

While AgResearch Fiddled

Think Piece 6: October 2008



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Summary

This think piece explores the urgent need for a wider discussion on the strategic direction of New Zealand's scientific research by considering whether decisions by Crown Research Institutes (CRIs) to progress research into areas that are unproven, risky and arguably of questionable merit – such as transgenic livestock – are warranted, considering the challenges that lie in front of us: (i) methane emissions; (ii) the risks to our clean, green national brand; and (iii) our limited resources, in particular our limited number of scientists, research funds and the time it takes to discover, trial and then implement 'acceptable' solutions. It concludes that the strategic direction of CRIs demand a closer look.

'Give up meat – at least for one day a week – and we can help to save the Earth' – and the reason – 'Our appetite for animal flesh is boosting fertiliser production, pollution and emission of greenhouse gases to dangerous levels.'¹

These are strong words from an influential man – the chair of the UN Intergovernmental Panel on Climate Change and Nobel Prize winner – Dr Rajendra K. Pachauri. His views are supported by a 2006 Food and Agriculture Organisation report which states that 'the livestock sector is... responsible for 18% of greenhouse gas emissions measured in CO₂ equivalent. This is a higher share than transport.'²

Dr Pachauri highlights a farming problem with a big bite – and a problem that no other country has a more vested interest in solving than New Zealand. With the number of livestock per person estimated to be the highest on the planet (see Figure 1), this issue is no longer the New Zealand agricultural industry's worst nightmare; but that, in my view, of every socially responsible New Zealander as well.

THE NEED TO FOCUS

If Crown Research Institutes, such as AgResearch, fail to invest sufficiently in reducing fertiliser use, pollution and the emission of greenhouse gases, solutions to these problems are likely to

be found elsewhere, potentially at the cost of New Zealand's agricultural industry. We would argue that although consumers increasingly desire meat and protein,³ the nature of the protein is becoming less important. So although there will always be a top-end market with restaurants and 'foodies', the reality is that the market is looking for cheap meat, comparable meat alternatives (i.e. vege 'meats'), comparable proteins (i.e. moves to less frequent meat meals, replaced by more pulses) and even laboratory-created meat (i.e. meat without animals).⁴ We are entering a new world and no one can really be sure how this will play out, but there are weak signals that are emerging and becoming increasingly strong.

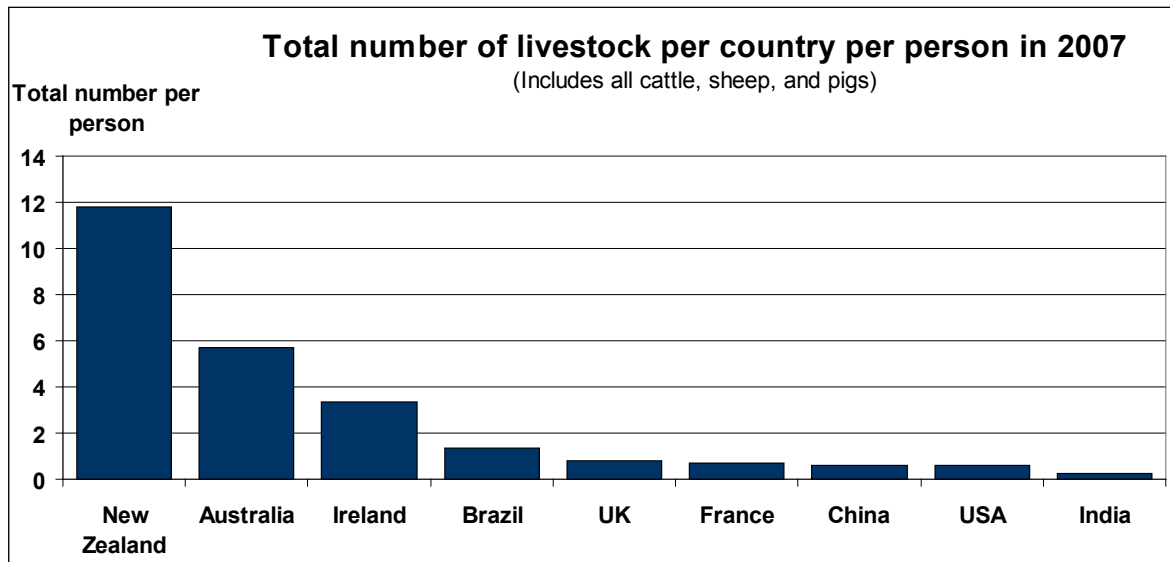
Firstly, we are seeing the desire for more facts, more comparisons and more alternatives. For example, geophysicists Gidon Eshel and Pamela Martin from the University of Chicago have calculated that 'changing eating habits to become a vegetarian does more to fight global warming than switching from a gas-guzzling SUV to a fuel-efficient hybrid car, such is the amount of CO₂ generated in the production of beef, pork or lamb'.⁵

