



Farming, Food and Health. **First**™

Te Ahuwhenua, Te Kai me te Whai Ora. Tuatahi

THE FUTURE OF SCIENCE

ANNUAL REPORT 2008





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COVER IMAGE FROM LEFT: Charisa Cornellison, Dr Jolon Dyer and Dr Stefan Clerens – members of the Protein and Structure team. This team has core competencies in proteomics and structural biology integral to AgResearch's 2020 Science.



PROTEOMICS AND ITS IMPORTANCE TO THE LIVESTOCK INDUSTRY

It is a crucial scientific capability in all aspects of the agricultural value chain – with research targeted at achieving greater returns for farmers through a higher quality product.

There is no doubt that proteomics – the study of an organism’s protein composition – will have a profound impact on agricultural scientific research in the years ahead.

Proteomics is a relatively new science, made possible by the technological breakthrough of mass spectrometry – a vastly powerful and sensitive analytical tool that now allows detailed examination of proteins by breaking them into their component amino acid pieces.

Proteins are vital to the function of every living thing, which makes them a key component of New Zealand’s agricultural exports – dairy products, meat and wool. To lift market outcomes for agriculture, it is critical we understand how proteins function, interact, change and perform both in the living animals themselves and in their protein-based products.

Proteomics, therefore, is central to the delivery of AgResearch’s 2020 Science, with the comprehension of protein expression in ruminants underpinning the Big Ideas.

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And it’s already proving its worth as the core science in AgResearch’s Wool Quality Programme. This comprehensive research

programme looks at genetic and protein differences in wool that relate to fibre qualities. These findings will be used to develop markers for traits such as bulk, strength and crimp, enabling farmers to breed wool for specific applications.

Another arm of the Wool Quality Programme looks at discolouration caused by UVA and UVB exposure – a long-standing problem for manufacturers of woollen products. Through locating, characterising and tracking the range of compounds inside wool proteins that lead to colour change, significant steps have been made in developing protective treatments for carpet and apparel wool.

Proteomics covers a broad range of tools and approaches in agricultural science. Through collaborations between different teams and sections within AgResearch, we can make the best use of our capabilities to look at the protein differences that affect quality traits in wool, meat and dairy products, and even begin to look at how very subtle modifications within proteins affect performance of these products.

Protein modifications, both within the living animal and through environmental and

processing conditions, have been linked to a wide range of quality and performance issues. For example, oxidative changes to specific amino acids within proteins can lead to colour changes and lowered mechanical performance in fibrous proteins. Through proteomic profiling and tracking these changes, exciting progress is being made towards understanding and controlling protein product quality and performance.

The ability to analyse and control an organism’s complete set of proteins represents a very exciting future for our livestock industry – through the capacity to look at protein differences in an animal and the significant effects these have on quality traits of agricultural products. Ultimately, focussing on this fundamental biology of our ruminant animals is going to have a substantial impact in strengthening the value of our primary sector.

The fundamental role that proteins play in the make-up of every organism puts this work at the heart of advances in agricultural science – and central to AgResearch’s ongoing ability to provide the development needed to support New Zealand’s agriculture sector into the future.

LEFT: Dr Jolon Dyer, Team Leader of the Protein and Structure team (Growth and Development Section), with the team’s liquid chromatography-mass spectrometry (LC-MS) facility. LC-MS is a critical tool in the expanding field of proteomics, which studies the protein composition and function of cells, tissues and organisms.

CHAIRMAN'S REPORT



Rick Christie

As this will be my last report as Chairman of AgResearch, it may be useful to reflect not only on the year past, but also over the six years of my association with AgResearch, and the significant changes that have occurred over that time.

To say that the business environment (for the pastoral sector) has changed would be an understatement. Dairying has become even more dominant, driven by strong global prices and demand and this has flowed into land values and conversions. This has been largely at the expense of sheep farming, which has gone sharply into reverse, for reasons which should have been avoidable. The net result of these changes for AgResearch has been negative as, although we have significant and important dairy research capability, the growth of the industry as a whole has not been reflected in substantially more research yet, except in the areas of feeds, environmental management and GHG emissions. Meat & Wool New Zealand in turn has had to restrict its levy-funded R&D investment, until the outlook improves.

International concern over food security is now a major issue, and it is perverse that such an important sector as sheep meat should be languishing. However, the medium term outlook looks promising providing the industry can organize itself better, both onshore and offshore, and start to become

a price maker in the high value markets we should be targeting.

