

final report

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1 The conference

Organisers: NZ Institute of Food Science and Technology
 Conference Theme: Food Sustainability
 Venue: Rotarua, NZ
 Date: 24-26 June 2008
 Period: 3 full days
 Format:

1. 4 concurrent sessions
2. Plenary sessions morning and afternoon
3. Industry exhibitors in entrance hall
4. 18 poster papers (no meat related papers)

Session themes:

Tues am	Economics	Technologies	Dairy	Food Science
Tues pm	Meat (listeria)	Consumer Awareness	Dairy	Food Science
Wed am	Packaging	Engineering	Meat Industry	Fonterra
Wed pm	Fruit&Veg	Food Safety	Meat Industry	NZIFST awards
Thurs am	Nutrition	Management/Innovation	Meat Industry	Organics
Thurs pm	Plenary	Plenary	Meat Industry	Plenary

Sessions attended by Ron Brooks in bold

Attendees: 400 registered for at least one day inc. 61 Fonterra employees
 Industry exhibitors: 33
 Conference handbook

1. Gave a very brief synopses of 96 of the 102 papers
2. Gave brief synopses of all 18 poster papers
3. Had programme of all papers
4. Contained a plan of exhibitors

2 First day Keynote speakers

2.1 Sustainability

Hon Pete Hodgson (Minister of Research Science and Technology)

Food is 56% of NZ exports. Volume is not the answer for NZ. Must move up the value chain, emphasising quality & safety. R&D expenditure is 1/3 that of western world average. NZ have built and are building pilot plants on various sites for use on a hire basis. He had announced a new initiative the day before called NZ Fast Forward.

www.maf.govt.nz/mafnet/new-zealand-fast-forward/index.htm From 1st July 2008, there will be \$700 million government funding over 10-15 years 1:1 with industry.

Major points

- More basic nitrogen cycle environmental research needed
- New value added food products
- Do not have nor graduate enough food engineers (32/yr from Massey)
- Need more large sized globally competitive firms

He talked about NZ not knowing enough about methane generation by sheep and cattle, turning wool into liquid, need to focus on food additives, functional foods and nutraceuticals. Sustainability defies definition. It is a path, a direction, it is only the pace that is up for discussion. It is yet to be embedded in everything NZ does. Everything is measured in money, money is embedded.

Biotechnology conferences 8 years ago focused on Human Health, then Food and now Biofuels. NZ will need to build plants to make biodiesel and ethanol from lignocellulose.

“Strategic imperatives facing NZ Fast Forward, the primary sector innovation fund”
Rod Oram (Financial/political journalist)

In the last 100 years, the world harvested area has increased by 40%, harvests by 570%, population by 260% and energy by 12,000%. Over the last 40 years agricultural commodity prices have decreased though dairy prices had doubled between 2006 and 2008. The world food inventory has halved to 55 days in the last 2 years and the UN says there will need to be a 50% increase in food production by 2030. Australia and NZ are net food producers. NZ is a low cost abundant producer but no longer the lowest cost. In sheep meat and dairy it will be the developing countries producing volume not NZ. Australia and NZ are less dependent on subsidies than any other world country.

Soil carbon needs to be researched. Crops and animals are researched but we need to improve the land.

“Incremental” science needs to change to “breakthrough” science.

On its own, Fonterra spends \$100 million a year (0.7% of revenue). Problem with NZ Fast Forward is it is only \$700million + \$700million from industry over 10 -15 years ie \$150 million a year plus it will be beaurocratic and the direction will change as government changes.

“Seafood sustainability”

Gillian Wrath (CEO, Cawthron Institute)

NZ largest independent community owned research centre with 180 research staff working on the sea food industry. She recommended reading the report (2007) by IPCC (Intergovernmental Panel on Climate Change) chapter 11 jointly produced by Australia and New Zealand www.ipcc.ch/assessment-report/ar4/wg2/ar4-wg2-chapter11.pdf and the Stern report (Nov 2006). “If you cannot do it forever, don’t do it”. NZ is not a leader in R&D or sustainability but it may be a fast follower. She had very little to say or learn from, just loads of motherhood statements like “we need to look at sustainability from a NZ and global point of view. Very poor presentation.

