AUSTRALIAN RENDERERS ASSOCIATION INC.

13th International Symposium

"Innovation in Industry"

RACV
Royal Pines Resort
Gold Coast, Queensland
Australia

21-24 July 2015

Thirteenth International Symposium

"Innovation in Industry"

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Australian Renderers Association Inc.

Australian Renderers Association Inc.
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License to Operate and Capacity to Innovate

Leadership must extract much more value from the overall value chain

John Brennan

John Brennan

Vice President, R&D and Technology Application
Nutreco Canada Inc.

John Brennan is Nutreco Canada Vice President R&D and Director Application & Solutions Centre, North America. He leads a multi-species team based in Guelph, Ontario. The team's mandate is animal nutrition and health-based research, technology transfer and training to support Nutreco's animal nutrition businesses in Canada, USA and Mexico.

He obtained a Ph.D. in animal nutrition from the University of Alberta and joined Maple Leaf Foods (MLF) R&D department as a Research Scientist. John became Research Manager at MLF Agresearch, a contract research organization where he led a clinical R&D program focusing on regulatory studies of enteric disease.

Thereafter John assumed overall responsibility for Nutreco's animal nutrition research program in North America. In April 2013, John was elected Chairman of the Animal Nutrition Association of Canada.

License to operate and capacity to innovate

John Brennan, Nutreco Canada Inc.

feeding the future

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July 2015

Outline

- The 2050 challenge
- Feed to food safety implications
- Efficiency opportunities

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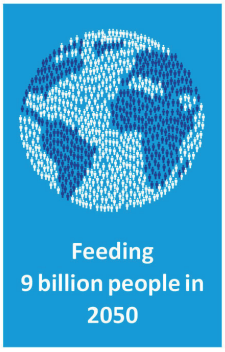
Our challenge

Doubling the food production

Halving the pressure on the planet



Feeding 9 billion people in 2050

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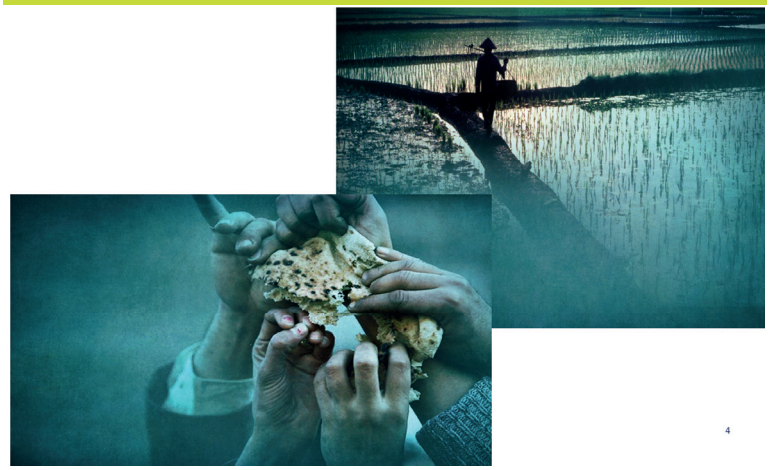
Science can deliver solutions….



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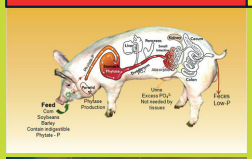
… but do we have permission?

GMO?	GMO?	Vaccine?



Girl in Bangladesh infected with smallpox in 1973. (Photo: CDC/James Hicks)

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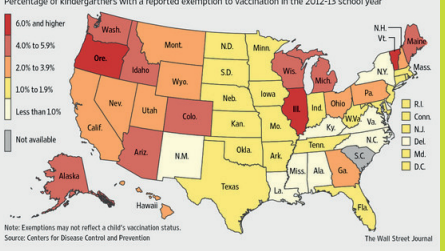
Missing the Vaccination

Percentage of kindergartners with a reported exemption to vaccination in the 2012-13 school year



Note: Exemptions may not reflect a child's vaccination status.
Source: Centers for Disease Control and Prevention

The Wall Street Journal

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Who evolves faster in a changing ecosystem?

- Genetic progress =

$$\frac{\text{Selection differential} \times \text{heritability}}{\text{Generation interval}}$$

Species	Generation Interval	Relative impact of Generation Interval
Human	30 years	1
Swine	2 years	15
Bacteria/virus	15 minutes	1,052,632

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Campbell et al. 2003

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Permission from whom?

- Consumers and other stakeholders
  - Diverse globally and locally
  - Expect and need food safety
  - Expensive to influence

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Outline

The 2050 challenge

Feed to food safety implications

Efficiency opportunities

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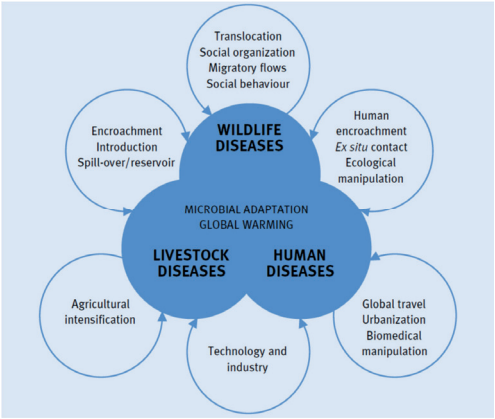
Climate change and emerging disease



Saegerman et al. 2012 IJPH 9 (2):13

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Humans: Emerging and zoonotic diseases

Emerging diseases of humans

- Newly discovered
- Increased in occurrence
- Spread to new locations or species. Why?
- Examples: West Nile virus, Lyme disease.

Zoonotic diseases

- Diseases of animals that can be transferred to people
- Many of the recent emerging diseases of humans are also considered zoonotic diseases
- Examples: rabies, salmonellosis, variant Creutzfeldt–Jakob disease (vCJD)

Center for Food Security and Public Policy, University of Iowa, 2014
http://www.prep4agthreats.org/Biological/emerging-diseases

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Zoonotic disease examples

Virus: Orf

Parapoxvirus

Fungus: ``Ringworm``

Trichophyton verrucosum

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Zoonotic pathogens

Why are they important%

- 60% of human pathogens are zoonotic
- 75% of emerging diseases are zoonotic
- 80% of agents with potential bioterrorist use are zoonotic pathogens

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Keith Hamilton, World Organization for Animal Health (OIE)
http://www.oie.int/fileadmin/Home/fr/Our_scientific_expertise/docs/pdf/Globalcooperation_oie1.pdf

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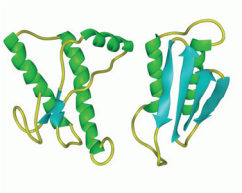
Recent emerging diseases: lessons

Porcine epidemic diarrhea virus (PEDv)

Aftermath of prion disease

- Species DNA testing



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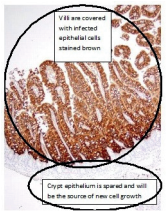
Recent emerging diseases: lessons

Porcine epidemic diarrhea virus (PEDv)

- Non-zoonotic re-emerging viral disease
  - Very high mortality in piglets
  - Virus shed in feces
  - Likes cold weather, not heat stable
- 1970's: Originally identified in the UK
- 2013: Re-emerged in the United States



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Recent emerging diseases: lessons

Porcine epidemic diarrhea virus (PEDv)

- 2014: Arrived in Canada
- First cases
  - All fed by one feed manufacturer
  - Pig starter feed "implicated"
  - Plasma protein investigated (Pasik et al. 2014)

- PEDv was a major risk to the Canadian industry
  - Record pork profitability due to PEDv in USA
  - Major financial impact
  - Had spread rapidly in the USA

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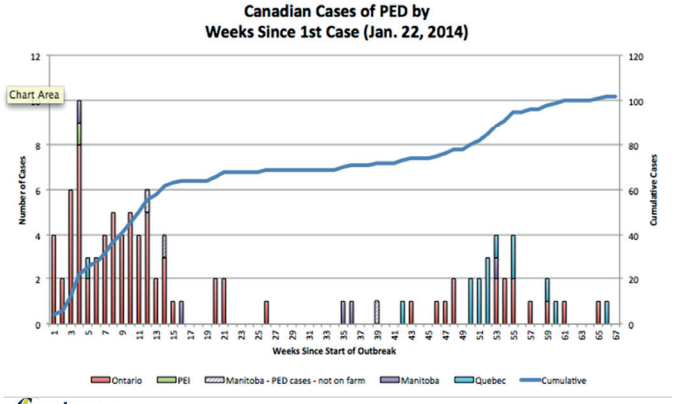
PEDv spread in Canada



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Thermostability of PEDv

	Rendering	Hydrolysis	Spray drying
Temperature, C	115-145	60-90	80-84
Time, min	30-90	380-440	0.3 to 1.5
Log reduction in virus	3.7 to 21.9	50	0.07 to 4.2
Risk of PEDv transmission	Negligible	Negligible	Negligible to Low

nutreco Samperdo et al. 2015

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Potential for cross-contamination by PEDv

Rendered products, post processing

- Negligible to low in GMP facilities*
- Viable virus could not be measured and verified

Animal transportation

- High risk
- PEDv PCR to verify

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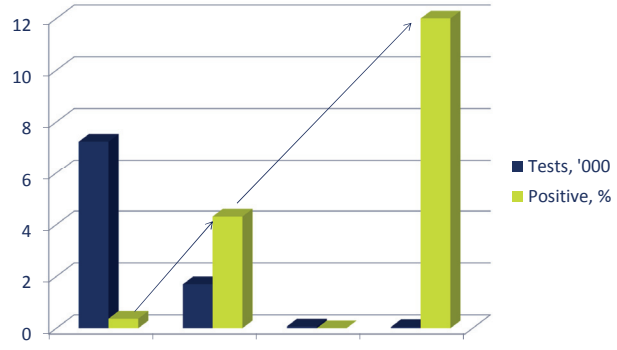
*Samperdo et al. 2015

Quebec PEDv PCR results 2014



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Potential vs actual risk of PEDv

- The true PEDv-risk of rendered proteins and fats requires
  - a measure or predictor of **viable virus**
  - pig bioassay insensitive and costly ($50,000)!
- There is an asymmetry between measures of **potential risk** (via PCR - $50) and **true risk**
- Important implications for perception of risk – PEDv or future emerging disease
- R&D in progress……

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Pork producer decisions – feed ingredients

Potential PEDv source	Producer and veterinarian concern	Mitigation	Decision
Porcine plasma protein	+++++	PCR negative	Excluded if PCR+ ive
Other porcine proteins and fats	++	PCR negative	One Province and some producers excluded all porcine products regardless of PCR status
Vehicles and drivers	+++++	Biosecurity	Good protocols well accepted

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Customer decision making process

"loss aversion"

"decision weights that people assign to outcomes are not identical to the probabilities of these outcomes"

nutreco Daniel Kahneman Nobel Memorial Prize in Economic Sciences (2002)

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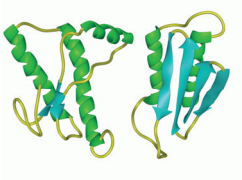
Recent emerging diseases: example #2

Aftermath of prion disease

- Species DNA testing



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DNA testing

BSE:

- certification of animal proteins - animal species
- all-vegetable diets

GMO:

- Certification of GMO-free plant protein sources

Future

- Exclusion of more species?
- Insect or other protein source identification/exclusion

Are we ready?

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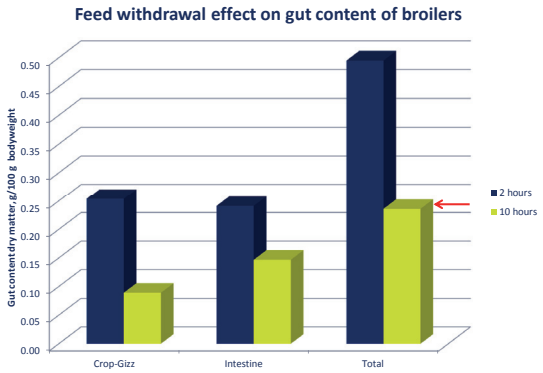
Broiler gut content (DM/100 g Bwt)



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Gomez et al. (2008)

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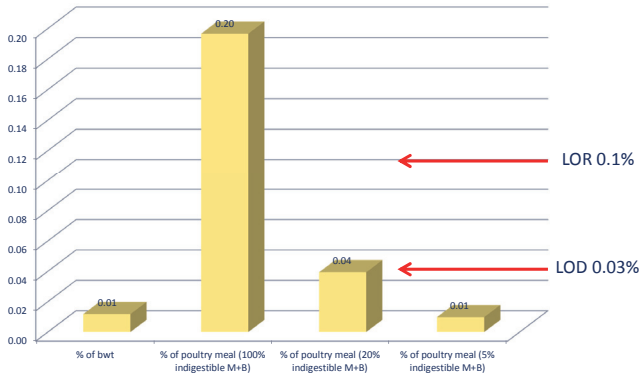
Residual M+B meal DM in poultry meal



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Calculated from Gomez et al. 2008
LOD and LOR from Elahi and Gray 2014 - PCR for pork into ground beef

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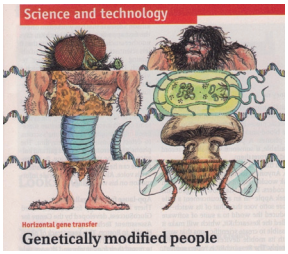
DNA and the consumer

- Consumer sees species identity as binary, a trust issue



- Requires modeling for animal proteins (Monte Carlo)

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Outline

The 2050 challenge

Feed to food safety implications

Efficiency opportunities

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Efficiency

Food proteins
- Meat, Milk and Eggs

Measurement
- Overall efficiency (“average tax rate”)
- Partial efficiency (“marginal tax rate”)

Thermal processing of animal proteins
- The benefit – destruction of pathogens
- The price - protein damage + energy cost

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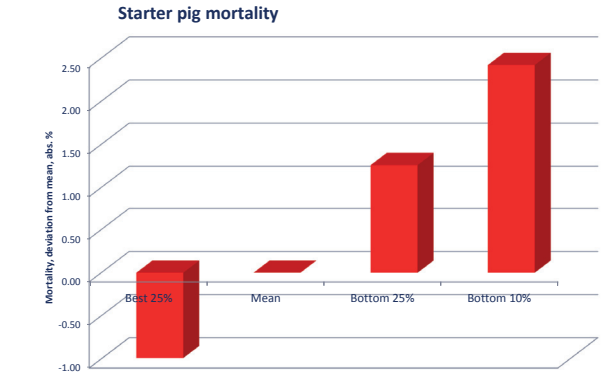
Benchmarking: Disease really matters



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Nutreco Canada Inc. regional benchmarking data (2014)

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Animal proteins and health

The trouble with all-veg diets

- Wet litter in poultry
- Poor palatability and digestibility in young animals
- Pigs and poultry are omnivores!

Health

- *Brachyspira* and *E coli* affected by starch and fibre (Pluske, 2002)
- Soybean meal not well tolerated by young pigs
- Health and feed intake benefits of plasma protein

Animal protein benefits could be better documented using new tools

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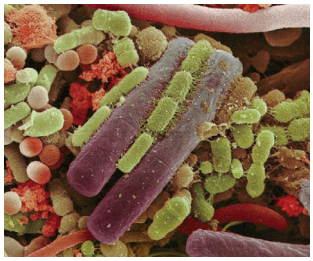
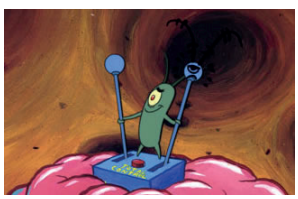
Gut microflora - more than passengers

Microbiota Modulate Behavioral and Physiological Abnormalities Associated with Neurodevelopmental Disorders



Animals and Microbes: Who Is Influencing Who?

Do we choose our microbes by our behavior? Or do the microbes choose and manipulate us by their behavior?



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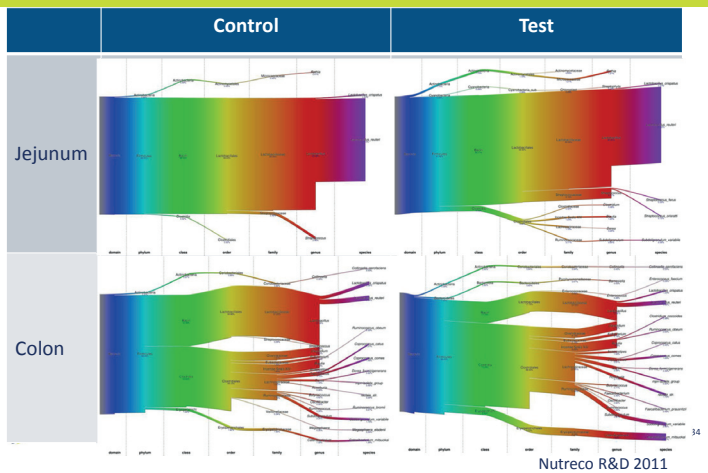
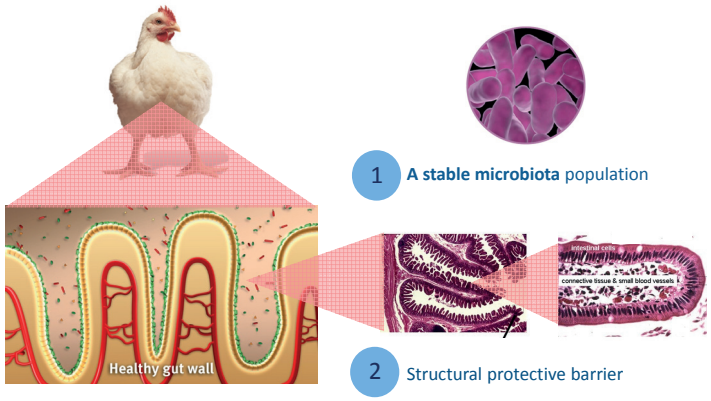
Feed additives to maintain healthy microflora



Nutreco R&D 2011

Intestinal health



1 **A stable microbiota** population

2 Structural protective barrier

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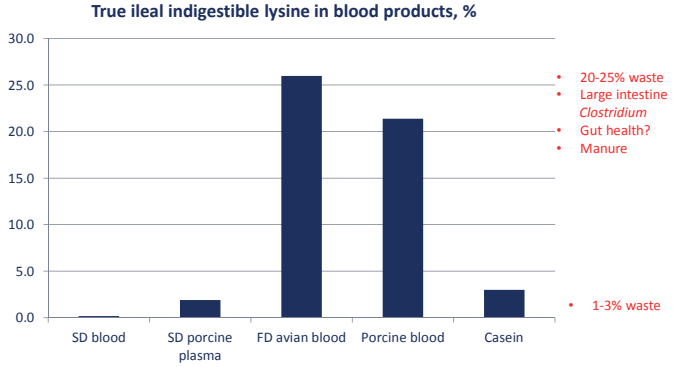
Tackling the indigestible fraction



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Almeida et al. 2013 based on standardized ileal digestibility in weaned pigs

Animal health – a changed perspective

Past

- Medications played a central role
- Antibiotics mitigated disease and stress effects
- A “Drug claim” was the pre-eminent product label

Future

- Animal management and biosecurity are central
- Anti-parasitics and efficiency additives (ionophores)
- Management of microbiota and animal physiology
- Antibiotics for treatment of disease

regulatory alignment with emerging science

new demands from customers

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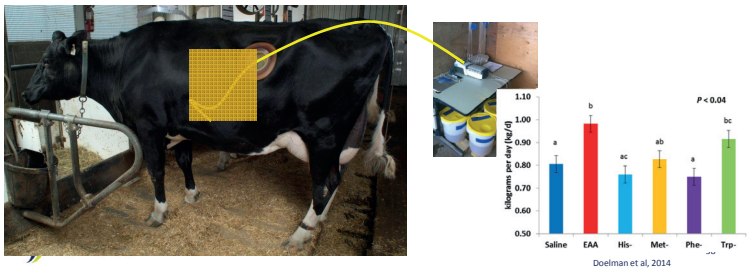
Measuring the efficiency of AA use

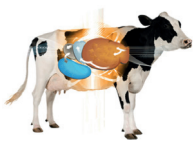
- *If* a protein source is 100% bypass and 100% digestible
- How much will be lost after absorption?



Doelman et al, 2014

Post absorptive efficiency of AA use

- Amino acid digestibility **80%**
- Post-absorptive efficiency **70%***
- Overall efficiency: 0.8 x 0.7 = **56% (good)**



0.7 x 0.64 = **45% (poor)**

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* Partial efficiency - excludes maintenance cost

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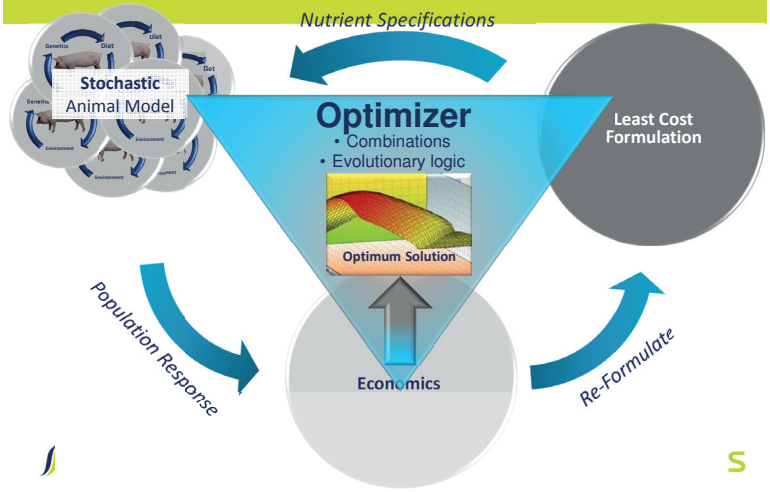
Bringing it all together.. optimization



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Implications for the food chain

- The next 35 years will bring more microbiological challenges than the past 35:
  - Invest in capabilities. Close data gaps.
  - Understand customer and consumer decision making
  - Strong industry associations (rendering; nutrition)
- Efficiency
  - Exciting new health opportunities and tools
  - Reduce indigestibility costs – innovation
  - Help reduce the inefficiency "tax"

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Conclusions

- **Feed to food safety**: Build capabilities and learn from the past
- **Efficiency:** **H**arvest the efficiency opportunities for animal proteins

Thank you

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Spirax Australia FREME

flash recovery energy management equipment

spirax sarco

www.spiraxsarco.com/global/au

Spirax FREME (Flash Recovery Energy Management Equipment) is an innovative heat recovery system that delivers major energy savings by recovering waste heat from a condensate return system and using it to pre-heat boiler feedwater or process water.

Heat and water previously lost can be effectively recovered, reducing utility bills, water treatment chemical costs and CO2 emissions.

Spirax FREME is proven to be able to achieve energy savings of up to 10%, giving a potential return on investment within months.

FR-1 skid mounted package

Proven energy savings - typical boiler feedwater application

Using condensate returned from the steam distribution system to heat boiler feedwater is an extremely effective energy saving measure. For every 6°C rise in boiler feedwater, 1% is typically knocked off the boiler energy bill. However, many steam systems fail to recover all the heat in returned condensate because:

- It would raise the feedtank temperature from the typical 85°C to 90°C to above boiling point, causing cavitation that can damage boiler feed pumps.
- Up to half of the recoverable energy in condensate can be lost as flash steam when condensate leaves a pressurised steam system and returns to atmospheric pressure.

The Spirax FREME system solves all these issues by feeding virtually all the energy from the returned condensate into the high-pressure side of the boiler feedpumps. The higher pressure means the boiler feedwater can be heated to well over 100°C (typically 120°C) without boiling and causing pump cavitation. By installing a Spirax FREME within your plant, nearly all plant condensate and flash steam will be returned and its energy recovered. As well as saving this valuable energy, Spirax FREME eliminates external venting of flash steam, visibly supporting your company's environmentally friendly operations and brand image.

Standard Product range

Feedwater flowrate kg/h	Type	Dimension/weights approximate in mm and kg				Connections			
		Height	Length	Width	Weight	Condensate		Feedwater	
						Inlet	Outlet	Inlet	Outlet
5000	FR-1	1850	1750	850	630	DN80	DN50	DN50	DN50
15000	FR-2	2000	2150	850	780	DN100	DN50	DN50	DN50

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Waste Water Rebuild

Rising out of the Ashes

Julie Seddon

Julia Seddon

Julia is the in-house environment and business sustainability specialist for Inghams Enterprises, one of Australia's largest food companies. She is responsible for the Company's sustainability and climate strategies, environmental policies and management systems, and provides specialist strategic and operational advice. Currently Group Environment and Sustainability Manager, she has been instrumental in moving the company beyond environmental compliance and making sustainability a key business priority.

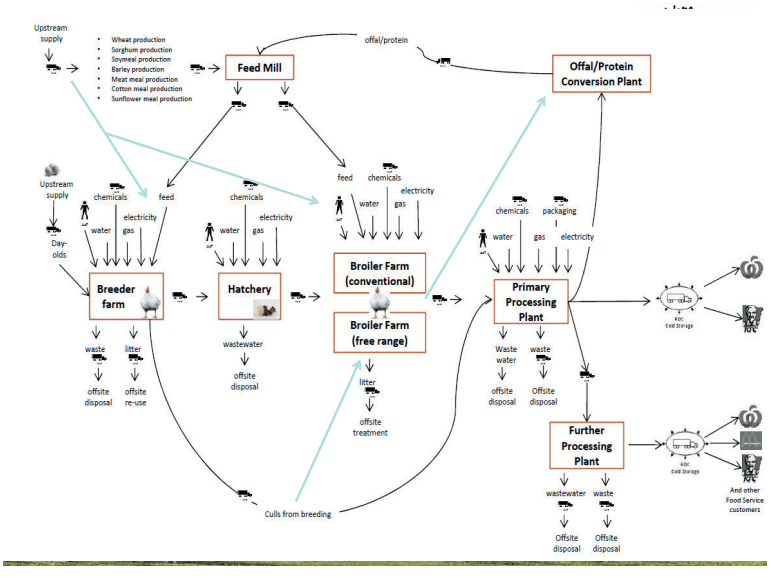
Winning the inaugural Prime Minister's Water Wise Award for the Murarrie Advanced Water Treatment Plant in 2010 marked Ingham's as a leader in its field and sets a new benchmark for water stewardship and efficiency in the food industry globally.

"Wastewater rebuild – rising out of the ashes with sustainability under your wing"

- *Inghams Enterprises*
- *Where does sustainability fit?*
- *What is in place?*
- *The Rebuild Opportunity*
- *Managing our biggest sustainability risk*
- *Inghams sustainable future*
- *Support and learning*

Inghams Operation Overview

- Founded in 1918 by Walter Ingham, 9,000 employees, $2.1 B turnover
- Fully integrated business focussed on production of poultry and stockfeed
- In 1965 consumption was 6 kg per person, today 40kg
- Inghams processes >3M chickens each week



Where does sustainability fit?

- Top business priorities - food safety, environment, animal welfare
- Environmental policy since 1980s
- Sustainability push led by CEO
- Have built sustainability into company values and objectives
- Company philosophy: “Doing the right thing and doing things right”
- Business case - reduce costs, maintenance, waste, motivational tool

Sustainability Strategy Goals

1. Water Stewardship
2. Energy and Climate Change
3. Supporting our Community
4. Zero Waste
5. Corporate Citizenship – staff & stakeholder engagement

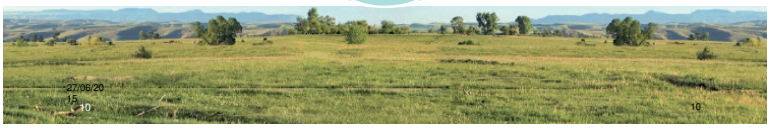
What's in place?

- Each site has an Environmental management plan integrated with the Sustainability Strategy
- Each site has a Sustainability Team which sets targets for reducing energy, water and waste
- Sustainability Action Plans
- Each site prepares a Sustainability Report every week
- Every year or so undertake major study/research (carbon footprint, LCA, waste to energy etc)
- Significant capital investment in advanced water treatment and other technologies

How do we manage supply chain sustainability risks?

- Identification - comprehensive carbon footprint, life cycle assessment (packaging and individual products)
- Measurement, monitoring and evaluation
- Investment – AWTP, renewable energy
- Collaboration engagement (staff, community), academia, specialists, supply chain (suppliers and customers), Water Stewardship Australia, SAI, RIRDC, industry

Natural Capital the reality



Large water user facing increasing climate variability and community expectations

- Water is essential to every aspect of operations
- BAU – global 55% increase in demand for water and 40% shortfall by 2030
- Important to understand our impact on the catchment and also how the catchment can impact our operations and future
- Water Stewardship helps to demonstrate use of fresh water is socially beneficial and environmentally sustainable

Water, our biggest sustainability risk

- Essential for business operation
- Quantity/quality, carbon intensity and cost
- Water efficiency, technology, stewardship

Drivers for Change

- Already very water efficient site
- Introduction of charges for nutrients
- Restrictions on supply and discharge infrastructure
- Involvement in global water stewardship standard development
- Professional support from water authorities
- In house capability

2010 Factory Fire

- 11 January 2010 fire devastated our Somerville operations.
- All employees were successfully evacuated with no injuries.
- Baiada and La Ionica reacted swiftly, helping us to process, employ our staff and ensure as far as possible business as usual
- The decision to rebuild in early Feb 2010 was supported by Victorian Government, customers, the NUW, and met with a standing ovation by employees at a local meeting.
- March 2010 – construction workforce double shifted and working seven days a week with a pre Christmas deadline
- Operational in November 2010

Rebuild Opportunity

- To embed sustainability into the rebuild
- Design state of the art processing plant for future
- New technology, streamlined and more efficient process
- Address increasingly important nitrogen issue by constructing SBR
- SBR's produce water clean enough for discharge and for further treatment
- Establish full reuse of wastewater
- Government supported redevelopment and proposed AWTP

Wastewater context

- Prior to the fire, waste water discharge compliance was an issue
- N too high and volume restrictions limited growth
- Working with South East Water to reduce and manage N but at some point additional treatment (SBR) would be necessary
- Good relationship with neighbours, employees and regulators (EPA, Council, SEWL....)
- Successful operation of worlds first AWTP at Murarrie established blueprint for other sites, but different location and timeframe

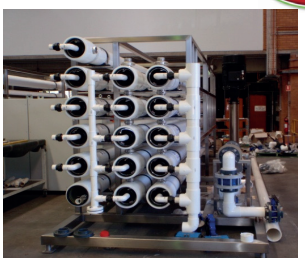
Advanced Water Treatment

- Fit for purpose - Guaranteed drinking water quality
- Multi barrier approach
- Physical, chemical and biological processes (screening, DAF, anaerobic, SBR), plus advanced treatment (sand filtration, membranes, Reverse Osmosis, UV and chlorination)
- Reduce water use by 70+%
- Developed multi stage approval process with food, health, export and environmental authorities and national risk assessment, audit protocol and guideline to regulate water re-use in the food industry
- Water used throughout selected processes including liquid palatants plants

Multi barrier + online monitoring = safe water

- Three major barriers for pathogens
  - Barrier 1: Micro-filtration and Reverse Osmosis
  - Barrier 2: Ultraviolet Radiation
  - Barrier 3: Chlorine Disinfection
- Online monitoring, alarming and automated (failsafe) shutdown to ensure CCP limits are always achieved

AWTP Construction, Victoria



Benefits to Business

Business Case
- QLD - Saved 545ML in first year & producing 754 ML
- VIC – saved 330ML in first year & now producing 390 ML
- AWTP costs less per kL than mains supply*
- Decoupled growth from water scarcity

Sustainability
- Water efficiency – wbp
- Energy efficiency – electricity usage up by 8%, using biogas to heat water in QLD
- Waste minimisation – zero to landfill
- Nutrient management – reduced N & P load to sewer

Stewardship
- Measured against WSA standards to ensure proper management of water
- PM's Water Wise Award, Woolworths Sustainability Grant, McDonald Water Stewardship Award

What did we learn?

- Previous success is no guarantee
- Require very clear baseline conditions and accepted performance criteria
- Collaborative design specifications are vital
- Time and site constraints shouldn't be underestimated
- Regional differences count (regulations, workforce, sludge disposal)
- technical capability of project team is paramount
- Internal expertise also important
- Rules of thumb are important – avoid commissioning of biological processes in winter
- Ensure design specifications are clear and agreed to.
- Better onsite supervision and project management – this would have identified some of the key problems before it was too late.
- More active role in commissioning.
- Ensure the contractor has a good track record / experience in all areas – eg. the ANR and converting ponds to SBRs (with diffused air system) were a first in second project

Large water user facing increasing climate variability and community expectations

- **Risk Management Future Proofing** – risk identification, management and planning; internal capacity building
- **Cost Reduction** –identify areas for further improvement; integration with existing systems; preparedness
- **Strategic value** – guide decision making, communicate sustainability to customers, government, community, staff and other stakeholders; opportunity for collaboration and demonstrated leadership; understand cost of business

- "Doing the right things and doing things right"

KEITH
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Water Efficiency Measures

Ben Baron

Good morning. My name is Ben Baron, and I'm from Talloman in Western Australia. For those that don't know about us, we are a dedicated rendering plant processing up to 3000 tonnes of raw material per week across four production lines. Talloman is located in the greater Perth area, close to the airport and directly under the flight path, so if you have a look out of your window next time you are descending into Perth, you might gets a bird's eye view of one of our country's most progressive rendering plants.

Before I begin, I'd just like to quickly thank Dennis King and Andy Bennett for the opportunity to come here and talk to you today. I was sponsored to attend the symposium this year as a prize from an ARA workshop last year, and even though I would have been happy with a carton of beer, I am grateful for this opportunity and appreciate the generosity of the ARA in sponsoring my place here.

I will be speaking today about some of the work that has been done at our site recently in regards to waste water treatment, specifically around product recovery and our experience with our FRC DAF. But before I do that, I will just take a moment to give you some background on why this is important to us.

Some of you might not know it, but Australia is the driest inhabited continent in the world, with the least amount of water in rivers, the lowest run-off and the smallest area of permanent wetlands of all continents.

Western Australia is a prime example of this, with the Kimberley region in the tropical north west of the state experiencing 85% of the state's runoff. That means for the rest of us, Western Australia is typically a hot, dry, arid desert, with water being our most precious resource.

I'll quickly run through a brief history of water treatment at our site:

I the 1980's, waste water, truck wash, condensate and separator stick water all went in to anaerobic lagoons, overflowing into evaporation ponds.

1988: Water authority installed groundwater monitoring bores and observed nutrient leaching into water table. We installed old style 10m^3/h DAF, using ferric sulphate and a polymer to separate the solids and fat. This was not very effective until we removed the high pH condensate stream, and installed balance tank which allowed for some cooling and gave us a homogenous stream.

1989: The DAF float, which was more of a slurry testing at only 3-4% solids, was sent to anaerobic lagoons and we irrigated the "clean" DAF water.

The 1990's saw the Department of Environment reduced the limits for BOD, nitrogen and phosphorus loading per hectare

1996: As a result of the loading restrictions, we installed a BNR (activated sludge) water treatment plant. This was an "off the shelf" unit suited for a small European town sewerage treatment with 300 BOD at 20°C. At that time we had 4500 BOD at 40°C. This was prone to blower failure through overheating and generated some odour.

1998: We covered the BNR reactors and installed a small bio-filter to manage this odour

In 2000, the ponds were decommissioned and the DAF float was sent off site for compost. For 240,000 litres per week this meant an additional expense of around $300,000 per annum.

2004: We called in the late John Green to sort out issues with our BNR. At this point he recommended the use of covered anaerobic lagoons to reduce BOD and take out temperature prior to feeding the BNR plant.

2005: The first covered anaerobic lagoon was installed

2006: BNR plant failed through overloading. On the advice of John's Environmental we set up in house testing for COD and monitored the water regularly for total alkalinity and volatile fatty acids

In 2008 our licence to irrigate was revoked due to high nutrient loading. Sewer became the only option with a headwork's charge of $1.25 million, which included the cost of connection to a high pressure main and discharge costs. As most of you are aware trade waste costs are directly related to nutrient loading, so with the high BOD came high discharge costs.

The DAF float that was going off site for composting was creating odours at that site and the DER insisted we use a licenced, and more expensive facility. As a result our disposal cost increased from $300,000 to approximately $1,000,000 per annum.

A Flottweg decanter and polymer dewatering unit that was used for desludging ponds was leased to take out some of the water, but this couldn't handle high fat DAF float. We could only get this to work by running the whole "dirty" water stream through the process and by-passing the DAF. We had to treat the raw water with lime (for pH control) and dose inline with a polymer into the decanter, but it did work. The result was thick spadeable solids. This meant that our solid waste was no longer considered a controlled waste and it also reduced our volumes to composting to 20-30 tonnes of sludge per week. While this was a significant improvement, we were still carting sludge off site and we couldn't reuse the solids.

Around 18 months ago, on the advice of Mike Johns, we inspected a chemical free DAFF at Teys Wagga that uses fine bubbles to separate the solids. Further enquiry led us to FRC, and the end result was a start-of-the-art, new age FRC DAF delivered to site in May last year. I'll leave Adriaan Van derBeek to tell you more about the technical capabilities, processes and application of the DAF in a little while. At first we tried to use the DAF "straight out of the box", but given the nature of the raw water (high in solids and fat) we struggled to get a good separation.

On cue, Mark Henderson from Hydrochem wandered in off the street, and quickly developed a chemical solution that would work for us. In addition to requiring a polymer that would give us a good separation, we also needed a GRAS polymer that would be safe for use in stock feeds and pet food ingredients, and allow us to re-process the sludge.

Jar tests quickly led to conducting a small trial. Concerned that fat content could affect milling, we first discharged the DAF float into the pre-cooker before trailing with the DAF discharging directly into the drier. We have left the DAF set-up with a facility to discharge to either, so we can direct the float to the pre-cooker or drier depending on the fat content of the raw water. Analysis of the meal from trials showed no difference to a typical analysis, so we were good to go.

We currently run our DAF at around 8,000-10,000 litres per hour to keep a consistent flow through the DAF and into the driers. The float off the DAF is typically 15% fat and 25-30% dry matter. With an average flow rate of xx.xx tonnes of float per hour, this gives us a comparative increase in yield of xx.xx%, or an additional xx.xx tonnes of additional product recovered per year. Relative to the volume of waste water through the DAF, it means as are recovering x.x% of our waste water as finished product. I'm sure all of you can do a quick back of envelope calculation for your plant, but based on an average volume, with current meal prices gives us a benefit of $xx.xx per annum.

The FRC DAF with the Hydrochem polymer has also been very successful in improving water quality. Analysis of the water over the weir show an 80% COD reduction on average from the DAF. Nutrient loading is also dramatically reduced with the DAF removing on average 50% nitrogen and 35% phosphorus from the raw water, meaning this nutrient is removed with the float and added back to our finished product.

Compared with our previous method, our water to the covered lagoons has a 60% lower COD, 50% less total nitrogen and 65% less phosphorus. This reduction is seen throughout the entire water treatment stream, with the water in our evaporation ponds now irrigation quality, which has allowed us to find more applications for water reuse on site.

At this stage we are now reusing treated water to irrigate our bio-filters and in our blood scrubber pump and blood wash down hoses. We have decommissioned our cooling towers and now run pond water through our condensers, which effectively uses the pond as a heat sink, and with further treatment we are also using up to 100,000 litres per day as boiler feed water. Not only does this reduce our demand on potable water, it also gives us additional capacity to draw water from our bore and reduces our dependence on sewer as a means of disposing of excess water. This re-use has halved the volume of water we send to sewer, and as the cost of discharging to sewer is based on volume and water quality, we get an extra benefit as the cleaner water has also reduced our discharge rate.

In regards to the operating costs, we have been steadily improving our operation of the unit and reducing the amount of polymer needed to separate the solids. Recent results show with the addition of only xx-xx ppm of polymer we are getting good separation and seeing no effect on the quality of the float or water over the weir.

To summarise, some of the benefits we have seen since the installation of the FRC DAF include:

- Increase production yield (product recovery)

- Eliminated costs associated with waste removal from site
- Reduction in labour
- Reduction in chemical usage for waste water treatment
- Reduction in trade waste discharge rates
- Increase in water re-use on site – leading to reduced consumption of bore and scheme water

Since commissioning the FRC DAF and with the addition of the Hydrochem polymer, we had seen environmental benefits around water use, re-use and water quality. In regards to the financial benefit; without mentioning any specifics we achieved full pay-back on the purchase price of the FRC DAF within the first 12 months and will continue to see an ongoing benefit to the business in the region of $xx.xx per week.

At this point I'd like to thank you for your attention, and I'll now pass you on to Mark Henderson from Hydrochem to tell you a bit more about what they do, their association with the rendering industry and what benefits they can bring to your business.