The so called "meat mega-merger" would have been an holistic way of achieving this, so it is a pity that the initiative has been shelved. The individual meat company downsizing and rationalisation which is now occurring is very necessary in view of the reduced sheep numbers, but is unlikely to reduce the ruinous competition at farm gate and offshore that has been a feature of the industry for most of its history. The lack of profitability at industry processing and marketing level also affects the research spend by companies, which is barely above maintenance levels, and many value adding opportunities for both red meat processes and products are going begging.

In contrast, the dairy industry has continued to motor ahead with a record payout reflecting strong international markets. On-farm performance around the country has been mixed, with some areas affected markedly by drought and, ironically, now rain. With better returns flowing quickly into land price, dairying is destined to remain

a high cost industry at the margin with high barriers to entry.

The year for AgResearch was typically busy and management and senior scientists put in a huge amount of work in bidding (and succeeding for over \$14m), for the 2007 Foundation for Research Science and Technology (FRST) round. However, with nearly double that amount up for 2008, the process soaked up considerable further time and effort, which would arguably have been better spent on scientific output. An irony is that despite successful outcomes, the margins available on much of this work, especially when it is simply a pass through for other institutions, are far too low to generate an adequate rate of return on capital, especially under IFRS rules.

As a consequence of this, together with the slow startup of our new animal health and associated investments in Palmerston North and failure to achieve budgeted revenues in the meat and wool sectors, AgResearch's operating profit was depressed for the year ended June 2008. Nevertheless, NPAT benefited from another major deal with the

sale of Catapult Genetics to Pfizer concluded in the third quarter.

Notwithstanding this return, the Board decided that disappointing revenue and margins, increasing operating costs and with the poor outlook for the sheep industry in particular would not allow us to maintain scientific, technological and specialist support capability at current levels any longer. Although in the longer term AgResearch should benefit from revenues from the recently announced Fast Forward Fund, neither the process nor the quantum of funding were sufficiently clear for us to defer the inevitable. Therefore we have commenced a moderate downsizing and this will impact on some areas of the company during FY 2008-9. Correspondingly, we will begin to seek opportunities outside our existing revenue streams in the international marketplace for pastoral science.

Looking back over the two terms of my Chairmanship I think the Board and management can be well satisfied with the progress we have made on many fronts. Some of the first term was tough, to find a

new CEO and unwind Celentis, switch the emphasis away from biotechnology, commence campus restructuring with the decision to close Wallaceville, and deal with some public pressures around our transgenics research at Ruakura. On the other hand we completely reorientated the company towards the pastoral sector to acclamation, pioneered the establishment of NZ's first special purpose VC fund (BioPacificVentures), set up a US-based beachhead with Finistere Partners, and negotiated a major collaboration with Massey University to establish the Hopkirk Institute for Animal Health Research. The second term was also a period of profound change with the sale of AgVax into private ownership at a substantial profit, the launch of the 2020 Science strategy, the beginning of another major collaboration with the University of Otago at our Invermay campus, the acquisition of Canesis Network to assure the continuance of wool related research in NZ and, of course, the aforementioned sale of Catapult Genetics also at substantial profit. Overall, the period saw major capital

restructuring with the investment of over \$35m on much needed new infrastructure, financed largely by the sale of non-strategic land assets and commercialisation of IP with a value of over \$40m, from which a \$5m dividend was also paid.

I have had the benefit of working with a first class Board over that time and am grateful for their input and assistance.

Special thanks however to Andy West, his senior management team and the very many extremely competent scientists, technicians and support staff without whom we could not have succeeded. It has been a real pleasure working with them all, and many others in the primary sector as well.

RICK CHRISTIE
Chairman

CEO'S REPORT



Dr Andrew West

This Annual Report places a strong emphasis on our 2020 Science strategy and our focus on New Zealand's pastoral sector, spanning from soils all the way through to final consumers. Throughout the year the scientists, engineers and technicians in AgResearch and its subsidiaries and joint ventures produced science and technology of benefit to the sector. They did this with the assistance of our support staff. I would like to thank all staff for their professionalism and for their dedication to farming, foods and textiles.