We saw, however, the value of relevant facts in the food miles debate, where largely due to the work of Caroline Saunders et al. at Lincoln University,⁶ New Zealand was able to prove that the 'energy used in producing lamb in the UK is four times higher than the energy used by NZ lamb producers'. So in 2006, accurate information on energy use removed the potential threat to New Zealand exports. Now in 2008, it is methane that is under the spotlight – and this time the facts don't appear to be working in our favour.

Secondly, the desire for facts, when combined with the immediacy of climate change, the emergence of trends such as increased desire to 'buy local', animal ethics and a growing demand to keep our environment clean, will increasingly lead to hard questions about the intensive farming of animals. For example, the Worldwatch Institute summed this up when it said:

'The human appetite for animal flesh is a driving force behind virtually every major category of environmental damage now threatening the human future: deforestation, erosion, fresh water scarcity, air and water pollution, climate change, biodiversity loss, social injustice, the destabilisation of communities and the spread of disease.'⁷

Figure 1: Total number of livestock per country per person in 2007⁹



Thirdly, feasible alternatives are appearing on the horizon. The *2008 State of the Future* reports on the world and states:

‘The majority of agricultural water and land is used to grow animals. It is scientifically possible to produce meat without growing animals; an animal rights group has offered \$1 million to the first producers of commercially viable animal meat without growing animals.’^{9,10}

The implications of laboratory-created meat being available in the global food economy¹¹ are likely to be significant. In fifty years’ time we consider this could mean:

- Meat will no longer be shipped around the world in large quantities, but will be produced in factories, and manufactured by machines close to large populations.
- GM animals will not be located in the outdoors. This may be supported by a desire to maintain the quality of the environment, but is more likely to be driven by economics.
- Premium-quality meat ‘grown the good old-fashioned way’ will continue to maintain a premium if quality can be guaranteed.

UNDERSTANDING THE DILEMMA

The longer it takes to solve the problems of animal farming, the more likely it is that alternatives to meat, milk, skins and wool will be researched, developed and adopted. In effect, New Zealand is playing a game where the winner takes all – if we succeed in solving these problems, we are well-positioned for the long-term future, and if not, we are in trouble. The players are countries with economies reliant on livestock (such as New Zealand), versus entrepreneurs (scattered throughout the world), who are attracted to the protein market for numerous reasons such as lucrative returns, animal ethics and/or minimising climate change.

Michael C. MacCracken, a presenter on climate change at the World Futures Conference (USA),¹² brought this point home to me. When hearing I was from New Zealand, his first words were something like ‘no doubt all New Zealand scientists are busy working on methane emissions’. On my return to New Zealand, it was therefore pleasing to read in the *Sunday Star Times* that experts understood the size of the problem. Ian Johnsson, general manager of Livestock Production Innovation at Meat & Livestock Australia, said ‘reducing emissions from livestock, is the highest priority for funding’, and Mark Aspin, Manager of the Pastoral Greenhouse Gas Research Consortium

(PGGRC), stated that ‘the nature of the science is if you had dream resources and plenty of capability you could bring a lot more skills and capability to bear’. Furthermore, the manager of the PGGRC told the *Sunday Star Times* that ‘about 25 people were currently working on methane-related research in New Zealand?’¹³ So if New Zealand has an internationally recognised time-sensitive problem that is resource-dependent and critical to our economy – why is the CRI responsible for agriculture allocating resources to research that is, I believe, not an economic imperative, such as transgenic livestock?

LOOKING CLOSER AT AGRESEARCH

AgResearch (a state science company) is currently trying to extend its transgenic livestock programme. If approved, the recent set of four applications to New Zealand’s Environmental Risk Management Authority (ERMA), would allow for DNA ‘from animals, microorganisms, viruses, plants or synthetic sequences and nucleic acids comprising sequences derived from animals, microorganisms, viruses, plants or synthetic sequences and consist of coding, non-coding or regulatory nucleic acids with proven functions’¹⁴ to be inserted into nine livestock species (submissions close 31 October 2008).