Adriann van der Beek

OVERVIEW

- About FRC Systems International
- Project Design Data
- DAF Details
- Treatment Results

ABOUT FRC

- Founded in 1979
- Office Locations
  - Toronto, Ontario
  - Atlanta, Georgia
  - Geraldine, Alabama
  - Fayetteville, Arkansas
  - Bogota, Colombia
- Over 500 projects in 20+ countries worldwide
- Ability to provide single products or turn-key solutions

Dairy	Dean, Unilever, PEPSICO, Nestlé, Leprino Foods, Sapputo
Meat	JBS, Maple Leaf, Cargill, Smithfield, Darling
Poultry	Tyson, Fieldale Farms, Perdue, Pilgrim's, ConAgra Foods, Bachoco, Keystone
Seafood	Trident Seafoods, Chicken of the Sea, Bioulnt, Pinsa, King & Prince Seafood
Fruit/Vegetable	Hormel Foods, Del Monte, Aconcagua Foods, Margetti, West Central
Other Foods	Mars Incorporated, Indiana Kitchen, Pedigree, Pillsbury, Heinz, Hill's
Cosmetics	Dial, L'Oréal, Galderma, BMSC, Mary Kay
Chemical/Pharma	Baxter, SmithKline Beecham, Colgate
Oil & Gas	Chevron, Texaco, bp, Mobil, Diamond Green Diesel, Valero, American Refining Group, Inc., Occidental, CHS
General Manufacturing	Caterpillar, Chrysler, Toyota, Tamko Roofing Products, Kimberly-Clark

TALLOMAN

Design Data:

- Application: Rendering
- Flow: 120 m^3/day (16 hrs)
- FOG: 2860 mg/L
- TSS: 9090 mg/L
- BOD: 15925 mg/L
- COD: 30875 mg/L
- TP: 150 mg/L
- Temp: 38,5 °C

THE CHALLENGE

Provide a DAF system that will:

- Recover valuable product in the waste stream
- Reduce contaminant loading on downstream process equipment
- Work effectively
- Provided consistent results
- Run without much manual intervention

PROCESS CALCULATIONS

Hydraulic Surface Loading Rate
is the influent flow of water applied over a given area - given in $m^3/m^2/hr$

Solids Loading Rate
is the mass of solids applied over a given area - given in $kg/m^2/hr$

PROCESS CALCULATIONS

Suitable hydraulic and solids loading rates for a given project vary based on:

- Type of application
- Flow rate
- Wastewater characteristics
- Water temperature
- Discharge requirements
- Chemical treatment program

HYDRAULIC SURFACE LOADING RATE

Given

- Flow: 120 m^3/day (16 hrs)
- FOG: 2860 mg/L
- TSS: 9090 mg/L
- COD: 30875 mg/L

Target HSLR: <2 $m^3/hr/m^2$

Convert m^3/day to m^3/hr:

$$\frac{120\ m^3}{16\ hr} = 7{,}5\ m^3/hr$$

$$\frac{7{,}5\ m^3/hr}{x\ m^2} = 2\ m^3/m^2/hr$$

Free Surface Area Required **= 3,25 m^2**

SOLIDS LOADING RATE

Given

- Flow: 120 m^3/day (16 hrs)
- FOG: 2860 mg/L
- TSS: 9090 mg/L
- COD: 30875 mg/L

Target Solids Loading Rate:

75 kg/m^2/hr

Convert mg/L TSS to kg/hr:

7,5 m3/hr * 1000L/m3 * 9090 mg/L * 1/1000000 mg/Kg

= 68 kg/hr

$$\frac{68 \text{ kg/hr}}{75 \text{ kg/m}^2\text{/hr}} = 0.9 \text{ m}^2$$

Free Surface Area Required **= 0.9 m^2**

WHICH DAF SIZE TO SELECT?

- Hydraulic Surface Loading Rate
  Area Requirement: 3.25m^2
- Solids Loading Rate
  Area Requirement: 0.9 m^2

FRC DAF Model	Free Area (m^2)	Dimensions (L x W x H, m)
PWL-15	4.5	4,06 x 2,39 x 2,54

PWL-15

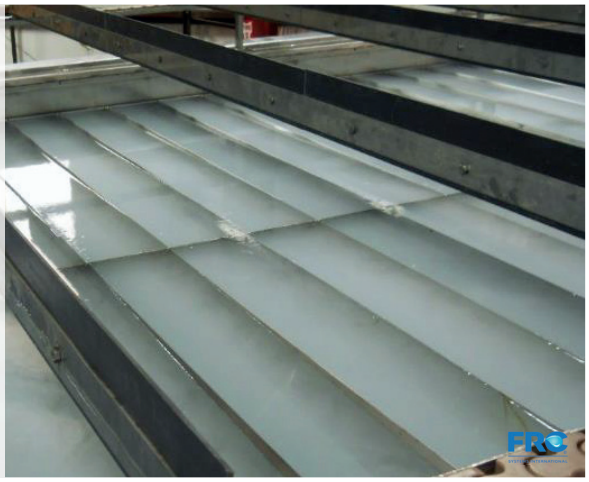
- Free surface area:
  4,5 m^2
- Design Hydraulic Loading Rate: 1,66 m^3/hr/m^2
- Design Solids Loading Rate: 15 kg/m^2/hr

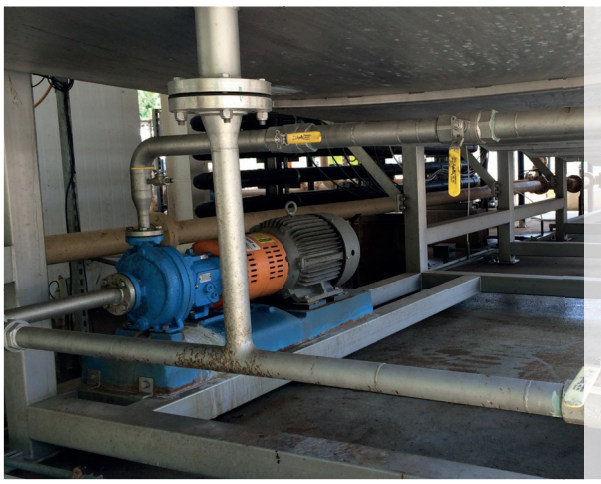
ROTATING SKIMMER

- Corrosion resistant skimmer blades, chain, and sprockets
- Automatic control

DEWATERING GRID

- Metal grid locks float sludge in place
- Allows water to gravity drain out of the sludge
- Keeps sludge from being pushed back under water





ANSI PUMPS

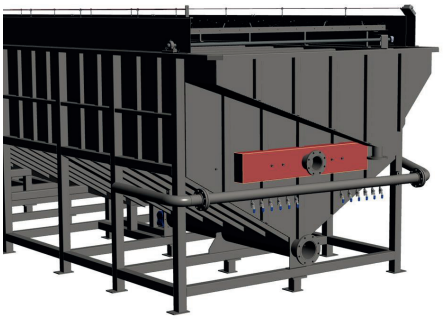
- No air in pump
- High solids tolerance
- Manufacturer agnostic

AIR DISSOLVING TUBE

- Allows compressed air to dissolve into recycled water
- No moving parts
- No air in pump

WHITEWATER DISTRIBUTION MANIFOLD

- Even distribution of air blanket across the DAF
- Reduced turbulence in the flotation tank
- Allows precision control over recycle pump discharge pressure
- Eliminates “burping” of excess air



INLET DISTRIBUTION BOX

- Incoming wastewater is spread evenly across the width of the tank
- Maintains calm conditions in the tank
- Additional whitewater injection point

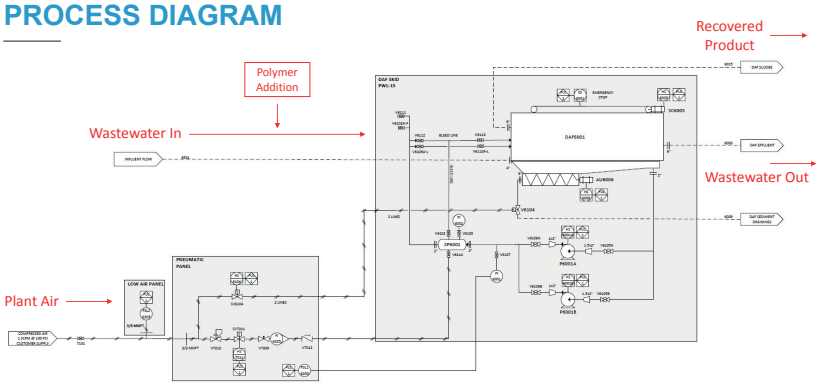
AUGER & DRAIN VALVE

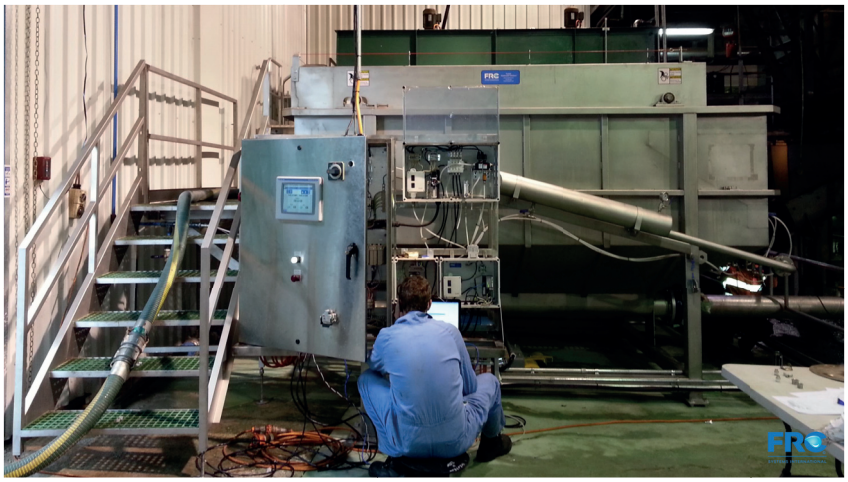
- Shaftless auger
- Pneumatic butterfly valve
- Automated concentration and discharge of settled solids

PNEUMATIC PANEL

- Regulates compressed air pressure to air dissolving tube and solenoids
- Controls air flow to air dissolving tube
- Actuates pneumatic valves
- Alerts of low recycle water pressure

PROCESS DIAGRAM



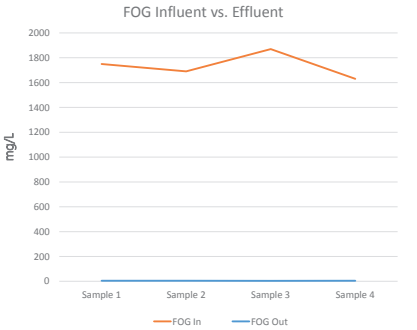


SAMPLING DATA (July – September 2014)

FOG

	DAF Influent	DAF Effluent
Sample 1	1750	5
Sample 2	1690	5
Sample 3	1870	4
Sample 4	1630	5
Averages	**1735 mg/L**	**5 mg/L**

Avg. 99% Reduction

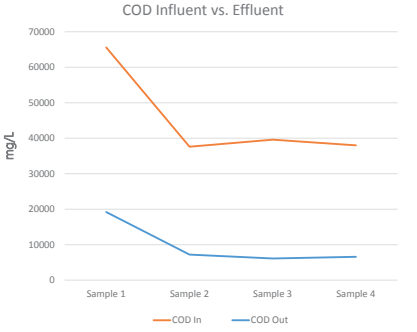


SAMPLING DATA (July – September 2014)

COD

	DAF Influent	DAF Effluent
Sample 1	65600	19200
Sample 2	37600	7200
Sample 3	39600	6100
Sample 4	38000	6600
Averages	**45200 mg/L**	**9775 mg/L**

Avg. 78% Reduction

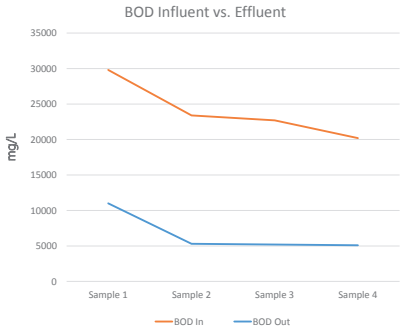


SAMPLING DATA (July – September 2014)

BOD

	DAF Influent	DAF Effluent
Sample 1	29800	11000
Sample 2	23400	5300
Sample 3	22700	5200
Sample 4	20200	5100
Averages	**24025 mg/L**	**6650 mg/L**

Avg. 72% Reduction



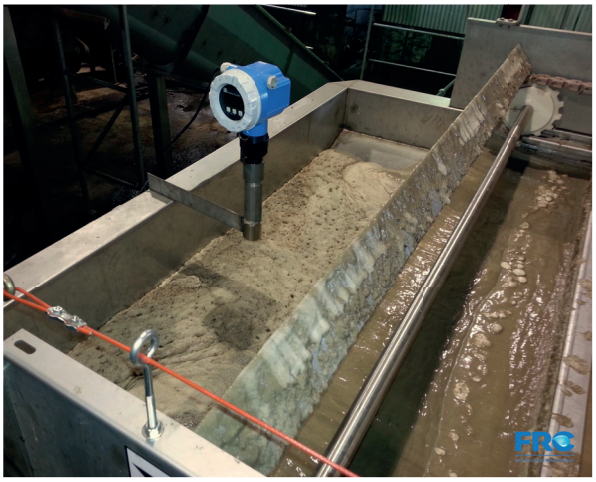
SAMPLING DATA (Averages for July 2014 – May 2015)

	DAF Influent (mg/L)	DAF Effluent (mg/L)	Avg. Reduction
FOG	2748	250	91%
COD	30832	6550	79%
BOD	13595	4664	66%
Nitrogen (total)	1333	647	51%
Phosphorus (total)	176	111	37%

DAF FLOAT

Fat
15,25% W/W

Dry Matter
27,64% W/W



RESULTS

Recovered Material:

- Contributes (*x amount*) of total plant yield
- Adds (*y $*) per year in sellable product
- Reduces load on aeration pond

QUESTIONS?

FRC SYSTEMS INTERNATIONAL
Trusted Wastewater Solutions™

FRC Systems International, LLC
Atlanta, GA USA
+1 (770) 534-3681
www.frcsystems.com

Mark Henderson

Mark Henderson is the National Industrial Accounts Manager at HydroChem.

Mark has a Bachelor of Science degree in biochemistry and over 10 years experience in water treatment in the Australian market.

ARA Symposium 2015

HydroChem Presentation
On Waste Water Resources

HydroChem

- Resource Opportunities
- Site Specific Investigation
- Contemporary Outcomes

HydroChem

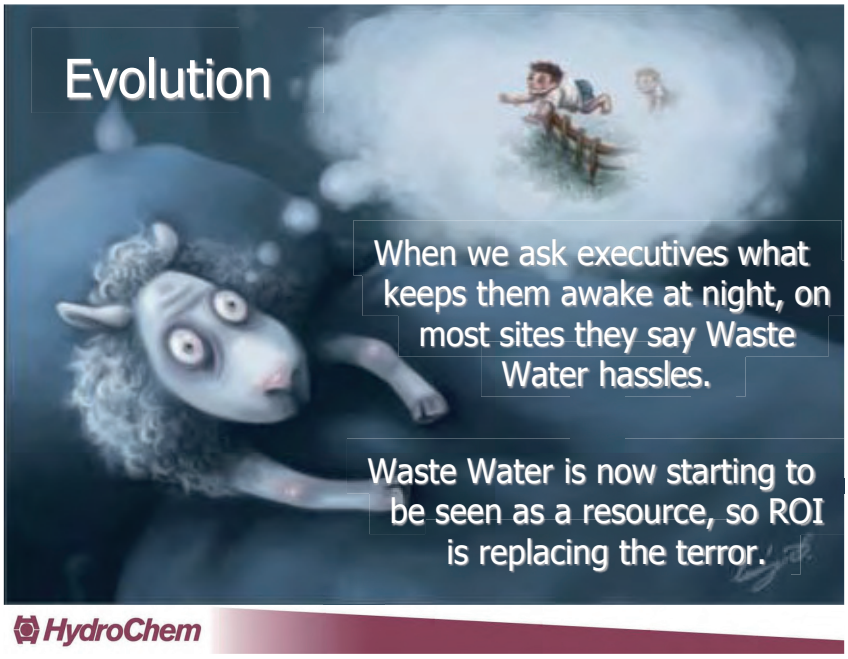
Why HydroChem ?

- Australian owned and operated
- Over 35 years of water treatment service
  Cooling Towers, Boilers & Waste Water
- Largest Service Team in Australia
- Recently doing groundbreaking effluent work
  with Rendering & Red Meat partners.

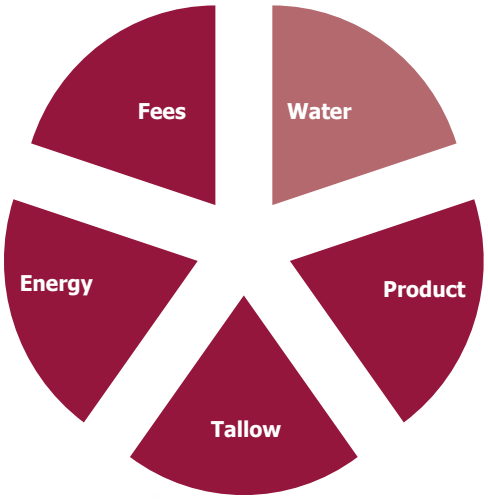
HydroChem

Resource Opportunities

HydroChem



Effluent Resource Opportunities



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Site Specific Investigation

HydroChem

Site Specific

Just because it worked somewhere else.....

HydroChem

Site Specific

...Doesn't mean it will work at your plant.

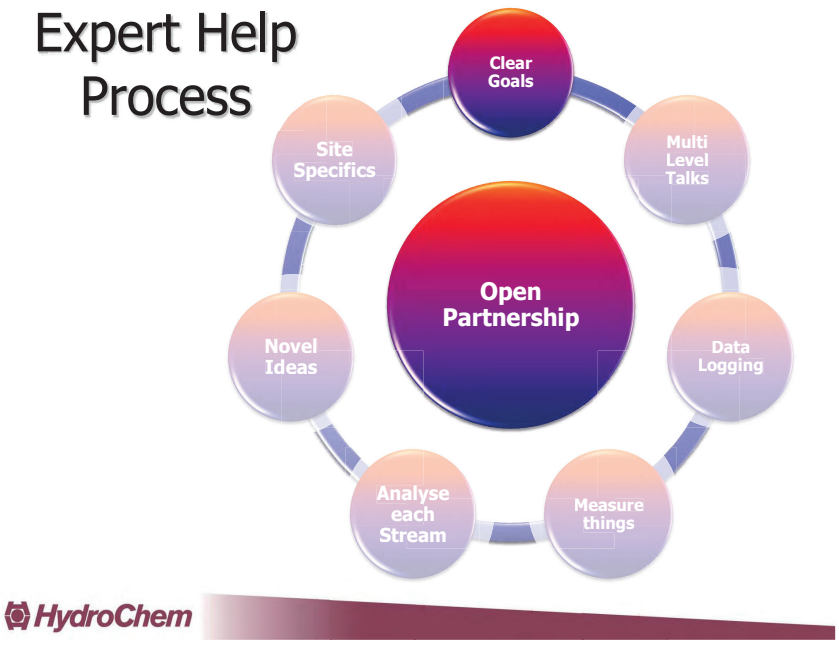
HydroChem

So how do we get the right solution just for *your* plant?

HydroChem

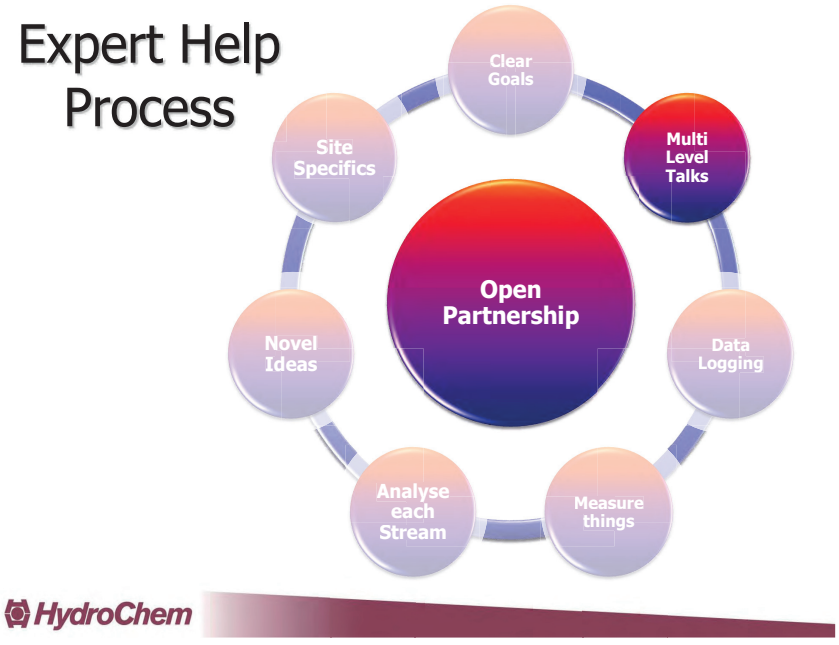
Expert Help Process

HydroChem



Clear Goals

- Minimise BOD to reduce council fees
- Get balance right to reduce odours from lagoon
- Recapture tallow to protect Biogas CAL



Multi Level Talks

- The original design specs say "X"
- The current operational situation says "Y"
- A lot of savings are found in the ground somewhere in between by engaging all stakeholders - managers, original consultants and site operators

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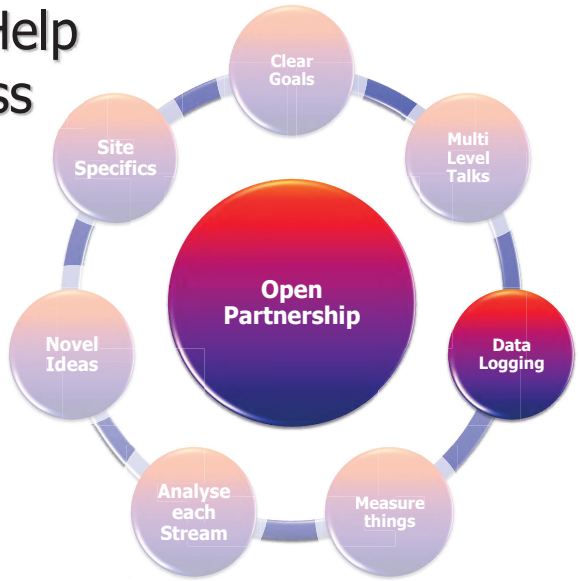
Expert Help Process



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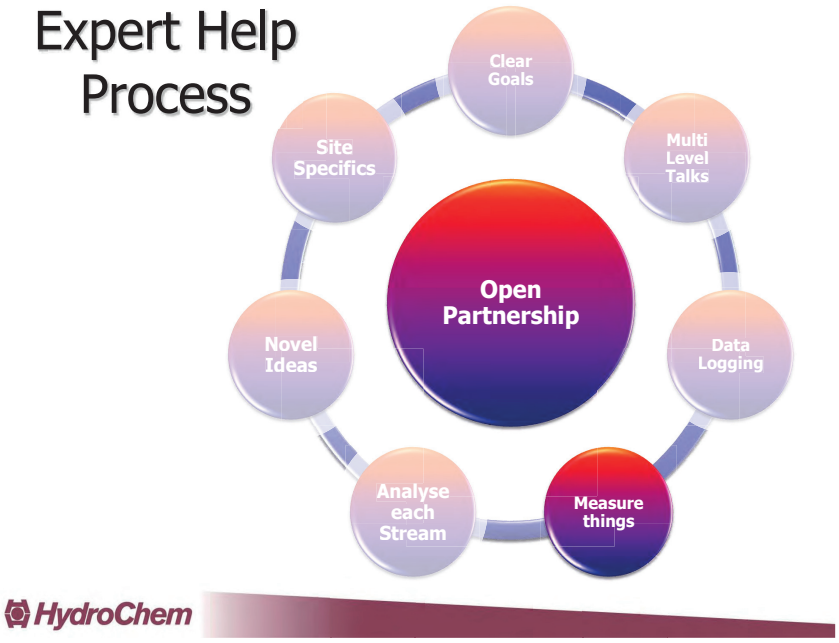
Data Logging

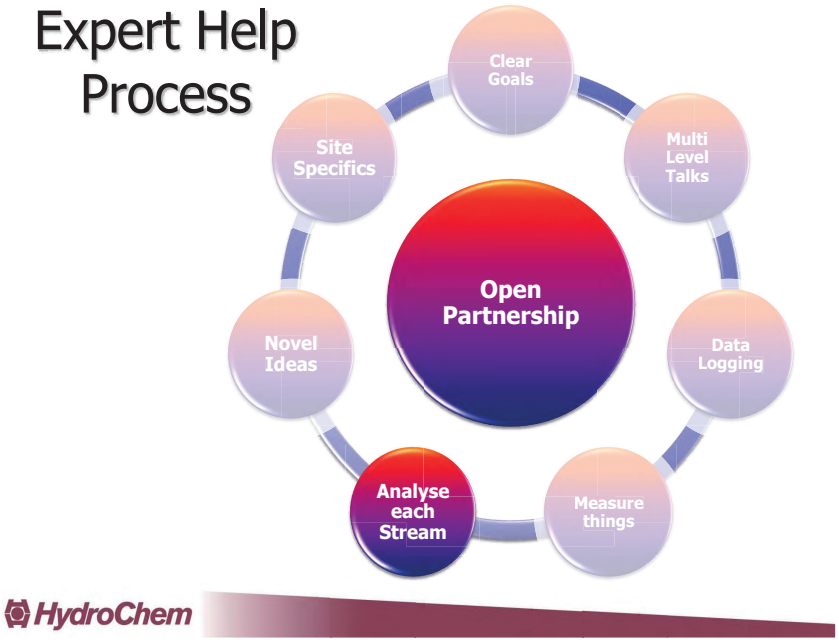
- What really happens in your sludge tank at 3am?
- Real time changes can tell you the whole story
- Why does the Oil & Grease shoot up every time Tony starts his shift?
- Clamp on mag flos to fit any pipe

HydroChem



Measure Things

- "You can't control what you can't measure"
- 6 pump outs per 18 hours using a 12kL tanker
- .....It takes 23 minutes for that steam line to get the right temp in the decanter....



Analyse each stream

- Red stream + Green stream = 120kL/h @ 3,800 BOD
  - Need a REALLY Big DAF

- Red Stream is 20 kL/h, with 8,200 BOD
- Green Stream is 100kL/h, with 400 BOD

  - Only needed a Red Stream DAF!!

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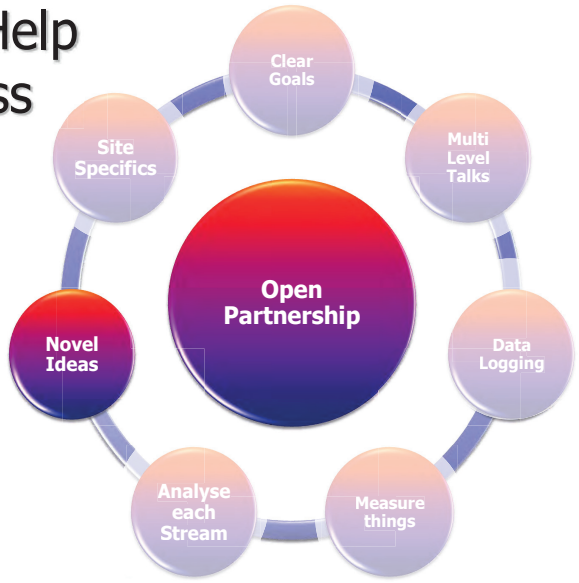
Expert Help Process



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Novel ideas

- Probe driven variable dosage rates
- GRAS rated polymers to allow reuse
- Anaerobic digestion to make Biogas
- Chemical Injection point 300m downstream for improved mixing

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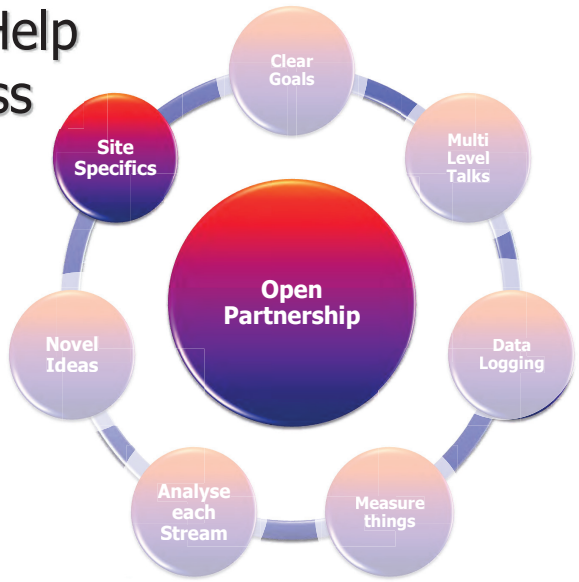
Expert Help Process



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Site Specifics

- Waste Water origins
- Waste Water end points
- Strict pH limit OVER 8.4
- Solution must not interfere with Engineering Manager's golf putting green

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.....Putting it all together.....

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Example I – Metro Render Plant

- No space for large balance tanks/lagoons
- High municipal charges for BOD
  - $1.09 per kL per 1,000 BOD !!
  - X 3ML per day @ 3,000 BOD = $9,810 per DAY
- 14 day composite samples, Massive load variations, All sludge must go offsite

Solution – all effluent must be analysed and treated via auto dosage in real time. Sludge through decanter for oil removal too.

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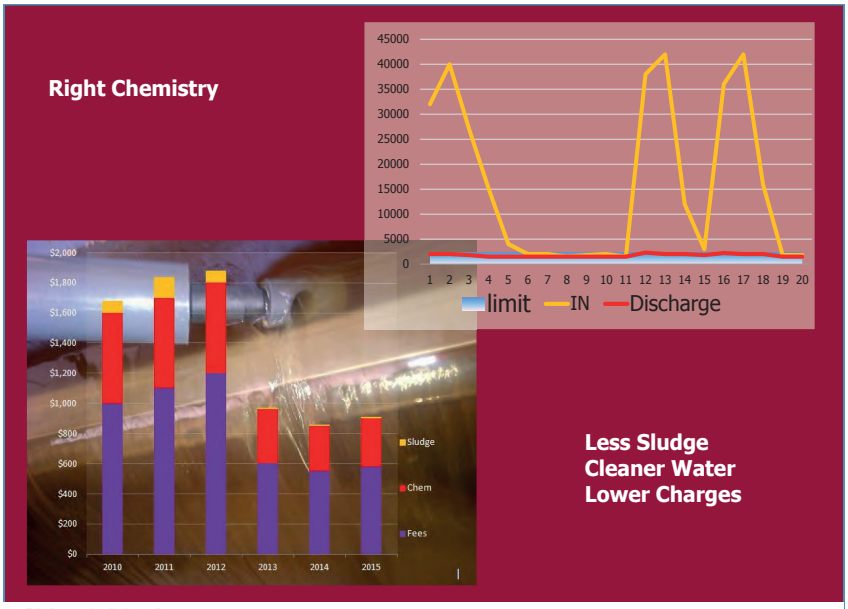

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Waste Water Innovation

Example II – Meat & Render Biogas CAL plant

- Too much flow for balance tanks
- Discharge to river – low Phosphate needs
- Strong COD concentration in feed effluent
- Excess FOG will choke Biogas production in CAL

Solution – Red Stream (containing oil) passed through a DAF with only 25% chem treatment. Three phase decanter removes over 4 ton tallow per day – that's 20 ton per week in the CAL!!!!

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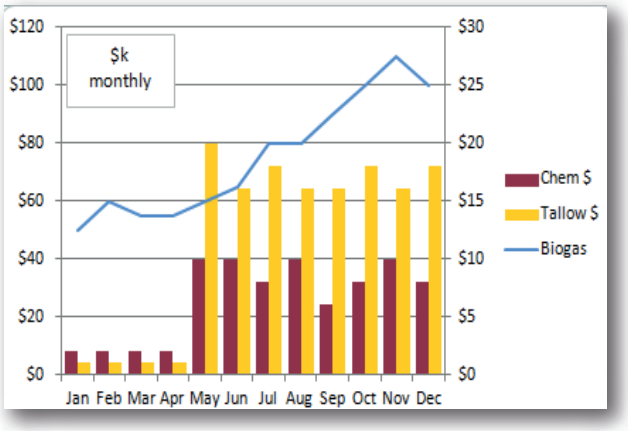

Hungry Bacteria do the most eatin' ..... and your left with no threat of a grease crust on top of you lagoon.

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Contemporary Outcomes

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Outcome Examples

- EPA compliant for the first time
- $250k pa tallow recaptured
- $600k pa saved on Municipal Fees
- $1M pa in composting eliminated
- $1M pa boiler fuel replaced with Biogas

How much money is hiding in your trade waste flow every day?

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Resource Opportunities

Site Specific Investigation

Contemporary Outcomes

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What's Next?

Where are you at now?

Where do you expect to be in 2020?

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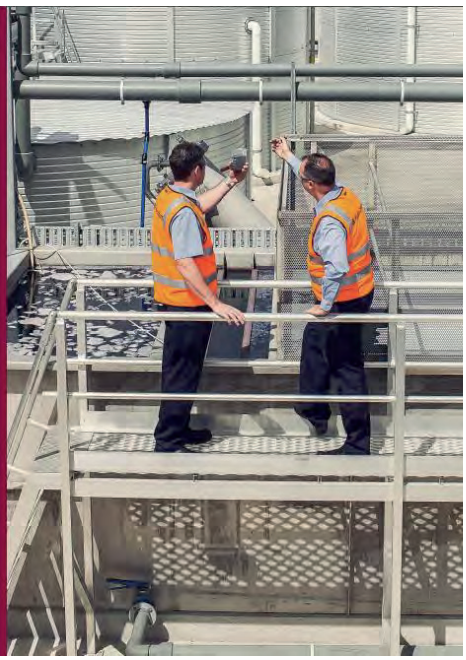

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New Age DAF and Polymers

Isaias Vinaroz

Isaias Vinaroz

Sales Manager Oceania, Process Food Technology

Isaias joined Alfa Laval in 1999. Until October 2012, he was based in Spain in the Food Segment, developing and researching the use of equipment in food production and processing.

Isaias moved to Australia in October 2012 to develop the Food business in Oceania, and since then has been committed to helping Australian meat processers grow their production capacity and technology.

Alfa Laval has been a member of the Australian Renderers Association in 2013.

Most recently the introduction of Alfa Laval 3 phase decanters to Teys rendering plant in Wagga Wagga has made exciting gains for their business, and Asaias is looking forward to sharing on this in his presentation.

Presentation Abstract:

Most meat and poultry processing companies have reduced their potential pollution from process water by installing DAF (dissolved air flotation) systems. More and more of these companies, however, also face a secondary problem – what to do with the recovered DAF skimmings.

We will talk about the CentriSkim process, an environmentally responsible recovery of fat and solids from DAF flotation skimmings .

CentriSkim provides an inexpensive solution for reducing DAF skimmings to recovered fat and an easily disposable water phase, as well as a wet concentrated solid phase. After this reduction, the solid phase usually comprises less than 15% of the original weight.

All Centriskim processes use centrifugal separation in a thermal method to extract fat and a highly concentrated solids phase: after heating, the skimmings will be separated into a solids, water and fat phase by means of a 3-phase decanter.

Tallows Recovery, Tricanter, Biogas Production

Dean Loughran

Dean Loughran

Since joining Teys Australia, Dean has experience in the construction and operation of waste water treatment plants at a red meat processing plant with on-site rendering. This experience includes operation of Covered Anaerobic Lagoons, BNR and DAF Technology. Recently Dean has been involved with the design and construction of Biogas re-use projects.

TITLE OF PRESENTATION

ARA Symposium

July 2015

SYSTEM

DAF **Waste Water Treatment**

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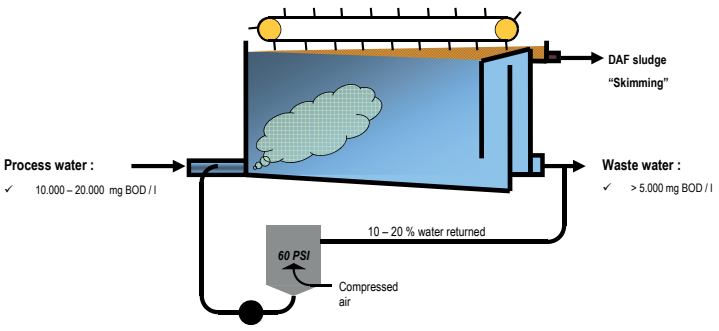

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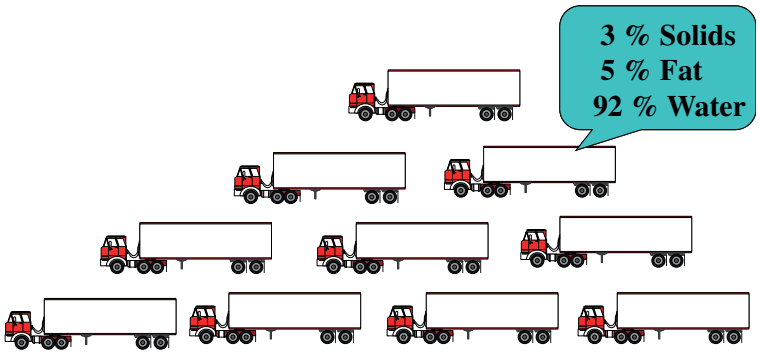
Transport
Untreated Skimmings



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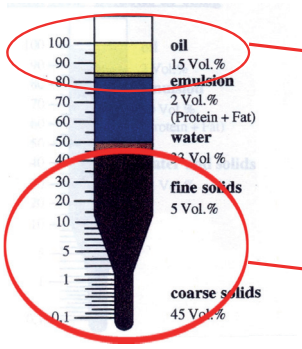
DAF sludge composition
Depend on the process parameters and plant



Oil/Tallow – low grade. Technical use

Water – to be returned back to DAF

Solids – possible use for compost

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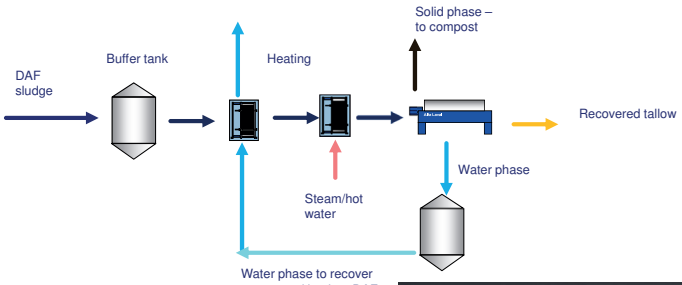
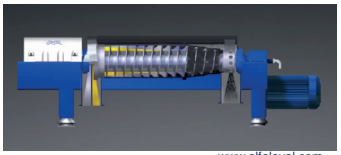
Simple process





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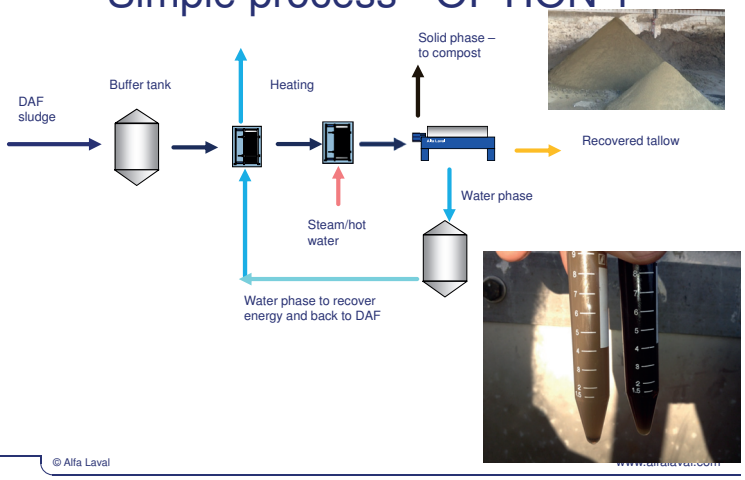
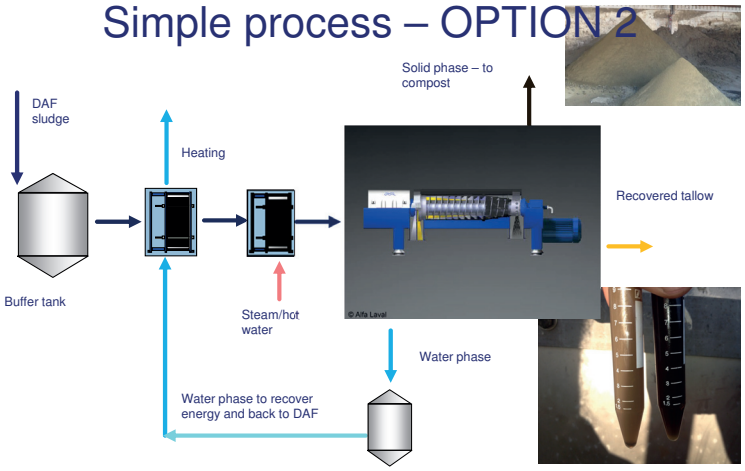
Simple process - OPTION 1

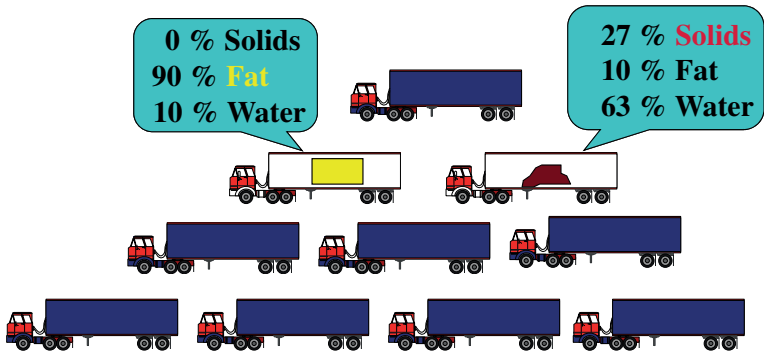


Simple process – OPTION 2



BENEFITS

Transport
On Site Processing



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Alfa Laval CentriSkim Process

Benefits

An inexpensive solution for reducing DAF skimmings to recovered fat and an easily disposable water phase, as well as a wet concentrated solid phase.

- Recovered "**fat**" phase for feed or technical purposes
- A **less costly solutions** for transport dry solids.
- Low energy consumption via regenerative heat from separated water phase.
- Return of "water phase" to **DAF**

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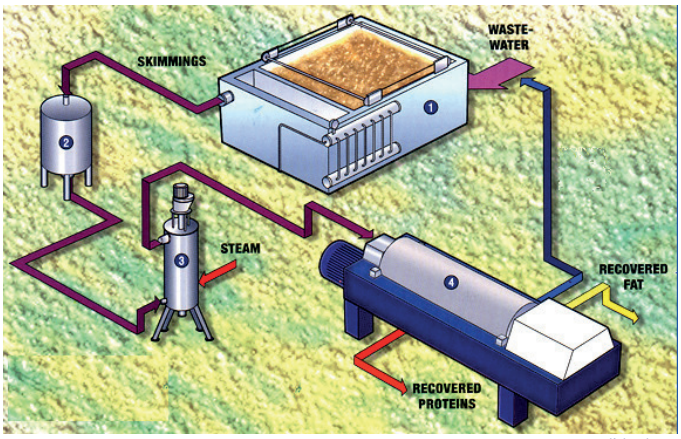

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FPRF Advances and Innovation

Erika Weltzien

Erika Weltzien

Erika Weltzien is Vice President, Business Development and Innovation, for Rothsay, a Division of Darling International Canada Inc. Erika is responsible for leading business development opportunities as well as an ERP implementation for Rothsay. She has over 20 years' experience in the rendering, feed, and hog production industries. She began her career with Maple Leaf Animal Nutrition, holding various positions in sales, product development, quality assurance, and nutrition before joining Rothsay in 2002. In 2008, Erika was promoted to the role of Vice President, Six Sigma, responsible for the alignment of Six Sigma with the business strategies of the Agribusiness group.