OUR FINANCIAL SITUATION

We had an unsatisfactory year. Whilst we grew our revenue by 10% (some of which was due to including a full year of the former Canesis activities) we came in \$13 million below budgeted revenue and this created a problem. We reduced expenditure in reaction and saved \$8 million on budget, but we ended the year with only a negligible operating profit. Nevertheless, we exceeded our budgeted net profit after tax due to the sale to Pfizer Animal Health of Catapult Genetics Pty Ltd, of which we owned 25%. Sale of such intellectual property (IP) is a core responsibility of AgResearch. However, commercialisations are sporadic and cannot be relied upon to regularly substitute for operating performance. Consequently, during 2008/09 AgResearch plans to reduce its annual operating expenditure, raise its

internal productivity and continue to grow its revenues, with the aim of achieving a 12% operating margin within four years. Factors that contributed to our financial performance included the severe downturn in the red meat industry and decline in the wool industry, the downtime of our lead scientists in preparing concept sketches and bids in the largest contest for government funds we have experienced; our ongoing commitment to supporting under- or un-funded scientists and rare animal genetics in the belief that the country needs such scientific capability and resources in the long-term; our continued commitment to increase the pay of our scientists and technicians by an annual, average 6.5% until it matches the average for all New Zealand professionals – currently we are 15% below; increasing lease costs due to our continued

commitment to modernise research facilities and the impact of the new International Financial Reporting Standards (IFRS) substantially increasing our depreciation costs; and our failure to attract early investment into some of our high risk commercialisation activities – which we use to help fund the erection of new laboratories – requiring us alone to supply the necessary capital and operating expenses.

The net result of bidding was that AgResearch lost \$1.25 million in the 2007/08 FRST funding round. When adjusted for 5% international, annual scientific inflation, this constituted a 12% cut in the contested funding we had previously received on contract from FRST, although some might be restored by sub-contracts. In response, we will peer-review all aspects of scientific and technical quality during the 2009 calendar year.

SCIENTIFIC AND TECHNOLOGICAL ADVANCES

Our year in science was highly productive. Only a few examples can be provided here. The first is that we sequenced the sheep genome as part of an international consortium. This was achieved in just six months at a fraction of the cost of the cattle genome. The sequence provides the opportunity to apply single nucleotide polymorphism technology to assess the inheritance of complex phenotypic traits, thereby improving the rate of genetic gain in the national flock. We were the first scientific team in the world to sequence the genome of a rumen methanogen, which will provide important information on the metabolic processes that control methane emissions from cattle. We also created the world's first detailed map of the genome of white clover, in association with ViaLactia; this will lead to over 1,000 genetic markers becoming available to accelerate breeding of this important forage plant. We developed an upgrade to the industry-standard OVERSEER™ software to estimate greenhouse gas emissions from farms. We appear to have successfully established a parasitic wasp of the devastating pasture pest clover root weevil; this is an essential step in achieving biological control of this weevil. We can now non-invasively measure the tenderness of meat, which has been a long-desired capability of meat processing factories. Finally, we also developed a low-impact insect-resist agent (based on imidicloprid) for carpets. This overcomes one of consumers' biggest concerns about woollen carpets: their incorporation of insecticides. I acknowledge the many supporting funding agencies, in no particular order, including Meat & Wool New Zealand (M&W/NZ), DairyNZ, Deer NZ, Fonterra, the Foundation for Research, Science and Technology, the Ministry of Agriculture and Forestry (MAF), the Fertiliser Manufacturers' Research Association, Wool Research Inc, Ovita, the Pastoral Greenhouse Gas Research Consortium and the Pastoral Genomics Consortium.

CONSOLIDATING 2020 SCIENCE

Towards the end of the financial year we began development of a detailed implementation plan for each of our five Big Ideas, covering dairy, meat and textiles, pestilence-free New Zealand, agriculture and its communities, and opportunities beyond

food and fibre. By year's end the plans were sufficiently developed to have identified the areas of science and technology we believe are required to transform our food industries from commodities to value add. We shall complete the plans in the 2008/09 financial year. Hopefully they will represent the single best science and technology plan for the pastoral food and textile industries prepared in New Zealand.

THE FAST FORWARD FUND

The new global concern over food security favours this country's economy and should sustain improved terms of trade in the foreseeable future. Perhaps as a consequence, in February the Government announced a significant commitment to this country's food industries in the form of its Fast Forward Fund. It is anticipated this Fund will be worth \$2 billion when matched by new private sector money and that it will be spent over 10-15 years. We believe this to be an important commitment. AgResearch made a contribution towards encouraging the recent change in public opinion to one that favours this country's primary industries. We believe this to be a long-term change in mood and that successive governments are likely to increase their support for the food and biomaterials industries – all of which ultimately rely on science and technology.