This set of applications cut at the very heart of the purpose of the HSNO legislation (the Hazardous Substance and New Organisms Act). In effect, past applications to ERMA were intended under law to include a ‘case-by-case’ assessment, being the identification, analysis and management of effects. However this application seeks a ‘licence to operate’ – in this case licensing AgResearch to complete a transgenic livestock programme. If approved, it is rather like ERMA giving AgResearch a driver’s licence for a fleet of cars without ensuring each car has a Warrant of Fitness. In other words, if ERMA approves the application in its current form, we believe the Authority will effectively be delegating its power and responsibilities to AgResearch.

AgResearch recently stated on its website that: ‘Already over 100 million hectares of land throughout the world is planted with GM crops, including many of our major trading partners... New Zealand’s ability to remain globally competitive may be compromised unless it addresses GM crop and animal issues’.¹⁵ Our research found however, that only 23 countries have adopted GM crops. In addition, of the top ten countries, the uptake was

between 0.3million to 58million hectares - meaning that the top three countries; the United States (with 58m ha), Argentina (19m ha), and Brazil (15m ha) – represent over 80% of land planted.¹⁶ AgResearch therefore seems to be asking New Zealanders to allow them to progress their GM livestock programme in order to keep up with three GM crop producing countries.

Since the late 1990s, there has been a great deal of public concern over such experiments. AgResearch's response has been to raise public expectations over the benefits, including the possibility of 'assisting in a treatment for MS' (see Figure 2) and the creation of additional wealth (see Figure 3). Nineteen months after AgResearch made the submission in Figure 3 below, Scotland's PPL Therapeutics posted a net loss of £12.7m (\$NZ36m) for the first six months of 2003¹⁷ and said that it would sell its last assets and close.¹⁸

Figure 2: Press Release; CEO, AgResearch, 3 May 2001¹⁹

The project involves the insertion of a copied human myelin basic protein, known as MBP, in dairy cattle to produce a special protein in their milk. There has been every indication that the project can assist in the treatment of Multiple Sclerosis as MBP is known to have beneficial effects for sufferers but cannot be produced in sufficient quantities to be widely available.

Figure 3: Submission to the Finance and Expenditure Select Committee;²⁰ General Manager Science, AgResearch, 21 Feb 2002

PPL Therapeutics, based in Scotland, is a company with an established record of biotechnology commercialisation, especially in the areas of transgenic animals. This area of commercial biotechnology activity is established overseas in a number of specialist companies and is already providing for advanced pharmaceuticals not otherwise available. AgResearch is two years into negotiating a commercial joint venture with PPL Therapeutics to build on AgResearch's world leading capability and scientific competitive advantage in the production of transgenic cows.

Successful completion of the joint venture will result in the creation of a New Zealand business worth approximately \$50m which can be expected to grow both domestically and internationally with time.

Although it is difficult to estimate the size of AgResearch's total investment to date, we note that a recent article states '[a]round \$30 million has gone into the programme.'²¹ As a state science company must operate within clear principles – such as 'for the benefit of New Zealand' and 'exhibits a sense of social responsibility'²² – we question whether further investments are in the best interests of the country. In particular we note:

- Profits are unproven and uncertain. According to Constructive Conversations reports published in 2008:
 - 'No biopharmed products have reached the stage of commercial production. Many are in various stages of the research, development and approval process.'²³
 - Biopharming is only 'one method or "production platform" for the production of biopharmaceuticals.'²⁴ Alternative platforms such as lab-based production are looking more effective.²⁵
 - 'Significant uncertainties remain regarding the potential benefits and hazards of biopharming. These include: cost-effectiveness in relation to competing platforms, unresolved technical problems, patent and regulatory issues, potential risks to human health, issues of gene spread, and animal-welfare concerns'.²⁶
- Manufacturing costs will be significant. In 2003, PPL Scotland estimated the cost to build such a plant would be about £42m (\$NZ121m) plus an additional '£15m (\$NZ43m) to have it validated by health regulators.'²⁷
- The *Report of the Royal Commission on Genetic Modification* concluded that 'wherever possible, non-food animals, or

animals less likely to find their way into the food chain, be used as bioreactors rather than animals that are a common source of food'.²⁸