“Food miles, carbon footprinting, NZ trade”

Caroline Saunders Professor, Agribusiness and Economics Research Unit, Lincoln uni)

NZ food products go to high value developed country markets and need to comply with environmental factors such as carbon footprinting, the introduction of carbon labelling and the food miles concept. Lower “carbon eating” has meant meat was moved down the “approved list” in the UK. Companies need to have answers prior to being asked “What is your footprint?” The food miles concept gained traction in the UK with the popular press helped by UK food producers. She did the Lincoln report and produced a carbon calculator. www.lincoln.ac.nz/carboncalculator Using the same methodology as UK, NZ dairy products use ½ the energy of equivalent UK products and lamb ¼ the energy landed in the UK. Grass fed had a lower carbon footprint than grain fed. But NZ did not have the ammunition ahead of time unfortunately. Now the UK Carbon Trust is talking about a carbon reduction label and to qualify one needs to keep reducing by 20% every 2 years. EU sets the initiatives but others will follow if

it is in their trade interests. Do companies have traceability, a biodiversity policy, a wildlife policy. These are now being discussed.

“Attitudes to food miles-research commissioned in UK”

Jonathon Kings NZ Trade & Enterprise

A study was commissioned into UK consumer attitudes to food miles and how it affected buying habits. www.fwi.co.uk (Farmers Weekly Interactive) pushes the line “local food is miles better”, The Epicurean pushes “chew the right thing” and “shop with conscience”. The debate has not gone away as the UK simplistic approach is favoured by the local suppliers as it contributes to their national good even if food miles is not true. UK consumers want to make tradeoffs. NZ study found the UK would pay up to 10% more for a sustainable product, in Spain and Germany price was the driver, Holland had animal welfare as the main driver. The problem is “sustainability” is not measurable. There are three “pillars” of sustainability Environmental, Social and Economic. The NZTE website shows how the world views NZ. This can be exploited.

“Unilever values & actions – food sustainability issues”

Nick Goddard (Unilever, Australia)

The ability to feed ourselves is the world’s biggest challenge, not disease, war on terror or climate change. The cause is a booming population. China beef consumption is predicted to rise 3-4% per annum over next 25 years. World consumption increase is linear. Where will it come from? Tackling hunger is the major threat to political and economic unrest globally. Unilever is the world’s largest tea producer (12%) and palm oil producer (4%). The founder Lord Unilever put money into education & infrastructure in the villages where palm oil came from to ensure long term sustainability and it paid off. They are now dealing with a US based “Rainforest Alliance Certified” scheme. What is next? Sustainability requires major inputs into soil fertility, nutrients, soil losses. Sustainability is commonly quoted but a major problem with sustainability is what set of parameters are going to be used. What is marketing driven and/or trade barrier driven rather than morally driven?

3 Second day Keynote speakers

“Sustainability and the tools available”

Rachel Brown CEO Sustainable Business Network

Founded in 2002, 700 partners, 6 regional offices. The “practical tools” given in this paper were her six key drivers

1. Sustainability was an ecological imperative. “Growing for good” recent government report was worth reading
2. Al Gore and his ongoing impact
3. Clean green image vital for NZ www.nzbcscd.org.nz (NZ business council for sustainable development)
4. Seek business sustainability by re targeting marketing www.moxie.co.nz
5. the power of NGO to promote or blacklist companies so their support is important eg GE (genetic engineering) free
6. Stay ahead of regulations and meet new local and global purchasing criteria (which are often different). Keep uptodate on all ecolabels and schemes.

Three other “tools” to use were

1. www.thenaturalstep.org.nz
2. “get sustainable” on SBN web
3. “green fleet” on SBN web

She then offered 3 case studies where “there are long term savings from investing now in low carbon sustainable technologies”. She gave no back up facts.

1. Comvita- “the brand is fantastic”, “profits are larger” no numbers or facts given
2. Phoenix Organics (drinks)- sold the business after building it to \$16million. Nothing else said. I do not see how this helps the environment
3. Grove Mill & CarboNZERO- they are “doing a very good job”, “these guys are doing very well”, “it is good for marketing”

The last statement says it all. It seemed to be a sales talk of join us or miss out but no facts to back it up. Ended with “By 2050, the low carbon market will be worth \$500 billion”.

“US perspective on global challenges for the meat industry”

Randall Huffman (President, American Meat Institute Foundation)

rhuffman@meatami.com

Oldest meat trade association in USA whose 650 members produce 90% of US meat. www.meatami.com leads to websites for top 10 issues they deal with

1. Food Safety at www.meatsafety.org

Rest in order are International trade, Origin labelling, Immigration, Industry structure Legislation, Nutrition&Health, Ethanol&Renewables, Proposition65/Preemption, Sustainability, and 10th is Industry image.

The US meat processing industry collectively work to address the key issues that have universal negative impact. These critical issues are best addressed by using the best possible scientific understanding and an effective communication platform. Two case studies they have worked on were E.coli testing and meat vs cancer link.