STRENGTHENING OUR CAPABILITIES

In agreement with the Public Service Association we increased the average, annual remuneration of our scientists, engineers and technicians by 6.7%, and of our support staff by 4.2%. We also moved all staff onto four weeks' annual leave and offered those staff already on four weeks a fifth week of annual leave. Finally, we made a concerted effort to ensure staff were well-informed about Kiwisaver (including a seminar series by Mary Holm) and, pleasingly, by year's end a full 464 had joined the scheme. Along with other, existing schemes, 47.5% of our staff save in a superannuation scheme.

In January we relocated 8 of our staff from our Wallaceville campus in Wellington to our Invermay campus in Dunedin. We then closed our Wallaceville campus and in the process made 15 staff redundant during the year. We have used the closure of our 100-year old Wallaceville campus to help fund the creation of three new research centres. We opened the first (the Hopkirk Animal Health Research Institute at Massey

University, Palmerston North) in the last financial year. This year the Environmental Science and Research Crown Research Institute (ESR) opened the second of these centres, the National Centre for Biosecurity and Infectious Diseases, at the site of our old Wallaceville campus. AgResearch retained staff at this centre to work with ESR and the NCBI's two other partners, MAF and the AsureQuality state-owned enterprise. The last of the three centres, the Centre for Reproduction & Genomics, remains under construction at our Invermay campus. However, during the year we commissioned some new, associated scientific facilities and we anticipate the main laboratories will be commissioned in December 2008.

Late in the financial year we announced our intention to convert our farm at Tokanui, just south of Te Awamutu in the Waikato, to dairying for research and development purposes. This farm will go on to replace our Dairy No.1 and Dairy No.2 farms at Ruakura, Hamilton. We intend to use Tokanui for research into new types of milk produced by means of new cattle genetics, new feed regimes, new management regimes and novel therapies. We also hope that it will be used as a development facility by the country's agritech firms.

Finally, we put a substantial effort into preparing a submission to government for an equity injection to allow us to create an industry-good, dairy and red-meats food R&D facility at Ruakura. It took us a full year to prepare this case in association with other such facilities proposed at Manukau, Auckland, for fast-moving consumer goods and proposed at Lincoln, Canterbury, for plant-derived foods. If funded, the Ruakura-based facility would be integrated with our new dairying R&D farm at Tokanui and our existing sheep and beef R&D farms at Whatawhata, to the west of Hamilton, and at Ruakura itself. The submission was provided to government at the very end of the financial year for its consideration.

CREATING NEW SCIENTIFIC COLLABORATIONS

It was an excellent year for collaborations, particularly with the University of Otago, and I would especially like to acknowledge Vice-Chancellor Professor David Skegg for his personal enthusiasm. We funded a Professorial Chair in Reproduction & Genomics at the University as part of our commitment to the new Centre at Invermay



Professor Julie Fitzpatrick, Moredun Research Institute in Scotland.



Professor William McKelvey, Scottish Agricultural College.



Professor Alan Bell, CSIRO Livestock Industries.

and I am pleased to report that Professor Neil Gemmill was appointed to this position. We also established a three-year, joint, \$500,000 per annum research fund with the University of Otago and used it to fund six, new, collaborative scientific projects of merit.

Just as we expanded an already vibrant relationship with the University of Otago so we also expanded our relationship with The Liggins Institute of the University of Auckland and signed a more extensive Memorandum of Understanding. This was assisted by The Liggins winning an extension to its related Growth and Development Centre of Research Excellence (CoRE). We similarly committed to further collaboration with Lincoln University, this being achieved partly through its also winning an extension to its BioProtection CoRE, in which AgResearch is a partner. Lincoln University invited AgResearch to participate in its new dairy R&D farm at Lincoln and we reciprocated by inviting Lincoln University to participate in our Tokanui dairy R&D farm.

The considerable effort we have placed in overseas relationships came to fruition this year when we hosted visits by the leadership of the Moredun (animal health research) Institute of Scotland and the Scottish Agricultural College (SAC). This led to our signing Memoranda of Understanding with both of these prestigious organisations and committing to funding joint post-doctoral and PhD positions with them. I would like to take this opportunity to personally thank Professor Julie Fitzpatrick, CEO of the Moredun, and Professor William McKelvey, CEO of the SAC, for their enthusiasm to collaborate with AgResearch. Finally, we continued our significant and important collaboration with Australia's Commonwealth

Scientific and Industrial Research Organisation (CSIRO) Livestock Industries and Plant Industry Divisions, with our committing to fund two post-doctoral research fellows with CSIRO Livestock Industries in the area of rumen micro-organism genomics. I would also like to personally thank their Divisional Chief, Professor Alan Bell, for his commitment.