Erika is Chairman of the Fats and Proteins Research Foundation. In 2010, she led a strategic review that resulted in the reorganization of the FPRF and a new direction. She is an active member of the National Renderers Association and is a past chair of the Animal Nutrition Association of Canada (ANAC) Nutrition Council.

Erika holds a Bachelor of Science degree in Animal Science and a Master of Science degree in Monogastric Nutrition from the University of Alberta.

FPRF Advances and Innovation

Erika M. Weltzien – Chairman, Fats and Proteins Research Foundation

13th ARA International Symposium, Gold Coast, Australia

The Fats and Proteins Research Foundation (FPRF) was established in 1962 to serve the rendering and its associated industries. FPRF's mission is to provide added value to all animal production by enhancing current usage and the development of new uses for rendered animal products. In addition to directing and managing a research process to realize these objectives, FPRF also works to develop solutions to challenges faced by the rendering industry and collaborates with other institutions with similar interests. FPRF is a nonprofit, non-lobbying organization. Approximately 65 companies voluntarily contribute funds in a cooperative effort to focus research resources on the industry's needs.

We continue to follow the strategic plan that we developed in the fall of 2010. The three strategic pillars are Research, Communication, and Membership. We focus our research priorities in areas that drive the most value for the industry. We then communicate the research findings in order to provide value to existing members and to attract new members. Broadening and strengthening our membership base will increase contributions which will support additional research.

Research Priorities

We have a robust research contracting and approval process to identify and fund research that addresses the most strategically important issues and opportunities for the rendering industry. By increasing the focus and direction in our requests for proposals and by raising awareness and knowledge of the rendering industry in the research community, we are attracting a greater number of high calibre, relevant research proposals.

The members of the research committees also invest significant amounts of time and effort to review and critique research proposals. Each proposal is evaluated using a standard set of

criteria including relevance and originality, technical feasibility, cost/benefit analysis, researcher qualifications, and budget in order to ensure that research funding is allocated in a manner that maximizes return on investment.

Since its inception, FPRF has funded over 650 research projects. Priorities are on pre-competitive needs that benefit the entire industry. The portfolio is comprised of projects with long-term (3 to 5 years), mid-term (1 to 2 years), and short-term horizons.

The key areas of focus are:

(1) Nutritional value of rendered products for livestock, poultry, aquaculture feeds and pet food
(2) Enhanced usage of rendered products in feed and development of novel, high value, non-feed uses of rendered products
(3) Biosecurity and food safety – prevention, detection, and control of pathogens
(4) Environment and sustainability – life cycle analysis, carbon footprint

In 2005, the Animal Co-Products Research and Education Center (ACREC) was established at Clemson University, with funding from FPRF. ACREC's mission is to advance the science and technology of animal co-products and the rendering process. In addition, the Center works to ensure microbial safety of rendered products for animal feeds and consumer protection, promotes environmentally sound practices, develops new market opportunities for the worldwide rendering industry, and provides educational opportunities in animal co-product utilization.

Our partnership with ACREC is yielding increasingly innovative and relevant research projects, in a diverse array of areas such as validation of pathogen destruction during the rendering process, the development of biomaterials from rendered proteins for use in the automotive industry, membrane technology for chemical-free wastewater processing, and the use of functional nanoparticles for odour destruction. We fund research in a wide variety of disciplines at Clemson, in particular engineering; this has led us to incorporate thinking beyond the realm of traditional animal science.

In addition to funding a significant portfolio of projects at ACREC, FPRF also supports projects from the "at-large" research community, particularly in the areas of pet food and aquaculture and, most recently on thermal death times for salmonella.

Allocation of Funding

FPRF's investment in research has almost doubled in the period from 2006 to 2015, from the ten years prior. We currently invest approximately $400,000 per year. It is interesting to look at how the allocation of this funding has shifted with changing priorities over the years. From 1995 to 2000, we invested $726, 000 in livestock and poultry nutrition projects, $149,000 in added value and novel uses, and nothing in pet nutrition, environment and sustainability, or biofuels. From 2001 to 2010, the focus shifted from livestock and poultry nutrition to that of

aquaculture and added value and novel uses, including some investment in biofuels research. Since 2006, we have significantly increased our investment in projects supporting added value and novel uses, biosecurity and food safety, and environment and sustainability.

Allocation of FPRF Funding by Category

	1995-2000	2001-2005	2006-2010	2011-2015
Nutrition - Livestock & Poultry	$726,000	$282,000	$343,000	$109,000
Nutrition – Aquaculture	$77,000	$254,000	$400,000	$70,000
Nutrition – Pet	-	-	-	$142,000
Added Value & Novel Uses	$149,000	$233,000	$760,771	$666,490
Biosecurity & Food Safety	$121,000	$47,000	$241,116	$472,831
Environment & Sustainability	-	-	$134,832	$393,620
Biofuel	-	$102,000	$118,341	-
TOTAL	**$1,073,000**	**$918,000**	**$1,998,060**	**$1,853,941**

Commercialization / Bringing Discoveries to Market

Some of our prior R&D investments have resulted in a number of projects that are at the commercialization phase.

This reflects the diversity and depth of the R&D portfolio. Because individual projects may have a low probability of technical and commercial success, it has been important to fund a diverse but focused portfolio of projects to help achieve FPRF's goals.

We still need to do more to bridge the gap (the "valley of death") between basic science and commercialization.

Overview of Current ACREC Research, Clemson University[1]

1) **Biodegradable Nanoparticles for the Destruction of Malodourous Organics** – Daniel Whitehead and Frank Alexis

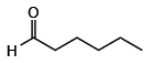
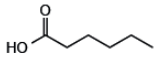
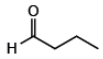
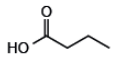
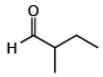
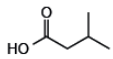
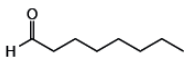
   The rendering process, while playing a vital role in handling animal by-products, results in the release of a complex mixture of small molecules that are malodourous. Control of these odours is becoming increasingly challenging as environmental regulations become more and more stringent.

   This on-going project has been devoted to demonstrating the potential of biodegradable functionalized poly(lactic acid) nanoparticles for rendering odor remediation in a series of proof-of-concept studies. To date, the researchers have confirmed their ability to (1)

synthesize and fully characterize amine-capped nanomaterials and (2) capture relevant malodourants of the aldehyde and carboxylic acid functional group classes, and (3) selectively target and capture groups of malodourants in mixtures containing multiple odour compounds. Preliminary data have also shown that the formulations are non-toxic to aquatic organisms. With these significant discoveries, they are now poised to investigate the development of multi-functional materials that are capable of sequestering a broader range of relevant malodourants and evaluating these at a rendering facility. These efforts are currently underway as a part of on-going ACREC and FPRF supported projects. The team has submitted a provisional patent application to protect the methodology and has applied for grants to further expand their research. A longer-term goal is the development of a scalable, commercializable product.

The technology being developed has the potential to revolutionize the rendering industry in terms of providing a next-generation alternative to established methods for odour remediation. Additionally, since the means of neutralizing malodourants is based on chemical reactivity instead of thermal degradation, the implementation of this strategy should return significant cost savings in terms of reduced energy consumption and reduced greenhouse gas emissions.

Table 1. Percent reduction of substrate vapor concentrations after reaction with nanoparticles functionalized with polyethylenimine.

Substrate	Structure	Percent Reduction
hexanal		97% +/- 2
hexanoic acid		86% +/- 6
butyraldehyde		In progress
butyric acid		86% +/- 6
2-methylbutanal		In progress
3-methylbutanoic acid		In progress
octanal		77% +/- 12

2) **Livestock Feed Preservatives Based on Antioxidants Extracted from Animal Co-Products –** Vladimir Reukov and Alexey Vertegel

Auto-oxidation of unsaturated fats is one of the primary mechanisms of quality deterioration in animal feed. These alterations in quality are manifested through adverse changes in flavor, color, texture, and nutritive value and there is some concern that toxic compounds are produced during the deterioration process. Most currently used

antioxidants are synthetic chemicals, and there is global concern among regulatory bodies and customers regarding the safety of these compounds (e.g. ethoxyquin). Naturally-derived antioxidants are available (e.g. tocopherols), but are expensive, and are often not as effective as their synthetic counterparts. Thus, there is a clear need for development of novel, inexpensive, and efficient natural antioxidants. Erythrocytes are readily available as a major component of animal blood. Being natural oxygen carriers, they are equipped with highly efficient antioxidant machinery, which utilizes a number of antioxidant enzymes and compounds.

Reukov and Vertegel previously developed a method for the production of purified enzyme concentrate from animal blood. They found it to be as effective as synthetic antioxidants (ethoxyquin and BHA/BHT) and more potent than natural antioxidants currently on the market.

This is now entering the commercialization phase as the researchers plan to scale up production and gain regulatory approval for a natural antioxidant derived from animal blood.

3) **Using Bacteriophages to Reduce Salmonella in a Rendering Environment** - Xiuping Jiang

Bacteriophages, viruses which infect and destroy bacteria, have been used for pathogen control in the food industry since 2006. In this project, Salmonella-specific bacteriophages were applied to rendering processing environment to reduce Salmonella contamination.

In previous studies supported by ACREC, a large collection of Salmonella-specific bacteriophages were isolated and characterized; the effectiveness of these bacteriophages on reducing Salmonella contamination in incoming raw materials, on various surfaces commonly found in the rendered processing environment, and in the finished animal meals under laboratory settings was demonstrated.

A field study was initiated to investigate the effectiveness of phage treatment on reducing the Salmonella on employees' boots as a potential source of Salmonella cross-contamination. In a preliminary test, a total of 28 swab samples was collected from employees' boots assigned to grinding room, finish meal loading-out area and walking through all areas as well as floor surfaces around boot baths in grinding room. Total aerobic bacteria, Escherichia coli and presumptive Salmonella were enumerated on tryptic soy agar (TSA) plates, Petrifilms® and CHROMagar® plates resulting in average counts of ca. 6.1, 2.1 (2.5) and 2.7 log CFU/boot, respectively. Chlorine concentrations ranged from 180 to 1,560 ppm in bleach samples taken from boot baths in rendering processing plant. Bacteriophages were able to survive in low concentration bleach sample over 8 h, although 1.7 log PFU/ml titer reduction was observed. Both phage treatment alone and the combination treatment of phage cocktail and low level of chlorine disinfectant on reducing Salmonella population on employees' boots are currently being conducted. There may be an opportunity to supplement low level of chlorine disinfection with phage treatment for an enhanced effectiveness in reducing Salmonella contamination.

To accurately detect viable Salmonella populations in a rendering processing environment, a real-time polymerase chain reaction (RT-PCR) method incorporating propidium monoazide (PMA) as a contaminant DNA cleaner was optimized. With PMA treatment (50 µM) in a mixed culture of live and dead Salmonella cells, the RT-PCR method could detect as low as 2 log CFU/ml live cells.

4) **Validation of Thermal Destruction of Pathogenic Bacteria During Rendering –** Annel K. Greene

Pathogenic microbial contamination of animal feed ingredients is a concern for animal health as well as for humans who may handle contaminated animal feed. For livestock and horse feeds, the U.S. Food and Drug Administration (FDA) list eight specific strains of Salmonella that can cause disease in the animal after consumption of contaminated feed. In pet food ingredients, FDA has proposed zero tolerance for Salmonella. Since rendered animal products include recycled animal digestive tracts and contents, it is important to validate the thermal lethality of rendering processes to destroy bacteria in these animal feed or pet food ingredients.

Commercial rendering cookers are reported to process in the temperature range of 240 to 290°F (115.6 to 143.3°C) for 40-90 minutes in order to thoroughly cook the raw animal by-products (Meeker and Hamilton 2006).

In 2013, a thermal death time (TDT) study was conducted with four of the eight pathogenic Salmonella strains identified by the FDA as hazardous in animal feeds) in commercially cooked rendered poultry and beef products. In that study, the uninoculated and inoculated samples were treated at 240°F (115.6°C) for up to 420 seconds. The inoculated populations of 10.4 logarithmic colony forming units per gram (log cfu/g) Salmonella were reduced by approximately 8 to 9 log immediately after inoculation into the hot rendering materials (time = 0 seconds).

In this study, 245°F (118.3°C) was used as the thermal cooking temperature for up to 600 seconds holding time after the rendering material reached 245°F internally. It was shown that rendering cooking temperatures drastically and rapidly reduced added populations of four specific laboratory isolated standard strains of Salmonella by 9 to 10 log cfu/g within 0 seconds of contact with rendering materials. However, there appeared to be low, background levels of wild-type strains of bacteria that were not killed; these were identified as Salmonella but were not part of the group of eight pathogenic strains of concern to FDA. Further study is required to determine whether they are heat resistant strains capable of surviving the rendering process.

5) **Development of Renderable Gloves** – Andrew Hurley

ACREC, FPRF and Clemson have invested a substantial amount of time and resources on the development of biodegradable waste bin liners. Results demonstrated that these could be placed directly into the cookers without increasing the polymer count of the oil or being visible in the meal.

The objective of this study was to build on the previous work with liners and develop a set of biodegradable work gloves that meet rendering facility requirements in addition to material and manufacturing limitations.

Thousands of gloves were designed, manufactured and tested utilizing production equipment and actual poultry processing facilities. Qualitative data (user feedback) for the gloves was positive, as compared to the current gloves utilized; however, it is recommended that further qualitative research be conducted.

6) **Economic Separation of Fat Components from Rendered Material** – Christopher Kitchens

Current rendering processes use continuous presses to remove fats from rendered material. However, pressing can leave 10 to 15% residual fat within the rendered product. The goal of this work is to investigate the use of carbon dioxide (CO_2) as a green solvent for applications in the rendering industry. This includes value-added co-products for energy, consumer products, and commodity chemicals/materials. Certain opportunities exist within the rendering industry for enhanced separations that will preserve value added content within the rendered material.

This research is a continuation of work that focused on the use of supercritical and liquid CO_2 to enhance the fat separation during the mechanical pressing of rendered materials at industrial relevant scales. Prior work demonstrated the ability to enhance the mechanical expression of fat from a ground poultry meal where up to 81% of the residual fat in the poultry meal was recovered by mechanically pressing the poultry meal in the presence of supercritical CO_2. In other words, the fat content of the ground poultry meal was reduced from the initial 12.1% to a final 2.3% after pressing in a lab-scale batch press operating at 40°C, 3000 psi of CO_2, and 8700 psi mechanical pressure.

Based on these results, modifications to the press shaft to optimize fat removal have been done and pilot scale studies are being conducted.

7) **Biocatalytic Conversion of Rendered Animal Fats to Value Added Products including Omega-3 Fatty** Acids – Mark Blenner

Polyunsaturated fatty acids (PUFAs) are widely used for aquaculture and human nutritional supplements. The current sources of omega-3 rich PUFA are mainly from fish oil, and the supply of these products by marine fisheries can no longer meet the growing market demand. Therefore, a new sustainable source of omega-3 fatty acids is needed. Microbial processes for omega-3 production are being commercialized now that use glucose as a feedstock; however, rendered animal fats have higher theoretical yield (more carbon-efficient) and cheaper feedstock. Oleaginous yeast, Yarrowia lipolytica has an active fatty acid biosynthesis pathway and is capable of utilizing hydrophobic substrates such as animal fats.

The primary objective of this study is to engineer Yarrowia lipolytica to grow on rendered animal fats and serve as a platform for the production of value added products, including omega-3 fatty acids. In order to establish the viability of this process, Blenner and his team will be studying the growth characteristics of this yeast on animal fats. They will prepare media with animal fats by autoclaving, simple addition of melted fats, or by addition of non-dispersed solid fat. Yeast will be cultured in these media and they will analyze the growth rate, as well as changes in the composition of the unmetabolized fat and the yeast using gas chromatography and thin layer chromatography. The rate at which naturally produced lipases mobilize the fatty acids from the rendered fat will be monitored by thin layer chromatography. Additionally, they will also study the yeast preference for particular types of fatty acids from rendered fat. To boost the natural propensity of this yeast to accumulate fatty products, they will remove pathways involved in the total breakdown on fatty acids. Finally, they will measure the accumulation of natural polyunsaturated fatty acids and an elongated fatty acid along the engineered pathway towards omega-3 fatty acids. In the next phase of this project, they propose to engineer the additional enzymes needed to convert the natural polyunsaturated fatty acids into omega-3s, to use genomescale models to predict mutations that would optimize omega-3 production, and to scale up the process.

8) **Interactive and Integrative Engineering of Rendered Proteinaceous Materials Based Thermoset Biocomposites for High-Strength, Superior-Performance Applications** – Srikanth Pilla

The principal scientific benefit of this study is the use of animal proteins in high-strength, high-performance structural engineering applications such as automotive. Despite other studies related to thermoplastic-based composites, R&D on animal proteins did not advance further due to inferior mechanical properties of thermoplastics. Hence, this study will try to address this significant shortcoming by developing unique thermoset composites with superior mechanical properties. In addition, the study proposes to attenuate the hydrophilicity of animal proteins by end-capping the responsible peripheral chemical groups via crosslinking, while also hydrophobizing the hydrophilic natural fibers. Moreover, the study aims to develop sandwiched biocomposite structures which not only have superior mechanical properties but also eliminates the inherent odor of the animal protein based materials which is a significant factor for their widespread applicability, especially in engineering applications.

This study is being conducted at Clemson University International Center for Automotive Research (ICAR), a world class research facility dedicated to excellence and advancement in the automotive engineering industry, in collaboration with major automotive industry partners and government organizations.

The economic benefits of the proposed project are immense. If successful, the study provides a major breakthrough for animal proteins into the automotive sector. The sales of vehicles are advancing at a rapid pace with an estimated 150M units to be sold worldwide

by 2015. Due to stringent CAFÉ standards (49-61 miles/gal for 2020-2025, respectively), the need for lightweighting is exigent. It is well known that the most drastic lightweighting can be achieved by adopting composite materials. Hence, a lot of R&D is dedicated to the development of composites, especially with multi-functional and structural properties. Currently, the majority of these are derived from petroleum resources but stringent environmental considerations, coupled with variable petroleum costs due to depleting oil reserves, have triggered the need for biorenewable materials.

Thus, while advocating sustainability, this study proposes to cost-effectively develop high-strength resins and structural composites from animal proteins. If successful, this new application base for rendering industry will help deploy animal materials for the automotive industry at prices comparatively higher than their current cost-structure.

9) **Ultrafiltration to Treat Rendering Facility Wastewaters** – Scott Husson

Rendering wastewater contains high levels fats, oils and greases, and proteins that must be removed prior to discharge. Dissolved air flotation is used for primary treatment of rendering facility wastewater, but it requires costly chemical additions. Membrane technologies have distinct advantages for treatment of impaired waters. Specifically, they provide a positive barrier to reject solids, can be conducted without addition of chemicals (unlike DAF), offer great flexibility in handling feed liquids with fluctuating properties, and offer a modular design that makes it easy to expand capacity as needed.

With support through ACREC, Husson's laboratory has demonstrated that ultrafiltration (UF) can be used for additive-free treatment of rendering facility wastewaters.

The goals of this project are to determine the best practices for UF membrane cleaning and to estimate membrane lifetimes using filtration data. This knowledge is important because membrane replacement due to loss of permeability represents the largest annual operating cost for this process. Data on membrane lifetimes will be especially important for refining our operating cost estimations.

During this period of study, filtration/cleaning cycles were carried out with direct-flow filtration using four different UF membranes for comparison. Specifically, the comparison focused on pressure change over time during constant flux filtration, and pure water flux recovery after cleaning with water rinse. The results indicate that regenerated cellulose membranes and activated polysulfone membranes show the best performance during multi-cycle tests. These two membranes will be used as the two test membranes in the remainder of work using other cleaning protocols.

Using data from filtration and cleaning cycles, it will be possible to estimate projected membrane lifetimes for this application, which is especially important for refining our operating cost estimations.

10) **White Paper: A Comparison of the Safety and Sustainability of Methods Used to Process Meat By-Products** – Charles Gooding

Competition for raw material streams traditionally handled by renderers is increasing as companies in the composting and anaerobic digestion businesses take hold. Renderers in California are particularly hard hit by the diversion of meat byproducts to composting and anaerobic digestion since these are considered to be 'greener' alternatives to rendering and thus receive government subsidies.

FPRF commissioned a white paper to compare the safety and sustainability of rendering versus other methods used to process meat byproducts. This review was done by Dr. Charles Gooding, who has done prior FPRF-funded research on carbon footprint and life cycle analysis of rendering operations.

Conclusions from this review are as follows:

1. Rendering provides the greatest assurance that pathogens will be kept out of the food supply and the environment.
    - Uncooked meat by-products (MBP) can contain viruses and bacteria that are harmful to humans and animals. Rendering is the safest and surest method of destroying these dangerous pathogens since controls are in place to ensure that temperature and time conditions sufficient to destroy pathogens are achieved.
2. Rendering provides the most effective waste management and recovery of valuable food resources.
    - Rendering converts nearly 100% of the fats, proteins, and nutrients in MBP into valuable ingredients of animal feeds. Alternatively, rendering and subsequent chemical processes can be used to convert meat byproducts into biofuels and higher-value industrial materials.
3. Rendering avoids 75% of potential greenhouse gas emissions and produces the most valuable products.
    - Greenhouse gas emissions (GHG, reported as carbon dioxide equivalents) were calculated using peer-reviewed data and NREL life cycle inventory factors.
    - Rendering retains nearly all of the carbon in the MBP and avoids 75% of potential GHG emissions. It produces fats and protein meals worth nearly $300, evaluated at average market values over the last 5 years. The economic value of biogas and digestate slurry, however, is only 10 to 20% of the value of products obtained from rendering.
    - Co-composting of MBP emitted 3 to 5 times as much GHG as converting all carbon in the material directly to CO_2. Co-composting MBP contributed nitrogen to the final product but the economic benefit was minimal.

Overview of Current "At Large" Projects[2]

1) **Redefining Essential Fatty Acid Requirements of Fishes in the Context of Rendered Fat-based Aquafeeds** – Jessie Trushenski et al., Center for Fisheries, Aquaculture, and Aquatic Sciences, Southern Illinois University

   Aquaculture's demand for marine-derived feedstuffs continues to increase despite record-high pricing for fish meals and oils. The issues of least-cost feed formulation and providing of adequate levels of LC-PUFA are further complicated by incomplete knowledge of the LC-PUFA requirements of many fishes. Quantitative essential fatty acid requirements are lacking for many commonly cultured fishes, and none of the studies conducted to-date have taken the interactive effects of overall dietary profile into account. Data generated by the Principal Investigator's laboratory suggests that saturated fatty acid (SFA) and monounsaturated (MUFA)-rich alternative lipids, including rendered animal fats, can make utilization of available LC-PUFA more efficient. We hypothesized that using SFA- and MUFA-rich beef tallow as the primary alternative to fish oil may effectively reduce minimum LC-PUFA requirements and allow for greater fish oil sparing in aquafeeds.

   The objective of this study was to determine the relative requirements of long-chain polyunsaturated fatty acids EPA and DHA in beef tallow-based feeds for Atlantic salmon Salmo salar, hybrid striped bass Morone chrysops x M. saxatilis, and pompano Trachinotus carolinus.

   The researchers evaluated growth performance and tissue fatty acid profiles of juvenile hybrid Striped Bass, Pompano, and Atlantic Salmon fed diets containing menhaden fish oil (FISH ONLY), beef tallow (BEEF ONLY), or beef tallow amended with purified sources of eicosapentaenoic acid (EPA) and/or docosahexaenoic acid (DHA) to achieve levels corresponding to 50% or 100% of those observed in the FISH ONLY feed (BEEF + 50% EPA, BEEF + 100% EPA, BEEF + 50% DHA, BEEF + 100% DHA, BEEF + 50% BOTH, BEEF + 100% BOTH). Diets were randomly assigned to replicate tanks of fish (N = 3-4, 10 fish/tank), and fish were fed assigned diets for a period of 8-10 weeks. Results suggest that beef tallow may be used as a direct replacement for menhaden fish oil in practical diets for a number of fish species, but performance may be improved by supplementation with LC-PUFA, particularly DHA. The three trials described herein have expanded our knowledge and understanding of fatty acid requirements in fish and have demonstrated that beef tallow has considerable value—perhaps even strategic value compared to traditional, plant-derived oils—as an ingredient in aquafeeds. Presentations of these results at national and international meetings have generated great interest in the aquaculture community; manuscripts are in various stages of completion (several in preparation, one in review) and, once published, will increase the awareness of and interest in beef tallow as an ingredient in aquafeeds.

2) Determination of Temperatures Required to Ensure Destruction of Pathogens in Rendered Product

It has long been assumed that the cooking temperatures reached during the rendering process are sufficient to destroy Salmonella and other pathogens; however, scientific proof is now required to satisfy FDA. Determining the temperatures needed to mitigate microbiological hazards in rendering raw materials, and then validating that these "critical limits" are satisfactory, will be essential for renderers with the impending implementation and enforcement of the new Food Safety Modernization Act (FSMA) regulations.

The overall goal is to provide specific scientific data to rendering processors so that critical limits can be set for their specific cooking process, regardless of cooker design or type of raw material.

The specific data needed includes:

- Identification of an appropriate lethality performance standard
- Identification of "worst case" raw material product
- Establish D and z values for the "worst case" raw material product
- Create or identify a tool to evaluate lethality

Three studies have been commissioned to investigate this area:

1. Determining the process lethality of Salmonella and Escherichia coli O157:H7 in heat treated, rendered meat and poultry products – Dr. Dale R. Woerner et al., Colorado State University
2. Determination of Salmonella thermal destruction times for rendering of skin-on poultry carcass-derived slurries – Dr. Mathew Taylor et al., Texas A&M University
3. Determination of D and Z values of Salmonella ssp. in rendered products – Dr. Mindy Brashears et al., Texas Tech University

3) Use of rendered products in pet food

Several studies have been commissioned by FPRF to promote the use of rendered products in pet food:

1) Evaluation of techniques used to extend shelf-life and methods for analysis of rendered protein meals in pet foods – Greg Aldrich, Kansas State University

2) Assessing the efficacy of chemical treatment to control Salmonella in rendered protein meals – Cassandra Jones and Greg Aldrich, Kansas State University

3) The impact of rendered protein meal level of oxidation on shelf life and acceptability in extruded pet foods: determining sensory limits for oxidation values – Kadri Koppel and Greg Aldrich, Kansas State University

4) Flow behavior and spray coating efficiency during production of rendered protein meals – Kingsly Ambrose and Greg Aldrich, Kansas State University

Conclusion

FPRF is committed to its mission of providing value by supporting research that enhances current usage of rendered animal products or develops new uses. We rely on sustained contributions in order to do this.

In addition to research projects, FPRF funding also supports the development of crucial technical capabilities that will allow our industry to tackle the problems and opportunities of today and tomorrow.

A collaborative, pre-competitive approach allows members to access the critical mass of resources needed to obtain meaningful progress. Joining FPRF is a much more efficient, less expensive way to innovate and achieve speed to market than relying on an in-house program alone.

It is important not only to fund research that is aligned with key strategic areas of interest, but also to communicate the findings of that research so that they can be actively used to benefit the industry.

By showing a return on investment, we hope to encourage increased funding to support additional research and to attract new members.

Acknowledgements

[1,2]This text contains excerpts from authors' progress and final report submissions to FPRF.

Reducing Undesirable Foreign Material through the use of Biopolmers

Darren Harpur

Darren Harpur

Aduro Biopolymers develops novel resins and materials from bio-derived feedstock. Darren has been associated with the technology since 2008 in his role as project lead with the University of Waikato's commercialisation company WaikatoLink in Hamilton New Zealand. In 2013 the company raised series A investment and I transitioned into the role of Acting CEO, and CEO from January 2014.

His background comes from the finance sector and small business ownership spanning 15-20 years. In that time he gained extensive experience in all facets of commercial and retail banking, foreign trade and exchange and small business ownership.

From 2008 in his role a Commercial Manager with WaikatoLink he was responsible for 4 subsidiary company's formed to raise investment and commercialise a diverse range of technologies; bone implants, solar energy, anaerobic digestion, novel binding protein scaffolds for the biotech sector. The fourth company was developing bioplastics and became Aduro Biopolymers.

He has experience in commercialisation of early stage technologies, project management, raising investment, licence negotiation and business and team management.

ARA Presentation July 2015, Royal Pines Resort, Gold Coast Australia

Topic - Biopolymers to reduce plastic contamination in rendered products

Darren Harpur

About Aduro Biopolymers

Aduro is a joint venture "limited partnership" between the University of Waikato's technology transfer company WaikatoLink, and Wallace Corporation both located in Hamilton New Zealand. Aduro was formed late 2012 after several years of research completed by masters and PhD students led by Chemical Engineer and Senior Lecturer Dr Johan Verbeek. Aduro holds Granted patents in several countries for Novatein ™, a method and process to convert bloodmeal into a thermoformable biopolymer capable of being processed using conventional plastics industry equipment.

The company's mission is to seek and commercialise opportunities that transform primary industry co-products into product applications that solve unique problems within businesses and particular industry sectors.

This has led Aduro to innovative research and development initiatives amongst research institutions and Universities around the globe. In 2015 Aduro partnered with Eastern Bioplastics in Virginia for the commercialisation of their Feathersorb™ oil absorbent product range made from refined poultry feathers and we're negotiating with the Fats and Proteins Research Foundation for access rights to renderable gloves and bin liners developed out of a sponsored research project between FPRF and Clemson University.

How it All Started.

The idea behind Novatein ™ came from a series of questions asked of ourselves.

- What if we could find new untapped uses for meat industry co-products that don't require huge capital investment?
- What if we could solve a problem within the meat processing sector using co-products as a feed stock?
- What if we could solve that problem at the right price with a product that outperformed the competition or alternative solutions?

The Solution

Plastics are made from polymers. Bloodmeal is mostly protein which in its' simplest form is a polymer. Other researchers' efforts to convert raw blood into commercially viable thermoformable biopolymers have not yet been successful. Aduro has developed a way to use bloodmeal as a feedstock for thermoplastic polymer production. The polymer produced is called Novatein ™ and it falls into a polymer category called biopolymers. Generally speaking biopolymers are intended to be short life polymers although they can be tailored to a certain extent. They are designed to breakdown in ecological systems using sunlight, moisture and microbial activity. Novatein is sensitive to moisture which makes it an ideal polymer for the manufacture of a number of devices used in the meat processing sector.

Novatein ™ in its crude form is a "non-product specific" biopolymer. Much like conventional Masterbatchers' in the plastics industry that blend polymers with additives, colorants and fillers to meet a product specification, we can tailor Novatein ™ to meet a chosen product's mechanical and physical properties.

Now that we have a low cost method of production of a commercially viable biopolymer, the question before us was: Is there a problem or an opportunity in the primary industry sector that we could solve using Novatein™?

As we interviewed people within companies in the wider primary industry sector one problem jumped out at us; plastic contamination in rendered co-products. In November 2012 we began a research and development program in partnership with Meat & Livestock Australia to develop a Novatein ™ formulation for products to help address that problem. The result of that research and development is the Port Jackson lamb rectal plug developed in partnership with Bestaxx Innovation in Sydney who hold the product design rights. Aduro has developed trialled and tested over 10,000 Port Jacksons in meat processing plants in New Zealand and Australia.

The Port Jackson has been shown to reduce faecal contamination rates in a wide range of ovine flocks, empty and full bellied, lamb and mutton. With some modification we believe it will also be a superior product for use in bobby calves and goats.

With further development we believe Novatein™ can be formulated to make weasand clips and beef throat plugs.

What's Next for Novatein and the Port Jackson?

Within the next few months Aduro has plans to commission a Novatein™ pilot production facility in New Zealand and to make the Port Jackson for the NZ and export market. We expect to be supplying Novatein Port Jacksons to Australia in 2016. We believe there is an opportunity for a Novatein facility in Australia and we're currently investigating the feasibility of setting up that operation somewhere on the east coast once we're happy with the roll out of our pilot plant in New Zealand.

We're open to how we might achieve that objective in Australia, be it a wholly owned plant or one set up in JV or partnership with companies who share our goals and objectives.

For further information please contact:

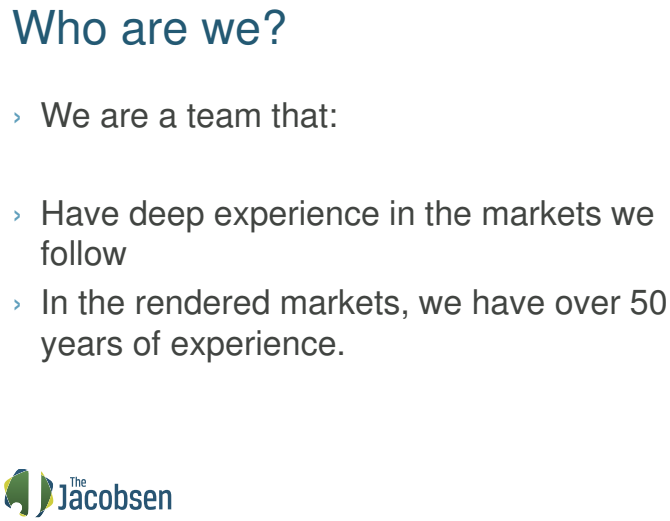
Darren Harpur
Aduro Biopolymers LP
Phone + 64 21 40 88 28
Adurobiopolymers.com

Informing the World – Part 1

John Donicht

John Donicht

Mr. Donicht traded fats and oils for from 1995 to 2000 before starting By-Products Interactive with a partner. The original vision of BPI was to create a trading platform to trade by-product commodities that did not trade on a centralized exchange. BPI bought The Jacobsen Publishing Company in 2000, and John Donicht has been president of the organization since 2001. Mr. Donicht received his BS in economics from the University of Wisconsin and an MBA in finance from the University of Minnesota.



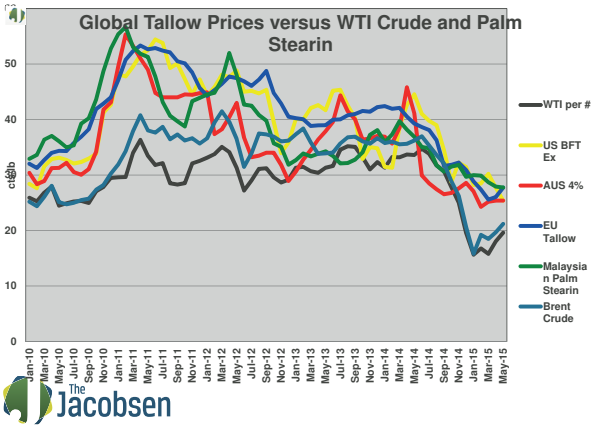
What we do:

- “Bringing transparency to opaque markets”
- Founded in 1865, The Jacobsen is the benchmark for many rendered products in the US market.

Global Fat Market

GLOBAL OVERVIEW (RENDERED FAT)				
	Production	Consumption/Exports		
	Animal Fat Production	Exported	Biodiesel/Renewable Fuel	Domestic Use Other
	1,000 Metric Tons			
U.S.	4.22	21%	25%	54%
Brazil	1.97	2%	28%	70%
EU	2.5	NA	25%	75%
Australia	0.6	72%	5%	23%
TOTAL	9.29	14%	25%	61%

Global Price Overview Fats



Export Market: tallow

Global Exporters of Tallow 2009-2014 (metric tons)								
	2009	2010	2011	2012	2013	2014	% Change 13-14	% Change 09-14
Australia	344,350	352,347	364,578	362,543	430,395	460,945	7%	34%
United States	805,734	879,231	668,690	566,372	459,340	444,121	-3%	-45%
New Zealand	135,285	142,747	119,200	133,053	127,557	138,587	9%	2%
Canada	170,280	181,889	144,744	161,989	138,290	129,101	-7%	-24%
Uruguay	69,726	61,035	64,015	75,850	50,215	50,898	1%	-27%
Paraguay	5,957	12,332	11,179	14,342	29,141	39,200	35%	558%
Argentina	45,124	6,196	9,356	6,679	11,873	15,459	30%	-66%
Brazil	3,399	5,380	261	4,181	13,945	492	-96%	-86%
TOTAL	1,647,514	1,685,455	1,432,154	1,362,565	1,316,525	1,337,601	2%	-19%
Source: Global Trade Atlas								
Less Intra EU Trade								

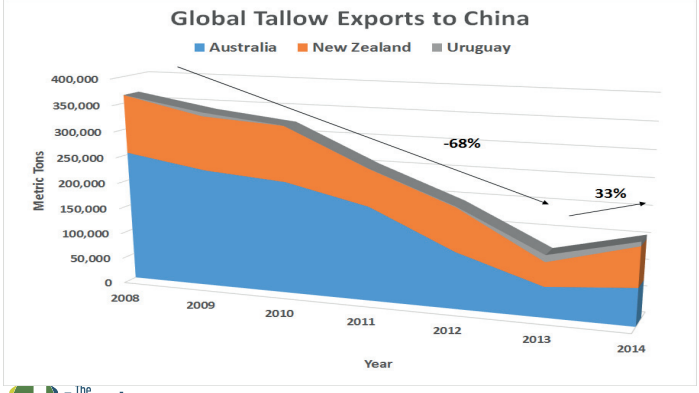
The Jacobsen

Import Market: Tallow

Global Importers of Tallow 2009-2014 (metric tons)								
	2009	2010	2011	2012	2013	2014	% Change 13-14	% Change 09-14
Singapore	39	43	125,690	178,156	417,330	349,557	-16%	896200%
Mexico	439,313	429,058	377,467	341,906	306,584	292,888	-4%	-33%
China	339,350	322,495	252,412	193,566	117,160	155,328	33%	-54%
Turkey	114,295	137,403	92,844	95,231	56,358	63,288	12%	-45%
United States	31,376	46,148	49,287	62,696	59,491	62,680	5%	100%
Central America/Caribbean	98,412	128,377	87,243	69,323	50,950	62,536	23%	-36%
Japan	41,223	54,329	47,323	50,162	42,064	42,276	1%	3%
Brazil	28,621	28,152	19,986	13,919	26,724	38,195	43%	33%
Nigeria	110,664	89,779	44,134	41,826	21,630	31,541	46%	-71%
South Korea	102,601	98,384	51,503	35,357	17,043	31,042	82%	-70%
Taiwan	55,923	51,171	41,724	45,731	23,468	30,963	32%	-45%
Russia	16,738	15,006	14,022	16,424	15,882	28,822	81%	72%
Pakistan	65,957	67,164	36,037	37,918	26,539	27,294	3%	-59%
Canada	28,152	31,662	26,314	18,697	20,122	23,700	18%	-16%
EU28	17,385	2,977	1,759	14,468	18,443	19,333	5%	11%
Morocco	13,841	15,427	16,913	10,501	5,000	9,065	81%	-35%
Venezuala	18,887	14,721	23,369	18,589	18,799	3,800	-80%	-80%
TOTAL	1,647,514	1,685,455	1,432,154	1,362,565	1,316,525	1,337,601	2%	-19%
Source: Global Trade Atlas								
Less Intra EU Trade								

The Jacobsen

China



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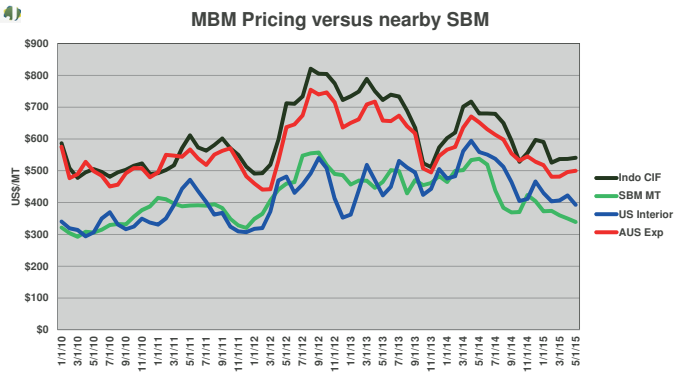
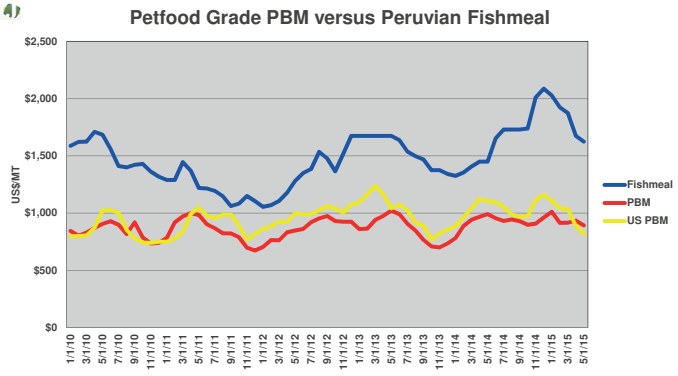
Global Protein Price



The Jacobsen

Global Protein Prices



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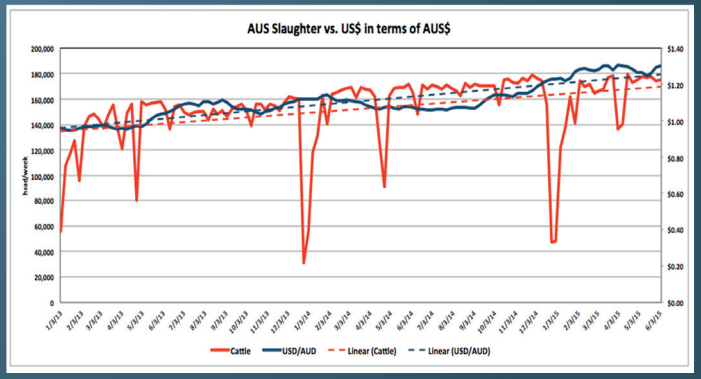

Sources: MLA, Oanda

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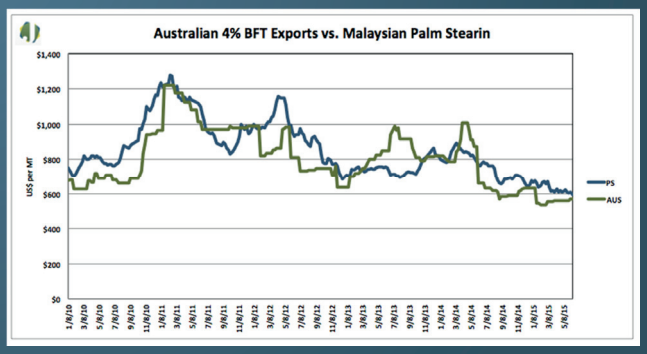

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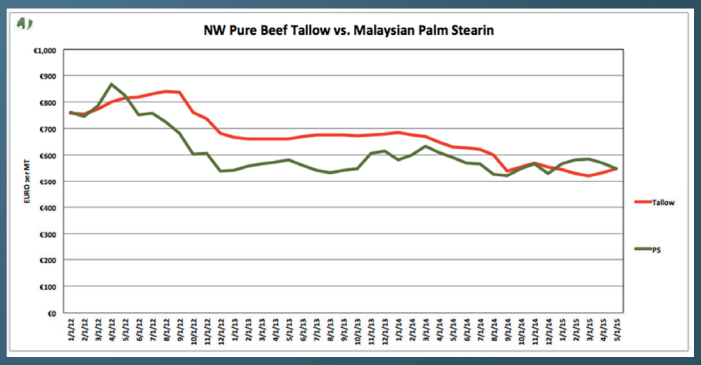
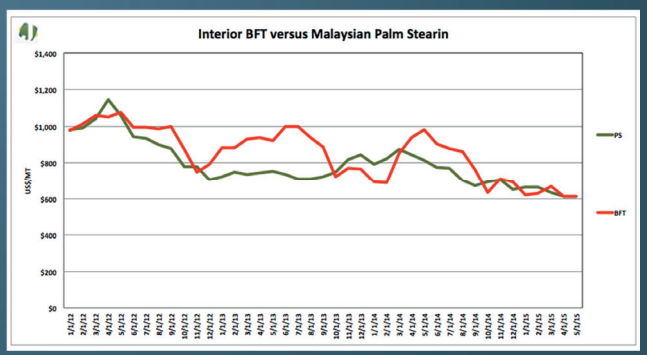


Sources: The Jacobsen, Oanda



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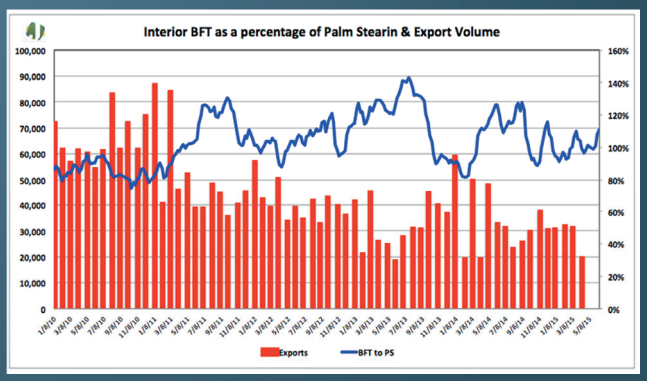

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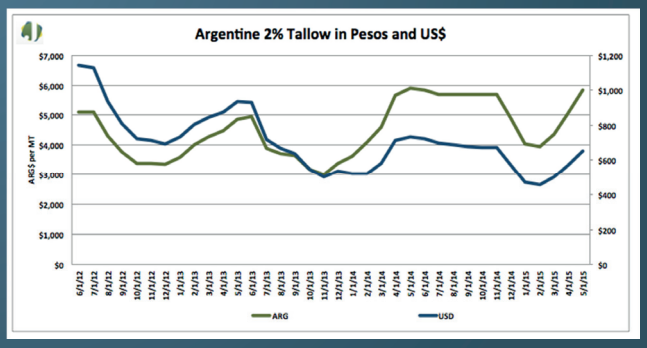

Sources: The Jacobsen, Oanda

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The Jacobsen

Current and Emerging Trends in Mean Production

Panel discussion and presentation with representatives from Beef, Sheep, Pork, Poultry and Aquaculture Industries

Andrew Spencer

Chief Executive Officer

Mr Spencer has been employed as the CEO of Australian Pork Limited since July of 2005. Through that period he has helped to work the industry through significant challenges, including the 2009 "Swine Flu" pandemic, large increases in imported pork volumes into Australia and a profitability crisis in 2007/8.