Of 207 outbreaks of O157:H7 since 1982, 20% caused by beef; 2006 (8 recalls, 0 illness), 2007 (20 recalls, 9 illness), 2008 to June (5 recalls, 1 illness) with most positives in June to Aug ie summer.

The FSIS undersecretary called for testing all imported and local beef not just ground beef. AMI did not support this as there is no agreed validated laboratory method and most outbreaks are not linked to beef. USDA only do 12,000 tests/yr compared to industry 10million/yr and last 5 yrs it has plateaued at 0.2positives/100,000. Testing has now expanded to trim testing but not all fresh beef.

USA has interventions of hot water/ steam/ 2% lactic/ 2% acetic/ 10% Na triphosphate washes which are all equally effective. There are multiple hurdles in US abattoirs of hide removal/ steam/ vacuum/ carcass spray/ thermal treatments/ acid wash and "best practice". This is all on website.

There was a major news report of a link between meat consumption and cancer. AMI found that it was only colorectal cancer of the 17 cancers checked and it was only linked with men and it only came from a literature review and the literature was not peer reviewed and it was processed meat and they did not define what the "processed meat" was. He had previously talked in Australia about this. He said there was a 517page study www.dietandcancerreport.com, could not find it on AMI website but there are numerous references to what AMI reported on this topic.

"Building the NZ wine industry sustainably"

Phillip Gregan (CEO NZ Winegrowers)

Explained the Integrated Winegrape Production scheme (IWP). "NZ wine is not cheap, has no better taste, is no better than others." The \$800million industry has over \$250million exports. 16 years ago they decided to promote wine as being produced in a sustainable and environmental manner from a clean green land. They have now got 580 wineries voluntarily agreeing to the IWP, their environmentally sustainable practices are checked by external auditors and the aim is to be 100% sustainable by 2012. There have been many improvements to practices that have been valuable economically. The changes have not been "marketing" driven but it is still a good marketing selling point. Sustainability is a passport to the market. As yet there is no definition of sustainability internationally.

"McDonalds-managing a sustainable supply chain"

Arron Hoyle, Purchasing Manager, Aust/NZ

Aust/NZ has \$2.8 billion revenue from 1.3 million people and use 15 suppliers (10 private) with no supply contracts in place. They use 1x10⁶ tonnes beef/yr in the world but this is only 2% of the world's beef. They are concerned about animal welfare and do 600 audits per year on animal welfare in Asia. It was a sales talk.

3.1 Tuesday papers

"Biofuels-How sustainable are they?"

Elizabeth Yeaman (Renewable Energy EECA)

www.eeca.govt.nz Energy Efficiency & Conservation Authority

Transport uses 44% of all fuel in NZ and only 0.7% is renewable. All of France is B5 ie 5% biodiesel in diesel. Fonterra has a NZ whey to ethanol plant. CRL Energy Ltd produced a report in Feb 2007 for EECA on Energy and Greenhouse Gas Emissions from NZ tallow, available on the web. Tallow diesel would have half the greenhouse gas emissions of fossil

diesel and an energy saving of 58%. She used tallow yield figures of 2.1kg/hd sheep and 40.5kg/hd beef. The EC definition of “byproduct” is if it is <10% the value of the finished product. So, tallow is a byproduct.

NZ is way behind Australia in biodiesel use (she said). The NZ policy declared 1st July 2008 is to have 2.5% replacement by 2010 which is 150 – 200 million litres of biofuel. To meet the BSO (Biofuels Sales Obligation, a NZ thing) sustainability principle they must emit 35% less greenhouse gas and not compete with food production. There is a biofuels specification in NZ www.biofuels.govt.nz. NZ fleet of cars are 2/3 supplied from Japan 2nd hand and Japan do no work on renewable fuel so no cars have been altered to cope with biofuels. There have been trials in NZ on B5, B10 and E10 on road vehicles and B60 and B100 on fishing boats. NZ is in the top 4 in the world in generating energy from renewables.

“Environmental sustainability-Does it matter for the NZ food industry?”

Nelson Gapare (Sector Sustainability, Ministry for Environment)

He rambled on with no ideas, no solutions, laid out challenges and said they are all opportunities. His best offer was “Bank of America has offered \$20 billion to help customers pursue green business opportunities so go and grab some”. Another offering was “if you put less chemicals into your product the more money you will have for your bottom line”. Also, “there are lots of policies coming out of government and lots of discussion and I think that is a good thing”. He said “you need to think outside the square” and gave as his only example McCains who use biogas from anaerobic digestion of their waste to power part of their factory. What he did not say is this was done in the 1970’s. Overall, a very embarrassing presentation made worse by the fact he thought he had “stimulated discussion”.