- The set of applications threatens the integrity of the HSNO legislation (see above).
- New Zealand's clean green brand is a national asset.²⁹
- It was recently reported that a survey shows 'less than a third of New Zealanders support the genetic engineering (GE) of animals.'³⁰
- Government research funds should be spent in areas where the private sector is unwilling to invest, where research could positively impact on our long-term future and where our failure to invest will destroy our competitive advantage, and
- AgResearch's financial position and its impending redundancies.³¹

History tells us that New Zealanders will be delivered the country we deserve. If we don't challenge our state companies, we may be delivered additional risks we cannot afford. In contrast, if we demand excellence in national strategy development and implementation, we will be delivered solutions to the critical issues that face New Zealand and we will live in a country we are proud to call home.

End Notes

- 1 Robin McKie and Caroline Davies, "Is our taste for Sunday roast killing the planet?" *The Observer* (London), 7 September 2008. Retrieved 8 September 2008, from: www.guardian.co.uk/environment/2008/sep/07/food.meat
- 2 Juliette Jowit, "Meat must be rationed to four portions a week, says report on climate change." *The Guardian* (London), 30 September 2008. Retrieved 1 October 2008 from: www.guardian.co.uk/environment/2008/sep/30/food.ethicalliving
- 3 Henning Steinfeld, Pierre Gerber, Tom Wassenaar, Vincent Castel, Mauricio Rosales and Cees de Haan, *Livestock's Long Shadow: Environmental Issues and Options*. (Food and Agriculture Organisation of the United Nations, Rome, 2006), pxxi. Retrieved 12 September 2008 from: www.fao.org/newsroom/en/news/2006/1000448/index.html and [ftp://ftp.fao.org/docrep/fao/010/A0701E/A0701E00.pdf](http://ftp.fao.org/docrep/fao/010/A0701E/A0701E00.pdf)
- 4 Note: The Food and Agriculture Organisation of the United Nations (FAO's) mandate is to raise levels of nutrition, improve agricultural productivity, better the lives of rural populations and contribute to the growth of the world economy.
- 5 "Global meat production is projected to more than double from 229 million tonnes in 1999/2001 to 465 million tonnes in 2050, while milk output is set to climb from 580 to 1043 million tonnes." – Stenfield *et al.* *Livestock's Long Shadow: Environmental Issues and Options*, pxx. See also FN 1, McKie and Davies, "Is our taste for Sunday roast killing the planet?" *The Observer* (London), 7 September 2008.
- 6 The In Vitro Meat Consortium, "Why In Vitro Meat?", retrieved 30 September 2008 from: www.invitromeat.org/content/view/full/12/55/
- 7 Passage quoted from McKie and Davies, "Is our taste for Sunday roast killing the planet?", *The Observer*, 7 September 2008. Refers to the report by Gidon Eshel and Pamela Martin, *Diet, Energy and Global Warming* (University of Chicago, Chicago, May 2005), retrieved 30 September 2008 from: www.geosci.uchicago.edu/~gidon/papers/nutri/nutri3.pdf
- 8 Caroline Saunders, Andrew Barber and Greg Taylor, "Food Miles – Comparative Energy/Emissions Performance of New Zealand's Agriculture Industry – Executive Summary", (Lincoln University, Christchurch, 2006). Retrieved 30 September 2008 from: www.beehive.govt.nz/Documents/Files/Food%20Miles%20Executive%20Summary.doc
- 9 McKie and Davies, "Is our taste for Sunday roast killing the planet?", *The Observer*, (London), 7 September 2008.
- 10 See Excel Spreadsheet 'Think Piece 6 - Workings for Figure 1' on our website.
- 11 Jerome C. Glenn, Theodore J. Gordon and Elizabeth Florescu, *2008 State of the Future*, (World Federation of UN Associations, Washington D.C., 2008) p4. Further information about the Millennium Project see: www.millennium-project.org/millennium/sof2008.html

