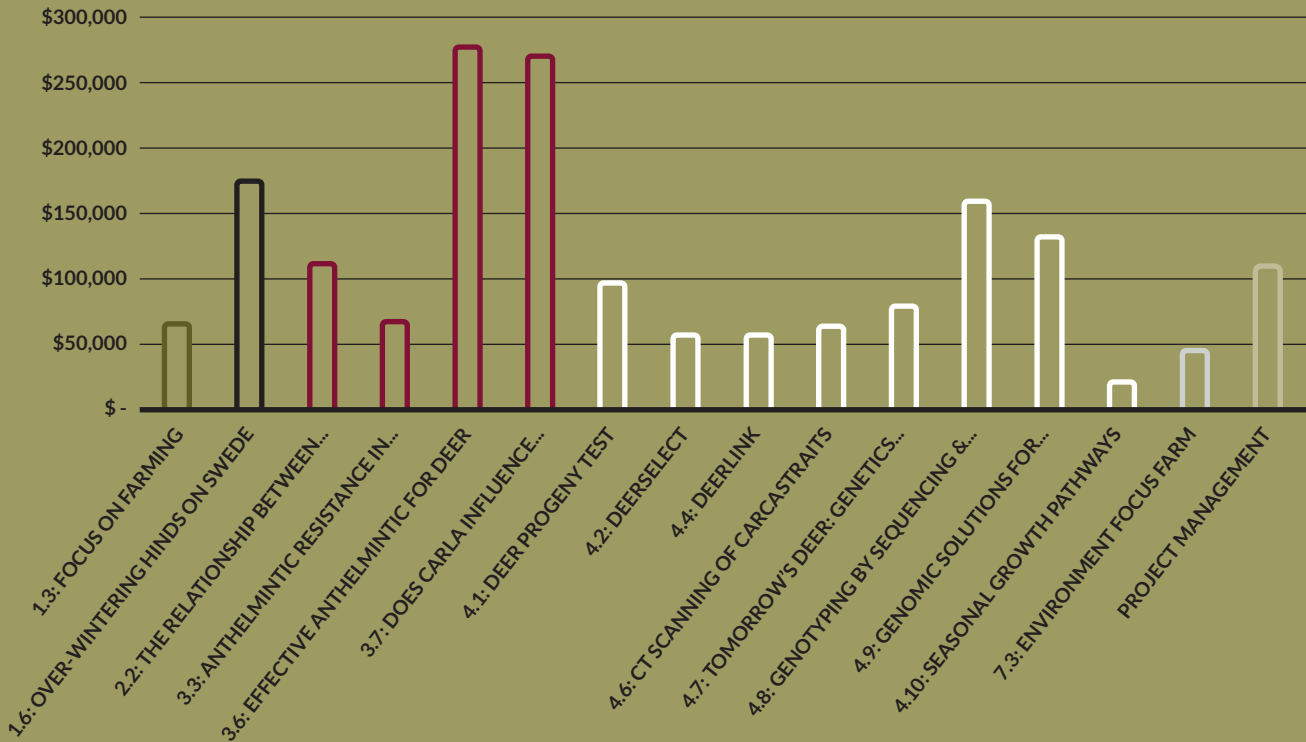
Full sub-project descriptions are available on any sub-project of interest, from DINZ's Science and Policy Manager<sup>3</sup>, on request.

## Hitting Targets sub-projects in 2017/18 *(new items in bold)*

THEME	SUB-PROJECT TITLE
Growing deer/Caring for deer	2.5 The relationship between Behaviour, Stress and Productivity in Deer
Caring for deer	3.6: Effective Anthelmintic for Deer
	3.7: Does Carla Influence Parasitism in Deer?
	<b>3.8: Understanding the Life Cycle of Lungworm and Gastrointestinal Worms and Nematodes</b>
	4.9: Genomic Solutions for Health and Wellbeing
Growing deer	4.1 Deer Progeny Test
	4.2: DEERSelect
	4.4: Deerlink
	4.7: Tomorrow's Deer: Genetics for the Future
	4.8: Genotyping by Sequencing and Genomic Prediction
	4.10: Seasonal Growth Pathways
Caring for customers	<b>5.1: Incidences and Causes of Deep Muscle Bruising</b>
Caring for the environment	<b>7.4: Long-term Monitoring of Deer Impacts on Waterways</b>

<sup>3</sup> Catharine.sayer@deernz.org; 04 471 6116

### TOTAL INVESTMENT INTO HITTING TARGETS IN 2016/17 BY SUB-PROJECT



### DEERESEARCH INVESTMENT BY RESEARCH THEME 2016/17