“Sustainable food futures for NZ”

Richard Le Heron & Nick Lewis (Uni of Auckland)

Positioning a biological economy in a globalised world. Sustainability is being changed as a result of the Brunton report www.sustainabilitynz.org. This is the 6th Sustainability conference in NZ in last 2 months. Some retailers are now setting standards for suppliers and it is used as a marketing tool. A survey showed 50% of buyers expected to read a sustainability tag (though it is not known if it affects buyer habits). Buyers like the feel good feeling of reading that goods they buy says how the labour is treated, about a reduced effect on the environment, reduced energy, reduced waste, care for animal welfare, sustainable future. One can register to qualify for a Green Global certified tick with product carrying a Gold 2008 Company stamp nb there is also Green Seal certified. Corporate social responsibility and sustainability is now a price of entry. NZ needs to be proactive and join the actors and shapers rather than be acted on and shaped. ISO 14020 and ISO 14024 are standards ecolabelers need to follow. Whether we agree with this plethora of certifications, we need to understand them, and stay ahead of developments by helping produce them.

3.2 Meat Engineering Sessions

It was the first NZIFST annual conference that has had a Meat Industry segment. This segment ended up dominating the conference with five half days compared to two for Dairy, two for Food Science and others just one each. Rob Archibald, R&D Manager with ANZCO Foods was overall chairman of the Meat segment and by the sound of it was the driving force behind so many papers. It was standing room only for most of the meat sessions with 70 to 80 people attending each paper.

3.3 Listeria Themes (Tues pm)

“Listeriosis-what is the issue?”

Sally Hasell (Hasell Consulting) -

Listeria has emerged over last 20 years as a pathogen of concern with the move to long shelf life ready to eat refrigerator stored foods that do not need cooking. It survives and grows under conditions that control other foodborne pathogens. It grows above pH 4.4, in high salt, and is inactivated above 70°C. The EU, USA and FDA have policy or draft guidelines will be used as a foundation for an NZ strategy to be developed by NZFSA. There are about 20 cases/yr in NZ at a rate of 0.5/100,000 which is the same as other similar countries

“US meat industry perspective on control of Listeria in ready to eat environment”

Randall Huffman (AMIF)

Discussed very high risk foods (deli meat and uncooked frankfurters), high risk (pate and meat spreads) and moderate (reheated frankfurters and dry fermented sausage. Found a good way of cleaning machinery was drape a tarp over it and insert a flexible steam line underneath for 30 mins above 160°F. USA use 4 levels of sanitary zones one inside the other with 4 being the lowest level ie locker rooms and 1 the highest ie in contact with product. Note that NZ use numbers in reverse order. AMI are happy to provide any design details.

“Listeria-the other chicken problem”

Roy Biggs (Tegel Foods)

Roy.biggs@tegel.co.nz

Cooked chicken is an ideal environment for Lm, worse than sausage which is worse than bacon. Sliced chicken roll will not meet 5 week shelf life target. They hold every batch for 3-4 days until tested and cleared. Sampling costs \$130,000/yr. He thought a paper by RB Tomkin (JFP) “Control of Lm” is the best paper on the topic. He is happy to supply the paper to anyone.
Wed am

“Sustainability of the NZ meat industry”

Trevor Johnston (CEO Riverlands)

His impression was automation was only happening with sheep (he has been a beef man for over 40 yrs) and was surprised when I told him MLA were funding development work in NZ. He started when the industry used 52 men at 8/min for a 40 hr/5day week fully unionised. Technology came in the mid 80's with shift work and chilling rather than freezing. At 120hr a week, technology was economic and automation was welcomed as it helped the job and the workforce became customer focussed. Now, all byproducts are saved and are worth \$100/hd. There are 30 men/chain, and 9/min. Hot boning started in 1986. He is pro hot boning. Carcass washing stopped in the mid 80's (it just spreads the dirt around he said). The vet used to be the “enemy” but now they have 3 QA staff per shift and the vet is one of the team to ensure best quality. Operators need to be behind a technology otherwise it will not work. Each technology must work otherwise the next idea on that site will not be supported. There are now very few much larger sheds. He talked of black gold (coal), white gold (milk) and red gold (beef). He noted that this was the first Meat Session and was happening because companies are now talking to each other.