Prior to 2005 Mr Spencer worked over a period of ten years in France, South Africa and Germany in the agricultural biotechnology, seeds and chemicals business. He commenced his career in Australia in marketing and product management in the agricultural chemicals business sector after completing his studies in the mid 80's.

He has an Agricultural Science degree from Melbourne University.

Mr. Spencer is also a director of the Pork Co-operative Research Centre and the Australian Farm Institute.

Australian Renderers Association 13th International Symposium
21 -24 July, 2015
RACV Royal Pines Resort, Gold Coast, Queensland

Australian Pork Limited
"Current and Emerging Trends in Meat Production"

Australian Pork Ltd (APL) is the industry owned services and representation body for the Australian pork industry. It is a producer-owned company delivering integrated services that enhance the viability of Australia's pig producers. The organisation aims to enhance opportunities for the sustainable growth of the Australian pork industry by delivering integrated marketing, innovation and policy services along the pork industry supply chain. APL pursues opportunities for the industry at both the domestic and international level.

Present and recent past industry pork production as well as issues around trade in pork including export and import trends will be covered in this paper. Additionally, some of the key strategic issues that are expected to impact on the Australian pork industry are discussed and what the industry is doing to make sure that our position with respect to those issues is optimised.

The Australian pork industry produces some 4.8 to 4.9 million carcasses each year – at least in the past couple of years (see figure 1 below). This figure has increased at a very slow rate since an industry profitability crisis occurring around 2007/2008. This crisis was brought about by rapidly increasing import volumes of pork leading to depressed pork prices domestically alongside very high grain prices driven by global trade dynamics. Fifteen percent of pork production in Australia disappeared as a result.

There are two clear segments for pork in the domestic market. The largest is the processed sector mainly made up of ham and bacon sales. Most of the product supplied to this sector is manufactured from imported pork - some 70%. The other segment is fresh pork which includes products like pork chops, roast pork, etc. This part of the market is exclusively supplied by the domestic production sector because quarantine protocols do not allow imported pork to be sold as fresh product. Imported pork must be sold as processed product due to having to be cooked to a certain time and temperature standard for biosecurity reasons. Pork supply flows are shown in figure 2 below.

Volumes of imported pork have risen rapidly since the early 2000's. Today and for the past several years, somewhere between 130 and 150 thousand tons of imported pork – shipped weight - reaches Australian shores. These imports are made up of two key primal cuts of pork, firstly middles from Europe where there is a relative oversupply and boneless legs from the North America, similarly where there is a relative oversupply of legs. The long term import volumes trend is shown in figure 3 below.

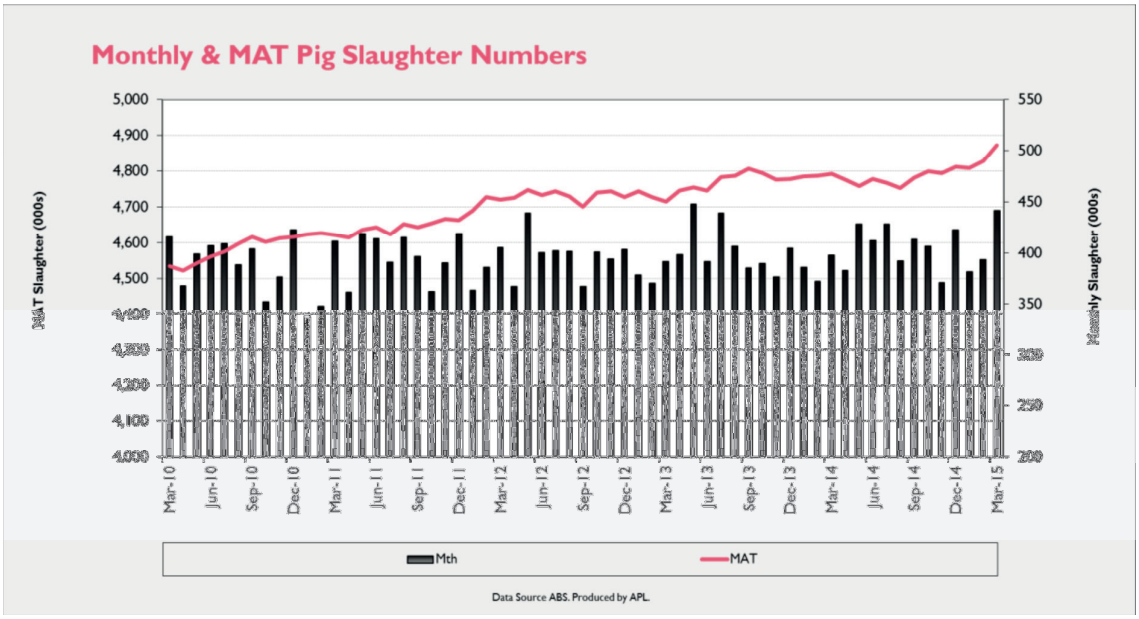

Figure 1: Monthly and Moving Annual Total Pig Slaughter Numbers in Australia 2010–2015

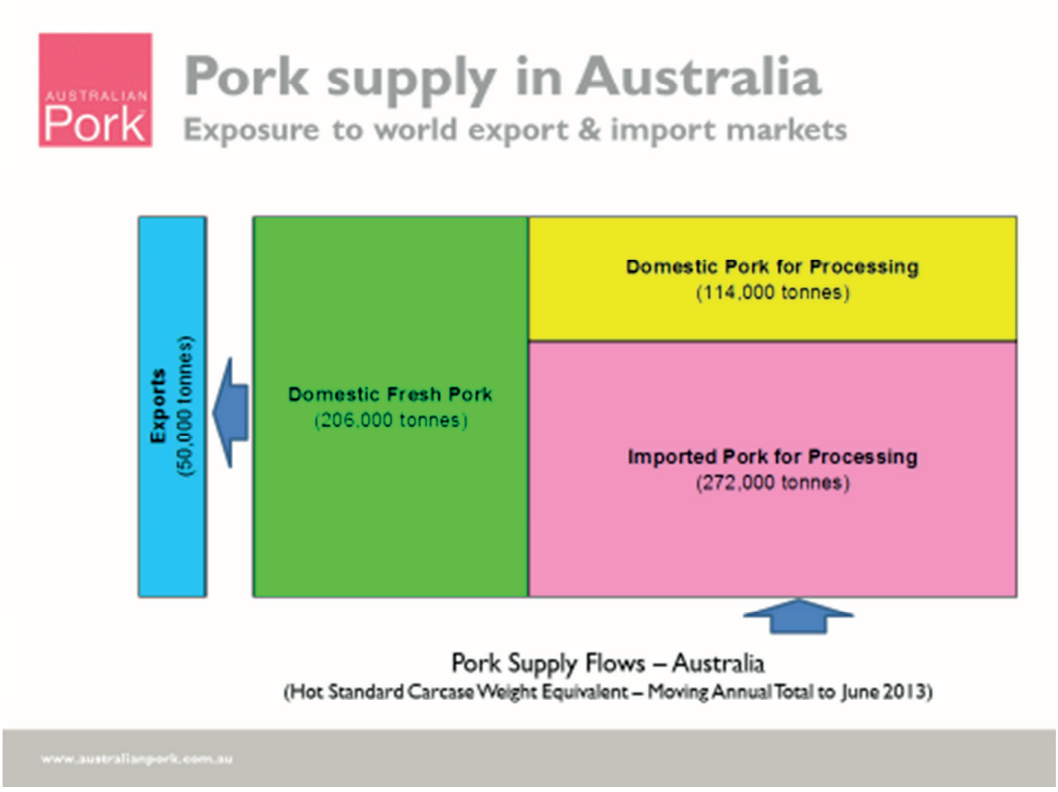

Figure 2: Typical Annual Pork Supply Flows by Market and Product Type

So the Australian pork industry has very strong import competition and there are a number of reasons for this. Those reasons include issues such as foreign agricultural subsidies, trade barriers,

production costs, local retailer preferences and carcass sizes. Imported pork is unlikely to disappear from the Australian food landscape and Australian pork producers have accepted that in their strategic planning.

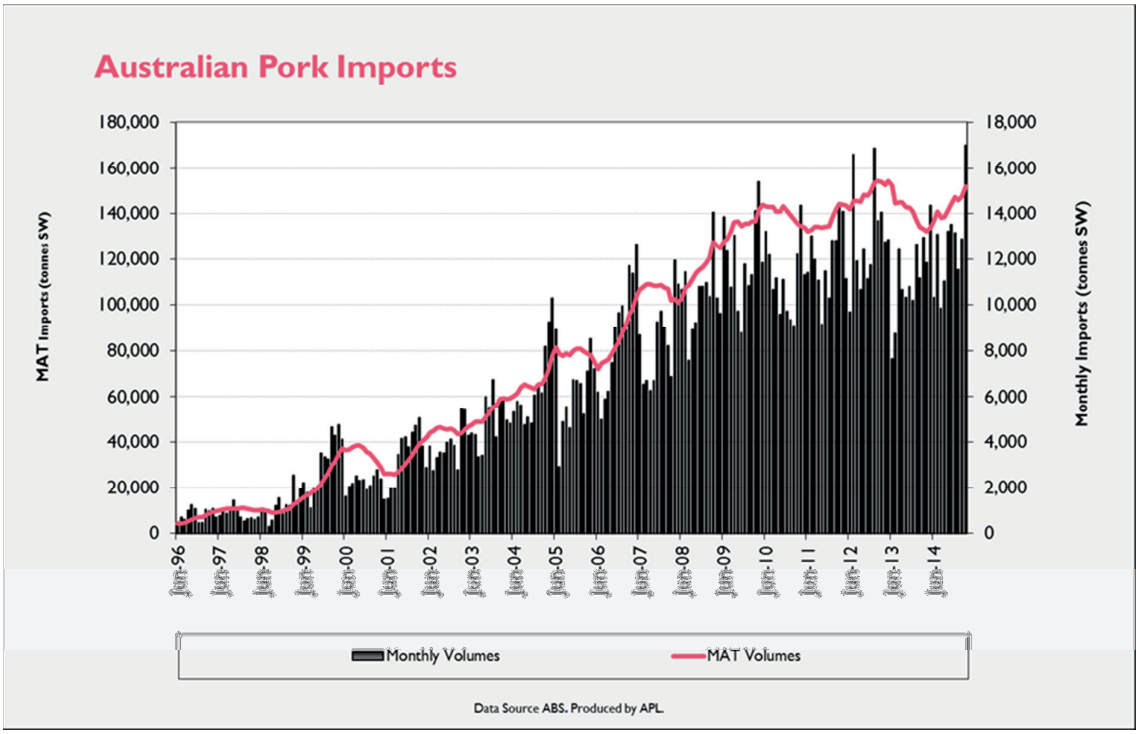

Figure 3: Australian Pork Imports since the mid 90's

In the global arena, if Australia is to be competitive in selling our pork, it will not be doing so on being the cheapest. The future success of the Australian pork industry will be built around differentiation attributes. The industry is working on a number of these differentiators including (1) eating quality, (2) production systems and ethics, and (3) product integrity attributes.

Pork eating quality depends on a number of factors. The first of these is avoiding boar taint and the industry has made some significant progress in the past few years at doing better in this respect. The widespread use of the product Improvac® – an Australian invented vaccine to prevent boar taint - has markedly improved performance in this arena. Chilling and handling practices post farm gate also play an important role in final consumer eating quality and processors continue to optimise these practices. One of the biggest impacts on pork eating quality is how it's handled in the home – how it's cooked. Many Australian consumers claim that they do not completely understand how to cook pork since traditionally it has not been one of the major proteins for our food culture. This is another area being addressed through some targeted messaging.

The Australian pork industry is a world leader in the area of progressive welfare thinking and implementation. In 2010, the industry decided that it would voluntarily phase-out the use of sow stalls – highly confining individual pens used for pregnant sows - by 2017. This is a world first initiative and today the industry reports achievement of this objective to a level of around 70% and remains on the track to achieve it fully. This progress has been enabled by millions of dollars' worth of research and development investment into new sow housing methods. Today, the Australian pork industry are world leaders in the management of group housed sows.

Additionally, around 25% of all pork farms with the right infrastructure, presently are planning or already have installed systems to collect gases produced from effluent to either flare or run through biogas installations to generate electricity.

We have built industry and product attributes around ethics that are globally highly regarded and an asset for our product offering in Australia and all around the world.

But it's the product integrity characteristics that really open new market opportunities in the global pork industry. Australia's attributes in this area are developing extremely quickly and at the edge of what's technically possible globally.

Our product integrity systems are built around three key components.

The first component is our quality assurance system called APIQ✓®. APIQ✓® is a recognised highly robust quality assurance system covering areas such as animal welfare, biosecurity, general management best practice and food safety. Over 90% of pork produced in Australia is produced on APIQ✓® certified establishments and work is ongoing to make that percentage even higher.

PigPass is the industry's traceability system that - once regulated in all jurisdictions - will be capable of tracking every pig movement in the country. This system is predominately designed to enable the better management of an emergency disease outbreak. There are however many other benefits to such a system where the industry has such comprehensive data around the movement of pigs, including food safety and product wholesomeness issues.

Physi-trace is the industry's world first trace back technology. A chop sourced from any retailer in Australia for example can be sent to a laboratory and traced back to source farm within 24 hours with no other information than just the piece of raw meat. The technology works through a trace elemental fingerprinting database and sampling system and is based upon original technology from the CSIRO. No other country has this capability for tracing the origin of their pork back to farm.

Combining these three technologies gives our industry enormous power to understand where pigs are, where they have been and with which other pigs they have been in contact. It also enables us to check retail product claims for pork. If a piece of pork is labelled free range for example in a butcher's shop, we can take a sample of that product, find the farm of origin and check the certifications for that farm in our quality assurance system, where the free range certification should be shown.

When one is looking for future growth export markets for pork such as China, healthy, safe and natural is absolutely top of the priority list. Healthy, safe and natural is what our product integrity system allows us to guarantee.

In short, the Australian pork industry will never produce the world's cheapest pork. We understand that our future success rests on our ability to produce better pork and to market it as such to our domestic and international consumers. Nothing sharpens an industry's focus like import competition, and whilst the competition has given our industry many difficulties, we need to use the sharp focus it has given us to do what we do even better for the future.

Andrew Spencer

Dr. Vivien Kite

Having obtained her PhD at the University of New England in Armidale in hen physiology and behaviour, NSW, Vivien Kite took up the offer of a Post-doctoral Fellowship at the Poultry Research Centre (now the Roslin Institute – home of Dolly the Sheep!) in Scotland, where she worked for several years on a Commission of the European Community animal welfare contract, studying transportation stress in broilers and the establishment of objective measures of motivation in animals.

Returning to Australia in the late 80s, she embarked on a career in agri-politics, eventually taking up the position of Deputy Director of the Australian Poultry Industries Association in 1989. She has worked with the ACMF for the past 25 years, and has particular responsibilities for the industry's welfare, flock health, food safety, and other technical issues. Over the course of that time she has also managed the chicken meat industry's national research and development program, which is run through the Rural Industries Research & Development Corporation.

Vivien represents the Australian chicken meat industry on the International Poultry Council, on which she currently holds a position on the Executive. She is also the industry's resident blogger!

Current and Emerging Trends in Production - Poultry Meat Sector

Dr Vivien Kite
Executive Director
Australian Chicken Meat Federation (ACMF) Inc

Global Poultry Meat Trends and Outlook

The poultry meat production has grown steadily over the past half century, driven by increasing affordability of and demand for poultry meats, particularly chicken meat. The average per capita consumption of poultry meat globally 50 years ago (FAO, 2003) was 3.2 kg, whereas today it would be in the order of 14 – 15 kg.

Over the past four years, global chicken meat production alone has increased from 81,346,000 tonnes (ready to cook equivalent) in 2011 to an estimated 87,385,000 tonnes in 2015, an average increase of 1.9% pa. The average rate of increase across the same years, excluding China, which suffered falling demand for poultry products since 2012 due to avian influenza and a number of food safety scandals, is 2.3% (USDA, 2015).

The outlook for the global poultry meat market in the immediate future is strong, with beef prices high, feed costs lower and relatively stable, and expected strong growth in demand in most regions. However, the unprecedented spread and numbers of outbreaks of avian influenza (AI) witnessed globally since December 2014 is likely to impact somewhat upon this outlook. Primary effects are three fold – loss of consumer confidence in some markets (as evidenced in China), impacts on supply due to culling of effected flocks and other control activities, restrictions on trade of breeding stock due to AI, and impacts on global trade flows resulting from restrictions and bans imposed by importing countries on products from affected countries and/or regions within countries. The size of these impacts will of course depend upon how long the current expansion of AI goes on for, where spread occurs to, and the success of control and eradication programs in affected countries.

While these impacts are unlikely to result in negative growth in the global poultry meat market, they may temper earlier growth forecasts made prior to the current wave of AI, which estimated growth in poultry meat supply the order of 2.3% pa in the decade 2013 – 2023, with poultry meat becoming the largest meat sector from 2020 onwards (OECD/FAO, 2013).

Poultry Meat Production in Australia

Growth of the poultry meat sector to date

Of the various poultry meats produced in Australia, chicken meat is by far the most significant, representing more than 95% of all poultry meat produced and consumed. The next biggest poultry sectors are turkey and duck meat in that order.

Australian chicken meat production has grown at times spectacularly over the course of the past half century, from an insignificant base in the early 60s to well over a million tonnes today. This expansion in production has been mirrored by, indeed driven by, an ever increasing hunger for chicken meat on the part of the Australian consumer (see Figure 1). In 2015/16, it is estimated that Australians will each consume 46.1 kg of chicken meat (ABARES, 2015).

While the rate of growth in production has slowed somewhat in more recent years, the industry has continuing to grow over the past five years at rates between 1.5 and 3.7% pa, fuelled by ever increasing per capita consumption rates. There is no question that this increasing demand has been fuelled to a large extent by chicken meat's price competitiveness vs other meats. In March this year, ABARES (2015) reported that over the five years to 2014/15, chicken meat was on average 50 per cent cheaper than pork, 59 per cent cheaper than lamb and 65 per cent cheaper than beef.

Free range chicken meat currently represents over 15% of total production. This sector has experienced particularly strong growth over the past decade, from a base of less than a few percent of total chicken supply to its current strong position in the marketplace.

It is important to note that the Australian chicken industry is very focussed on the domestic market, with less than 5% of meat produced exported.

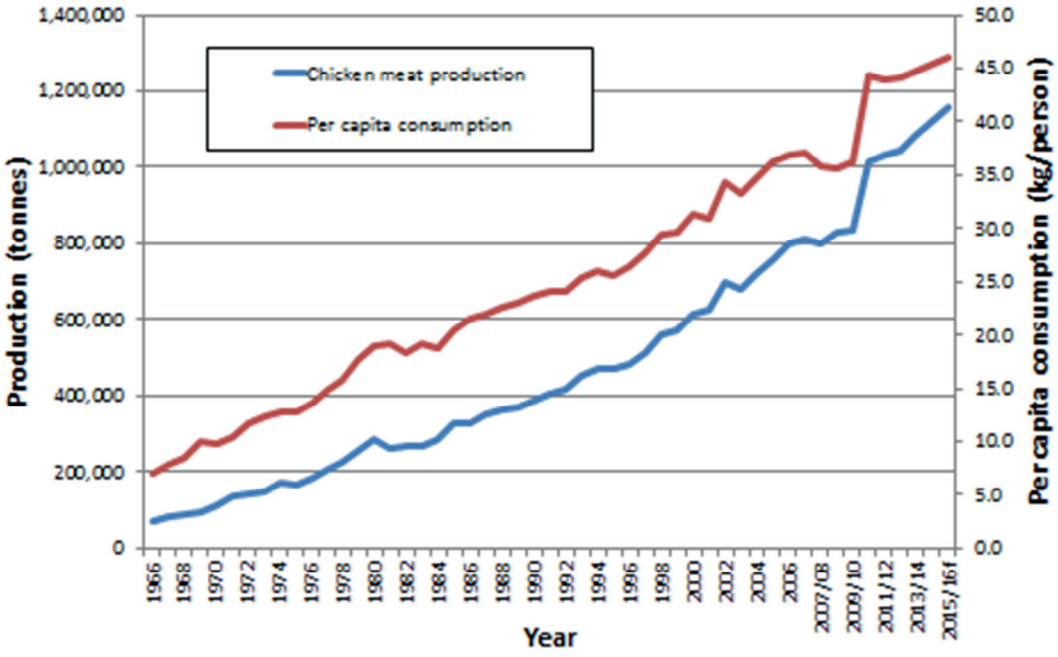

Figure 1. Australian chicken meat production and consumption over time (historical and forecast)

Outlook for poultry meat production in Australia

ABARES (2015) forecasts that chicken meat production will increase by approximately 3% over the coming year; indeed, growth of between 3 – 4% pa for the coming five years is expected to be maintained, although current difficulties with supply of fertile eggs may place constraints on meeting these targets in the immediate future. The industry expects that this rate of growth will be maintained further into the future also, as chicken meat further increases its competitive advantage over other meats, particularly its price competitiveness.

Statistics on production in the other poultry meat sectors is more difficult to obtain. While growth in these sectors (particularly duck meat) is also expected, the proportion of total poultry meat production represented by these sectors actually declined in the decade from 2012/13 – from 5% in 2002-13 down to 3.6% in 2012/13 (ABARES, 2012; 2005).

The recent trend of above industry average growth in the free range sector is expected to be maintained.

Some shifts in where chicken meat is produced can be expected over the coming five years, following the recent trend towards expansion in the industry in SA and Queensland and some retraction in WA. Expansion in regional NSW and away from the current hub in Sydney and the Central Coast is also likely.

Risks and opportunities

Avian influenza

While Australian poultry flocks have to date escaped the current global wave of AI, Australia has experienced seven outbreaks of avian influenza over the past four decades, the most recent in two related layer farms at Young in 2013. On each occasion the initial infected flock was quickly identified, reported to authorities and acted on to eradicate the disease, so that there was no opportunity for significant further spread. There has not been an outbreak in a meat chicken flock for over 30 years – they have all been in long lived birds (egg layers and breeders) – but despite this, and the rapid eradication of outbreaks, the chicken industry has been significantly impacted by each outbreak. These impacts have included loss of export markets - an impact that has also been felt by the rendering and pet food sectors which utilise Australian poultry meat products.

Avian influenza presents an ongoing risk to the Australian poultry industry. A large, prolonged and/or multi-region local outbreak could significantly affect overall production as a result of direct losses due to culling and other disease control activities, and disruptions to the supply of fertile eggs if breeder flocks are caught up in the outbreak. It could also result in the loss of export markets and loss of consumer confidence in poultry meat products, leading to reduced domestic demand for poultry products. However, past outbreaks have not significantly impacted consumption, and overseas experience suggests that such impacts on consumption tend to be short term.

Finally, avian influenza, even where it occurs outside of Australia, could potentially have very direct consequences for Australian production levels due to the imposition of restrictions on trade and movements of genetic stocks.

Imports

As a result of the unique flock health status of Australia's poultry industries, the local industry enjoys a high level of protection from imports. This position has been defended vigorously by the industry over past decades, and will continue to be defended in the future.

Protocols for importation of raw and cooked chicken meat into Australia have been established and available since 2009. To date, poultry producers in other countries have not been able to meet these protocols. However, it is possible that applications for permits to import chicken meat under these protocols may be received and, in the case of a limited number of countries, may provide opportunities for imports into the Australian market in the future. The current restrictions on imports of turkey meat have indeed been challenged, and these arrangements are currently under review.

Under a separate risk management protocol, cooked chicken meat may be imported from New Zealand. Other than for that, the only imports currently permitted constitute a small volume of processed chicken meat products that have been fully retorted (ie cooked to high temperature in its container), such as sometimes found in canned chicken or soups.

An independent economic study commissioned by the industry in 2003 estimated that unrestricted importation (of chicken meat) would result in approximately 40% Australia's demand for chicken meat being imported. This market penetration figure was used in the modelling underpinning the

Import Risk Assessment for Chicken Meat released in 2008 (Biosecurity Australia, 2008). Such a high level of penetration would clearly have significant impacts on domestic production, although it would take some time to reached and the full effects would not be felt immediately.

Nevertheless, and while importation clearly represents an ongoing threat to domestic production in the medium to longer term, at this point in time it is not envisaged that importation will have a significant impact on the outlook for Australian chicken meat production in the horizon of the coming five years.

Competitiveness in the meat category

The chicken industry has achieved significant productivity improvements over the past half century. In 1975, it took 64.1 days and 4.66kg of feed to grow a chicken to 2kg. Currently it takes less than 35 days and as little as 3.4kg of feed. However, further significant efficiency gains, mostly due to genetic improvements, are not only possible, but have been demonstrated to be achievable, both here in Australia and overseas. Furthermore, while chicken genetic companies have successfully introduced a range of welfare, sustainability and other traits into their meat chicken breeding programs, performance targets for growth, yield and feed conversion efficiency improvements continue to be significant criteria. While the old breeding target of 'a one day a year' improvement in the time to reach target weight may no longer be the driver of genetic programs, an annual improvement of 2-3 points of feed conversion efficiency is an important and attainable goal. Such increases in efficiency will further increase chicken's competitiveness over other meats, and are expected to cement chicken's position of Australian consumers' favourite meat.

Exports

Opportunities for increased poultry meat export to Asia and the Middle East are being explored by the industry, capitalising on the Australian industry's advantages in terms of its favourable food safety record and bird health status. For the foreseeable future, however, this will have a limited impact on overall production, as opposed to value of exports, and exports are forecast to continue to represent only a modest share (less than 5%) of the total demand for chicken meat over the coming five years (ABARES, 2015).

Conclusions

The outlook for the global poultry meat production is fundamentally very strong, although avian influenza could continue to impact trade flows, production and demand.

Australian poultry meat production is expected to continue to grow at rates of approximately 3 – 4% pa for the foreseeable future. Local (and global) disease incidents, such as avian influenza, could presnent with the attainment of these forecasts. These forecasts are also assume the maintenance of Australia's strict restrictions on importation of poultry meats, particularly chicken meat.

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Dr. Kathleen Giles

Dr Kathleen Giles (Ferme) grew up on a mixed farming enterprise in the mid-north of South Australia. Her passion for agriculture and livestock lead her to pursue a career in veterinary science and agriculture.

Dr Giles holds a Bachelor of Veterinary Medicine and Surgery from Murdoch University, WA and is a member of the Australian and New Zealand College of Veterinary Scientist in ruminant nutrition. As a vet she worked extensively in rural South Australia and Victoria.

Kat served as the Sheepmeat Council of Australia's Senior Policy Advisory in Animal Health and Welfare from 2011-2013. Kat was appointed CEO of Sheepmeat Council of Australia in January 2014. Kat has a strong focus on agricultural policy and building profitable business's for sheep producers.

Australian sheep

Industry projections 2015
April update

KEY POINTS

- Lamb slaughter revised up to 21.4 million head
- High global sheepmeat stocks
- A$ continues to work in Australia's favour
- Positive three month rainfall outlook
- Flock revised down to 69.8 million head

KEY 2015 NUMBERS

Lamb Slaughter	Lamb Production	Lamb Exports	Mutton Slaughter
21.4 (million head)	471,000 (tonnes cwt)	220,000 (tonnes swt)	7.5 (million head)

* Graphic illustrates year-on-year change

MLA's Market Information – Ben Thomas
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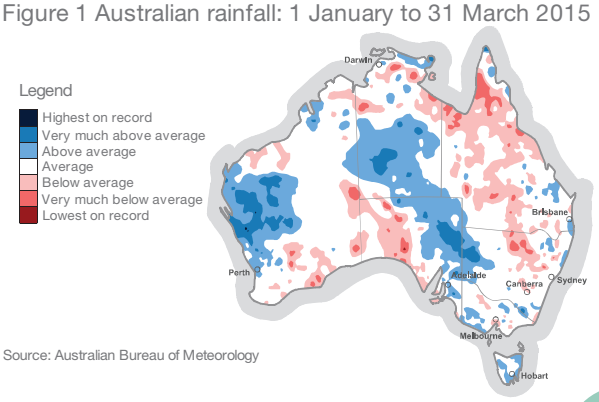
Introduction

After a strong start to the year, slow moving product in Australia, the US and China, Australia's three largest sheepmeat markets, may serve to cap Australian sheep and lamb price potential for the remiander of the year.

Offsetting this potential downward pressure will be a reduction in lamb slaughter, which will occur when there is a significant improvement in seasonal conditions in southern Australia. For mutton, while slaughter and throughput has already slowed, any sustained support for prices will depend on when restocking interest is ignited.

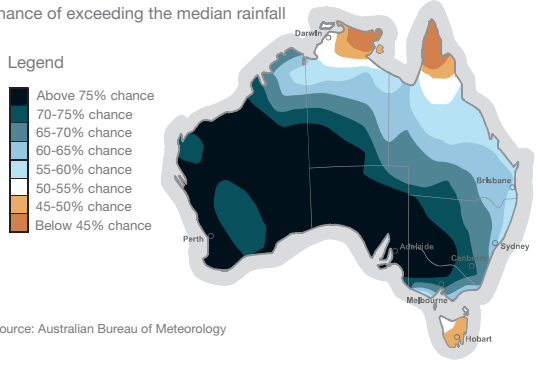
Fortunately, after a dry February and March, the Bureau of Meteorology's (BOM) three month rainfall outlook points to 'above average' rainfall for the majority of southern Australia, which, if it eventuates, will go a long way to relieving the lamb supply pressure.

Figure 1 Australian rainfall: 1 January to 31 March 2015



Source: Australian Bureau of Meteorology

Figure 2 Australian rainfall outlook: 1 April to 30 June 2015
Chance of exceeding the median rainfall



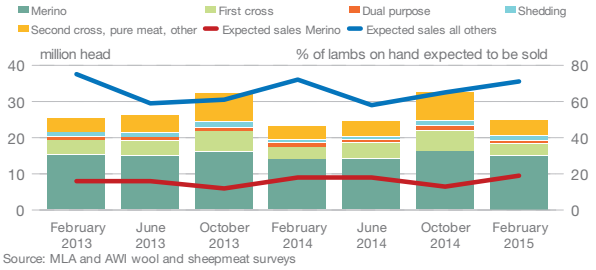
Source: Australian Bureau of Meteorology

February MLA & AWI wool and sheepmeat survey results

MLA and AWI wool and sheepmeat survey results suggest that, as at 28 February 2015, the Australian breeding ewe flock had remained relatively unchanged year-on-year, at 41 million head. The total number of lambs on hand was 7%, or 1.6 million head, higher than year-ago levels, at 24.8 million head. In line with the greater number of lambs on hand, the total number of intended lamb sales in the four months following February (March to June) was 9.8 million head – up 6% on the corresponding period last year.

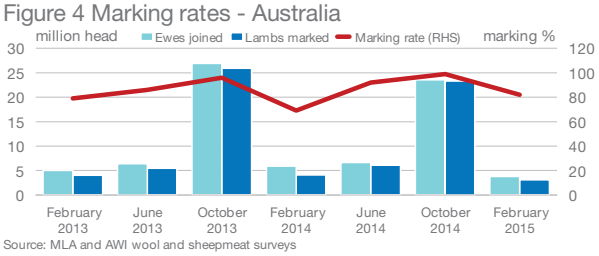
The national average Merino marking rate lifted 30% year-on-year, to 77% in February, while the national marking rate for all other breeds was 6% higher, at 93%. It should be noted that the number of lambs marked during the period captured by this survey is very low. (For more details on the February survey results, please refer to Appendix 1).

Figure 3 Lambs on hand and expected lamb sales



Source: MLA and AWI wool and sheepmeat surveys

Figure 4 Marking rates - Australia



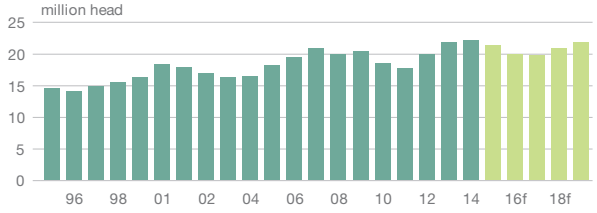
Source: MLA and AWI wool and sheepmeat surveys

Slaughter

After a drier than expected first quarter, Australian lamb slaughter for 2015 has been revised higher, to 21.4 million head – which is still 850,000 head lower than the 2014 total. Tighter supplies are likely to become more prevalent once seasonal conditions improve.

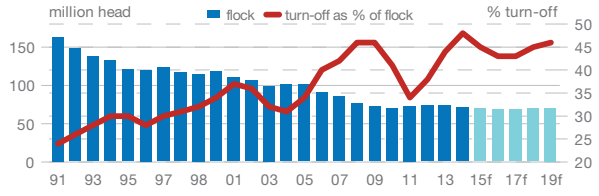
The 2015 sheep slaughter forecast (7.5 million head) remains in line with the initial prediction, at 26% lower than 2014, with signs of shortening supplies already evident. Importantly, with a pronounced slowdown in sheep slaughter, and continued high lamb slaughter, the national flock forecast for 30 June 2015 has been revised to 69.8 million head (down 1.8 million head, or 3%, on 2014) – falling below the 70 million mark for only the second time in over a century.

Figure 5 Australian lamb slaughter



Source: ABS, MLA forecasts f = forecast

Figure 6 Australian sheep flock



31 March until 1999, 30 June from 2000

Source: ABS, MLA forecasts f = forecast

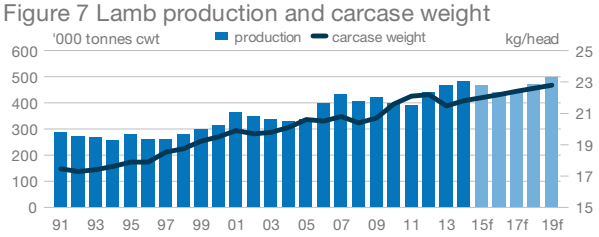
Production

While the first quarter has been dry, producers' ability to consistently finish lambs – grain assisted in some instances – has minimised the impact of the poor feed conditions on lamb carcases. For this reason there has been a significant upward adjustment in average lamb carcase weights, which, when multiplied by the revised higher lamb slaughter for 2015, will mean lamb production is forecast to be 470,800 tonnes cwt – but still back 3% year-on-year.

While first quarter lamb slaughter has been high, the reductions are likely to roll out over the coming quarters, becoming more pronounced as the year progresses, especially considering how high slaughter was in the second half of 2014.

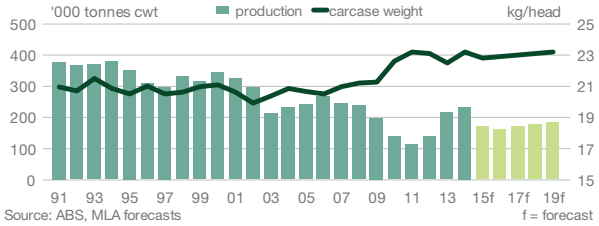
The mutton production forecast for 2015 remains at 171,000 tonnes cwt, back 27% year-on-year.

Figure 7 Lamb production and carcase weight



Source: ABS, MLA forecasts f = forecast

Figure 8 Mutton production and carcase weight



Source: ABS, MLA forecasts f = forecast

Global demand

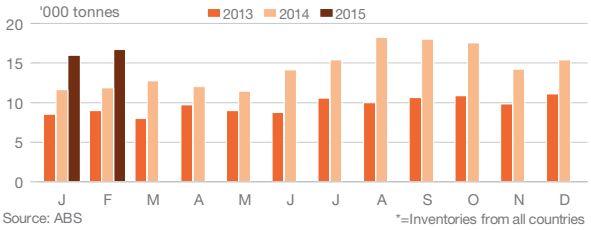
In contrast to the high Australian lamb volume exported during the first quarter, global demand for lamb is reportedly subdued, and likely to remain so over coming quarters.

The first demand concern is in the US, where the slow moving product from cold stores has seen lamb stocks (from all countries) up 40% year-on-year. However, there is a lag on this measure and stocks are likely to have been drawn down over Easter – a peak demand period.

Secondly, imported Australian and New Zealand product in China is comparatively more expensive than domestic product, slowing trade.

Nevertheless, underpinned by higher lamb slaughter, Australian exports for the first quarter were up 6% year-on-year, with the US (12,302 tonnes swt), China (8,714 tonnes swt) and the Middle East (16,037 tonnes swt) the largest markets, while shipments to the EU were 3,031 tonnes swt.

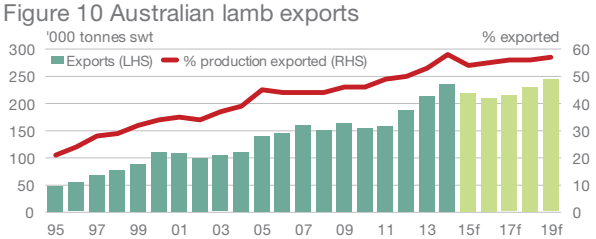
Figure 9 USA sheepmeat cold storage inventories*



Source: ABS

*=Inventories from all countries

Figure 10 Australian lamb exports



Source: DA, MLA forecasts

f = forecast

The current downward export lamb price pressure from weaker demand is likely to be alleviated as the year progresses, as global stocks clear. The forecast slowdown in Australian sheep and lamb supply will also tend to hold export prices steady, dependent on the extent of the slowdown in lamb slaughter, and when it eventuates. The A$ is predicted to remain below 80US¢, which will also be of assistance.