End Notes continued

- 10 People for the Ethical Treatment of Animals, "PETA Offers \$1 Million Reward to First to Make In Vitro Meat", retrieved 7 September 2008 from: www.peta.org/feat_in_vitro_contest.asp
- 11 Jerome C. Glenn, "The Future of Food", in an interview by Wendy McGuinness on 29 July 2008, available from: www.sustainablefuture.info/Site/Publications/Interviews/Jerome_C_Glenn.aspx
- 12 Discussion with Michael C. MacCracken, co-editor of *Sudden and Disruptive Climate Change* (Earthscan Publishing, 2008), at the World Future Conference, Washington D.C. 25-29 July 2008. For more information on the Conference see www.sustainablefuture.info/Site/News/Archive/World_Future_Conference.aspx
- 13 Tim Hunter, "Big stakes but the science can't be rushed", *Sunday Star Times*, 7 September 2008. Retrieved 8 September 2008 from www.stuff.co.nz/4684235a13.html
- 14 AgResearch, "GMF07001", (application made to ERMA, 2008), p23. Retrieved from: www.ermanz.govt.nz/consultations/make-submission.html?aid=GMF0700
- 15 AgResearch, "Transgenic Livestock Programme: Fiction and Facts", retrieved 6 October 2008 from www.agresearch.co.nz/transgenic/fiction-fact.asp See similar statement, NZPA, "NZ needs to keep up with GE technology", *Business Day*, retrieved 4 September 2008 from: www.businessday.co.nz/industries/agribusiness/4681122.
- 16 "The Next Green Revolution", *The Economist* (New York), 21 February 2008, retrieved 7 September 2008 from: www.economist.com/business/displaystory.cfm?story_id=10727808
- Note: $57.7 + 19.1 + 15 = 91.8$ [being total top three producers] / 114 [being total top ten producers] = 81%

- 17 Heather Timmons, "Company That Cloned Sheep To Sell Assets and Shut Down", *The New York Times*, 16 September 2003. Retrieved 8 September 2008 from: www.query.nytimes.com/gst/fullpage.html?res=9501E7DE173AF935A2575AC0A9659C8B63

June 30, 2003 Exchange Rate	Currency Conversion
£UK 1 = \$NZ 2.835219	£12,700,000 \$36,007,274

Currency conversion source www.imf.org/external/np/fin/data/rms_mth.aspx?SelectDate=2008-06-30&reportType=CVSDR

- 18 Heather Timmons, "Company That Cloned Sheep To Sell Assets and Shut Down", *The New York Times*, 16 September 2003. See also www.gene.ch/genet/2003/Sep/msg00058.html
- Note: This impacted on PPL (New Zealand) Limited's 4000-strong flock of AAT-producing transgenic sheep, which were then destroyed in accordance with controls. See www.ermanz.govt.nz/news-events/archives/mediareleases/2003/mr-20030717.html
- 19 Keith Steele – CEO of AgResearch, "Press Release, 3 May 2001", retrieved 30 September 2008 from: www.sustainablefuture.info/Site/Hot_Topics/Genetic_Modification/Genetic_Modification.aspx#68083-9
- 20 Dr Paul Atkinson – General Manager Science of AgResearch, Wallaceville, 21 February 2002. "Quantification of the commercial prejudice to AgResearch if a constraint period of two years is legislated", retrieved 30 September 2008 from: www.sustainablefuture.info/Site/Hot_Topics/Genetic_Modification/Genetic_Modification.aspx
- 21 "GM proposal "big ask" Feds say", *The New Zealand Farmers Weekly*, 29 September 2008, Page 9.
- 22 Crown Research Institutes Act 1992 (NZ) s 5. Retrieved 30 September 2008 from: www.legislation.govt.nz/act/public/1992/0047/latest/DLM265144.html?search=ts_act_Crown+Research+Institutes
- Note: Section 5 - Principles of operation
- (1) Every Crown Research Institute shall, in fulfilling its purpose, operate in accordance with the following principles:
- (a) That research undertaken by a Crown Research Institute should be undertaken for the benefit of New Zealand;
- (b) That a Crown Research Institute should pursue excellence in all its activities;
- (c) That in carrying out its activities a Crown Research Institute should comply with any applicable ethical standards;
- (d) That a Crown Research Institute should promote and facilitate the application of—
- (i) The results of research; and
- (ii) Technological developments;
- (e) That a Crown Research Institute should be a good employer as required by section 118 of the Crown Entities Act 2004:

(f) That a Crown Research Institute should be an organisation that exhibits a sense of social responsibility by having regard to the interests of the community in which it operates and by endeavoring to accommodate or encourage those interests when able to do so.