“Automation on the dressing chain”

Geoff Bates (Manager Automation Development at DeviceWorks. IRL)

He said he had a Farm Equipment Co. (I think the operative word is “had”). Dressing sheep is a manual operation with a few simple mechanical aids. There are some significant recent developments. It is unthinkable to return to pre inverted dressing system. There was automation work in NZ until 1990 then MIRINZ and general funding stopped. Robot prices are ¼ to 1/3 what they were 20 yrs ago. The mistake is people design the process for a person rather than for the machine. He thought he always delivered though others in R&D often did not which gave it a bad name. Never develop extra features, it is just more to go wrong. Too many R&D people are prepared to negotiate reduced \$’s to get a grant then cannot deliver the result or it loses money. Australia and NZ are the only countries in the world that will ever work on sheep because of their expensive labour. He succeeded with the Y cutter. He succeeded with the MillMech Sort Pall Cutter (?). He succeeded with an automated sock splitter (99% success rate in mid 2008). Auto visceration needs to be worked on as it is a hard manual task. They were well on their way to succeeding with a gas depelter being partly funded by MLA from Australia. He said it was vital to have a Food Safety person on every team (who is his food safety person?).

“Improving efficiency and yields with robotics”

Chris Hopkins (CEO Scott Technology)

He said he was a commerce not technical guy. Company going 96 years with last 40 in automation and last 7 in Meat. NZ productivity is low. If it increased 50% it would still only be in middle of OECD. Automating a process is not task/person replacement. Their focus is boning room automation. Started with LEAP. Started on hind leg where yield improvement was the focus. Aimed for 10/min. Started by using two directional X ray units to create a 3D image. Targeted eliminating bandsaw when splitting animal into hind quarter / saddle /fore quarter by using a knife to eliminate bone dust. Yield improvement is 0.5% ie \$0.65 / carcase. Y cutter does 2 / min. is safer and can improve cut accuracy that will yield more \$\$\$ and will save \$1.30 per sheep in total through labour saving. He said the learnings were: Find a partner to share R&D cost, take the budget and double it, take the time and treble it. 20 plants each doing one million sheep is the total NZ market which is not a lot of equipment to get your money back from. He showed the animated film of the completely automated boning room. Traceability was not mentioned, (I thought this was a driver.) He said that while automation is not new and has not been a major force, it is changing rapidly because of the drive for efficiency and changing labour strategies.

“Bioplastics from meat industry waste proteins”

Lisa van den Berg, Dr John Verbeek (Waikato uni, Engineering Dept)

80,000 tonnes of blood are processed annually in NZ into low value animal food and fertilizer. Processing at 90-100°C reduces solubility and studies showed blood protein to produce plastics that were neither homogeneous nor extrudable. This study added Na dodecyl sulphate, urea and NaSO₃ to bloodmeal to produce extruded and injection moulded plastic successfully. Tensile strength of 24MPa and Young's modulus of 1550MPa were achieved, better than LDPE. Work is continuing to improve strength and reduce VOC emissions. They have the potential to grow bacteria so could not be used in food contact. They will biodegrade in waste tips.

“Rapid on line measurement of glycogen to predict pH in beef using near infra red”

Dominic Lomiwes, Auckland University of Technology- now at AgriSearch

MSc thesis. Glycogen breaks down to lactate, lowering pH. Beef needs to be <5.7 to be tender. So, if glycogen is measured then pH can be predicted. Measured LD muscle 45mins after slaughter for glycogen and pH. Project showed that NIR was no good as a predictor.

“E.coli O157:H7-a discussion on the beef industry”

Mohammad Koohmaraie, Director, US Meat Animal Research Centre.

After many years in this position he had just left to do private consulting. E.coli O157:H7 ranks far below Salmonella. First detected in 1982 in the world. Outbreak in 1993 changed the way US converts cattle to beef. Since 1996, the target was 1 positive per 100,000 tests. Then in 2007, there were 20 recalls totalling 33×10^6 lbs (15,000 tonne) beef of which 7 caused human disease. Cargill did full scale trials and found positives as follows: 24 (faeces), 74 (hides), 13 (carcasses), 1 (washed carcass). The conclusion was hide not faeces was the source. They divert meat for 1hr before and 1 hr after as well as 1 hr of detection ie 3 hrs production diverted to rendering, so a wash cabinet pays for itself (100-200mg/l Cl). Hide removal is critical part, so a test and hold system was introduced. Also better to focus on kill floor by separating hide on and hide off with 1) physical barrier 2) worker barrier 3) air flow from hide off to hide on 4) train personnel. The Beef Industry Food Safety Council (BIFSC) were pressured by US consumer groups. He said that industry do so many more tests than government so have more extensive data. There is a law in US which allows customers at restaurants to order hamburgers cooked as rare as they wish and the restaurant must comply. A potential problem source.