Mutton exports for the first quarter were lower year-on-year, underpinned by reduced slaughter, with shipments to the Middle East (15,069 tonnes swt) and China (9,957 tonnes swt) accounting for the largest volumes.

While a slowdown is expected for the coming months, the five-year outlook remains positive, with demand growth from developing Asia, and continued high meat prices in the US.

Sheep and lamb prices

After a strong start, Australian lamb prices could come under pressure over coming months, largely due to the slow moving product in China and the US.

However, year-to-date prices are positive, with light lambs (12-18 kg cwt) having performed the best relative to the other categories, averaging 19% higher year-on-year, at 518¢/kg cwt. In comparison, and while fetching higher prices, the year-on-year increase for trade lambs (18-22 kg cwt) and heavy lambs (22+ kg cwt) was less significant, up 8% and 5%, at 534¢/kg cwt and 541¢/kg cwt, respectively.

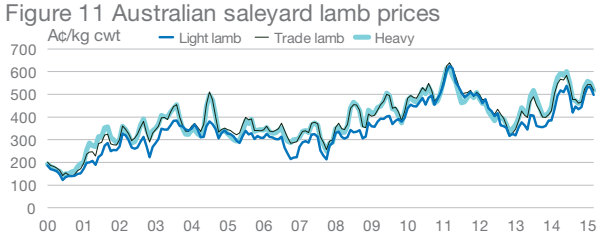
Of potential benefit at the lighter end of the spectrum over the coming months will be restocking interest if the current three month rainfall outlook comes to fruition. This will also alleviate some of the potential price pressure from the slower trade.

Tightening mutton supplies, already evident over the first quarter of 2015, will support sheep prices for the remainder of the year, with the greatest downward pressure occurring if the slower international volumes take longer than expected to clear, and autumn and winter remain dry.

Mutton prices averaged 342¢/kg cwt for the March quarter, up 42% (or 102¢) from the same time last year.

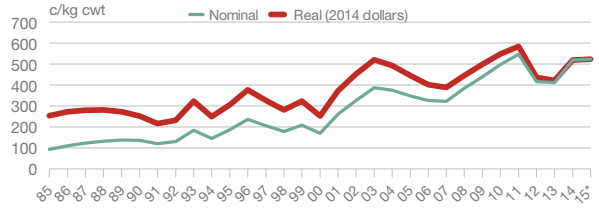
Despite the recent easing, both lamb and mutton prices are still expected to average much higher than in 2014, providing autumn rains arrive, as forecast.

Figure 11 Australian saleyard lamb prices



Source: MLA's NLRS

Figure 12 Average national trade lamb prices



Lamb before January 1996, 16–18kg cwt, score 3; from January 1996, lamb, 18–20kg cwt, score 3; from July 2003, trade lamb, 18–22kg cwt, score 2–4

Source: ABARES, MLA's NLRS

* Year to date

Situation and outlook for the Australian sheep industry

	2011	2012	2013	2014	*2015f*	*% change on 2014f*	*2016f*	*% change on 2015f*	*2017f*	*2018f*	*2019f*	*% change on 2014f*
Sheep & lamb numbers ('000 head)												
at June 30	73,099	74,722	75,548	71,630	*69,800*		*68,700*		*69,200*	*70,000*	*71,000*	*-0.9%*
percentage change	-5.8%	2.2%	-0.9%	-3.2%	*-2.6%*		*-1.6%*		*0.7%*	*1.2%*	*2.6%*	
Slaughterings ('000 head)												
sheep	4,933	6,063	9,614	10,086	*7,500*	*-25.6%*	*7,100*	*-5.3%*	*7,500*	*7,750*	*8,000*	*-20.7%*
lamb	17,793	20,009	21,886	22,251	*21,400*	*-3.8%*	*20,000*	*-6.5%*	*19,900*	*21,000*	*22,000*	*-1.1%*
Avg carcase weight (kg)												
sheep	23.2	23.0	22.5	23.2	*22.8*	*-1.7%*	*22.9*	*0.4%*	*23.0*	*23.1*	*23.2*	*0.0%*
lamb	22.1	22.2	21.5	21.9	*22.0*	*0.6%*	*22.2*	*0.9%*	*22.4*	*22.6*	*22.8*	*4.3%*
Production ('000 tonnes carcase weight)												
mutton	114	140	217	234	*171*	*-26.9%*	*163*	*-4.7%*	*173*	*179*	*186*	*-20.5%*
lamb	393	443	470	487	*471*	*-3.3%*	*444*	*-5.7%*	*446*	*475*	*502*	*3.1%*
Sheep exports ('000 head)	2458	2,279	1,973	2,300	*2,300*	*0.0%*	2,400	*4.3%*	2,500	2,600	2,700	*17.4%*
Exports ('000 tonnes)*												
mutton shipped weight	82	107	172	186	*125*	*-32.8%*	*118*	*-5.6%*	*126*	*131*	*135*	*-27.4%*
carcase weight	108	134	206	223	*163*	*-26.9%*	*153*	*-6.1%*	*164*	*170*	*176*	*-21.1%*
lamb shipped weight	160	189	214	237	*220*	*-7.1%*	*210*	*-4.5%*	*215*	*230*	*245*	*3.4%*
carcase weight	193	222	250	280	*256*	*-8.6%*	*245*	*-4.3%*	*250*	*268*	*285*	*1.8%*
Domestic utilisation ('000 tonnes carcase weight)												
mutton	6	5	10	11	*9*	*-22.0%*	*9*	*8.2%*	*9*	*9*	*10*	*-7.3%*
kg/capita	0.3	0.2	0.5	0.5	*0.4*	*-20.0%*	*0.4*	*0.0%*	*0.4*	*0.4*	*0.4*	*-20.0%*
lamb	200	222	220	207	*215*	*3.9%*	*199*	*-7.4%*	*195*	*207*	*216*	*4.3%*
kg/capita	8.9	9.8	9.5	8.8	*9.0*	*2.3%*	*8.3*	*-7.8%*	*8.0*	*8.3*	*8.6*	*-2.3%*

Source: ABS, DA, MLA forecasts

f = forecast (in italics)

* excl. canned/miscellaneous

Australian lamb exports ('000 tonnes swt)

	2011	2012	2013	2014	% change	2014 Q1	2015 Q1	% change
To:								
North America	39.4	42.1	45.6	53.5	17%	13.5	14.2	6%
US	34.3	36.7	39.2	46.2	18%	11.9	12.3	4%
- Canada	3.9	4.7	5.6	6.2	11%	1.5	1.8	18%
- Mexico	1.2	0.8	0.8	1.0	26%	0.1	0.2	32%
Middle East	34.9	51.8	59.8	64.2	7%	14.1	16.0	14%
Greater China	29.6	34.6	48.9	53.0	8%	12.5	10.3	-17%
- China	21.2	29.5	39.5	38.8	-2%	9.1	8.7	-5%
- Hong Kong	6.2	3.5	7.5	10.6	41%	2.9	0.9	-70%
- Taiwan	2.1	1.6	1.8	3.6	94%	0.5	0.7	57%
South East Asia	8.9	8.7	9.7	11.5	18%	3.0	3.4	13%
Japan	7.4	7.7	7.7	10.1	32%	2.2	2.3	6%
South Korea	2.7	3.0	3.2	4.8	52%	1.1	1.3	24%
EU	13.0	12.1	11.7	14.0	20%	3.5	3.0	-14%
Other Europe	2.2	1.9	1.6	2.1	31%	0.3	0.6	82%
Pacific	10.9	14.0	13.3	10.7	-19%	2.6	4.6	80%
South Africa	3.2	2.0	1.8	1.4	-22%	0.4	0.4	-5%
Other Africa/Mauritius	3.4	5.7	4.4	4.8	10%	1.0	1.4	41%
Other	4.5	5.0	6.0	6.7	11%	1.1	1.0	-14%
Total	**160.0**	**188.6**	**213.7**	**236.9**	**11%**	**55.2**	**58.6**	**6%**

Source: DA

Pacific = PNG, New Zealand & Pacific Islands

Other Europe = Eastern Europe and Western Europe other than EU

South East Asia = Indonesia, Singapore, Philippines, Malaysia and Thailand

Australian mutton exports ('000 tonnes swt)

	2011	2012	2013	2014	% change	2014 Q1	2015 Q1	% change
To:								
Middle East	39.5	46.7	40.9	52.8	29%	15.6	15.1	-3%
Greater China	9.2	22.1	71.2	60.5	-15%	18.0	12.0	-34%
- China	5.1	16.4	57.9	50.1	-14%	14.7	10.0	-32%
- Hong Kong	0.5	0.9	6.6	2.4	-64%	1.2	0.2	-83%
- Taiwan	3.6	4.9	6.6	8.1	22%	2.1	1.8	-15%
South East Asia	9.0	11.7	19.0	25.7	35%	6.5	7.1	9%
Japan	4.5	3.2	3.8	5.1	35%	1.3	0.8	-37%
South Korea	1.0	1.0	1.0	1.3	29%	0.4	0.4	3%
North America	6.1	8.1	12.2	17.9	47%	5.3	4.6	-13%
- US	4.5	7.5	8.7	13.3	52%	4.5	3.9	-13%
- Mexico	0.2	0.4	2.9	3.7	28%	0.7	0.5	-20%
- Other North America	1.3	1.3	0.6	1.0	71%	0.2	0.2	14%
EU	3.5	3.7	5.0	4.7	-5%	2.1	1.8	-15%
Other Europe	3.2	4.5	4.7	3.8	-20%	0.1	0.1	12%
Pacific	2.0	1.0	2.5	3.3	34%	0.8	0.7	-18%
South Africa	1.9	1.3	1.2	0.9	-27%	0.1	0.4	243%
Other Africa/Mauritius	1.6	1.6	4.8	2.2	-54%	1.7	1.0	-43%
Other	0.7	1.9	2.6	7.7	195%	1.5	0.7	-56%
Total	**82.2**	**106.7**	**172.0**	**186.0**	**8%**	**53.4**	**44.5**	**-17%**

Source: DA
Pacific = PNG, New Zealand & Pacific Islands
Other North America = Canada and the Caribbean
Other Europe = CIS, Eastern Europe and Western Europe other than EU
South East Asia = Indonesia, Singapore, Philippines, Malaysia and Thailand

Appendix 1 – MLA & AWI wool and sheepmeat survey

Overall, the survey results suggest that seasonal conditions across Australia over the three months to February improved on the same time last year, with 21% of respondents reporting 'above average' conditions, compared to only 10% last year. The proportion reporting drought conditions had also halved year-on-year, down to 11%. Despite these results, water and feed stocks are becoming an increasing concern in the south-eastern states, particularly, and the season ahead will hang in the balance of whether decent autumn and winter rainfall eventuates.

The proportion of producers reportedly intending to increase their ewe flocks in 2015 was 18% higher than year-ago levels, at 24.3% of the total respondents, while 57% of respondents (up 12%) planned to maintain their flock size for the year. Encouragingly, only 10% of respondents are intending to decrease their ewe flock this year – 48% lower than the same time last year.

The survey results suggest that the number of Merino ewes to be joined with Merinos increased 2% year-on-year in the February survey period, at 21.3 million head, while Merino ewes to be joined with other breeds declined 5%, at 9.1 million head. First cross ewe numbers were up 1% in February, at 5.7 million head, while dual purpose breeds registered a 28% decrease, totalling 1 million head. Shedding ewes on hand increased 11% in February, at 1.4 million head, and all other breeds (pure meat, second cross, composite breeds etc) recorded a 17% lift compared to last year, totalling 2.3 million head.

Jed Matz

Chief Executive Officer

Jed represents the council at meetings with federal ministers, senior public servants, international delegates, industry representatives and producer groups.

Some of Jed's key achievements at Cattle Council include: developing and implement a strategic plan for the grassfed beef sector; restructuring Cattle Council's governance and funding structures, including the implementation of direct membership for all Australian beef producers; identifying and negotiating new funding opportunities for the council; negotiation of acceptable welfare standards for land transport of livestock; development and implementation of the Cattle Council Code of Conduct; management of the Australian cattle industries policy response to climate change and the Governments proposed emissions trading scheme.

Jed graduated from the University of Adelaide (Roseworthy) with Bachelor in Agricultural Business majoring in both marketing and international trade, has worked with the Department of Primary Industries and Resources SA, as an English teacher in Japan and with the South Australian Farmers' Federation representing the interests of Sheepmeat, Cattle, Wool, Poultry and Pork Producers.

Australian cattle

Industry projections 2015
Q2 Update

April 2015

KEY POINTS

- 2015 production revised to 8.2 million tonnes
- EYCI averaged 437¢/kg cwt in Q1
- Feeder steers from Darwin 271¢/kg lwt in Q1
- Positive rainfall outlook

KEY 2015 NUMBERS

Slaughter	Production	Beef Exports	Live exports
8.2 (million head)	2.3 (million tonnes cwt)	1.15 (million tonnes swt)	990,000 (head)

* Graphic illustrates year-on-year change

MLA's Market Information – Ben Thomas
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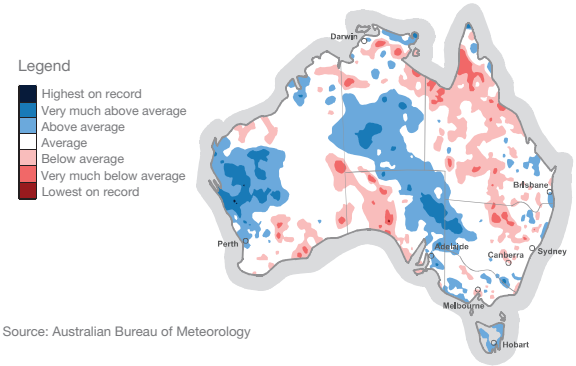
Introduction

Higher than expected first quarter cattle slaughter has resulted in an upward revision for the 2015 total, with the effect rippling out to production and exports over the course of the year. In turn, the impact of tighter supplies on markets will be exacerbated in 2017, when slaughter is tipped to trough, before slowly increasing thereafter.

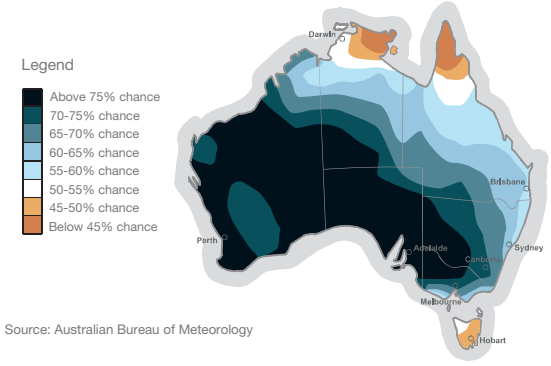
Influencing the second quarter 2015 beef update has been the persistence of dry conditions for most of central Queensland, and the likelihood of restocking interest remaining minimal until the next wet season. However, the rainfall outlook for southern Australia over the June quarter is very positive, which – if coming to fruition – will see the southern markets support cattle prices and alleviate some of the slaughter pressure.

Figure 1 Australian rainfall: 1 January to 31 March 2015



Source: Australian Bureau of Meteorology

Figure 2 Australian rainfall outlook: 1 April to 30 June 2015



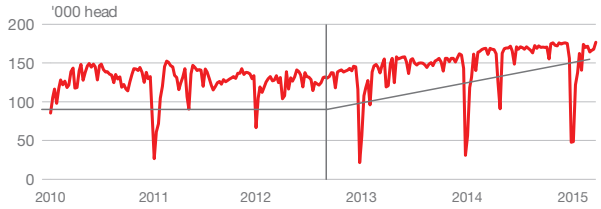
Source: Australian Bureau of Meteorology

Slaughter

Following higher than expected cattle slaughter across the eastern states during the first quarter of 2015, the national adult kill has now been revised up to 8.2 million head. While this is still 11% below last year's three decade high cattle kill, it will make the rare sequence of three consecutive years with greater than 8 million adult cattle killed.

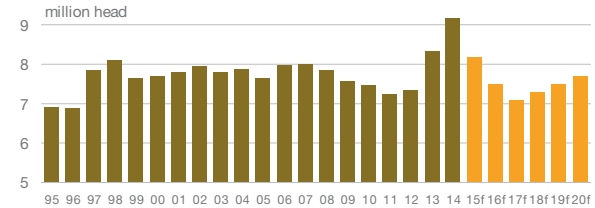
High slaughter is anticipated to continue through the second quarter of 2015, before tapering off as the year progresses – provided average rainfall is received at the beginning of the wet season (at the end of the year). The current and projected high numbers of cattle on feed is expected to support slaughter throughout the year, and reduce the degree of contraction when it eventuates. Looking further out, a 9% year-on-year decline in adult cattle slaughter is anticipated for 2016, to 7.5 million head, before bottoming out in 2017 at 7.1 million head.

Figure 3 Eastern states adult cattle slaughter



Source: NLRS

Figure 4 Australian adult cattle slaughter



Source: ABS, MLA forecasts

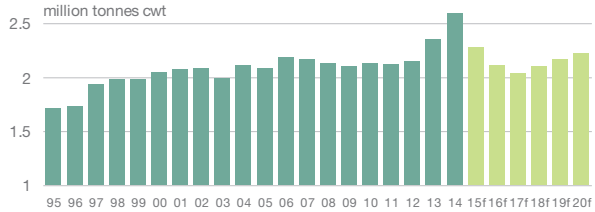
f = forecasts

Production

With slaughter adjusted higher, and carcase weights expected to be steady with last year, Australian beef and veal production is anticipated to be 2.28 million tonnes cwt – back 10% from last year. The projected large number of cattle on feed will act to partially offset the proportion of store cattle slaughtered, which is expected to be significant, especially in northern Australia.

In line with slaughter, the greatest decline in production is likely to be felt in the final quarter of 2015, forming a period of consistently lower year-on-year production throughout 2016 and 2017. Beef and veal production is forecast to reach a low point in 2017, at 2.04 million tonnes cwt, back a further 11% on 2015 volumes – stimulating strong competition for what will be a tight pool of beef.

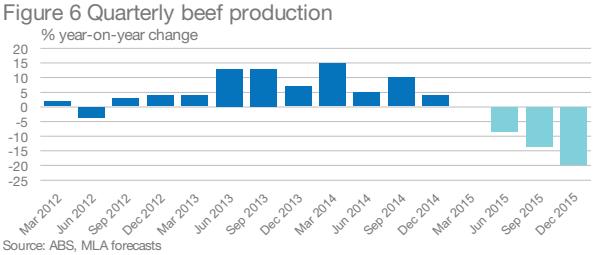
Figure 5 Australian beef and veal production



Source: ABS, MLA forecasts

f = forecasts

Figure 6 Quarterly beef production



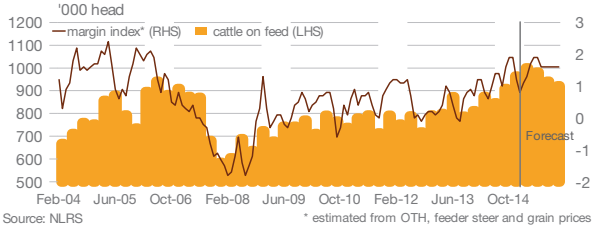
Source: ABS, MLA forecasts

Cattle on feed

While good rain at the start of the year boosted saleyard feeder prices, with the eastern states feeder steer indicator averaging 242¢/kg lwt and 246¢/kg lwt in January and February, respectively, grainfed OTH rates kept pace, pushing further into record territory.

While prices at the other end remain strong, lot feeders have also been encouraged to continue purchasing large numbers in anticipation that supplies will become tight once Australia phases out of drought. In addition, as much of eastern Australia failed to receive above average rainfall in March, feedlots have continued to be utilised as a platform to finish cattle. Hence, looking forward, numbers on feed are expected to be 980,000 head for the March quarter, before slowly easing through to the end of 2015 – yet still remaining at historically high levels.

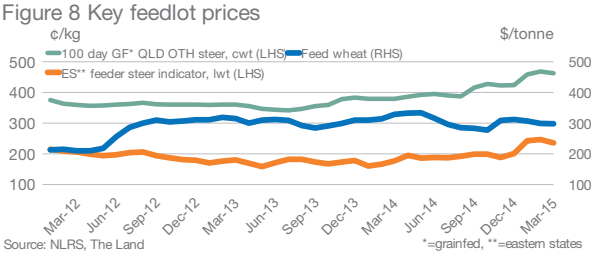
Figure 7 Cattle numbers on feed



Source: NLRS

* estimated from OTH, feeder steer and grain prices

Figure 8 Key feedlot prices



Source: NLRS, The Land

*=grainfed, **=eastern states

Demand outlook

International demand for Australian beef and veal for the remainder of 2015 is set to continue with the same intensity as the first quarter. Exports are forecast to reach 1.15 million tonnes swt, back 11% year-on-year, but still the third consecutive year exceeding one million tonnes swt.

After three months, beef exports are up 8% year-on-year, at 297,055 tonnes swt, with the US comfortably the largest market, accounting for 36% of the total volume, followed by Japan (23%), Korea (12%) and China (9%).

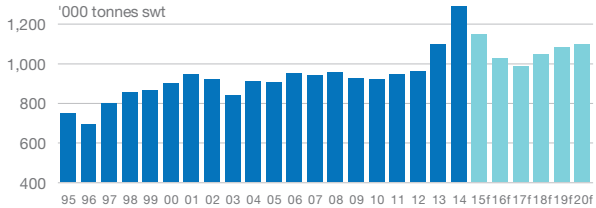
The high volumes of beef, poultry and pork currently in US cold stores seems likely to apply some downward pressure on the US market over the coming quarter. The build has been exacerbated by the slowdown in exports as a result of the west coast port disputes, and this has been compounded by an appreciating US$, very high pork and poultry production and a cold winter.

On the flip side, the US port issues have meant reduced competition from US beef in Japan, with Australian beef exports to the market up 13% during the first quarter, boosted by chilled grainfed product, up 32%, at 35,704 tonnes swt.

Further assisting Australian trade over the first quarter has been the A$ trading below 80US¢, which is expected to continue for the remainder of 2015, and the high export volume will continue to constrain supplies on the domestic market.

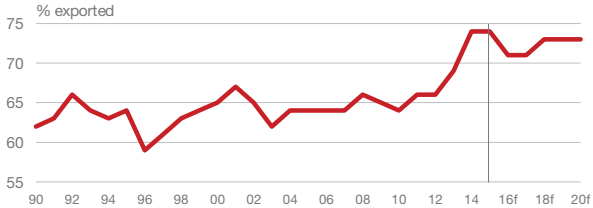
The northern live cattle trade is also likely to be boosted in coming months, following the release of Indonesian import permits for 250,000 feeder cattle in the second quarter. Cattle exports had increased 60,000 head in the first two months of 2015, with Indonesia taking 67,821 head and total shipments at 191,263 head.

Figure 9 Australian beef and veal exports



Source: DA, MLA forecasts
f = forecasts

Figure 10 Beef and veal production exported



Source: ABS, MLA forecasts
f = forecasts

Cattle prices

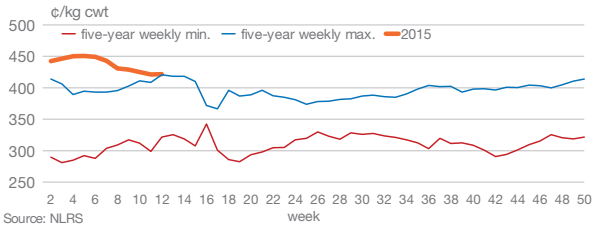
Australian cattle prices started 2015 on a very positive note, with the Eastern Young Cattle Indicator (EYCI) averaging 437¢/kg cwt over the March quarter, the highest quarterly average on record, assisted by particularly strong demand for feeder cattle.

Northern National Livestock Reporting Service (NLRS) reported markets at the beginning of the year had the most significant gains in response to rainfall during January, yet through February and March there was very little follow up, and the 100¢/kg cwt premium over southern markets for EYCI eligible cattle diminished as the quarter progressed.

Similarly, direct-to-works prices across all categories averaged significantly higher year-on-year, with the national heavy steer (300-420 kg cwt) indicator up 25%, at 404¢/kg cwt. Similarly, live export prices were very strong over the first quarter, with feeder steers from Darwin averaging 271¢/kg lwt, while the same category from Townsville averaged 228¢/kg lwt, up 21% and 22% year-on-year, respectively.

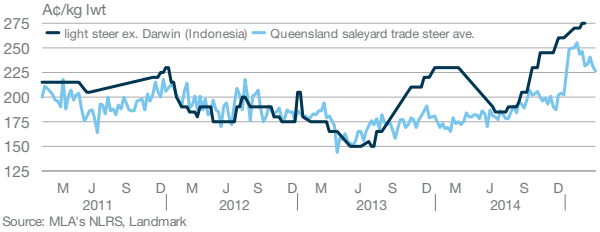
Going forward, the continued strength of the cattle market will depend on whether or not the positive three month rainfall outlook comes to fruition, and the timeliness if it does. The robust international demand fundamentals will remain in play and act as support for cattle prices, but a significant contraction in supplies to processors is needed to sustain substantial support for the market. Northern prices should be underpinned by the large pre-Ramadan shipments of cattle to Indonesia, but considerable uncertainty remains over Indonesian permits for the remainder of the year.

Figure 11 Eastern Young Cattle Indicator



Source: NLRS

Figure 12 Australian saleyard and live export cattle prices



Source: MLA's NLRS, Landmark

Situation and outlook for the Australian cattle industry

	2011	2012	2013	2014	2015f	% change	2016f	2017f	2018f	2019f	2020f	% change 2020f on 2014
Cattle numbers ('000 head)*	**28,506**	**28,418**	**29,291**	**28,456**	*26,800*		*26,500*	*26,600*	*27,100*	*27,500*	*27,900*	*-2%*
percentage change	0.4%	-0.3%	3.1%	-2.9%	*-8.5%*		*-1.1%*	*0.4%*	*1.9%*	*1.5%*	*1.5%*	
Slaughterings ('000 head)												
cattle	7,261	7,352	8,360	9,226	*8,200*	*-11.1%*	*7,500*	*7,100*	*7,300*	*7,500*	*7,700*	*-17%*
calves	682	625	690	688	*630*	*-8.4%*	*630*	*625*	*640*	*680*	*700*	*2%*
total	8,046	7,977	9,110	9,914	*8,830*	*-10.9%*	*8,130*	*7,725*	*7,940*	*8,180*	*8,400*	*-15%*
Avg carcase weight (kg)												
cattle	287.3	287.5	278.0	276.8	*276.0*	*-0.3%*	*278.0*	*282.0*	*283.0*	*284.0*	*284.0*	*3%*
calves	62.8	68.0	65.0	60.0	*60.0*	*0.0%*	*60.0*	*60.0*	*60.0*	*60.0*	*60.0*	*0%*
Production ('000 tonnes carcase weight)												
beef	2,086	2,114	2,324	2,554	*2,263*	*-11.4%*	*2,085*	*2,002*	*2,066*	*2,130*	*2,187*	*-14%*
veal	42.8	42.5	44.9	41.4	*37.8*	*-8.7%*	*37.8*	*37.5*	*38.4*	*40.8*	*42.0*	*1%*
total beef and veal	2,129	2,156	2,369	2,595	*2,301*	*-11.3%*	*2,123*	*2,040*	*2,104*	*2,171*	*2,229*	*-14%*
Cattle exports ('000 head)	695	619	850	1,294	*990*	*-23%*	*900*	*890*	*900*	*925*	*950*	*-27%*
Beef exports ('000 tonnes)**												
total, carcase weight	1,424	1,446	1,649	1,935	*1,696*	*-12.3%*	*1,514*	*1,455*	*1,544*	*1,595*	*1,617*	*-16%*
total, shipped weight	949.2	963.8	1,099.8	1,290	*1,150*	*-10.9%*	*1,030*	*990*	*1,050*	*1,085*	*1,100*	*-15%*
Domestic utilisation ('000 tonnes c/c weight)***												
imports	5.1	3.8	2.4	2.9	*3.0*	*3.4%*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3%*
total, carcase weight	705	706	709	660	*610*	*-8.0%*	*609*	*584*	*561*	*575*	*612*	*-7%*
kg/head****	31.5	31.1	30.8	28.2	*25.7*	*-9.0%*	*25.3*	*23.9*	*22.6*	*22.9*	*23.9*	*-15%*

Source: ABS, DA, MLA forecasts

f = forecast (in italics)

* As at 30 June, 2012 is an MLA estimate
** excl. canned/misc, shipped weight
*** Beef and veal production plus imports, less exports of beef and veal and canned/processed beef, carcase weight
**** kg/head consumption calculated from total carcase weight divided by Australian population

Australian beef and veal exports ('000 tonne swt)

	2011	2012	2013	2014	% change 2014 on 2013	2014 Q1	2015 Q1	% change
To:								
Japan	342.2	308.5	288.8	293.8	2%	60.3	67.9	13%
US	167.8	224.1	212.7	397.9	87%	67.6	105.7	56%
Korea	146.4	126.0	144.4	150.9	5%	35.3	34.3	-3%
China	7.8	32.9	154.8	124.6	-20%	37.3	27.2	-27%
Canada	10.1	15.7	17.9	32.9	84%	8.0	10.6	33%
Taiwan	36.7	38.3	35.7	36.4	2%	8.8	5.8	-34%
Indonesia	39.6	27.1	39.4	53.1	35%	13.1	9.1	-30%
Philippines	21.0	25.7	27.0	34.4	27%	7.5	4.6	-38%
Singapore	9.7	14.1	10.6	10.1	-4%	2.5	2.3	-8%
Malaysia	14.4	15.5	15.9	13.1	-18%	4.0	3.1	-21%
Thailand	2.5	2.8	4.3	5.4	27%	1.4	1.4	-1%
Hong Kong	8.9	6.3	5.1	14.7	191%	1.1	1.8	66%
EU	12.8	14.9	19.8	24.6	24%	5.5	5.0	-10%
Middle East	32.1	31.4	61.0	59.8	-2%	14.4	12.6	-12%
Other	97.2	80.4	62.1	35.2	-43%	9.1	5.6	-38%
Total	**949.2**	**963.8**	**1099.5**	**1287.0**	**17%**	**275.8**	**297.1**	**8%**

Source: DA

Main countries in other = PNG, South Africa, Central and South America, Russia
Eastern Europe & CIS includes Poland

James Rose

James Rose is the Managing Director of Skretting Australia with responsibility for the Australian and New Zealand markets. Skretting is the leading supplier of aquaculture feeds in the region.

Skretting is a global feed producer with manufacturing in every major aquaculture region around the world and is a business unit of Nutreco.

James has been with Skretting for 15 years with 10 years in his current role. He is part of the management team for the Skretting Business Unit and has had roles in the global sustainability and production teams. Prior to joining Skretting James worked in operational management, technical development and sales and quality management roles in the manufacturing sector.

Current and Emerging Trends in Meat Production: Aquaculture.

James Rose, Managing Director, Skretting Australia

ARA Symposium, July 2015

According to FAO reports, world per capita fish consumption increased from approximately 9.9 kg in the 1960s to 19.2 kg per capita in 2012.

This has been driven by a combination of population growth, rising incomes and urbanization, and facilitated by the strong expansion of fish production and more efficient distribution channels.

The world's marine fisheries expanded continuously to a production peak of 86.4 million tonnes in 1996 but have since exhibited a general declining trend.

The fraction of assessed stocks fished within biologically sustainable levels has exhibited a decreasing trend, declining from 90 percent in 1974 to 71.2 percent in 2011.

Thus, in 2011, close to 30 percent of fish stocks were estimated as fished at a biologically unsustainable level and therefore overfished. Additionally, a further 50% of fish stocks were at maximum sustainable exploitation levels; supply of capture fish is stable at best.

There has been a continued increase in the efficiency of use of capture fishery product with increasing use of by-catch, better use of trimmings and an increasing use of traditional reduction fishery product directly into the human food chain. Despite this these improvements there is a limit and further improvements will not solve the need for greater seafood availability.

In general, people in developing countries and especially those in coastal areas are much more dependent on fish as a staple food than those in the developed world. About 1 billion people largely in developing countries rely on fish as their primary animal protein source. In 2010, fish provided more than 2.9 billion people with almost 20% of their intake of animal protein, and 4.3 billion people with about 15 % of such protein (FAO).

Whilst capture production has been stable in the past two decades, there has been significant growth coming from aquaculture. 2014 was a landmark year when human consumption of farmed fish surpasses that of wild fish. (FAO).

Given the fast growing world population, especially in Asia with a relative high fish protein diet, the future of aquaculture needs to be about accelerated growth and sustainability. It was Kofi Annan who put the challenge to the aquaculture industry as "I do not ask you to change direction, but I ask you to accelerate progress. We need to work together if we are to overcome world hunger."

According to the FAO report, The State of World Fisheries and Aquaculture - 2014, global fish production has grown steadily in the last five decades, with food fish supply increasing at an average annual rate of 3.2 percent, outpacing world population growth at 1.6 percent..

Between 1980 and 2012, world aquaculture production volume increased at an average rate of 8.6 percent per year. World food fish aquaculture production more than doubled from 32.4 million tonnes in 2000 to 66.6 million tonnes in 2012.

Average annual growth rate in aquaculture production in the last decade has been 5.9 percent. There is debate about future growth rates for the coming decade with lower estimates of 2.54 percent per year to a more optimistic growth rate of 4.14 percent per year. It should be noted that even the lower estimate would see higher per capita seafood availability realised.

There are a small number of key species that will drive future demand for rendered raw materials.

In 2010 the Atlantic salmon industry produced approximately 1.7 million tonnes. It has been growing strongly and is forecast to continue this trend with cumulative annual growth rates (CAGR)

greater than 6 percent for the decade. This will see total production of 2.8 million tonnes by 2020. Shrimp production, at 4.1 million tonnes in 2010 will have 5% growth to achieve 6.5 million tonnes in 2020.

Tilapia production will see very strong 9% CAGR and grow from 3.4 to 8.0 million tonnes by 2020. Emerging Amazon species are forecast to achieve even higher growth rates of 18 percent and from a smaller base will achieve 1 million tonnes. Asian species are forecast to achieve more moderate, but still substantial, 4% growth and will be a 1.5 million tonne industry by 2020.

Atlantic salmon, shrimp and carnivorous developing species offer very significant on-going and developing opportunity for rendered animal proteins: a cumulative raw material demand of over 15 million tonnes by 2020.

In recent years aquaculture has achieved significant improvements in its sustainability position and performance.

Sustainable aquaculture is dependent on a number of key success factors: highly skilled fish farmers and good farm management; co-operation between industry, authorities, research institutes and community; a sound regulatory framework; leveraging technology and knowledge developed for more advanced species to other species and geographies; industry investment and industry responsibility.

An excellent example of how these factors can come together in a really positive way has been the development of the Aquaculture Stewardship Council (ASC). Founded in 2010, it is an independent not for profit organisation, that has developed a certification and labelling programme for responsibly farmed seafood. ASC's primary role is to manage the global standards for responsible aquaculture, which were developed by the WWF Aquaculture Dialogues. Skretting has been a leading member of ASC since its inception.

In response to the need, and value, that can come through improved sustainability the global salmon industry came together to form the Global Salmon Initiative (GSI). This is a leadership initiative by global farmed salmon value chain, focused on making significant progress towards fully realising a shared goal of providing a highly sustainable source of healthy protein to feed a growing population, while minimizing our environmental footprint, and continuing to improve our social contribution. The GSI members, representing over 60% of total production, have committed to achieving ASC certification for all their operations by 2020.

In Australia, seafood represents only 10 percent of retail protein revenue share. Of that salmon makes up 25% of sales. And yet the Tasmanian salmon industry has grown strongly. It was in June 1985, just 30 years ago, that the first small run of fingerlings was put to sea. Today the industry harvests over 50,000 tonnes and per capita salmon consumption has risen to European levels at approximately 2.5kg per capita per annum. There is still considerable growth opportunity for salmon and the industry continues to make significant investment in new hatcheries, farm sites and processing capacity.

This offers the Australian rendering industry a valuable domestic market for its products.

In Australia there is a shining example of how to take on sustainability for both the good of the environment and to develop a robust business that is delivering for its shareholders and community.

Tassal, Australia largest salmon producer, partnered with WWF Australia and was supported by Skretting to develop robust sustainability management in its business based on the ASC framework. This has seen them achieve significant sustainability improvements as well as providing a level of transparency and engagement that is second to none. In 2014 Tassal became the first company in the world to have all of its production sites achieve ASC certification: a truly great achievement.

Over the past 3 years marine raw material inclusion have been reduced from approximately 27 average to less than 21 percent. Rendered raw materials have varied between 40-48 percent, with a

downward trend due to the need to increase the energy density of the feeds being used. From a protein point of view rendered materials remain very important raw materials. In 2015 many salmon feeds have as little as 5 percent fishmeal inclusion and we are very close to being able to eliminate its use in aquaculture feeds entirely. Future use will soon be a choice based on specific need, availability or price rather than on necessity.

A limiting factor in the growth of aquaculture is now the availability of fish oil. Fish oil is currently the major source of long chain omega 3 fatty acids that are both necessary for fish performance and that deliver the health benefits of seafood consumption to people. Significant investment is currently being undertaken to develop commercial scale production of algae derived oils. With in the next few years there will be commercially available fish feeds made with algal oils and it is likely that with in 5 years they will be widely available.

Without dependency on fishmeal of fish oil there will be great flexibility in the selection of raw materials. Rendered materials can have a very strong place in this market and there is ample opportunity for value adding current products. This could be in the form of selected meals that have higher protein levels, lower ash levels or refined processing to increase digestibility.

In conclusion, aquaculture is positioned to deliver strong and necessary growth. This growth is an imperative if we are to meet the increasing demand for food due to rising global population and demand for increased meat in people's diet. In the past aquaculture has been reliant on capture fisheries for a substantial part of its feed raw material requirements. There has been significant learning and development over recent years and we are now within reach of completely breaking the need for fishmeal and oil in the feed for our industry. Future use will be a choice rather than a necessity. There are aquaculture companies around the world that are embracing the challenge set by Koffi Annan including Australia's leading producers. The growth of the industry will open up long term opportunity for rendered raw material producers. Increasing knowledge of nutrition, the development of commercially available raw material alternatives and a greater focus on sustainability can only increase these opportunities.

Consumer Driven Trends in Pet Food

Michelle Lang

Michelle Lang

Michelle is the Regulatory Affairs Manager for Asia, Oceania and the Africa Region at Nestlé Purina Pet Care. She has also been the Vice President of the Pet Food Association of Australia for the last 2 and a half years and chairs the Technical Committee.

Michelle has worked for NPP for the last 6 and a half years working in product development at the Blayney factory and regulatory affairs for the Australian market.

Michelle has a Bachelor of Science degree in Chemistry from Macquarie University.

She has participated on the board for the Australian Companion Animal Council and was a member of the Companion Animal Working Group for the government's Australian Animal Welfare Strategy.

Michelle was also a member of the Australian Standard for Pet Food Manufacture and Marketing Committee in 2011 and is in charge of its current review.

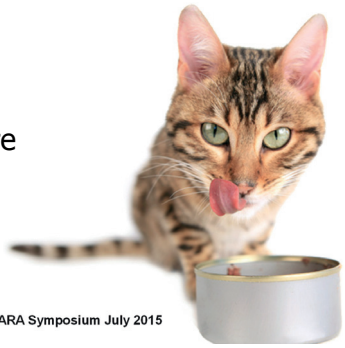
Pet Food Industry Assoc. of Australia

Emerging Pet Food Trends

Michelle Lang

Nestlé Purina Pet Care

PFIAA Vice President



PFIAA ARA Symposium July 2015

Facts About the Pet Food Industry

PFIAA Membership	64 Members	24 Manufacturers 10 Marketing 30 Allied	= ~ 98%* of the industry *excluding 'pet meat'

Pet Food industry is self regulated to the Australian Standard AS5812, issued in 2011

21 manufacturers accredited to the standard

Standard is now under first review

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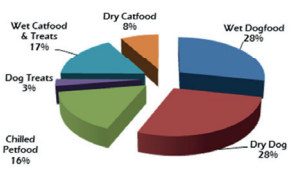
Market Data

PFIAA Market Report January to December 2013

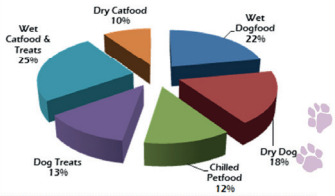
Total Grocery Channel – Australia (Tonnes)			Total Grocery Channel – Australia (Dollars(000))		
Category	MAT to Jan 14	% Growth YA	Category	MAT to Jan 14	% Growth YA
Wet Dogfood	108,879	-0.6	Wet Dogfood	364,520	1.7
Dry Dog	107,985	0.9	Dry Dog	301,779	3.4
Chilled Petfood	62,591	-3.6	Chilled Petfood	202,637	0.5
Dog Treats	10,091	4.5	Dog Treats	207,475	7.2
Wet Catfood & Treats	64,625	-3.6	Wet Catfood & Treats	417,054	1.4
Dry Catfood	31,172	-0.9	Dry Catfood	156,847	1.6
Total	**385,343**	**-3.3**	**Total**	**1,650,312**	**15.8**

Source: Symovate Aztec

Retail Petfood Sales by Volume T 12 months to December 2013



Retail Petfood Sales by Value $ 12 months to December 2013



Source : ABS

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Government and Industry Relations

Development of PetFAST reporting tool

Dept. of Ag and APVMA, deregulation of therapeutic pet food = ↓$ and ↓ time to implement innovation.

RSPCA, Animal Welfare Groups and formerly the Australian Companion Animal Council

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Government and Industry Relations

Australian Veterinary Association liaison committee … Pet Food related issues

Department of Ag Biologicals consultative Committee…Import issues forum

Export standards Branch - agree standard poultry attestations

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Prepared Pet food

Pet owners are connected to their pets, they are 100% part of the family

Owners are conscious of product quality:

- Odour
- Visual cosmetic
- Packaging
- Key attributes of the food
- Food acceptance

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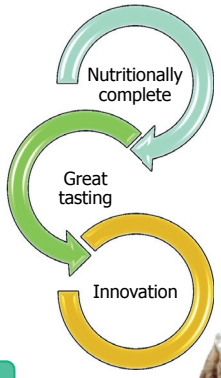
Prepared Pet food



Different formats : Dry, wet/retorted, Chilled, treats

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With such a **HUGE** variety of pet foods available how do they choose?