COMMERCIALISING OUR SCIENCE AND TECHNOLOGY

Sale of our 25% shareholding in Catapult Genetics was the year's highlight and paralleled our earlier sale of AgVax as a significant CRI commercialisation. As I reported last year, the creation of Catapult Genetics (a sheep and beef genetics marker company) represented some years of deliberate effort and investment by AgResearch and its partners, including M&WZN. Our long-run plan was to create a clean route to market for our sheep, beef and deer genetic research. To achieve this AgResearch invested \$5 million to restructure the original Ovita and then \$2.4 million to capitalise the spin out Catapult Genetics, concomitant with our \$1.5 million investment into securing commercial rights and freedom to operate for other cattle marker technologies in Australasia. By doing so we created an incentive for Australian research institutes to work with us that assisted in sequencing the sheep genome. Shortly thereafter Pfizer Animal Health began negotiation for acquisition of Catapult Genetics for an undisclosed sum. Pfizer's ownership brings benefit to New Zealand sheep and beef farmers as that company is now likely to invest in such genetics, whereas previously farmers and the Government had

to find all the money to do so. I would like to thank Dr John Hay for being AgResearch's Director on the Catapult Genetics Board.

Towards the end of the year AgResearch agreed to acquire from Wool Equities Ltd (WEL) the IP rights to Orico and ParaCo, the two biotech companies to evolve from the original Ovita consortium, meaning that AgResearch will resolve the future of almost all IP that came from the original Ovita FRST consortium. AgResearch will also acquire WEL's keratin production facility at Lincoln and the right to exploit the related Keratec IP in wool-derived washable, waterproof and breathable technology. This will complete our investment in wool R&D capability.

AgResearch continued to invest in PhytaGro, its transgenic plant joint venture. Over the year, PhytaGro secured considerable freedom to operate in the area of plant transformation and we used this to build and run our own ballistic gene gun. Similarly, we also continued to invest in our third generation X-ray security technology even though this did not secure external investment. During the year we produced a new, non-invasive measurement technology for the meat industry and began its commercialisation through licensing deals. Moreover, satisfying scientific and commercial progress was made in epigenetics by the Epigen consortium between AgResearch, The Liggins Institute, Southampton University and the British Medical Research Council.

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MAINTAINING CONNECTIONS WITH THE PASTORAL SECTOR AND WIDER COMMUNITY

AgResearch maintained its connections with the pastoral sector and wider community through being the Premier Sponsor at National Fieldays' 40th event and through participation in the South Island Fieldays at Waimumu and the Royal Show in Canterbury. We also continued our investment in science education through our specialist service and support of science fairs, university careers days, a campus open day and the like. We placed a particular emphasis on working with DairyNZ and M&WZN as their industries' representative bodies.

PARTNERING WITH MĀORI

We continue to steadily expand our relationships with Māori farming corporations and were pleased to be a gold sponsor along with Fonterra and DairyNZ at the biennial Ahuwhenua Trophy competition for the best Māori dairy farming enterprise. It was a pleasure to see Dean and Kristen Nikora of Cesped Farms, Hawke's Bay, win the ultimate trophy.

CHANGES IN PEOPLE

Rick Christie, our Chairman for the last six years, retired on 30 June and was replaced by Sam Robinson, a Hawke's Bay sheep and beef farmer. Andrew MacPherson, formerly CEO of AgVax and Canesis Networks Ltd has also been appointed to the Board.

On behalf of staff I would like to acknowledge Rick's truly significant contribution. I also thank him sincerely for the substantial support and encouragement he personally gave me.

CONCLUSION

We are increasingly relevant and thus important to the New Zealand pastoral sector. Throughout the year that has ended, AgResearch produced and delivered science and technology of real benefit to the dairy, red meat and wool industries. Given their growing importance to this country's economy and society, our research and development has been and will remain immensely satisfying tasks. AgResearch continues to grow, has a strong cash flow and has a strong balance sheet. We continue to increase scientists' pay by an average, annual 6.5% and we continue to build new laboratories.

DR ANDREW WEST
Chief Executive