“E.coli O157:H7 and NZ beef-market influences, consequences and strategies”

Roger Cook Assistant Director, NZFSA

There has never been a case of illness in NZ caused by O157 though there have been two E.coli related deaths, not caused by beef. It is a trade problem. \$1billion beef trade with USA. Regulations regarding O157 came out in 1995. GMP and MAP manuals have existed for many years in NZ but NZ did not believe there was a need to test their beef. The US have up to 11 decontamination interventions and still get 10% positives which results in 500 tonnes/week of beef going to rendering. NZ could not afford this. From 1998, all bulk trim in all the US listed premises is tested daily which was accepted by the US. NZ do not test ground up beef. The testing that is done, stopped USA from forcing NZ to put in US style interventions. However, bobby calves are washed to reduce overall numbers. Hide counts are only $10^2/\text{cm}^2$ in NZ compared to $10^5/\text{cm}^2$ in US. In 2008, US brought in new regulations and at Christmas 2007 declared they would buy no NZ beef. They then relaxed this to saying they would reject a days production in a single container if too high a count was detected. There is a bobby calf target of 0.27% by 2012 (0.51% average in 2004).

“Chilled meat-microbiology is only part of the story”

Neil Smith, Silverfern Farms

Over the last 10 years there has been a 30% increase in shelf life. There has been no evidence of microbial detriment from Spray Chilling. They target 1°C surface temperature prior to boning. The pH of lamb is higher so they only have pH criteria for beef and venison. Keep boning rooms dry to keep micro counts down. Air is filtered to 98% < 2 microns. Keep it cold, keep it dry, keep it moving – MAXIM. Lamb stored at -1.5°C good, 0°C good, $>1^\circ\text{C}$ not good. Consumers want tender but fibrous meat, then juicy meat. Do not want bone dust so use knives not saw. Spinal chord removal. Next is traceability.

“What affects the microbiology of chilled lamb?”

John Mills, AgResearch MIRINZ john.mills@agresearch.co.nz

Shelf life has a variable definition. pH<5.8 inhibits microbial spoilage. Bacteria grow on glucose first and then amino acids. It is the second group that produce off smells and flavours. Spray chilling then checking for APC and enterobacteria in both wet and dry boning rooms showed no count difference. Pseudomonas are strict aerobes so by vacuum packing it slows their growth. Since using new multilayer packs Bronchthrix do not appear. Shoulder is higher pH than leg (shoulder pH is usually 6.2) and is handled more, so tend to have a higher count. Woolly sheep tend to have a higher count than shorn animals. They have measured 10^6 APC per cm^2 on a well washed belt just before morning start of day's production after washing the previous night. Loading out at -1.5°C in a -1.7°C container is fine but if same meat is loaded out at 2°C it takes 50 days to get to 0°C and 2,000 days to get to -1.5°C . Product life decreases by 10% for each 1°C above -1.5°C . The pH of lamb is too high to prevent microbial growth. Controlled atmosphere CO_2 will improve shelf life by 30%. Meat will start to freeze at -2.0°C but at higher pH may start at -1.5°C .

3.4 Further E.coli discussion:

288 sheep carcasses were found to have very low counts of 0157. The testing used to be 5x25 gms of minced meat but the NZ test is now to take a thin slice off the surface. The NZ test uses a sponge over $1,200\text{cm}^2$ of calves while the US use 1 sponge over $8,000\text{cm}^2$ of hock and shoulder. Mohammad Koochmarai did a test comparing US, NZ, Aus, and Uruguay and NZ was 50% of the E.coli count of others. All the NZ bugs were 026. It is very expensive to conduct such tests. There is a recommendation in the US but not a regulation that when cooking hamburgers the centre should reach 60°C . The “consumer choice” requirement means a restaurant must cook a hamburger as per consumer demand. All cattle carry 0157 in the US. A US and a Canadian group are both working on a vaccine with plans for 1st trials in 2009. The USDA do not like the idea of doing trials on cattle when 0157 does not affect their health.