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Prepared Pet food Trends

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Opportunity for Rendered Products

Greater focus on meat and meat derived ingredients

Need to reduce sources of contamination – plastics entering food chain

In the interests of both ingredient suppliers and finished product manufacturers to look at food safe alternatives

Source : ABS

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Questions?

Source : ABS

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Processed Animal Protein Digestibility and its Impact in Aquaculture Diets

Dr Richard Smullen

Dr Richard Smullen

Group Technical and R&D Manager | Ridley AgriProducts Pty Ltd

Richard has been in the aquaculture industry for over 15 years. After completing his PhD at the Gatty Marine Laboratory, St Andrews University, Scotland, he became a post-doctoral researcher and lecturer at The Institute of Aquaculture, Stirling University.

After leaving the academic environment Richard worked for BioMar in Scotland as the Technical and Product Development Manager. Since October 2003, Richard has been the Technical Manager at Ridley Aqua Feed and has been responsible for R&D and Innovation in the business for over 10 years. He has recently been made Group Technical and R&D Manager where his responsibilities have been expanded to cover other sectors across Ridley. He is currently focussing on the development of high value proteins and oils from rendered products.

Processed Animal Protein Digestibility and its Impact in Aquaculture Diets

Dr Richard Smullen

Group Technical and R&D Manager

Ridley

July 2015

CSF Proteins Melbourne Camilleri Stockfeeds Bartlett

WHO ARE RIDLEY AQUA-FEED

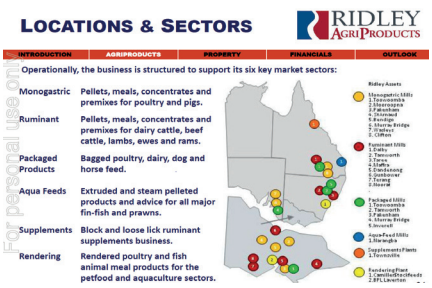
- Ridley Group - Largest Australian commercial provider of high performance animal nutrition solutions – 1.8mt
- Value proposition: close collaboration with farms to meet unique requirements
- Assured Quality:
  - Certified to ISO 9001:2000
  - Fully integrated HACCP system
  - GlobalGap accredited
- Rendered animal products

CSF Proteins Melbourne

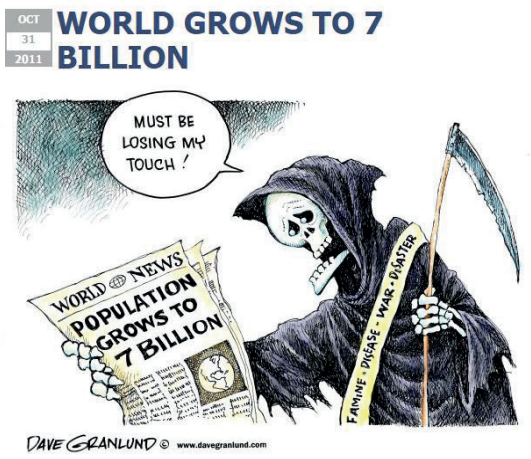
Camilleri Stockfeeds

Bartlett

GLOBALG.A.P.
The Global Partnership for Good Agricultural Practice



What's Driving the Growth of Aquaculture



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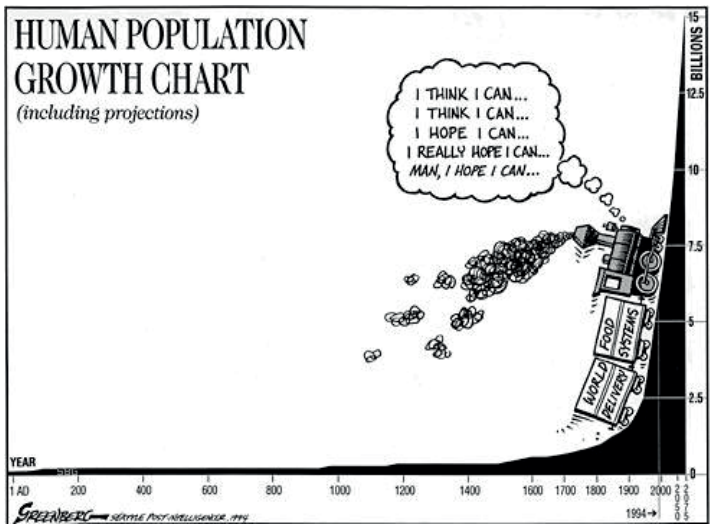

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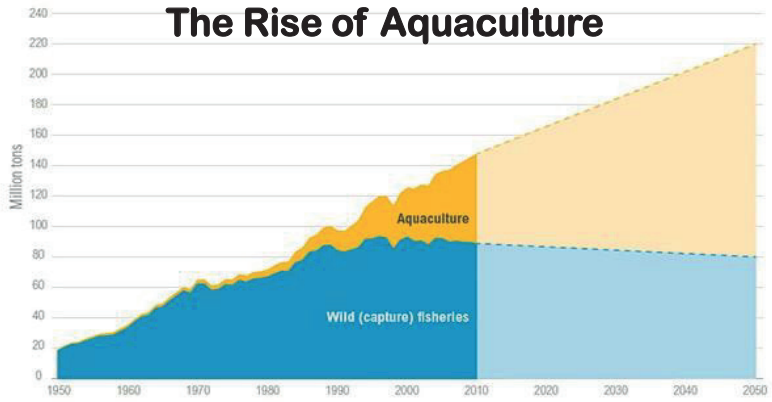
Aquaculture Is Expanding to Meet World Fish Demand



Source: Historical data 1950–2010: FAO. 2014. "FishStatJ." Rome: FAO. Projections 2011–2050: Calculated at WRI, assumes 10 percent reduction in wild fish catch between 2010 and 2050, and linear growth of aquaculture production at an additional 2 million tons per year between 2010 and 2050.

See www.wri.org/publication/improving-aquaculture for full paper.

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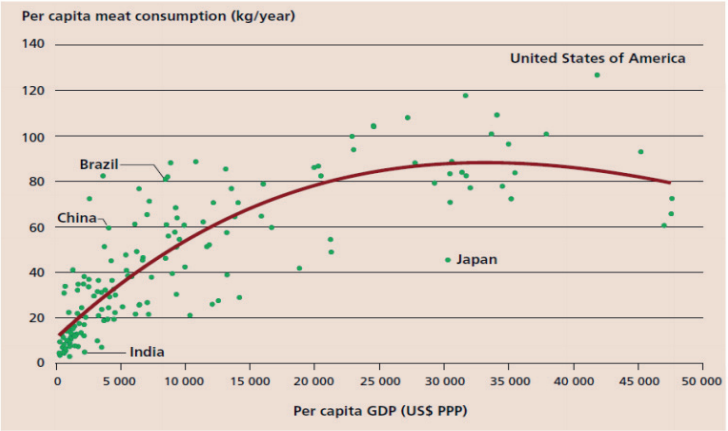
Meat Consumption

9 billion x 80kg = 720,000,000 tonnes of meat EACH YEAR



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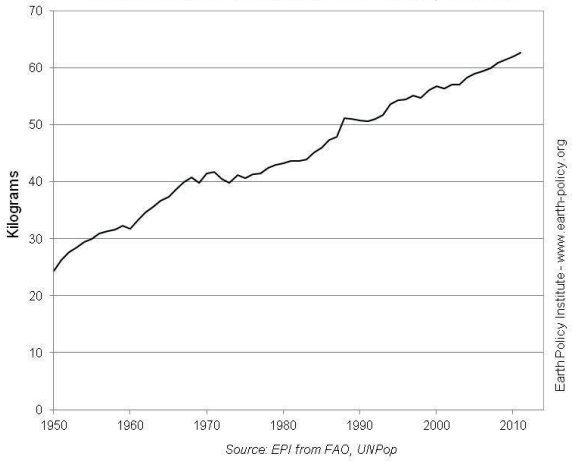
World Meat and Fish Production Per Person, 1950-2011



Source: EPI from FAO, UNPop

CSF Proteins Melbourne Bartlett

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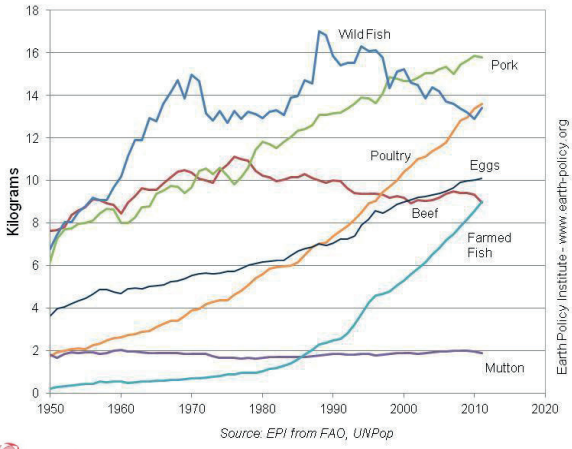
World Animal Protein Production Per Person by Type, 1950-2011



Source: EPI from FAO, UNPop

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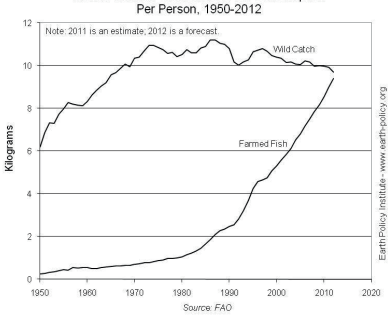
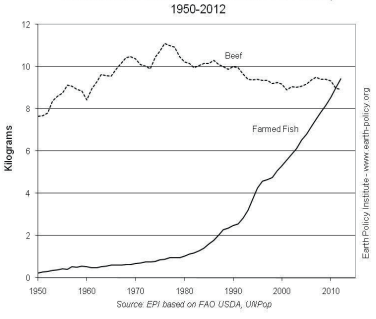
Growth of Aquaculture

World Wild Fish and Farmed Fish Consumption Per Person, 1950-2012



Source: FAO

World Farmed Fish and Beef Production Per Person, 1950-2012



Source: EPI based on FAO, USDA, UNPop

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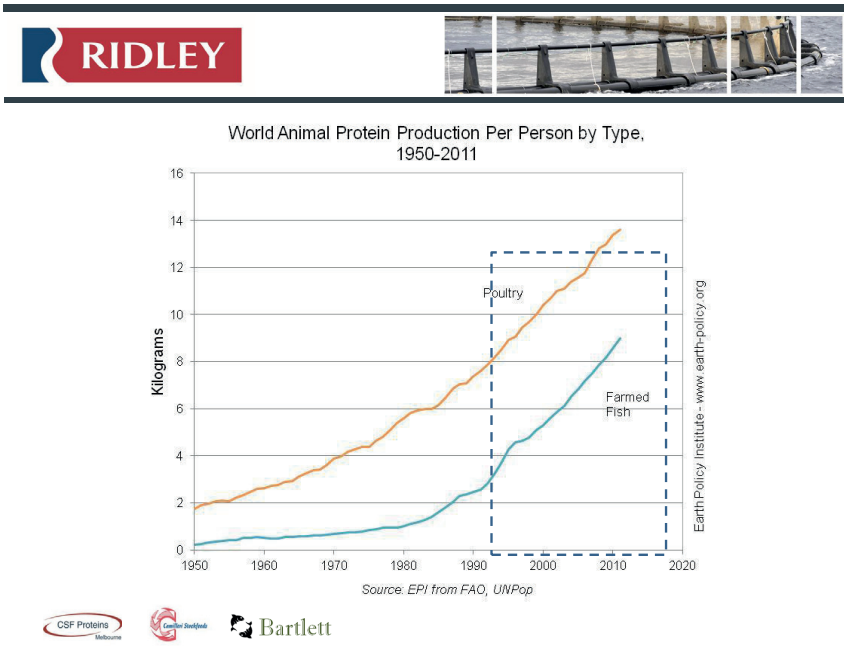
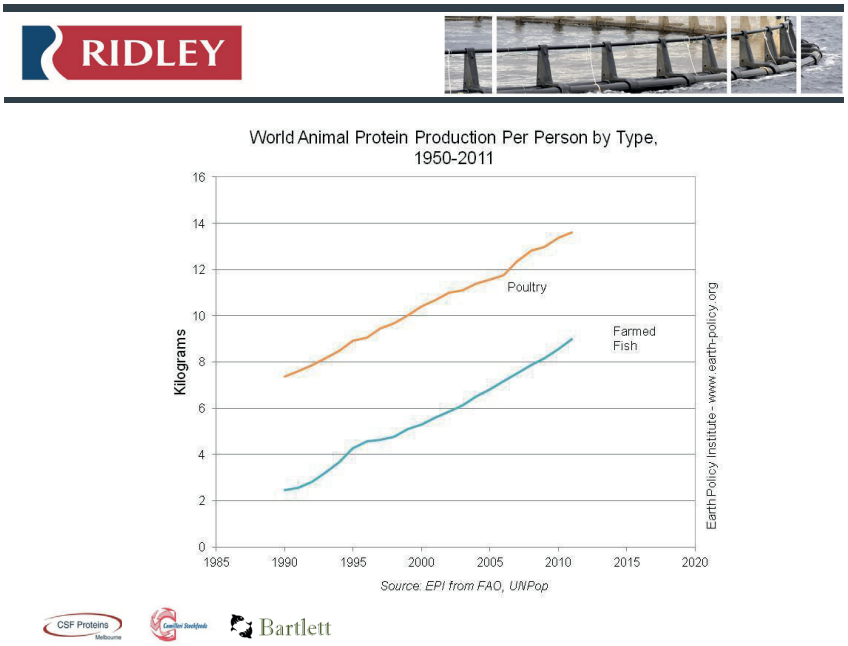

RIDLEY
World Animal Protein Production Per Person by Type, 1950-2011
Kilograms
Poultry
Farmed Fish
Earth Policy Institute - www.earth-policy.org
Source: EPI from FAO, UNPop
CSF Proteins
Bartlett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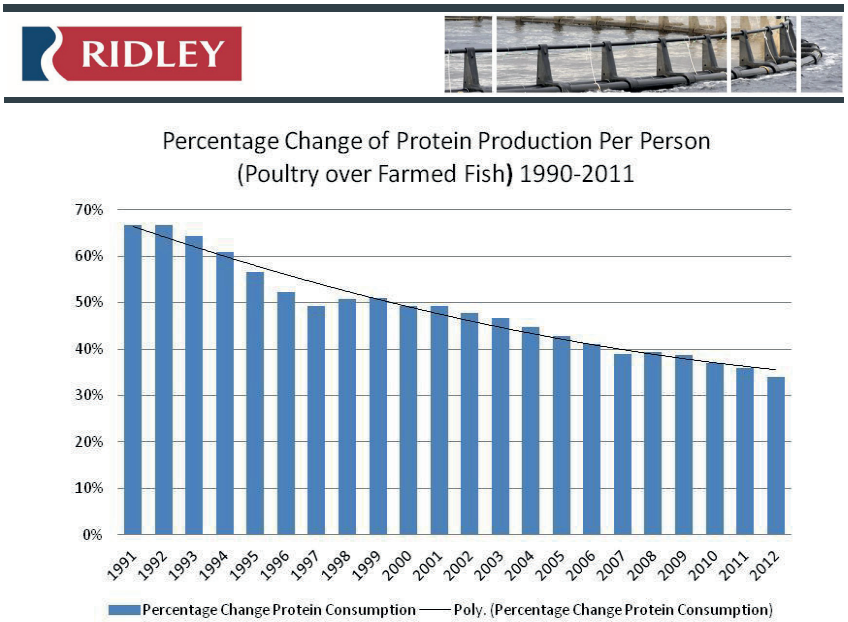
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Percentage Change of Protein Production Per Person
(Poultry over Farmed Fish) 1990-2011
Percentage Change Protein Consumption
Poly. (Percentage Change Protein Consumption)

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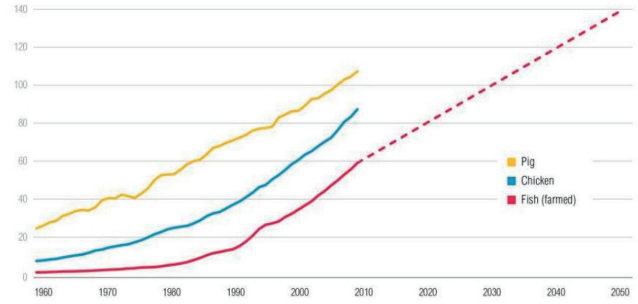
Aquaculture production must more than double by 2050 to satisfy projected fish demand

Million tons



Sources: Production data 1961–2010: FAO (2014a), FAO (2014b). Aquaculture production projections 2011–2050: Authors' calculations assuming a linear growth rate of 2 Mt per year.

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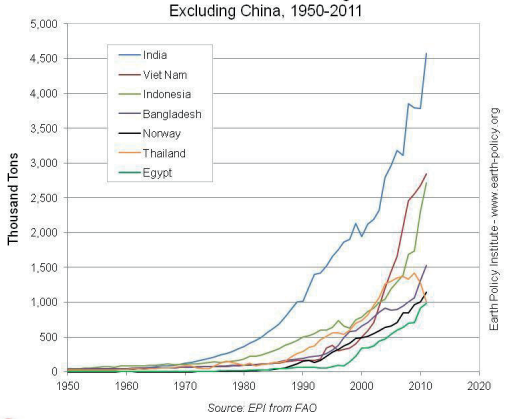
Where is This Happening

Farmed Fish Production in Leading Countries Excluding China, 1950-2011



Source: EPI from FAO

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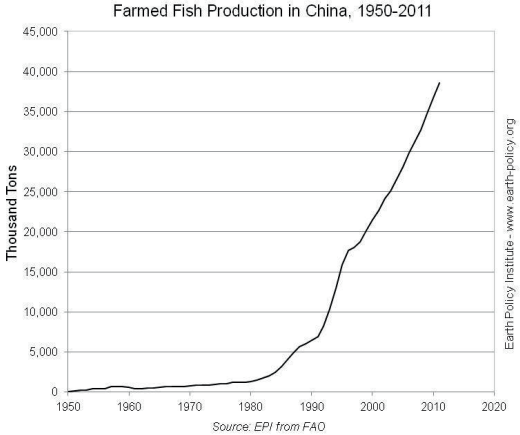
Where is This Happening

Farmed Fish Production in China, 1950-2011



Source: EPI from FAO

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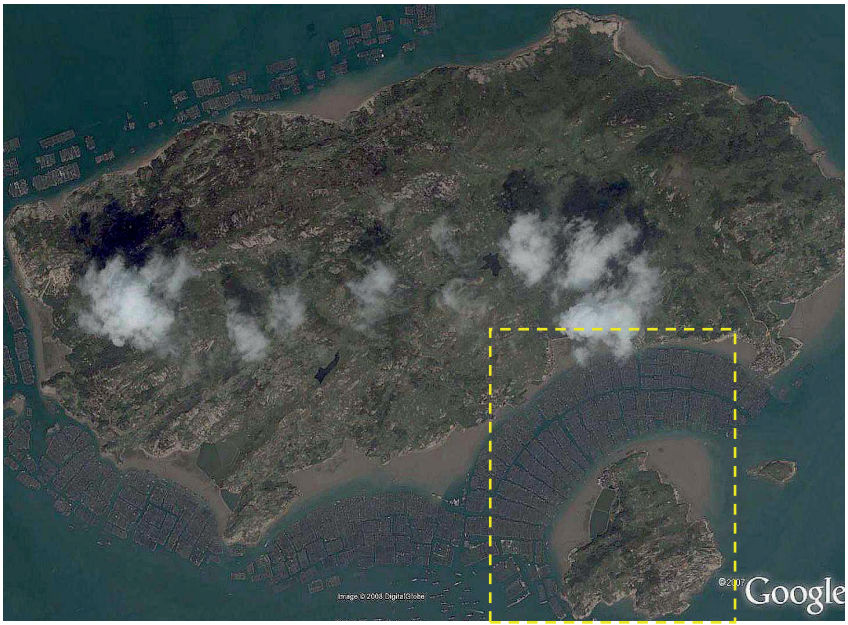

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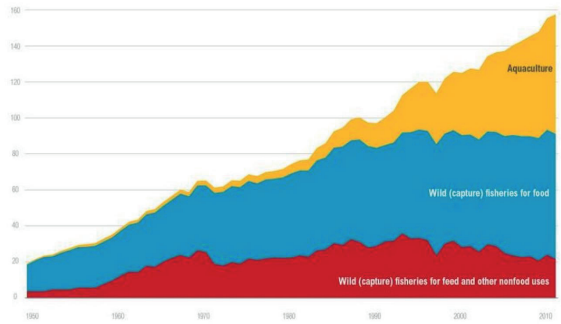
Aquaculture has emerged to meet fish demand

Million tons



Sources: FAO (2012a), FAO (2012b), FAO (2013), FAO (2014).

WORLD RESOURCES INSTITUTE

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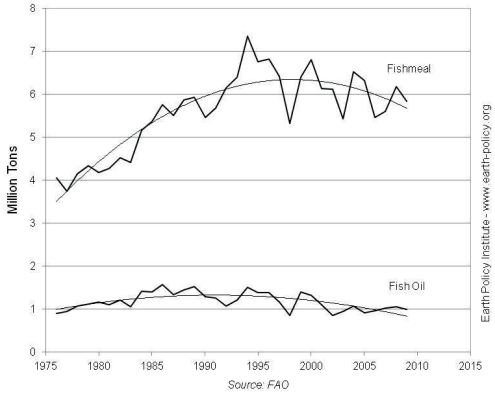
Fishmeal and Fish oil Production

World Production of Fishmeal and Fish Oil, 1976-2009



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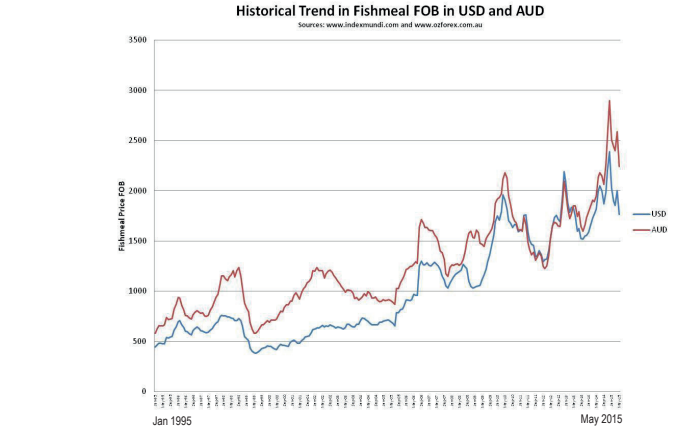
Commodity Price Variability



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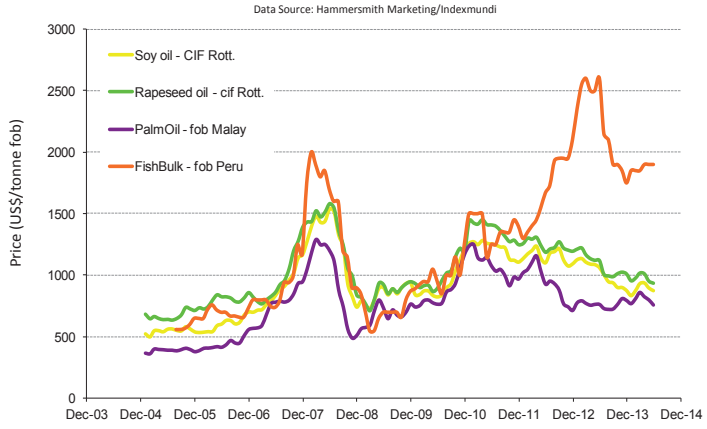
Commodity Price Variability



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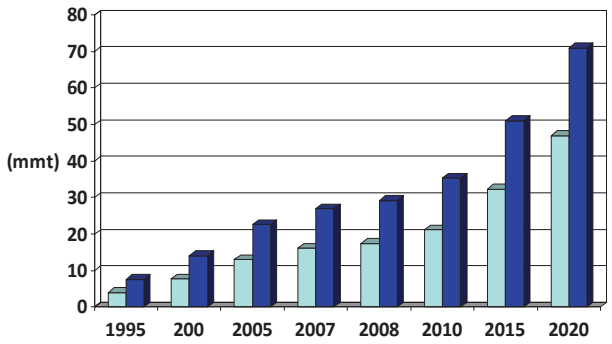
Global compound aquafeed predictions to 2020

Based on species EFCR note: production of fed species



Head of Fisheries
Qingdao, 2009

From 1991 to 2007, China aquafeed production increased from 750,000 mt to 13.26 million mt, 17.7 times, accounting for 56.1% of the world's total production

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Feedstuff shortage is a long-term challenge for China feed industry

	mmt	% (of feed)
Soyabean meal	27.4	63.8
Canola meal	7.7	18
Cottonseed	4.6	10.8
Peanut meal	2.45	5.7
Other plant	0.73	1.7
Fish meal	1.3	3
Total	44.18	

150%

ESTIMATED INCREASE TO 110 MILLION TONNES – 2030
44 MILLION TONNES – 2006/7

Data of main protein sources in aquafeed 2006/7

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PAP Can Play an Important Role in the Development of Aquaculture Feeds

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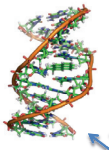
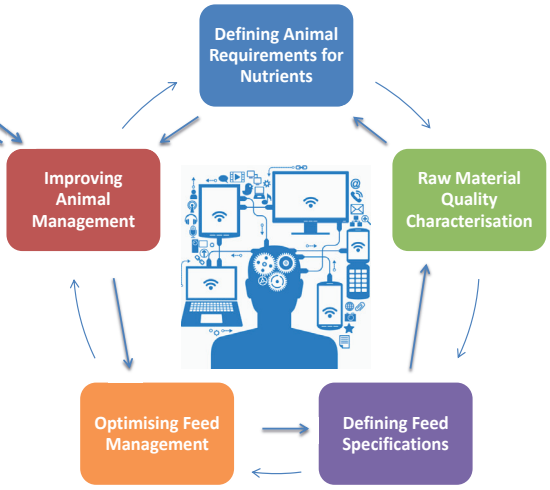
Feed Development Cycle





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Fundamental Principle - 1

Nutrition is Biochemistry

All nutrition is governed by the laws of physics

THERE ARE NO MAGIC INGREDIENTS !!!

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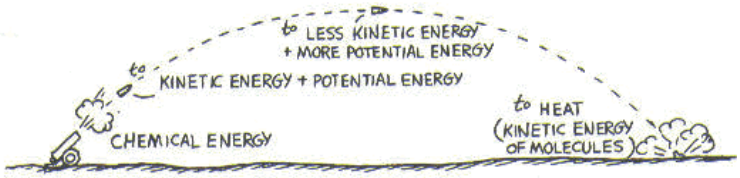
Fundamental Principle - 2



Energy Cannot Be Created or Destroyed
(It just changes forms)

Conservation of energy :
First Law of Thermodynamics

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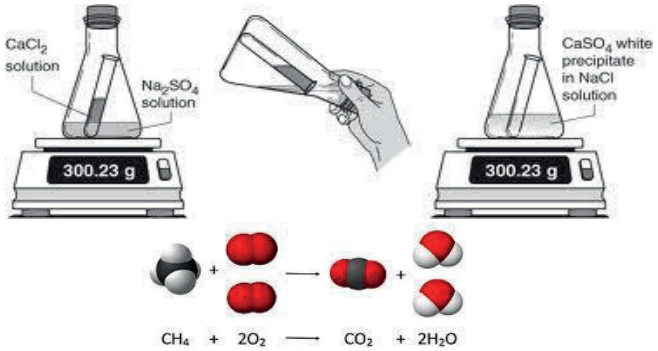
Fundamental Principle - 3



Law of conservation of mass

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Fundamental Principle - 4

Leibig's Law of the Minimum

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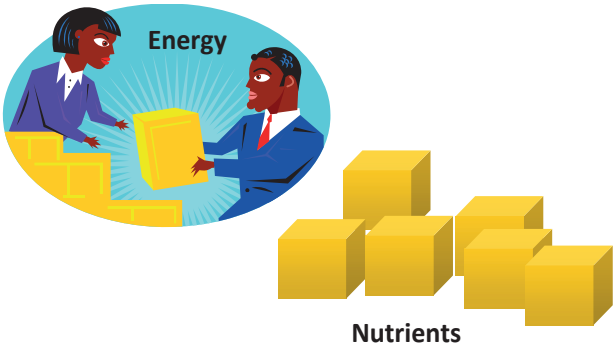
Fundamental Principle - 5



Use of nutrients depends on energy

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Essential dietary nutrient requirements

Energy - E	Protein - CP	Water – H_2O

Arg	His	Iso	Leu	Lys	Met	Phe	Thr	Try	Val

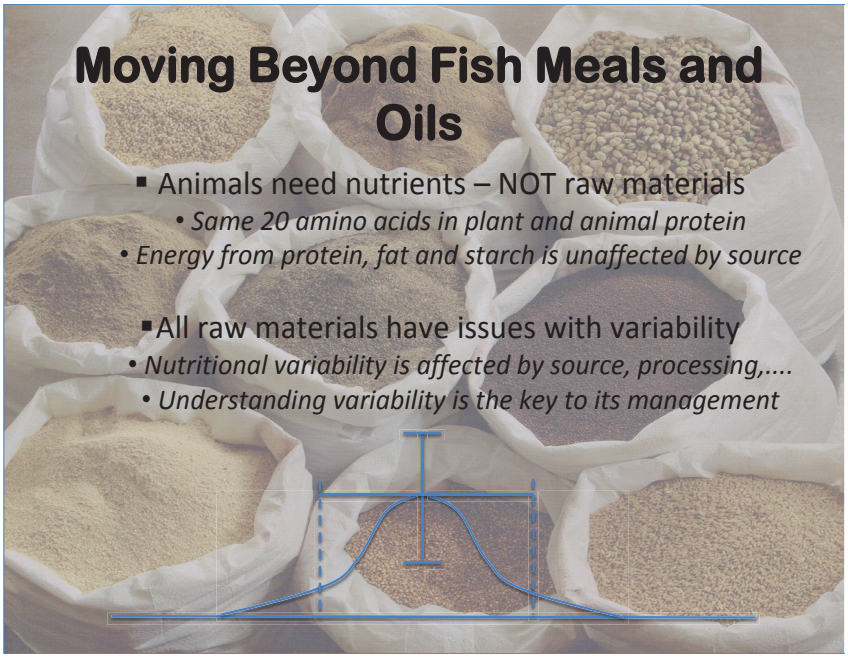
18:2n-6	18:3n-3	20:4n-6	20:5n-3	22:6n-3	Sterols	Phospholipids

Ca	Mg	P	K	Na	Cu	I	Fe	Mn	Se	Zn

A	D	E	K	B_1	B_2	B_6	Pa	Ni	Bio

B_{12}	Fo	Ch	In	C

40 + essential nutrient requirements – not ingredient requirement



Lots of R&D on rendered meals

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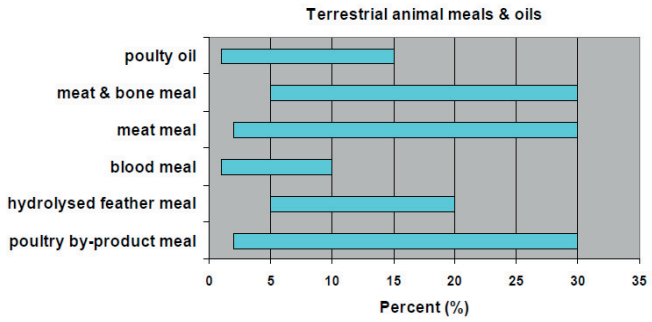
Typical Ranges of PAP and Oils in Aquaculture Feeds



Source: FAO State of the Worlds Fisheries & Aquaculture 2012; page 179

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Predicting Raw Material Quality

Aquaculture Nutrition

doi: 10.1111/anu.12137 *Aquaculture Nutrition* 2015 **21**; 54–62

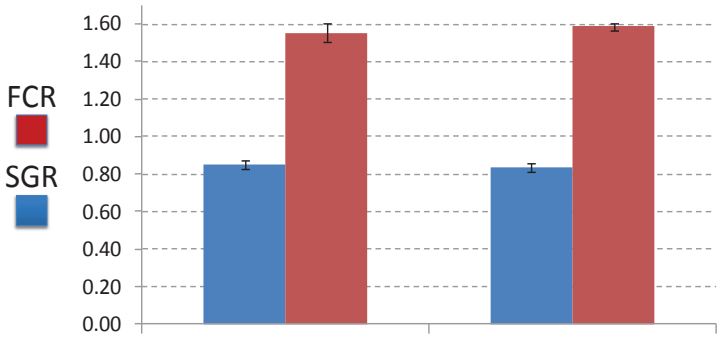
Using Near Infrared Reflectance Spectroscopy (NIRS) to predict the protein and energy digestibility of lupin kernel meals when fed to rainbow trout, *Oncorhynchus mykiss*

B. GLENCROSS[1,2], N. BOURNE[1], W. HAWKINS[2,3], M. KAROPOULOS[2,3], D. EVANS[2,4], N. RUTHERFORD[2,4], P. MCCAFFERTY[2,5], K. DODS[2,5], P. BURRIDGE[2,3], C. VEITCH[2,3], S. SIPSAS[2,3], B. BUIRCHELL[2,3] & M. SWEETINGHAM[2,3]

[1] *Division of Marine and Atmospheric Research, CSIRO Food Futures Flagship, Cleveland, Qld, Australia;* [2] *Aquaculture Feed Grains Program, Centre for Legumes in Mediterranean Agriculture (CLIMA), University of Western Australia, Crawley, WA, Australia;* [3] *Department of Agriculture – Government of Western Australia, South Perth, WA, Australia;* [4] *Department of Fisheries – Research Division, DoFWA, North Beach, WA, Australia;* [5] *Chemistry Centre of Western Australia, East Perth, WA, Australia*

Zero Fishmeal Salmon Diets

2014-2015 : Commercial cages – Commercial diets in Australia



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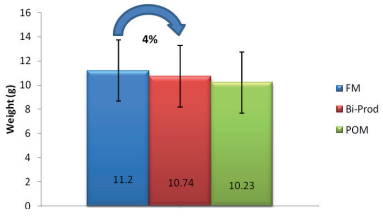
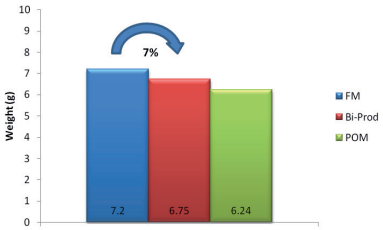
Replacement of Capture Fisheries – *P. monodon*

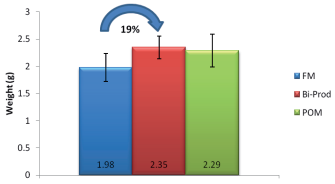
***P. monodon* End Weight Data - Fishmeal Replacement**



Weight gain - Fishmeal Replacement



***P. monodon* FCR - Fishmeal Replacement**



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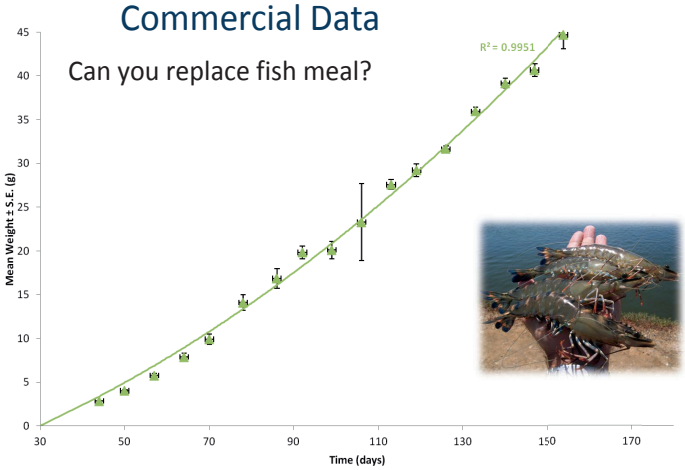
Commercial Data

Can you replace fish meal?



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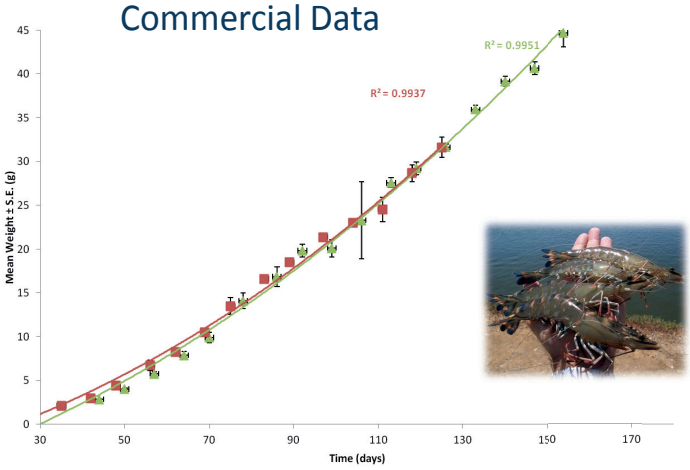
Commercial Data



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Standardising Assessment

Aquaculture Nutrition **2007 13;** 17–34

A feed is only as good as its ingredients – a review of ingredient evaluation strategies for aquaculture feeds

B.D. GLENCROSS[1], M. BOOTH[2] & G.L. ALLAN[2]

[1] *Department of Fisheries – Western Australia, Research Division, North Beach, WA, Australia;* [2] *New South Wales Department of Primary Industries, Port Stephens Fisheries Centre, Nelson Bay, NSW, Australia*

Abstract

The evaluation of feed ingredients is crucial to nutritional research and feed development for aquaculture species. In evaluating ingredients for use in aquaculture feeds, there are several important knowledge components that should be understood to enable the judicious use of a particular ingredient in feed formulation. This includes information on (1) ingredient digestibilities, (2) ingredient palatability and (3) nutrient utilization and interference formulations. A key aspect to note is the need to design all experiments with sufficient experimental capacity to detect significant effects.