- 23 Joanna Goven, Lesley Hunt, David Shamy and Jack A. Heinemann, *Animal Biopharming in New Zealand: Drivers, Scenarios and Practical Implications* (Constructive Conversations, University of Canterbury, 2008), p7. Available from: www.conversations.canterbury.ac.nz/documents/animalbioreport.pdf
- Note: Also see Biopharming definition: Biopharming – the production of pharmaceutical compounds in plant and animal tissue in agricultural systems (AERU, 2007: ix) Available from: www.researcharchive.lincoln.ac.nz/dspace/bitstream/10182/135/1/aeru_rr_296.pdf
- 24 Goven et al., *Animal Biopharming in New Zealand: Drivers, Scenarios and Practical Implications*, p9.
- 25 Goven et al., *Animal Biopharming in New Zealand: Drivers, Scenarios and Practical Implications*, p19.
- 26 Goven et al., *Animal Biopharming in New Zealand: Drivers, Scenarios and practical Implications*, Executive Summary. See also:
- (i) Dr William Kaye-Blake, Caroline Saunders and Mariana de Aragão Pereira, *Potential Impacts of Biopharming in New Zealand: Results from the Lincoln Trade and Environmental Model* (An AERU report commissioned by Constructive Conversations, Christchurch, 2008). Available from: www.lincoln.ac.nz/story_images/4696_RR307w_s15774.pdf
- (ii) Dr William Kaye-Blake, Caroline Saunders and Louise Ferguson, *Preliminary Economic Evaluation of Biopharming in New Zealand* (An AERU report commissioned by Constructive Conversations, Christchurch, 2007). Available from: www.researcharchive.lincoln.ac.nz/dspace/bitstream/10182/135/1/aeru_rr_296.pdf
- (iii) Dr William Kaye-Blake – AERU Research Officer, "Future of Biopharming in NZ still too early to tell" *Lincoln University News*, 22 June 2007. Retrieved from: www.lincoln.ac.nz/story20608.html

Dr William Kaye-Blake (2007) stated that 'several essential dimensions are still unknown, such as the total costs, the impacts of competing technologies, the actual market demand, and the impact on our existing primary sector industries and export markets.'

- 27 Richard Wray, "PPL drops hi-tech drugs plant", *The Guardian* (London), 29 April 2003. Retrieved from: www.guardian.co.uk/business/2003/apr/29/medicineandhealthgenetics

April 15, 2003 Exchange Rate	Currency Conversion	
£UK 1 = \$NZ 2.875253	£42,000,000	£15,000,000
	\$120,760,626	\$43,128,795

Currency conversion source www.imf.org/external/np/fin/data/rms_mth.aspx?SelectDate=2003-04-30&reportType=CVSDR

- 28 Royal Commission on Genetic Modification, *Report of the Royal Commission on Genetic Modification*, (2001), p355. Retrieved 30 September 2008 from: www.mfe.govt.nz/publications/organisms/royalcommission-gm/chapter-15.pdf
- 29 Fonterra, "Fonterra's Losses a Warning for AgResearch Partner", Press Release 1 October 2008. Retrieved 7 October 2008 from: www.scoop.co.nz/stories/BU0810/S00006.htm
- Excerpt: 'Fonterra's reported \$139 million loss arising from the contaminated milk incident in China is a warning to AgResearch that New Zealand cannot afford to damage our international reputation. But AgResearch's plans for producing pharmaceuticals in partnership with US biotechnology company GTC Biotherapeutics and Pharming NV puts New Zealand's reputation at risk, and presents significant financial risks to the economy. GTC Biotherapeutics made a total net loss of \$10.4 million for the first six months of 2008.'

June 30, 2008 Exchange Rate	Currency Conversion
\$US 1 = \$NZ 1.312502	\$ 10,400,000 \$13,650,023

Currency conversion source www.imf.org/external/np/fin/data/rms_mth.aspx?SelectDate=2008-06-30&reportType=CVSDR

- 30 NZPA, "Study reveals how NZers feel about GE in animals", Retrieved 12 October 2008 from: www.clearnet.co.nz/news/national/2008Oct/b6a0413a-f512-4753-9b69-b695b5fc6b0d.html
- 31 NZPA, "AgResearch Signals Redundancies", *www.stuff.co.nz*, 6 October 2008. Retrieved 7 October 2008 from: www.stuff.co.nz/4717848a13.html



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