“Quality control for pork and red meats”

Katja Rosenwald, AgResearch, MIRINZ (Danish lady who did PhD on pork)

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Pork research focuses on water holding capacity (stops dripping and meat goes too pale). Pale meat was finally found to be mainly caused by a halothane gene which has now mainly been bred out. CO_2 stunning improves quality compared to electric stunning. Chilling tunnels at -20°C & 3m/s gets pork to 4°C in 2hrs from kill. pH @ 24hrs not a good indicator of pork quality. To increase pH they wanted to reduce glycogen. This was reduced by 25% using diet control in last 3 weeks. But 24hr pH did not change. Temperature of meat 2hrs post mortem, and pH both affect meat colour. Stress affects meat temp 2hrs post mortem. Pigs can have a temperature of 43°C compared to normal $<40^\circ\text{C}$. Tenderness improved using stepwise chilling allowing rigor mortis to happen at 10°C rather than 4°C but meat was a lighter colour. Drip loss and pH were no different. This is all similar to red meat and also like in beef, consistency is improved ie improves the worst but does not improve the best. She compared 2 plants with similar stunning and found a 1.6 degree C difference in carcass temperature because of pre slaughter handling. She thinks that this is not an understood parameter in beef/lamb in NZ. She thinks animals should not see humans pre slaughter.

“Biological basis for meat tenderness and predicting tenderness variation”

Mohammad Koochmaraie, Director, US Meat Animal Research Centre

In April 2008 at a meeting in the US, all was doom and gloom for the future. There had been a steady decline in beef inventory since 1994, land prices had increased, ethanol fuel was taking land, sons were not staying on the land, corn increased from \$2 to \$8/bushel, price of beef had reached the switching point with chicken. The only positives were Russia, India and China needed to increase beef imports and affluence in US meant more steak buyers and less ground beef. Consumers wanted a reduction in variation of beef tenderness, juiciness and flavour. Tenderness varies in every muscle apart from tenderloin (rib eye has largest variation). In Denver, a company introduced a tenderness guarantee and got a higher price. Warner Bratzler shear force was used to measure tenderness. It is difficult to do and takes a long time. It is different to the MIRINZ tenderometer whereas the Aus method is similar to WB. He set up the “slice shear force” value which involves cooking for five minutes then take 1 slice @ 45⁰ and measuring. It is idiot proof. (nb he is happy to provide the method to anyone). In lamb, tenderness gets worse up to 24hrs post mortem. Sarcomere length, proteolysis and collagen all affect tenderness but to varying degree depending on the muscle. In 1998-99, they found NIR could predict tenderness in 10secs and is non invasive. They gave it to a group to commercialise but they charged too much so it never took off. They have now taken it back to redevelop and re release. Several SNP based genetic markers have been demonstrated to have some effect on tenderness so genetic selection will become more important. The slice shear force and NIR can be used on line to sort carcasses for tenderness pre boning.

“Meat forever-quality, sustainability, survival”

Carrick Devine, Bioengineering, HortResearch, NZ

He complained that the NZ industry avoids change and do not pass on knowledge. He cannot buy a steak in a shop with guaranteed tenderness. Unfortunately, there is no global tenderness standard in cooking or in testing.

Myths need to be abolished. Electrical stimulation causes no quality defects. It has a positive effect on quality. It does not affect drip. It enhances tenderisation. It is impossible to over stimulate (It has been blamed for toughness-this is wrong. It increases drip-this is wrong). Faster tenderisation will have more initial drip but for the same tenderisation there is the same amount of drip. Drip is a defect caused by proteolysis. Reduce drip and you reduce tenderness. Vacuum packed meat is more tender-this is wrong. Marbling is most important for tenderness-wrong, as once a certain minimum level is reached it has no further benefit. Hot boned cannot be as tender as cold boned is true unless muscles are individually wrapped. A higher pre rigor temperature inhibits tenderisation only in the absence of good stimulation. If we reduce stress, it will improve quality particularly with bulls. NIR measures change in cytoskeletal proteins which measures change in water binding so measures change in tenderness. Animal fats are not bad for you when taken as part of a balanced diet.

“Tailoring processing to market specific meat quality requirements”

Dr Clyde Daly, Carne Technologies Ltd

There are three major electrical inputs in animal processing. 1) electrical stunning 2) electroimmobilisation- to suppress convulsive activity 3) electrical stimulation- applied 5-40 mins after death to hasten the onset of rigor mortis. They all affect the pre-rigor muscle environment. While the market destination is not always known, he said for the local trade the aim should be for fast rigor/slow chilling/high stimulation and a chilled product and for the export trade slow rigor/no stimulation/rapid chill and a frozen product (all for better shelf life of export trade). He said there was a practical limit to electrical stimulation (broken backs and safety). He showed