KEY WORDS: nutrition, fishmeal replacement, methodology

Received 31 August 2005, accepted 26 June 2006

Correspondence: Dr Brett Glencross, PO Box 20, North Beach, WA 6920, Australia. E-mail: bglencros@fish.wa.gov.au

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What we need to Standardise

- **CHARACTERISATION**
  - *Species, Genotype, Processing, Origin, Analysis,...*
- **DIGESTIBILITY**
  - *Diet-strategy, Faecal collection, Acclimation, Analysis, ...*
- **PALATABILITY**
  - *Diet-strategy, Animal size, Inclusion levels, Duration,...*
- **UTILISATION**
  - *Diet-strategy, Animal size, Inclusion levels, Duration,...*
- **FUNCTIONALITY**
  - *Binding ability, Expansion capacity, Hygroscopy, ...*

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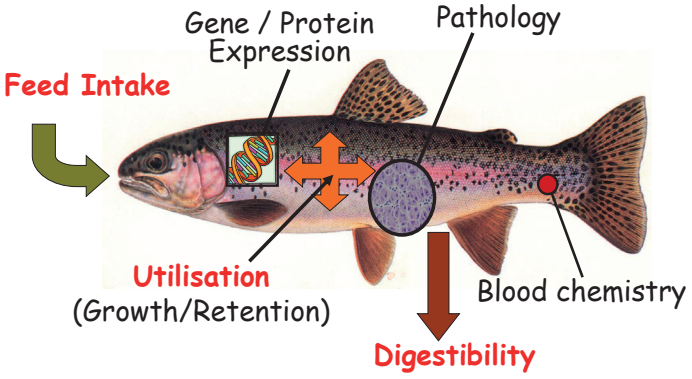
Assessing Nutritional Effects



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Digestibility - Summary

- ✓ *Diet digestibility is an assessment of the nutrients absorbed from a diet*
- ✓ *Ingredient digestibility assumes that the digestibility of a diet is the SUM of the digestibility of each of its ingredients*
- ✓ *Results can be affected by faecal collection method and certain ingredients exacerbate this*
- ✓ *High-level analysis of the digestibility effects of different ingredients and diets has important implications to understanding the value of ingredients*

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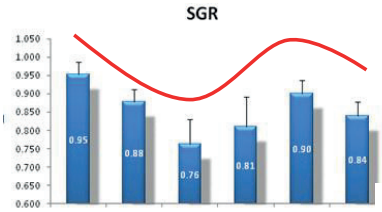
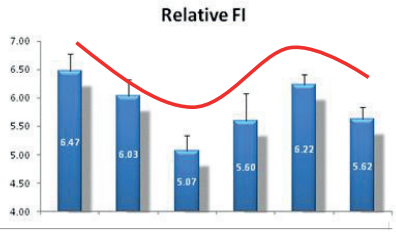
Importance of Palatability





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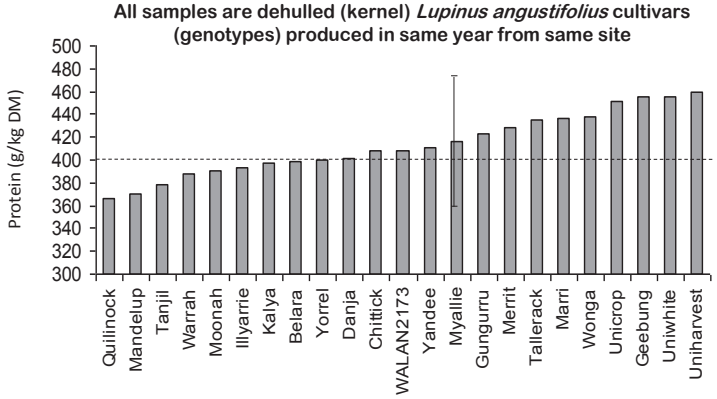
Variability in Composition



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Variability in Composition

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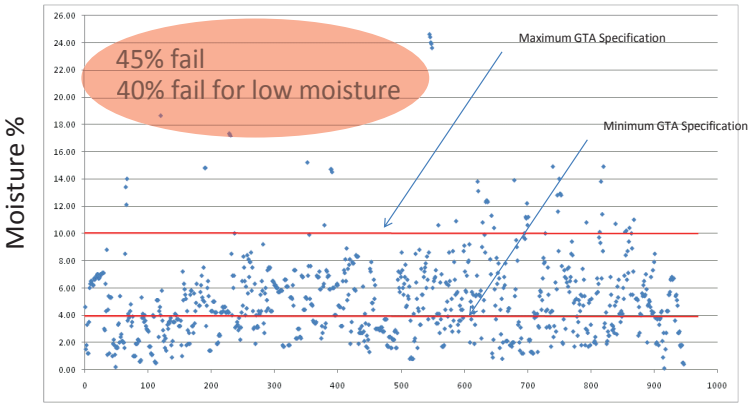
Blood meal quality – moisture content



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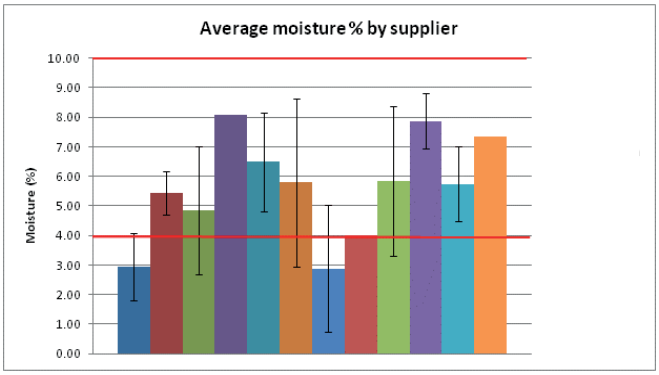
Blood meal quality – moisture by supplier



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Blood meal quality – Mink digestibility

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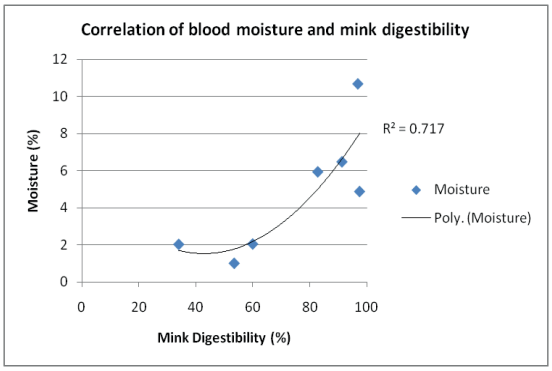
Blood meal quality – Mink digestibility



Mink is a good correlation for digestibility

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Blood meal quality – Barramundi digestibility

Ingredient ADCs (%)

Poultry	76.7	88.1	89.7	95.1	83.8	-
	0.0	*1.3*	*7.5*	*2.5*	*1.9*	-
Blood meal	60.3	61.1	-	60.2	55.6	-
	8.1	*6.9*	-	*7.4*	*4.3*	-
Corn gluten	57.2	64.9	-	71.2	82.3	81.7
	7.4	*5.8*	-	*8.5*	*4.0*	*12.1*
Fishmeal FM1	94.0	108.2	133.1	108.5	100.3	-
	0.3	*1.2*	*0.6*	*4.4*	*1.7*	-
Fishmeal FM3	68.3	86.9	125.1	93.5	88.3	-
	3.2	*3.8*	*2.2*	*2.4*	*3.8*	-
Raw wheat	30.2	30.0	-	31.1	90.7	31.0
	5.3	*5.1*	-	*9.4*	*16.3*	*1.9*
Pregel starch	4.4	9.0	-	-20.2	-	26.6
	4.7	*3.9*	-	*6.4*	-	*1.7*
Fishmeal (2009)	98.2	-	98.9	105.0	95.6	-
	5.9	-	*2.4*	*4.7*	*3.7*	-

NSW Fisheries show that a blood meal sample that had 3% moisture had a digestibility in barramundi of only 55%

NSW Industry & Investment

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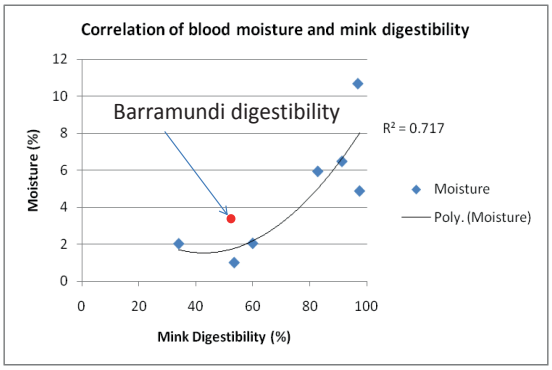
Blood meal quality – Mink digestibility



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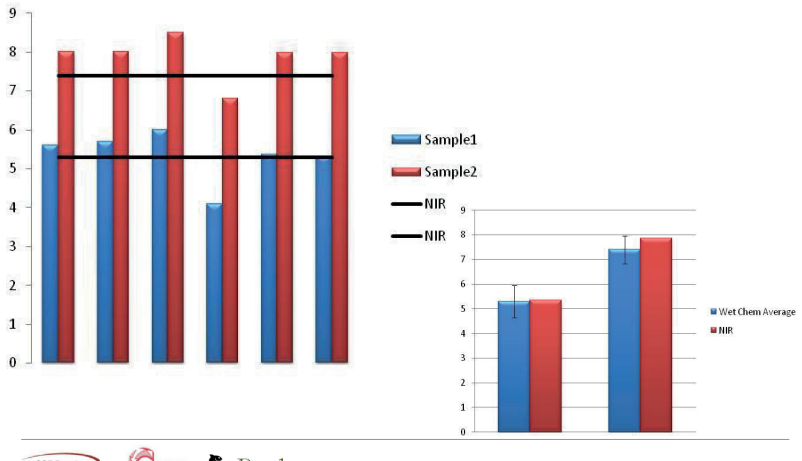
Blood Moisture Percentage – lab variation vs NIR



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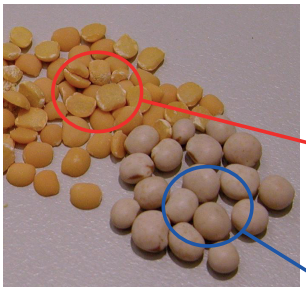
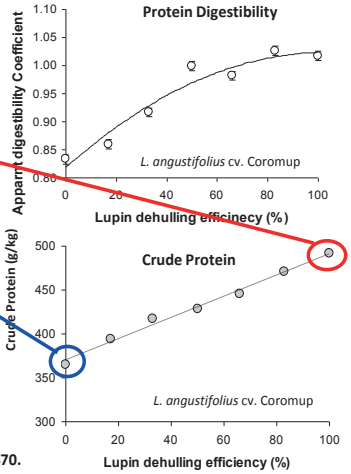
Processing Effects





Glencross et al. (2007) **Aquaculture Nutrition 13, 462-470.**

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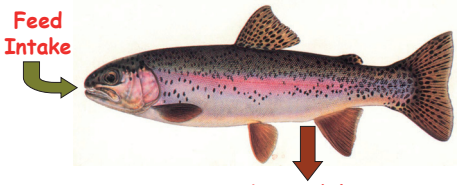

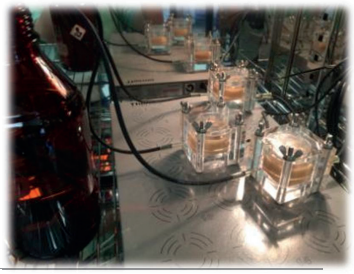

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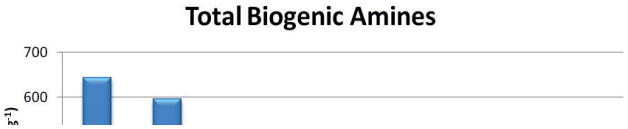
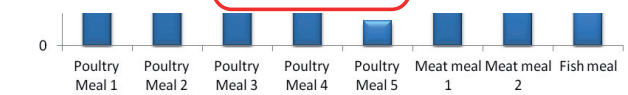
Poultry Analysis - Freshness



NIR Analysis | Kemin FOX II Results

Protein (%)	Fat (%)	Moisture (%)	Peroxide Value (mEq/kg Sample)	Peroxide Value (mEq/kg Fat)	Hexanal (ppm)	2,4-Decadienal (ppm)
66.5	14.2	3.8	0.95	7.92	29	19
67.5	12.1	4.9	0.21	1.79	< 1	< 1
69.4	11.6	3.9	0.08	0.65	< 1	< 1
65.6	12.3	5.5	0.71	5.92	< 1	< 1



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MBM Analysis - Freshness

	Protein (%)	Fat (%)	Moisture (%)	Peroxide Value (mEq/kg Sample)	Peroxide Value (mEq/kg Fat)	Hexanal (ppm)	2,4-Decadienal (ppm)
MBM 1	51.1	14.1	4.1	0.26	2.19	21	20
MBM 2	50.2	13	6.9	0.15	1.27	< 1	2
MBM 3	53.2	13.1	3.5	0.78	6.48	< 1	< 1
MBM 4	51.3	12.5	6.9	0.68	5.7	4	< 1

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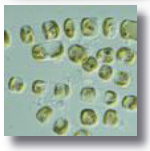
New Raw Materials Arising



- Genetically Modified Crops (rapeseed)
  - *Advanced sources of oils and protein*
  - *Will be here within 5 years*
  - *Deregulation is underway*
  - *Fishery independent sources of omega-3's*
- Microalgae biomass
  - *Potential source of oils and protein*
  - *Was being touted as carbon offset (?)*
  - *Source of some novel bioactives – Fucoidans*
- Quality Animal Protein Meal and Oil Products made with a nutritional focus

CSIRO nuSEED MBD ENERGY LIMITED CSF Proteins Melbourne Camilleri Stockfeeds Bartlett

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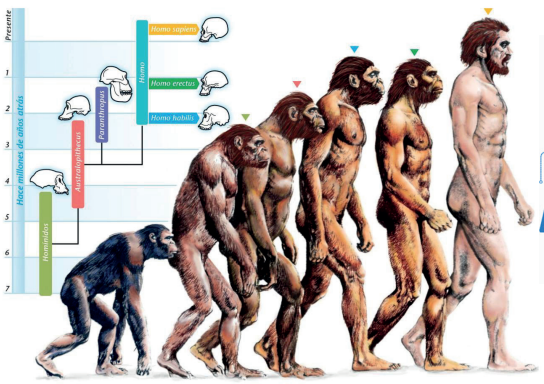
We need to evolve our thinking



Summary

- Feed demand is going to exceed 100MMT by 2050
- There are constraints to raw material security
  - Reliance on fishery resources is not an option
  - Changing landscape in resource use
  - PAP and oil play a key role in the future
  - Need to control quality control at point of manufacture
- Need to make better use of R&D
  - Better understand the nutrient needs of our animals
  - Better understand constraints to raw material use
- Embrace the use of alternatives
- Evolve our thinking

Thank You!

Feed Me!

Symposium Dinner Guest Speaker

Max Walker

Max Walker

Iconic Australian Personality, MC, Keynote and After Dinner Speaker

The consummate professional, Max Walker is well educated, well travelled, a wonderful story teller and a successful businessman. One of Australia's favourite sons of sport, he is an Australian speaking and MC phenomenon. Max Walker has spoken or hosted over 4,000 different events throughout Australia and the world, and presented approximately 3,000 hours of television.

Max Walker was one of a select group of sportsmen who played both Senior VFL/AFL Football and Test Cricket. He played 94 senior games with the Melbourne Football Club and 13 years of first class cricket with Victoria and Australia.

Max played Test Cricket in a golden era under the captaincy of Ian and Greg Chappell. He proudly pulled on the baggy green cap for Australia to tour New Zealand, England and The West Indies, playing through 34 test matches. Max took 138 wickets at an average of 27.47 and supported his team with 12 catches. He contributed 586 runs (avg. 19.53).

During the years 1977-79, when World Series Cricket was launched, Max and his team mates were in the thick of the action. Max played through 6 Super Tests, and took 26 wickets at an average of 23.7 (best 7/77). He scored 144 runs (avg. 13.00), 3 n/o and a highest score of 30.

Max Walker has experienced most speaking scenarios in diverse locations - from magnificently appointed high-tech theatres and glamorous ballrooms, to the outdoor arenas of the Australian desert. His speaking roles have included formal Master of Ceremonies to hosting complex award events, keynotes, workshops, after dinner and gala ball extravaganzas. It is his experience, confidence and ability to deliver that takes the risk or "unknown quantity" from the speaker equation.

Max has hosted 3,000 plus hours of "live" television. In the early eighties he was Channel 7's cricket expert on World of Sport. With Channel Nine he was both host and commentator on programs including Wide World of Sports, Nine Network Cricket, Nine News and The Footy Show.

A practicing architect for 10 years, Max is also a successful entrepreneur; a hands-on director of four companies, the author of 13 books (with sales in excess of 1,000,000 copies), his latest being the compilation of cricketing yarns, Caps, Hats and Helmets. Max Walker has also been the face and voice of numerous multi-million dollar advertising campaigns.

Tallow and Oil Markets Outlook

Rob Jones

Rob Jones

Roby Jones graduated from the University of British Columbia in 1981 with a Bachelor of Commerce Degree. After graduation, Rob spent a year in Germany playing professional ice hockey. He then returned to Canada to start his business career.

Rob worked in the Transportation Industry for two years, followed by ten years in the Commodity Trading Industry with Wilbur Ellis Company.

For the last 20 years, Rob has worked at West Coast Reduction Ltd. as Director of Sales and Marketing.

Rob has sat on various boards of the Canadian Feed Industry. He is currently the Vice Chairman of the National Renderers Association International Market Development Committee and is First Vice President of the American Fats and Oils Association.

Rob enjoys all sports. He resides in Vancouver with his wife Sarah, and their three children; Meghan, Sam and Andrea.

Thank-you for the opportunity to speak to the 13th Annual Innovation Symposium for the Australian Renderers Association.

I will start with an overview of the discussion:

1) Landscape of the Canadian Rendering Industry
2) Innovation by Desperation
3) Innovation through Collaboration
4) Canadian Tallow and Biodiesel Markets
5) Challenges and Opportunities

Landscape of the Canadian Rendering Industry

The Canadian Rendering Industry is really comprised of 3 major independent renderers and 2 major beef packer renderers scattered across the second largest country in the world. There are other smaller regional operations, but nothing of consequence.

We have Sanimax in Eastern Canada, Rothsay covers the central part of Canada and West Coast Reduction is located in the 3 western provinces – British Columbia, Alberta and Saskatchewan. The 2 major packer renderers, JBS and Cargill, are located in Western Canada, in the Province of Alberta.

From an animal population perspective, in Canada the poultry industry is scattered coast to coast, whereas 80% of the pork produced in Canada is produced in Eastern Canada and 20% in Western Canada. The complete opposite is in effect with the beef industry. 80% of beef is produced in Western Canada and 20% in Eastern Canada.

Most Canadian rendered proteins stay in Canada, with the exception of ruminant meat and bone meal. Approximately one-third of Canadian ruminant meat and bone meal production requires access to export markets.

Canadian tallow and yellow grease production enjoys some domestic disappearance within the feed and biodiesel sectors, but over 50% of our production needs to be exported. I will expand on this shortly.

The focus for this year's Symposium is Innovation in Industry. Sometimes, innovation is won through inspiration and sometimes, innovation is thrust upon you because of one BSE infected cow.

It has been 12 years since the discovery of BSE in Canada. Since then, our company has been challenged to create innovations within our industry to ensure our future. These innovations are not limited to just one company. It was a challenge to all Canadian renderers and the authorities that govern them.

Following the discovery of a BSE infected cow on May 20, 2003, Canadian renderers had to demonstrate to the world market that their products are not only safe, but that renderers can adapt to deliver what the market demands.

Though BSE affected all Canadian Renderers, I will focus on what actions West Coast Reduction took to recover markets and grow.

Innovation by Desperation

Our immediate concern was the smooth and continued movement of our product. In order to ensure this, we had to make significant changes to our operations.

On the protein side, we had to separate ruminant material completely out of certain plants.

- Change the way we handle materials.
    - Plants had to become species specific and protocols were put in place to remove ruminant material from specific plants.
- Plants became classified as:
    - Ruminant

  - Non-Ruminant
  - Both
  - Specified Risk Material
- Mixed Species Plants, destined to become Non-Ruminant Plants, were cleaned out and inspected by the Canadian Food Inspection Agency (CFIA) and the US Department of Agriculture (USDA) to certify that ruminant material was no longer stored or processed on the site.
- Depots were set up to trans-load ruminant or mixed material to the appropriate plant.
- Plants were dedicated to handle Specified Risk Material.
- Transportation equipment was dedicated to handle SRM Material.
- Dedicated rail cars and truck trailers to handle ruminant protein meals.

All these changes were introduced in response to market and governmental requirements and most were completed within an 8 week period following the announcement of BSE in May of 2003.

The tallow side of the equation provided its own issues.

West Coast Reduction had just completed loading thousands of tons of tallow to a bulk tanker vessel which had sailed from the Port of Vancouver and was making its way to Korea. Within 48 hours, Korea closed the market to tallow.

We brought the vessel back. Our Korean customers made it clear that Canadian tallow would not be off-loaded at destination.

We needed to find a way to save our markets and we needed to do it immediately. We had discovered an O.I.E. Guideline Rule which stated the following:

CHAPTER 11.5.

BOVINE SPONGIFORM ENCEPHALOPATHY

Article 11.5.1.

General provisions and safe commodities

The recommendations in this chapter are intended to manage the human and animal health risks associated with the presence of the bovine spongiform encephalopathy (BSE) agent in cattle (*Bos taurus* and *B. indicus*) only.

1. When authorising import or transit of the following *commodities* and any products made from these *commodities* and containing no other tissues from cattle, *Veterinary Authorities* should not require any BSE related conditions, regardless of the BSE risk status of the cattle population of the *exporting country*, *zone* or *compartment*:
   a. *milk* and *milk products*;
   b. semen and *in vivo* derived cattle embryos collected and handled in accordance with the recommendations of the International Embryo Transfer Society;
   c. hides and skins;
   d. gelatine and collagen prepared exclusively from hides and skins;
   e. tallow with maximum level of insoluble impurities of 0.15% in weight and derivatives made from this tallow;
   f. dicalcium phosphate (with no trace of protein or fat);
   g. deboned skeletal muscle meat (excluding mechanically separated meat) from cattle which were not subjected to a stunning process prior to *slaughter*, with a device injecting compressed air or gas into the cranial cavity or to a pithing process, and which passed ante-mortem and post-mortem inspections and which has been prepared in a manner to avoid contamination with tissues listed in Article 11.5.14.;
   h. blood and blood by-products, from cattle which were not subjected to a stunning process, prior to *slaughter*, with a device injecting compressed air or gas into the cranial cavity, or to a pithing process.
2. When authorising import or transit of other *commodities* listed in this chapter, *Veterinary Authorities* should require the conditions prescribed in this chapter relevant to the BSE risk status of the cattle population of the *exporting country*, *zone* or *compartment*.
3. When authorising import of *commodities* according to the conditions prescribed in this chapter, the risk status of an *importing country* is not affected by the BSE risk status of the *exporting country*, *zone* or *compartment*.

Standards for diagnostic tests are described in the *Terrestrial Manual*.

Now we had to convince our customers that an international guideline existed, and that “Protein Free Tallow – tallow with less than 0.15% insoluble impurities” was safe.

Innovation through Collaboration

West Coast Reduction first liaised and collaborated with the Canadian Food Inspection Agency (CFIA) to create systems that were based on sound science.

Working internally with the CFIA, we were able to establish protocols to safeguard the integrity of our products. After certifying our systems and protocols with the CFIA, we worked externally with other government agencies to

broaden our reach. Canadian trade commissioners abroad helped facilitate a dialogue between the CFIA and foreign government authorities.

This framework allowed the CFIA to negotiate export conditions which eventually led to the creation of negotiated Export Certificates. Japan, having had experience with BSE, accepted the OIE recommendation and a certificate was created quickly. Other countries were still inexperienced and required more assurances and operational changes to open their doors.

Eventually, most tallow markets were reopened for Canadian tallow except China, which I will discuss shortly.

When my colleague, Humphry Koch spoke to you 8 years ago, he said: "Between May 20, 2003 and July 12, 2007, Canada's rendering industry had to restructure itself in an attempt to adapt to continually changing circumstances. The impact of these changing circumstances and the long term affects they will have on the Canadian cattle industry in general, and the rendering industry in particular, is yet to be determined."

Today the picture is a lot clearer…well, almost!

In February of 2015, another case of BSE was confirmed in Canada. The CFIA is still conducting their analysis on this recent case though official findings are still not available. The impact of another BSE animal in Canada has been minimal. Indonesia is the only exception on meat and bone meal.

The systems, put in place through Innovation by Desperation and Innovation by Collaboration are working. The confidence instilled in our trading partners is not wavering.

Canadian Tallow and Biodiesel Markets

The Canadian tallow export market is comprised of bulk vessels from Eastern Canada, railcars to the US and the bulk vessels from the West Coast.

Of the export tallow volume, West Coast Reduction ships almost two-thirds of all of Canada's tallow and yellow grease through its facility in Vancouver.

West Coast Reduction has 84,000 MT of bulk liquid storage at the Port of Vancouver where it stores, handles and ships not only tallow and yellow grease, but also canola oil.

Over the years, the major markets for Canadian tallow have been Japan, Korea, Central America and Mexico. Recently, we have shipped product to Singapore.

Prior to 2003, China was a large importer of Canadian tallow. Unfortunately, that market was lost in May of 2003. Fast forward to February 2012 and China reopens the market to Canadian tallow.

However, there is one small caveat. In order to complete the Export Certificate, we need an Import Number issued by the Chinese AQSIQ.

To date, no importer has been able to get an AQSIQ number. Therefore, the Chinese market remains closed to Canadian tallow.

Prior to 2007, tallow basically had two markets to go into - the feed industry and the oleochemical industry.

As governments worldwide started to impose mandates or give out incentives, the biodiesel industry grew and evolved. Today, it is a major player in the consumption of tallow. Markets for tallow have certainly changed. I call it: "The Good, The Bad and The Ugly"

The Good: Prices for animal fats have increased dramatically over the past 8 years.

The Bad: As an exporter, certain markets have been lost due to the higher price.

The Ugly: It is yours and my tax dollars that support the industry.

In Canada over the past 15 years, there have been many incentives, federal grants and subsidies to encourage biodiesel manufacturing and usage. Many plants have taken advantage of the "free money" only to have fallen by the wayside. Currently, Canada has a 2% mandate across the country with some eastern provinces having no mandate. The province of British Columbia has a 4% biodiesel mandate.

West Coast Reduction looked at building a biodiesel plant and found that you needed 3 things to be successful in the biodiesel industry: financing, feed stock and customers.

Our company has financing and feed stock, but lacked a customer base.

The Canadian Oil Industry is comprised of 5 or 6 major players. Bluntly speaking, they wanted nothing to do with biodiesel, let alone a Fatty Acid Methyl Ester from tallow with a 7^{o} C cold flow point. Therefore, Canadian produced biodiesel made from tallow, does not comply with customer requirements.

The customers, Big Oil, have elected to go with high end renewable diesel which has cold flow properties of greater than -20^{o} C, or canola oil based biodiesel which they will use during the warm or summer months.

Today, there are 12 biodiesel plants in Canada with only 3 of significance that are operational.

Challenges and Opportunities

Today, the rendering industry faces many hurdles. "Good" or "Bad", consolidation with larger companies buying smaller companies continues to evolve within North America.

We are faced with animal health issues, with the aforementioned BSE affecting the beef and dairy industries, and not to be left out, the poultry industry has Avian Influenza (AI) and the hog industry has Porcine Epidemic Diarrhea (PED).

Government rules and regulations continue to change and evolve. It is imperative that we, as an industry, are front and center with these organizations so that we can help shape the regulatory landscape.

The pet food industry continues to grow and evolve to the point where renderers are losing raw material. Our challenge is to work with raw material suppliers to ensure the best possible return for their package of renderable material.

Logistics, whether it is a truck, rail or ocean vessel, continue to make our life extremely difficult and frustrating. As the co-founding patriarch of our company, Jack Diamond would say "If it was easy, everyone would be doing it."

As an industry, renderers have a very good story to tell. We are the "original recyclers". We are sustainable. We are environmentally friendly. Perhaps it is our time to tell our story.

Thank-you for your attention and I would be happy to answer any questions.

Informing the World – Part 2

Tina Caparella

Tina Caparella

Tina Caparella publishes Render bi-monthly in association with the National Renderers Association as a public service to the North American and global rendering industry. As Render's editor for nearly 19 years, Tina has strived to promote the exchange of ideas and information on government regulations, plant operations and technology, research and development, environmental control, quality assurance, and worldwide markets between all facets of the global rendering and associated industries. Tina began working at Render in 1980 in an administrative role before taking over the editor/publisher position in 1996. During her publishing career, she has worked on magazines for the US Air Force and California Glass Association as well as several regional magazines and newspapers in California. Tina has a business management degree from Riverside College and resides with her husband in the Sierra Nevada foothills east of Sacramento, California, where they enjoy hiking, kayaking, and camping with their 5-year-old grandson.

Informing the World – *Render* magazine

Bio: Tina Caparella publishes Render bi-monthly in association with the National Renderers Association as a public service to the North American and global rendering industry. As Render's editor for nearly 19 years, Tina has strived to promote the exchange of ideas and information on government regulations, plant operations and technology, research and development, environmental control, quality assurance, and worldwide markets between all facets of the global rendering and associated industries. Tina began working at Render in 1980 in an administrative role before taking over the editor/publisher position in 1996. During her publishing career, she has worked on magazines for the US Air Force and California Glass Association as well as several regional magazines and newspapers in California. Tina has a business management degree from Riverside College and resides with her husband in the Sierra Nevada foothills east of Sacramento, CA, where they enjoy hiking, kayaking, and camping with their 5-year-old grandson.

A long time ago, in a galaxy far, far away…

There was a period of invisibility where renderers could go about processing the raw materials they collected without much disturbance from outside forces like government, regulators, and consumers. But alas, those times are long gone and as renderers go forth into the future, battles with evil forces will continue. That's where *Render* comes into play, providing a light saber of sorts to fight the dark side with knowledge and wisdom much like a Jedi Master.

Okay, enough with the Stars Wars, but seriously, renderers are no longer the *Invisible Industry* as they were defined in this 1977 book written by Frank Burnham, *Render's* first editor and publisher and my grandfather and mentor. Almost 20 years later, renderers were declared *The Original Recyclers* in this book edited by Dr. Don Franco of the National Renderers Association in the United States. Ten years after that, rendering was deemed "essential" in an updated NRA book, and now, another decade later, rendering leaders around the world are further propelling the industry into the future by promoting rendering as "sustainable."

Yet long before these invaluable industry books were published, there was *Render*, a magazine born out of a desire to educate beyond just a small group of renderers on the west coast of the United States. Back in the 1960s, the Pacific Coast Renderers Association (PCRA) distributed a quarterly newsletter to its members, but as the industry entered into the 1970s, PCRA leadership recognized the need to "shrug off the cloak of invisibility that had shrouded the rendering industry for 2,000 years and implement a positive program to inform the public about the role rendering plays in improving the quality of life." The first issue of *Render* came out in February 1972 with Burnham at the helm as editor and eventually becoming publisher a few years later. His extensive background of working in public relations as a member of the US Air Force and as a writer for the aviation industry propelled the magazine through its first 25 years, at which time I stepped into those big shoes after working in various roles at *Render* for about 16 years.

In 1972, the US rendering industry processed 30 billion pounds of “meat scraps and residue” into some 9.5 billion pounds of commodities used in soap, animal feed, and industrial applications. Today, 43 years later, those figures are double what they were back then, while the US population has grown by just over 50 percent.

Although *Render* began as the official publication of the PCRA, its audience expanded across the United States to renderers and their employees, meat processors, feed manufacturers, nutritionists, and government entities. Those first issues were well received and readership grew. At one point, over 7,000 subscribers received *Render* six times a year. In August 1979, the National Renderers Association (NRA) took ownership of *Render*, which continues today, allowing the magazine to further grow its readership both nationally and globally. Even though PCRA and then NRA owned the magazine, editorial was and still is independently decided by the editor/publisher. Subscriptions have always been complimentary to those with a connection to rendering, with expenses of the magazine covered by advertising revenue.

Render shot out of the starting gate its first year with an array of topics, such as the “invisible” industry’s contribution to the US economy and trade, research, pollution control, an interview with the US Sierra Club, tallow, US exports, and the US beef and poultry industries. The following year, news about Australia and New Zealand was included, warning US and Canadian renderers of the “increasingly stiff competition” coming from down under. Interestingly, grease theft, a challenge for today’s renderer, was first addressed in April 1980. One subject that has always been important to readers is the US market report, which was scattered in various issues during the first few years but became an annual highlight in each April issue beginning in 1980. This yearly statistical and analytical look at US rendering production, consumption, and exports has become a much demanded resource for bankers, investors, and renderers themselves as a way to gauge how the industry is faring year-in and year-out. Recently, *Render* began including annual data on the European rendering industry in each August issue, and would welcome statistics from Australia, New Zealand, and other countries and continents, if available.

Although *Render* has always included stories of international interest and focus, it wasn’t until 2011 that it officially became “The International Magazine of Rendering” after it was recognized by global industry leaders as the only publication covering the recycling of animal by-products and used cooking oil. Today, *Render* regularly features a column from the World Renderers Organization, highlights the European and Australian industries, and travels the world in both print and electronic form spreading the message of the challenges, successes, and importance of the global rendering industry. In addition, nearly one-quarter of all *Render’s* readers reside outside of the United States.

Currently in its 43rd year, *Render* continues to cover a multitude of educational topics from all corners of the world, from improvements in rendering operations and the nutritional aspects of rendered products in animal feed to the ever-increasing government regulations and futuristic processes, with some actually coming to fruition, like biodiesel, which was first discussed in *Render* 23 years ago.

Despite much industry consolidation over the years, current readership is holding strong at around 3,500, with just over half of those subscribers being involved or employed in rendering or inedible kitchen grease collection and processing. The remainder of the readership comprises of users of rendered products, including biofuels and feed, government entities, meat processors, and suppliers to the industry. Of the 3,500 subscribers, about 10% opt to receive the magazine electronically, a number that continues to grow every year.

Another way *Render* informs the world is through its website and social media sites, including Facebook and Twitter. Each issue is posted to *Render's* website at www.rendermagazine.com for subscribers and anyone searching for information on the rendering industry to read. News of timely importance is posted on the website while news of interest is shared on Facebook with an automatic post on Twitter.

Render is also distributed at various conferences in the US and worldwide, including those focusing on pet food, livestock feed, and meat production, as well as NRA's yearly legislative fly-in. Every January, NRA and *Render* exhibit at the world's largest annual poultry, feed, and meat trade show in Atlanta, GA, informing tens of thousands of attendees from around the world on the valuable benefits of rendered proteins and fats.

As mentioned earlier, *Render* is provided free of charge to readers thanks to the generous support of advertisers that include not only industry suppliers, but renderers like West Coast Reduction in Canada and Baker Commodities in the US, who has advertised on the back cover since the very first issue. In the early years, Keith Engineering, located in California at the time and a West Coast representative for The Dupps Co., was also an advertiser.

Much effort goes into keeping expenses and, thus, advertising rates down while still provided a top-notch publication that continues to be praised time and time again, 43 years after its birth. In fact, advertising rates have increased only 30% over the last 25 years, an astounding figure, especially in the publishing world. A heartfelt gratitude is extended to all who support the magazine, whether it's financially, by a written word, or as a dedicated reader.

We now live in an era where transparency is necessary and often demanded. The industry must be proactive in educating those around us on the role rendering plays in maintaining a viable environment. *Render* is a vital tool for informing the world about the original, essential, and most sustainable recyclers to the animal agriculture industry.

Stakeholder Engagement ‘Dealing with them before they get Difficult’

Kevin O’Grady

Kevin O'Grady

Kevin has worked in the business sector in New Zealand, Australia and other countries since graduating with honours in Agricultural and Environmental Sciences from the University of Newcastle-upon-Tyne, England. His main area of involvement has been in Agribusiness and the supply chain from production through to marketing.

He has extensive experience in the regulatory and commercial sectors plus wide ranging commercial experience in both the meat and horticultural industries. This includes consulting on issues including quality assurance, food safety, traceability, occupational safety and health, market access, product security, product development, marketing and promotions including promoting meat products into the Middle East. He has developed a solid reputation for developing integrated quality management systems that meet all customer and regulatory requirements. He has implemented these in a number of sectors, not only in primary industries.

Kevin OGrady is now a Director and Principal Consultant for Pinnacle Quality Pty Ltd, a multidisciplinary group offering a complete range of sustainability and quality based business solutions. He is based in Melbourne, Australia but has worked on issues all around the world.

He has written widely and conducted seminars with engagement largely from the area of meeting regulatory or sustainability standards. He has also used "stakeholder mapping" in cases of dispute or stakeholder outrage to assist companies to better address this part of their business.

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Stakeholder engagement processes 'It does not have to get difficult'

Introduction

A stakeholder consultation is an increasingly important process for many businesses especially those wanting to demonstrate sustainability. .

But it's not easy. The reality is that, for many companies, conducting a stakeholder consultation is something of a dark art— especially where relationships with those stakeholders have not been good. However, in modern stakeholder theorists do not advocate exclusion of any stakeholders. It is therefore important to know the process and to understand what is expected — and not just of you.

That is because many of the those expecting consultation, be it a regulator, a standards setting body or a vocal stakeholder have often been less than clear on what is expected.

With that in mind, this article will attempt to take you through some of the basic requirements of this potentially vexing process.

Notes

1. **Here we are dealing with formal stakeholder engagements. There are other stakeholder process such as neighbour notifications, ongoing community relations functions and specific specialised techniques, such as stakeholder mapping that can also be useful.**
2. **This paper does not deal with disputes although many of the concepts are similar. The objective at all times is to manage an effective stakeholders process so that disputes and complaints are reduced or eliminated.**

How do you contact stakeholders?

For formal consultations there are Standards and Regulations that may indicate acceptable methods of contacting stakeholders. However, the method must also suit the particular circumstances. There is no point using written notifications if a population has a low literacy rate, or using email that only a few of the target population can access.

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Contact methods could therefore include one or more of the following:

- Direct email contacts in the language of the recipients
- Personal contacts by phone or letter
- Notice published in the national and/or local press in the country in which the evaluation is due to take place
- Local radio announcements
- Signage posted around the area in the language of the local people if the community have English as a second language.
- Announcement in village shop/church hall or local customary notice board
- An announcement by the applicant using existing, ongoing mechanisms for consultation between managers and local stakeholders (for example, a stakeholder database)
- Face-to-face meetings with stakeholders

You should also post documents relating to the consultation on your website and draw attention to them. Some independent third party organisations — such as national organisations representing the industry. Even NGOs with an interest with your industry, you should take advantage of this as well as posting the documents on your own web site.

3.0 Who should you consult?

Who you consult will be decided on a case-by-case basis. You will need to consider who the stakeholders are. You will also be expected to run a database or contact list for stakeholders and to keep it up to date. What matters is that you can clearly show that a wide and inclusive group of stakeholders has been consulted.

You cannot simply exclude certain groups or individuals because they are difficult to deal with. However reacting appropriately to how they respond is also important (see also *How do you deal with non-participation?*).

Stakeholders could include:

- Immediate neighbours, local communities and other affected parties (see also *What is the difference between interested and affected stakeholders?*) adjacent or close to the operation
- Any national body representing the industry in question

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- Any state or national statutory bodies or authority with some legal mandate over the operation such as government departments or local authorities
- Providers of relevant local services (such as power, transport and — in almost all cases — water)
- NGOs involved in the social or environmental aspects of the operations management nationally, regionally or locally
- National, regional or local representatives of indigenous peoples.
- Labour organisations or unions representing the sectors' workers
- Contractors who provide services to the operation
- International NGOs that have put in a request to be contacted about operations in particular regions or countries.

How long should the consultation period be?

How long a formal consultation period should be is not well defined; most standards are little help. As a rule you should leave plenty of time for the process. Forty-five days is usually too short. Sixty days (or over) is more likely to be appropriate. However, there are no hard and fast rules.

What is the difference between interested and affected stakeholders?

All stakeholders are treated in the same way in the consultation process. It is important, however, it to make a distinction between interested and affected stakeholders and to base your strategy around these categories.

Affected stakeholders

These include direct neighbours and local communities and any others whom your operations may affect. Stakeholder consultation with these groups can be expected to be more specific and to happen more often. For example there may be a need for notification of events like construction or maintenance work which may exacerbate odours. In other cases discussions at local forums on local issues are valuable, for example consultations over periods of increased road haulage activities.

Affected stakeholders should be a priority in all your stakeholder consultations. Some may be part of more than one group identified for the purpose of stakeholder consultation: a neighbour who is also part of a relevant NGO, for instance. However, they remain affected stakeholders in their own right.

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Interested stakeholders

These are people or groups not directly affected by your operations but with a relevant interest. National or regional NGO groups with a general focus on rural industry are likely to be interested parties where a primary industry is concerned. Interested stakeholders will be entitled to all the same rights of participation in stakeholder consultation as affected stakeholders. However, they may not need to be consulted over all the same sort of issues as the affected stakeholders. Your strategy should reflect this.

Clarity is essential: you should indicate who is an affected party and who is an interested party on your stakeholder database or stakeholder record.

One group may not fit neatly into these categories, however. Regulated authorities may have specific reporting and consultation requirements. For example they may need a report on the conditions of permits and licences. In these cases simply follow the required consultation at the required time. In other contexts they can be treated as interested parties,

How is the consultation recorded?

There are several approaches to recording a consultation. Formal consultations required by a standards or legislation and ongoing consultation with community contacts, for example, are very different in style and implementation. Both, however, will need to be recorded.

Day-to-day contacts with stakeholders may seem less important but they are part of the process. Therefore, although it is not specifically required by some standards and regulations there should be a record made of all such communications on a 'community consultation' form or record. In any case, this record could prove useful in managing disputes. An example of a community consultation record is laid out below.

For more formal stakeholder consultations required by a standard or legislation there needs to be a formal record with at least the following information.

- Names and contact details of individuals and organisations consulted
- Notes on all information received orally (such as minutes of meetings with dates, times and places recorded)
- Copies of all correspondence and/or written comments received.

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Many standards also require companies to show how stakeholder feedback was taken into consideration and acted upon. If there was feedback but no action taken it needs to be clear why.

In both cases there is a requirement to let the stakeholder know what you did. This does not, however, mean that you need to do everything a stakeholder suggests; just make sure you record your actions and reasons.

For example (hypothetical only for the purpose of demonstration):

Stakeholder comment: "Your systems seem OK but I know that in heavy rainfall there is an increased risk of run off and pollution.
Action taken: That's a good point maybe we could increase monitoring and testing of waterways at those times.

Stakeholder comment: "This is a rural area, while you maintain roads through the property wouldn't it be better to put in permanent sealed roads around the whole area given the number of trucks you have going in and out?"
Action taken: None
Reason: Prohibitive cost

A simple record can be used to record the stakeholder's consultations and the results of that consultation. For example:
.

Name and organisation	Contact details e.g. ph. fax e mail.	Method of contact	Date and time	Comments	Action taken on comments	Feedback on actions given

What does indigenous stakeholder engagement require?

Many standards and regulations make particular mention of indigenous stakeholder engagement and have specific requirements for dealing with indigenous people.

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Often the biggest and most time-consuming challenge is who to consult. The first step therefore should be to investigate and confirm who the mandated representatives are and even consider taking advice from experts on how to consult effectively with a particular indigenous group.

You should also seek guidance on the culturally appropriate way to engage with indigenous populations and document the fact. This will demonstrate to a certifier that you took steps to create a meaningful consultation.

In many standards there is a requirement for free prior and informed consent (FPIC) when dealing with indigenous communities and some other communities — for example where land use and tenure rights are an issue. A legally acceptable record of free prior and informed consent is important supporting material in such cases.

Without free, prior and informed consent from local and affected communities, the default assumption is that consent is not granted.

What is substantial consensus?

Substantial consensus is an expectation in many standards and regulations but is a principle that is often misinterpreted. Ideally you should get a consensus of social, environmental and economic stakeholders. This will not always happen, however.

For example a common problem involves an organisation presenting a consensus from a consultation of mainly favourable parties. In these cases the consultation may not be deemed wide and inclusive. You must make the consultation balanced, even if you expect certain groups to always be negative. If you can show that a participative process was carried out in good faith such that it will be possible for observers to assess any negative comments against other comments from the process.

This brings us to some common myths associated with substantial consensus. They are:

- If I do not agree you cannot reach this standard or satisfy this regulation.
- If our group does not participate you cannot get a substantial consensus. (see *How do you deal with non-participation?* below)
- If a group is philosophically opposed to a company or operations the consensus is not possible.

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In all these cases a genuine attempt to run an inclusive and participatory stakeholder engagement is important— even when non-participation or sustained or philosophical opposition prevents consensus[1].

However, this has to be clear to the observer that you made the effort. It is not acceptable to point to a group and say, “They don’t like us and will never agree”, unless there has been a genuine attempt to engage and there is a clear history of opposition regardless of the issue.

How do you deal with non-participation?

Non-participation indicates that one party is not happy with a situation and won’t engage at all or unless certain preconditions are met. As mentioned, for some sustainability standards it is not necessarily a block. There is, however, an onus on the company to try to engage and to try to identify (and if possible address) the fundamental reasons for the non-participation.

In a case of non-participation good records will allow it to be made clear that this is what was happening. Records such as replies to correspondence indicating non-participation, minutes or records of attempts to consult, or any other history of non-participation or non-cooperation with the company.

Related to this are cases where participation is conditional on a concession in an unrelated area. This could involve demands for a wage increase or provision of roads or facilities for communities, or where participation is conditional on payment. Again, where possible, evidence of this needs to be recorded so as to put this into context.