an MLA graph and said Australians had done most of the work in the area of “heat toughening/heat shortening”. Below pH 6 and above 35°C at slaughter will produce heat shortening, according to MLA. In red meat, deeper areas cool slower so look paler than the faster cooling surface of meat which looks redder. They developed a predictive model of chilling rate vs stimulation vs shear force. Modelling helps to do “what if” studies to understand the interactions (there was a question about surely the interaction reflects what was built into the model in the first place). The new generation of electrical stimulation varies pulse interval, pulse amplitude and voltage. They used 10msec pulses @ 15/sec and low (90 v) to high (1,134 v) power. The application in factories did not happen until NZS6116:2006 which introduced A,B & C risk levels. Different tissues responded differently. 50Hz stops the heart but 1,500Hz does not, so it is still halal. Should avoid low voltage stimulation. Low voltage/high frequency produces inconsistent pH effects. In Australia, using medium voltage (300 v) and 15 pulses /sec can still be Class A or B ie touch safe. The pH drops in the minutes after post mortem (eg 6.2 to 4.8) with medium voltage not as good as high voltage initially but after a few hours the pH is the same. They talked of “SmartStim” where pH can be user defined. They could improve tenderness by having higher frequency at the beginning of stimulation.

They said they used 2amps so if there is poor contact and it drops to 1amp the animal is still saturated whereas Australia go the way of more expensive equipment where they vary voltage with response.

He acknowledged the funding of MLA and support of Dean Gutzke/Ian Richards and displayed the MLA logo prominently.

“The cost of carbon in the NZ meat industry”

Dennis Butler, Environmental Manager, Alliance Group

Alliance are the 2nd largest meat company in NZ. Dennis is on the Technical Advisory Group-Agriculture. Agriculture is 49% of NZ total emissions (Energy 43%, Industry 6%) and the NZ meat industry contributes a large proportion of that. There is a New Zealand Emissions Trading Scheme (NZETS). It will be implemented from Jan 2008 to 2013 covering all sectors of the economy and all Kyoto gases. Estimates for the sheep and beef sub sector are for liabilities of NZ\$660 million without the benefit of free allocation and at a carbon cost of NZ\$30/t CO₂ equiv. It has not been determined if this will fall on processors or farmers but either way it far exceeds the current level of profitability of the sector, he said.

There are two key drivers.

- 1) The NZ government are determined it will happen
- 2) The UK customers ie supermarkets will insist

It is not about the science and it is not about whether or not you believe in climate change. Politicians will act, political opposition has collapsed. Don't stand on the sidelines yelling at the referee, get on the field and play..... or lose as you will not know the rules.

International scheme – Hold NZ CO₂ equiv to 1990 levels (presently 25% above that). By May 2008 this would cost NZ 1 billion.

Domestic scheme (NZETS MkII) - Agriculture will be brought in by 2013 (Industry 2010, trees 2008). There will be a one off cost of \$30 million and the ongoing cost of NZ\$660 million/yr (22 million t CO₂ x\$30/t) is equivalent to NZ\$8-NZ\$10 per head. Agriculture will get free “units” equivalent to 90% of 2005 levels (not 100% of above 1990 levels). NZ will need to work out the on farm and off farm emissions. The Climate Change (Emissions Trading and Renewable

Preference) Bill is out and the Select Committee reported back on 16th June 2008 with 1,000 amendments.

The split between dairy, sheep and beef for free units is yet to be discussed. By 2011, farms need to start collecting data. By 2013, it will need to be reported on. Rio NZ have a discharge of 639,000 t CO₂ equiv and the NZ Meat Industry 22 million t CO₂ equiv. so why he asked, is Rio on the front page of the newspapers complaining and there is no noise from the meat industry. In 2005, sheep and dairy emissions were about on par but sheep numbers have declined since.

“New Zealand venison, sustainable and delectable”

Graham Brown, Lyndon Matthews, Deer industry NZ Ambassador

This was a light, marketing, full of pictures talk with no applicability to the rest of the red meat industry.

4 Overall comment:

This was the first time the NZIFST annual conference had a Meat Industry segment, driven by Rob Archibald, R&D Manager with ANZCO Foods who was overall chairman of the Meat segment. Meat ended up dominating the conference with five half days compared to two for Dairy, two for Food Science and one each for the other six. The meat sessions were very well attended with 70 to 80 people each but there were few questions. While I represented MLA this time, it is important to ensure that at least two MLA representatives are present if there is a Meat segment in future. MLA were given special mention by a number of speaker who had been funded by MLA. A few of the papers are published in the NZ equivalent of the AIFST Food Journal. They are not printed in a conference manual and are not handed out at sessions.