What if stakeholder resources are limited?

Often stakeholders are asked to comment on operations that may be specialised or require specialist knowledge. Alternatively stakeholders may be volunteers in an organisation and may not have adequate time and resources to take part in the consultation. This is especially the case for smaller NGOs.

In these cases lack of resources is a reason for non-participation. However, it must not be interpreted in the same way as deliberate non-participation.

[1] An important exception in many standards is any lack of consensus on issues related to disputed land tenure rights.

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There is an expectation that the company to make an effort to reach out and facilitate the input of under-resourced stakeholders. Methods may include going to see them or arranging convenient public meetings for them to attend.

Be careful, however. A company that invests money in getting stakeholders to meetings may then lay itself open to accusations of buying stakeholder support. There should therefore be no direct payments to individual groups or stakeholders for participation. Support for attending meetings, if this needs to be given, needs to be clearly collective — for example taking care of meeting room bookings or providing transport.

In the event of smaller consultations a quick phone call often helps to get a stakeholder's views on the record without over-burdening their resources. In these cases you must provide a copy of their comments back to the stakeholders so there is no ambiguity as to what was said.

What do you do when they've had enough?

Consultation fatigue and stakeholder disinterest is a growing problem. This is not surprising. In recent years there has been a proliferation of standards and requirements, many of them based on wide stakeholder involvement. Companies find themselves dealing with stakeholders who are either not interested or are weary with a growing number of consultations from a growing number of companies.

So far no one has really come to terms with this issue. This may seem an intractable issue. However, there are some techniques that can be used to get round it.

Typically a first round of consultations includes a similar method — for example a broadcast e-mail, a public announcement or a letter. If, after a period of time, there is no response a targeted phone consultation can be used. This does not, however, have to be extensive, especially if the first round has demonstrated that there is not much interest.

Conclusions

As you can tell, stakeholder consultation is a far from straightforward process. Not just companies but standards-setting bodies, regulators and stakeholders themselves can find it difficult. However, do not actively exclude of any

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stakeholders. It is therefore important to know the process and to understand what is expected.

We can help with.

- Stakeholder mapping.
- Developing stakeholder engagement systems.

Ongoing engagement strategies.
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The Challenges facing Tallow Markets

Tom Coughlan

Scot Amedee

Damian Evans

Tom Coughlan

Tom is an Agricultural Science and Commerce graduate and is Commodity Manager with Wilmar Gavilon. He commenced with the former trading entity of Wilmar Gavilon 9 years ago and today Tom's role includes managing the tallow trading and freight for Australia and New Zealand.

Wilmar Gavilon is a 50:50 joint venture formed to invest in the sourcing and distribution of a variety of feed ingredients, oils and fats. Today Wilmar Gavilon is a vertically integrated supply chain with approximately 2 million tons of commodities traded or handled annually. Wilmar International Limited, headquartered in Singapore, is Asia's leading agribusiness group. Gavilon is a subsidiary of the Marubeni Corporation.

Tom's previous employers include Ralph's Meat Company, Colonial Agricultural Company, and the family farming operation located in Riverina NSW.

wilmar GAVILON

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International Outlook

Panel discussion and presentations

Dr. Martin Alm

Dr. Alm studied chemistry at the Technical University of Braunschweig. During his promotion he worked at the Institute of Soil Biology of the Federal Agricultural Research Centre (FAL), Braunschweig. In 1998 he started his career at SARIA Bio-Industries, one of the leading rendering company in Europe with factories in ten different countries. Besides the rendering sector, SARIA is involved in the edible fat melting sector, blood processing, biodiesel production from animal fat and used cooking oil, food waste collection, biogas, hides, skins and leather, pharmaceutical specialties, trade of slaughter-by-products e.g. for human consumption or gelatin production. Dr. Alm was responsible for "Research and Development", later extended by "Regulatory Affairs". For SARIA he was member of the board of the German Rendering association, of the research group of the German biodiesel association, of the standing technical group, the council and the executive board of EFPRA, the European Fat Processors and Renderers Association in Brussels, and of the research committee of FPRF, the US based "Fat and Protein Research Foundation". He was also the contact person to the relevant German ministries, the European Commission and European Parliament.

Since 2009 Dr. Alm is director and owner manager of "Dr. Alm Research and Consulting". He is Technical Director of EFPRA, consulting member of the board of the German Renderers Association, the representative of Germany in the WRO, the world renderers organization, of which he is since June 2015 Second Vice President, and member of the Research committee of FPRF. He regularly publishes newest insights of the markets and regulatory developments in papers linked to the food, feed, meat, oil & fat and rendering industry.

European Outlook 2014/2015

Dr. Martin Alm, Technical Director,

European Fat Processors and Renderers Association

The EU faced in 2014 another year of increasing volumes of processed raw material, based on increased category 3 volumes. One reason for that might be the ongoing Russian import ban for meat.

The category 1&2 sector stayed stable. The derived products are mainly used for energy purposes with the exemption of biodiesel from cat 1 &2 fats and fertiliser from cat 2 MBM. But the volumes of cat 1 will decrease in the coming years. After the election of both, the new European Parliament and the European Commission in 2014, Brussels´ officials started working again. Based on strong pressure from the slaughterhouses the SRM list of Member States with negligible BSE risk will be adjusted to the international OIE standard. The SRM list will not completely disappear (like foreseen by OIE) but a small SRM list will still remain. This is brain, eyes, skull and spinal cord of bovines older than 12 months. The SRM for sheep and goat was not adjusted. For the European rendering sector this will mean a dramatic shift of cat 1 to all: food, cat 3 or cat 2. It is difficult to forecast how much cat 1 will disappear, especially in the food market. But it is clear that there will be some over-capacities in the cat 1 sector.

Less cat 1 material will also affect the production of biodiesel from animal fat. The revised RED (Renewable Energy Directive) still acknowledged biodiesel from cat 1 & 2 fat as advanced biofuels. It counts double towards the quota.

Regarding cat 3 fats and proteins the classical markets stayed strong in 2014:

- Fat: Animal feed and oleochemical uses before biodiesel, pet food and food
- Proteins: pet food still the strongest market (please note, that ruminant proteins are still banned in feed for farmed animals). Second biggest market is fertilisers. Strongest growing market is fish feed (for non-ruminant proteins only).

The next EFPRA Congress will take place in Messinia, Greece from 1.-4.6.2016.

Ross Hamilton

Ross Hamilton is Vice President of Government Affairs and Technology for Darling International, Inc. He earned his B.S. and M.S. degrees from Texas Tech University and Ph.D. in Animal Nutrition from the University of Missouri. He was on the faculty of South Dakota State University for 12 years. Dr. Hamilton joined Darling International Inc. in 1996. He has co-authored more than 150 scientific papers and publications and is a member of various science-based organizations. He has served on the American Feed Ingredient Association's (AFIA) Board of Directors and Executive Committee, is a member of the AFIA Biosecurity Taskforces and the Nutrition Member Interest Group. He is calso urrently on the Institute for Feed Education and Research (FEEDER) Board of Trustees, where he serves on the Research Committee. Dr. Hamilton is a past-Chairman of the Board for the Fats and Proteins Research Foundation (FPRF) and is currently Chairman of the Board for the National Renderers Association (NRA).

International Outlook - North American

ARA 13th International Symposium,

Ross Hamilton, Ph.D.
VP Government Affairs & Technology
Chairman, NRA

DARLING INGREDIENTS INC.

Strategic Planning

DARLING INGREDIENTS INC.

Strategic Planning Task Force Members

1. Tim Guzek, Sanimax (Chair)
2. Duane Anderson, Central Bi-Products
3. Andy Andreoli, Baker Commodities
4. Ridley Bestwick, West Coast Reduction
5. Kim Broekemeier, Tyson
6. Tim Carlson, Hormel
7. Michael Glenn, BHT ReSources
8. Ross Hamilton, Darling Ingredients
9. Michael Koewler, Sacramento Rendering
10. Doyle Leefers, National Beef
11. JJ Smith, Valley Proteins
12. Gus Wintzer, G.A. Wintzer & Son

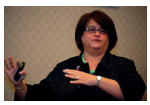
Nancy Foster, David Meeker, Kent Swisher and Jessica Meisinger provided insights and support throughout the process

Process

1. **Beginning**
   - October 2014 NRA Board Meeting
2. **Onboard & Insights**
   - Started November 2014
3. **Discovery & Development**
   - 2 meetings, webinars
4. **Review & Recommend**
   - Today and tomorrow

DARLING INGREDIENTS INC. *Creating sustainable food, feed and fuel ingredients for a growing population*

Stakeholder Advisory Board Members



Audrey Adamson

Mike Brown

Barry Carpenter

Chad Gregory

Carlos Saviani

DARLING INGREDIENTS INC. *Creating sustainable food, feed and fuel ingredients for a growing population*

Vision

To deliver sustainable **rendering** solutions to our global community.

Mission

NRA advocates for a sustainable food chain, public health and the environment through the production and marketing of rendered products and services.

To accomplish this, NRA…

- Promotes effective public policy, regulation and technology
- Encourages responsible business practices
- Supports free movement of rendered products in domestic and international markets
- Improves stakeholder awareness and understanding of the value rendering delivers

DARLING INGREDIENTS INC. *Creating sustainable food, feed and fuel ingredients for a growing population*

Strategic Intentions:
People and Community

Advocate understanding and awareness of the value **rendering** provides to global communities through communication, education and outreach to deliver the following impacts:

- Maintain and promote *sustainable business operations* in our local and larger communities through shared values.
- Enhance our ongoing *value proposition to current and new members, as well as stakeholders,* and maintain strong capabilities to manage domestic and international crises.
- Attract and retain *new talent* to our industry.

DARLING INGREDIENTS INC. *Creating sustainable food, feed and fuel ingredients for a growing population*

Strategic Intentions:
Domestic and international markets

Promote the demand and market access for rendered products to domestic and international customers. Secure adequate resources from key strategic partnerships (members, federal government and strategic allies).

Image and value of rendered products and services

Product safety – Establish the APPI Rendering Code of Practice, a 3rd party certification program, as the industry standard for plants and customers.

Sustainability – Establish Economic, Social and Environmental metrics through a continuous improvement model.

Value – Advocate that rendering is the best value for co-product streams defined by the food recovery hierarchy (people, animals, energy, fertilizer, compost and lastly landfill).

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Food Safety Modernization Act (FSMA)

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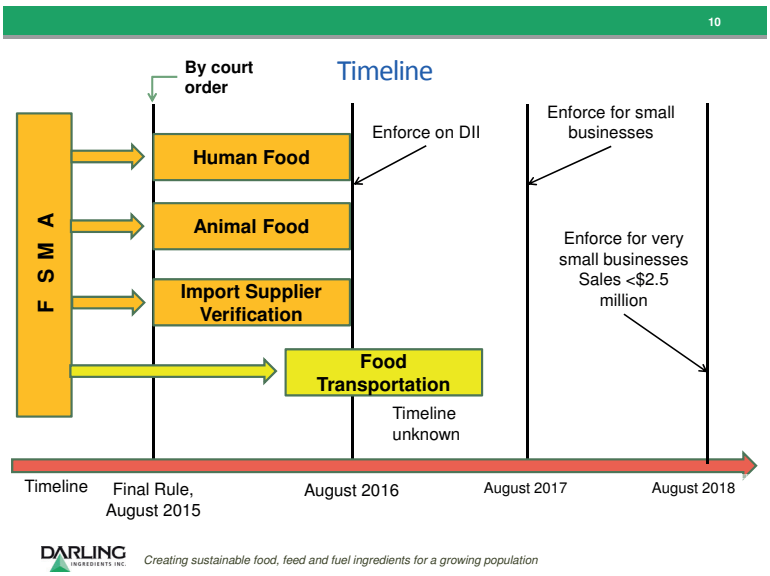
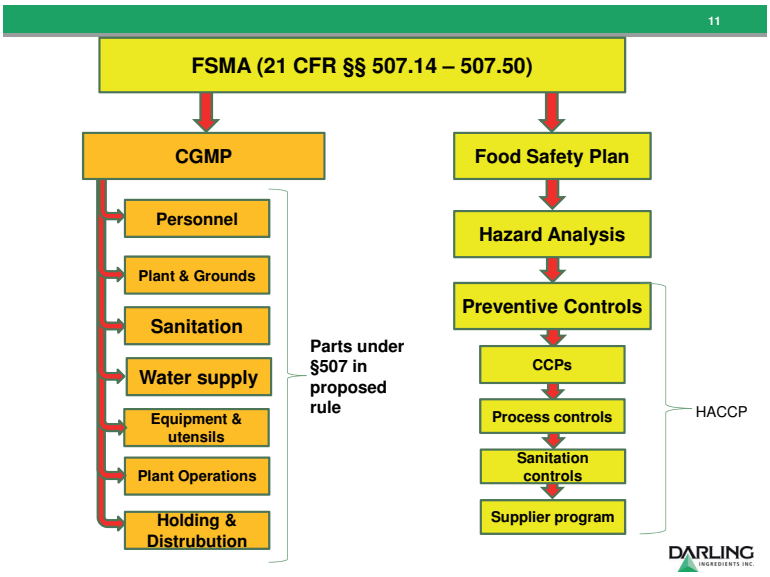
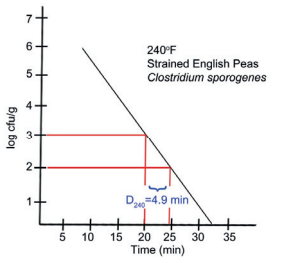


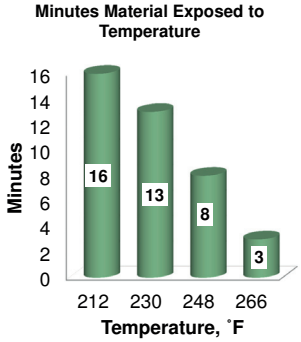


Microbiologist at Clemson, Texas A&M, Texas Tech. Kansas State, and Colorado State Universities are studying thermal death time to validate the cooker as a critical control point and develop models that can be used to predict log reductions under various processing conditions with different raw material matrices.



Time and Temperature Profile

Continuous cooker with fat added back

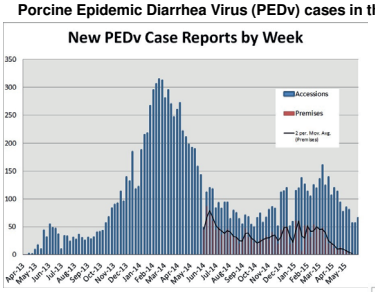


Animal Diseases

DARLING INGREDIENTS INC.

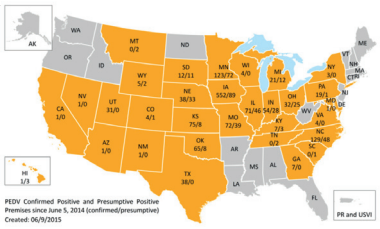
14

Porcine Epidemic Diarrhea Virus (PEDv) cases in the USA as of June 9, 2015



Swine Enteric Coronavirus:
PEDv and Porcine Delta
Coronavirus Disease

PEDv also reported in
Canadian Provinces:
Ontario,
Manitoba,
Quebec,
Prince Edward Island



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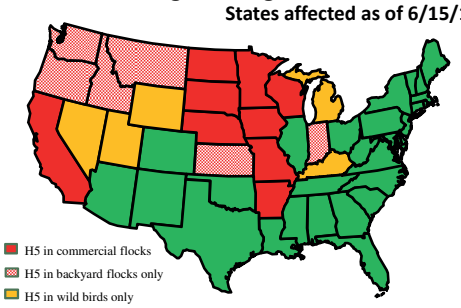
High Pathogenic Avian Influenza (HPAI)
States affected as of 6/15/15



Strains:
H5N8 – West Coast
H5N2 – most cases
H5N1 – differs from Asian

	Depopulated	Annual production
Layers & pullets	**41 million**	**360 million**
Turkeys	**6 million**	**240 million**
Total	**47 million**	

DARLING INGREDIENTS INC. *Creating sustainable food, feed and fuel ingredients for a growing population*

Lucas Cypriano

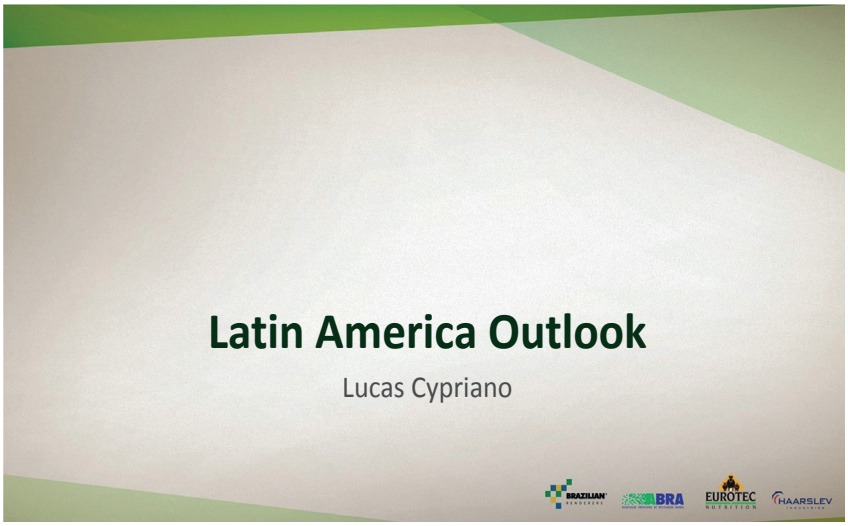
Lucas studied Computer Science from 1991-1993 at IGCE / UNESP in Rio Claro and graduated with a degree in Animal Science from FCAV / UNESP in Jaboticabal in 1998.

He worked as a poultry and swine nutritionist for 5 years in 3 companies : Cooperativa Central do Oeste Catarinense, Supremais Produtos Bioquímicos and Socil Guyomarc'h, now called InVivo NSA.

Lucas worked from 2003 to 2011 with Eurotec Nutrition, a company that held around 60% market share of preservatives used by the Brazilian animal protein meals & fats industry. He then held the position of National Sales Manager and then Technical Manager of the nutrition product line from 2004 where he was in charge of product development. Lucas was also involved in quality management, microbiology control and preservation of meals and fats as well as supplying technical assistance to the sales team of the company.

From 2011 until now, Lucas is in charge of the Technical Department of the Brazilian Rendering Association – ABRA – giving technical presentations at conferences and symposia, providing support for ABRA members, publishing technical articles, developing research for ABRA, and being the technical person responsible for ABRA´s HAPPC and Best Practice Program. He has also been a member of Scientific Advisory Panel of the World Renderers Organization since 2014.

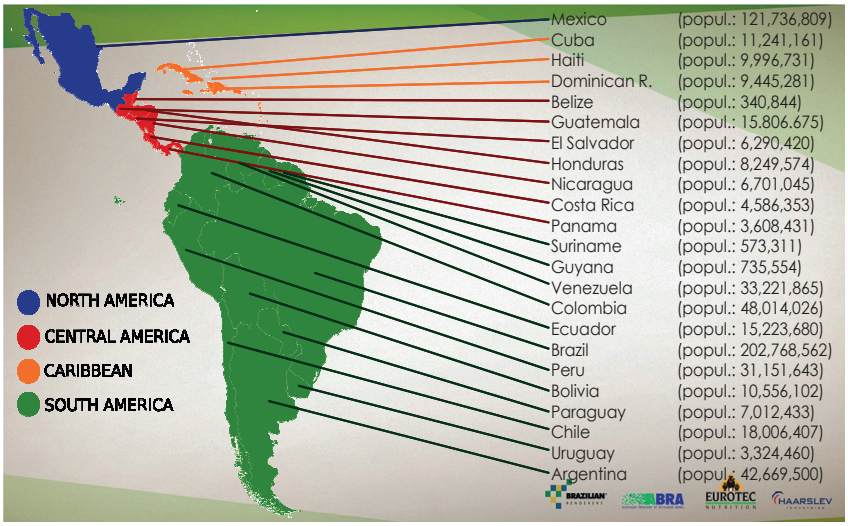
Lucas is fluent in Spanish and English.

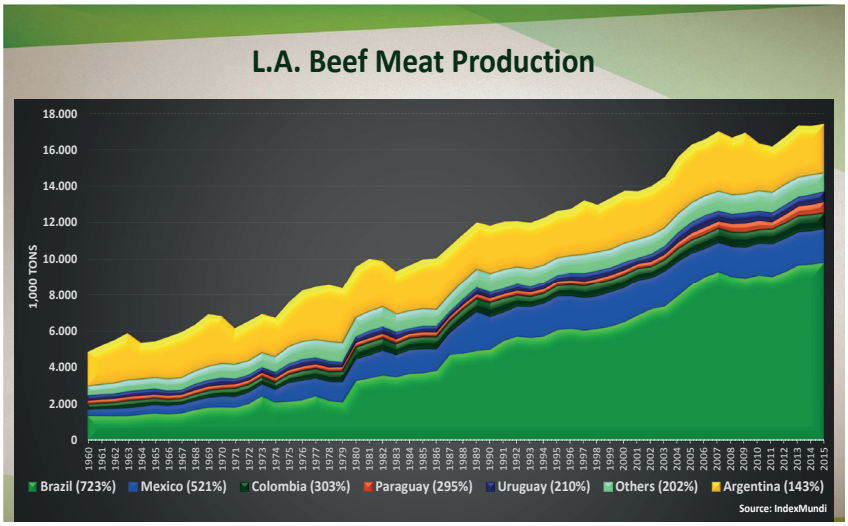


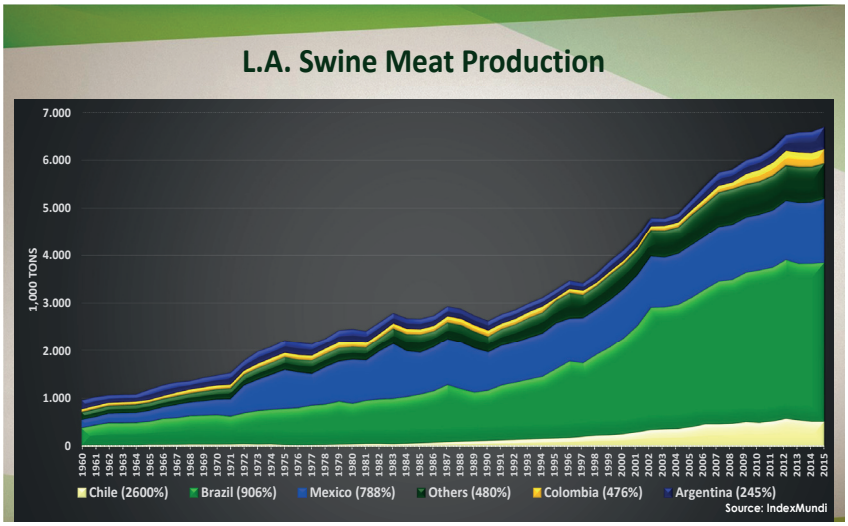
Different terrains

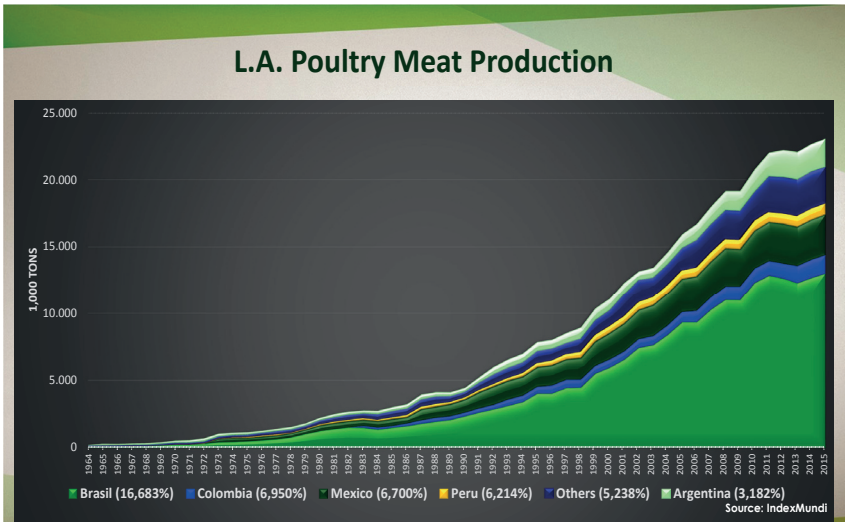
Different climates

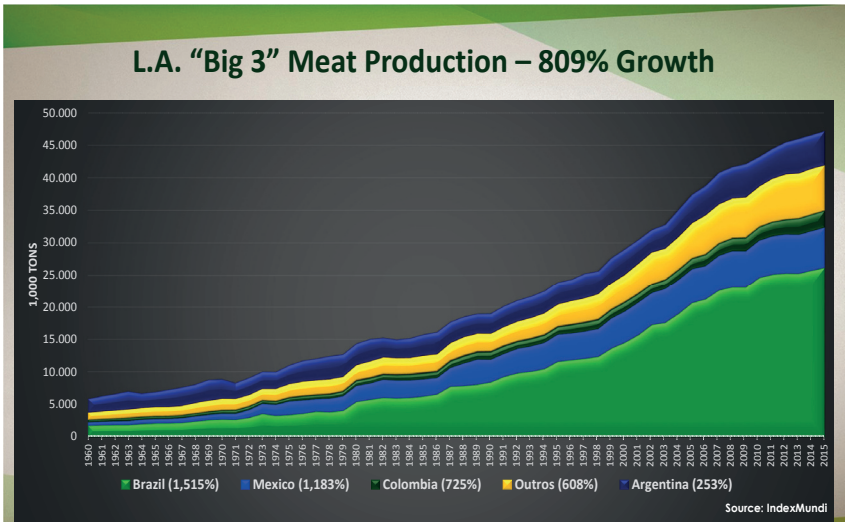
Different crop & fishery conditions


NORTH AMERICA
CENTRAL AMERICA
CARIBBEAN
SOUTH AMERICA
Mexico (popul.: 121,736,809)
Cuba (popul.: 11,241,161)
Haiti (popul.: 9,996,731)
Dominican R. (popul.: 9,445,281)
Belize (popul.: 340,844)
Guatemala (popul.: 15.806.675)
El Salvador (popul.: 6,290,420)
Honduras (popul.: 8,249,574)
Nicaragua (popul.: 6,701,045)
Costa Rica (popul.: 4,586,353)
Panama (popul.: 3,608,431)
Suriname (popul.: 573,311)
Guyana (popul.: 735,554)
Venezuela (popul.: 33,221,865)
Colombia (popul.: 48,014,026)
Ecuador (popul.: 15,223,680)
Brazil (popul.: 202,768,562)
Peru (popul.: 31,151,643)
Bolivia (popul.: 10,556,102)
Paraguay (popul.: 7,012,433)
Chile (popul.: 18,006,407)
Uruguay (popul.: 3,324,460)
Argentina (popul.: 42,669,500)
BRAZILIAN
BRA
EUROTEC
HAARSLEV


L.A. Beef Meat Production
1,000 TONS
18.000
16.000
14.000
12.000
10.000
8.000
6.000
4.000
2.000
0
Brazil (723%)
Mexico (521%)
Colombia (303%)
Paraguay (295%)
Uruguay (210%)
Others (202%)
Argentina (143%)
Source: IndexMundi

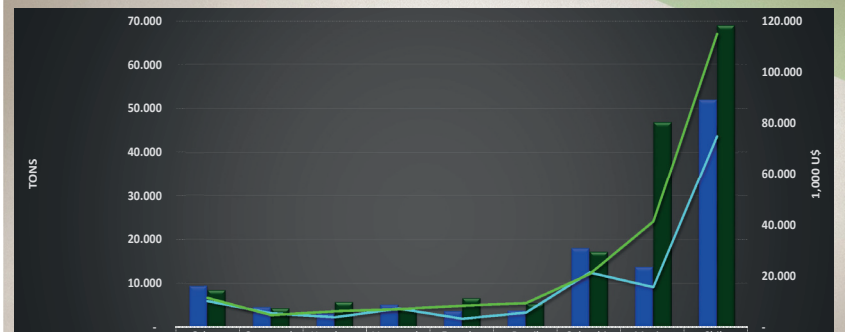

L.A. Swine Meat Production
1,000 TONS
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0
Chile (2600%)
Brazil (906%)
Mexico (788%)
Others (480%)
Colombia (476%)
Argentina (245%)
Source: IndexMundi


L.A. Poultry Meat Production
1,000 TONS
25.000
20.000
15.000
10.000
5.000
0
Brasil (16,683%)
Colombia (6,950%)
Mexico (6,700%)
Peru (6,214%)
Others (5,238%)
Argentina (3,182%)
Source: IndexMundi


L.A. "Big 3" Meat Production – 809% Growth
1,000 TONS
50.000
45.000
40.000
35.000
30.000
25.000
20.000
15.000
10.000
5.000
0
Brazil (1,515%)
Mexico (1,183%)
Colombia (725%)
Outros (608%)
Argentina (253%)
Source: IndexMundi


Latin America
Fish Oil & Meal
Export / Import Market
Fish products: fish meal & fish oil (HS6: 2301.20 & 1504.20)

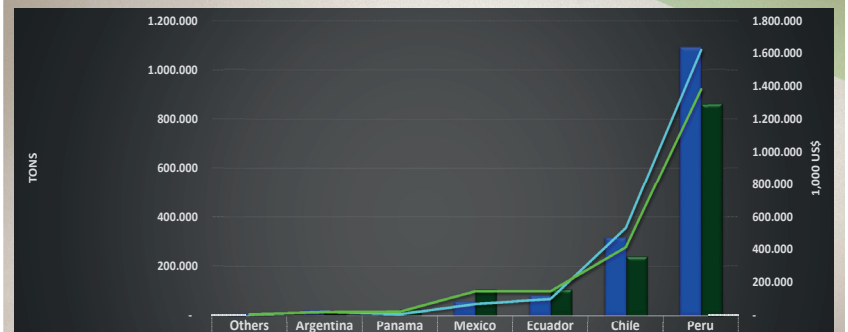
Imports per Country – Fish Meal



	Others	Guatemala	Honduras	Venezuela	Ecuador	Brazil	Colombia	Mexico	Chile
2010 (114 thousand ton)	9.475	4.654	3.184	5.198	3.719	3.829	18.058	13.765	51.967
2013 (169 thousand ton)	8.594	4.402	5.839	4.408	6.751	5.526	17.338	46.924	68.816
2010 (148 million U$)	10.263	5.544	3.933	7.403	3.369	5.806	21.418	15.712	74.918
2013 (225 million U$)	11.546	4.818	6.298	7.146	8.459	9.478	20.890	41.361	114.713

Source: UNComtrade

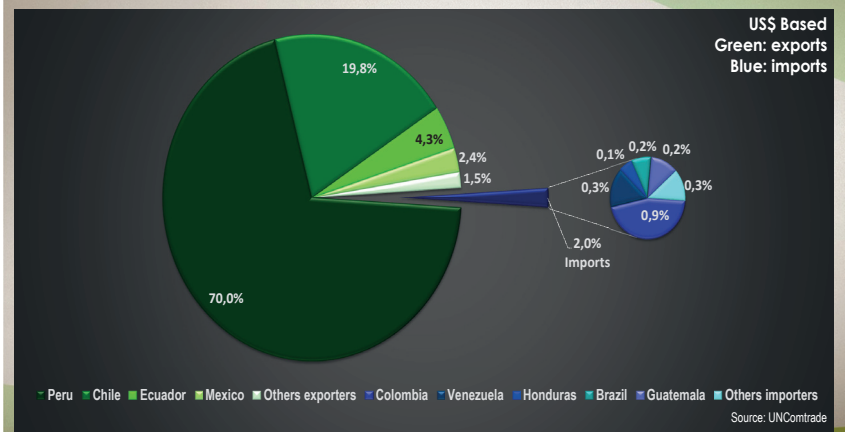
Exports per Country – Fish Meal



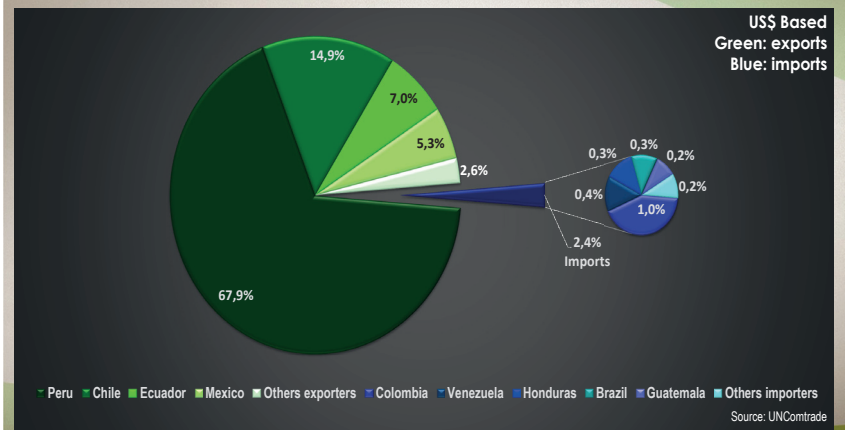
	Others	Argentina	Panama	Mexico	Ecuador	Chile	Peru
2010 (1,594 thousand tons)	8.923	21.893	9.633	57.897	82.979	318.582	1.093.604
2013 (1,374 thousand tons)	12.416	18.823	26.658	106.694	107.495	239.710	861.842
2010 (2,374 billion U$)	7.889	24.210	10.247	71.648	102.919	533.595	1.623.029
2013 (2,158 billion U$)	10.634	22.967	26.000	149.699	149.897	416.731	1.382.308

Source: UNComtrade

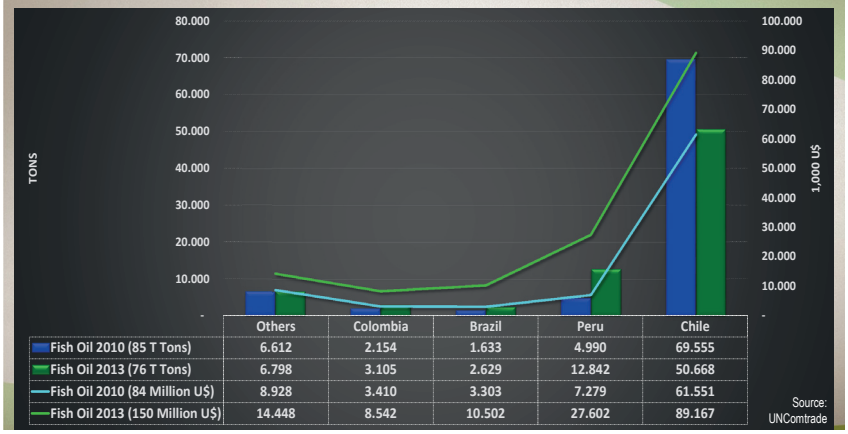
2010: Net Exporter: 2.2 Bi US$ & 1.5 Mi ton of Fish Meal



2013: Net Exporter: 1.9 Bi US$ & 1.2 Mi ton of Fish Meal

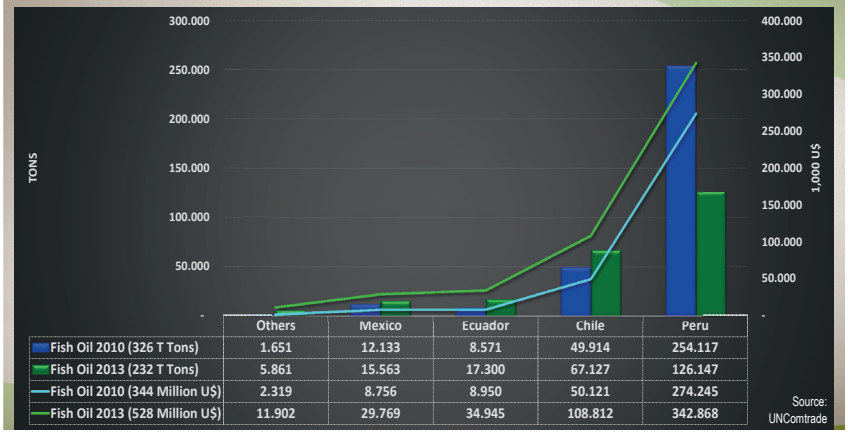


Fish Oil Imports



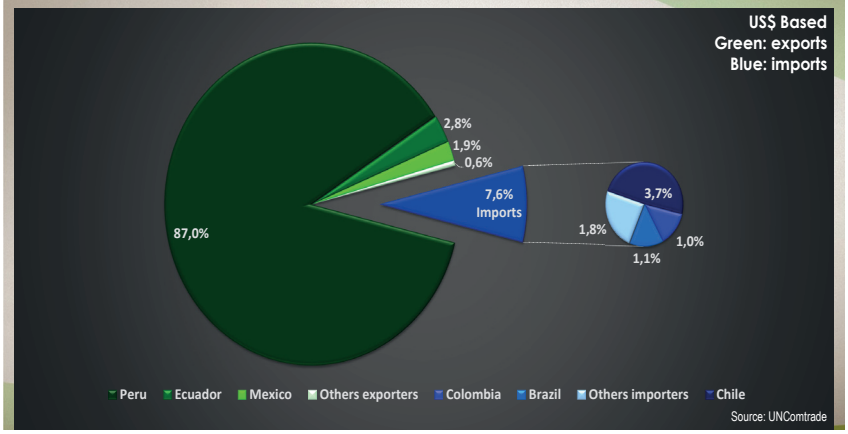
	Others	Colombia	Brazil	Peru	Chile
Fish Oil 2010 (85 T Tons)	6.612	2.154	1.633	4.990	69.555
Fish Oil 2013 (76 T Tons)	6.798	3.105	2.629	12.842	50.668
Fish Oil 2010 (84 Million U$)	8.928	3.410	3.303	7.279	61.551
Fish Oil 2013 (150 Million U$)	14.448	8.542	10.502	27.602	89.167

Fish Oil Exports

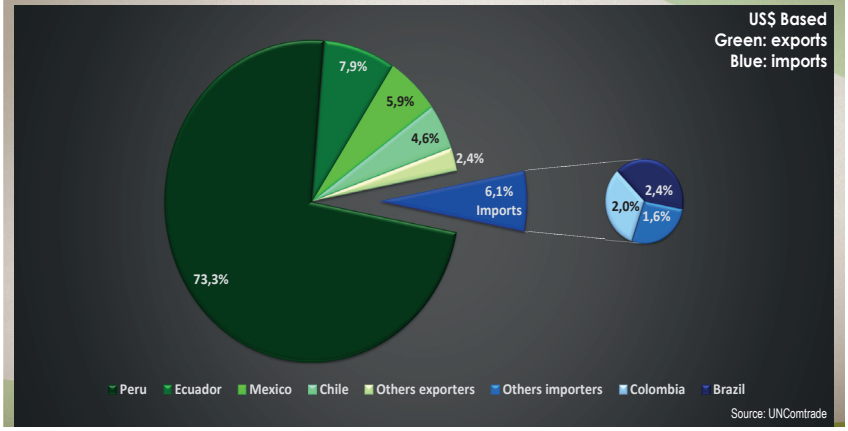


	Others	Mexico	Ecuador	Chile	Peru
Fish Oil 2010 (326 T Tons)	1.651	12.133	8.571	49.914	254.117
Fish Oil 2013 (232 T Tons)	5.861	15.563	17.300	67.127	126.147
Fish Oil 2010 (344 Million U$)	2.319	8.756	8.950	50.121	274.245
Fish Oil 2013 (528 Million U$)	11.902	29.769	34.945	108.812	342.868

2010: Net Exporter: 259 Mi US$ & 241 T ton of Fish Oil



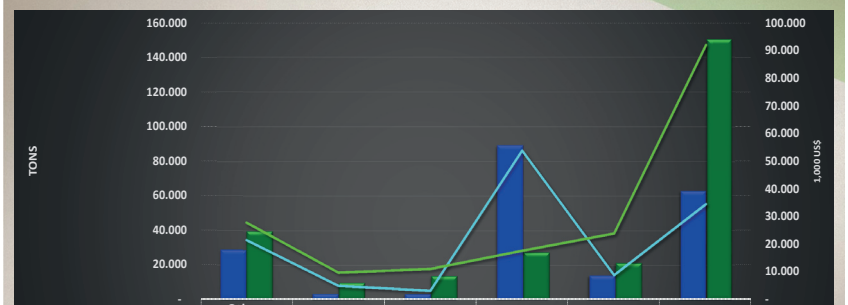
2013: Net Exporter: 378 Mi US$ & 156 T ton of Fish Oil



Latin America
Land Animal Fat & Meal
Export / Import Market

Land animal products: meat and bone meal, poultry meal, feather meal, blood meal & animal fats (HS6: 2301.10, 0507.90, 0505.90, 1501.10, 1501.90, 1502.90, 1502.10, 1502.00, 1503.00, 1506.00 & 1516.10)

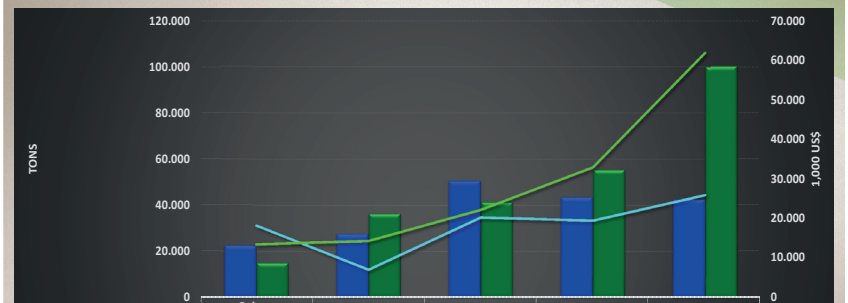
Land Animal Meal - Importers



	Others importers	Colombia	Argentina	Mexico	Honduras	Chile
2010 (203 thousand tons)	28.869	3.671	3.541	89.347	14.263	63.036
2013 (262 thousand tons)	39.667	10.015	13.920	27.562	21.391	150.209
2010 (128 Million US$)	21.716	5.238	3.447	53.951	9.108	34.676
2013 (183 Millions US$)	28.019	10.002	11.335	17.882	24.116	91.990

Source: UNComtrade

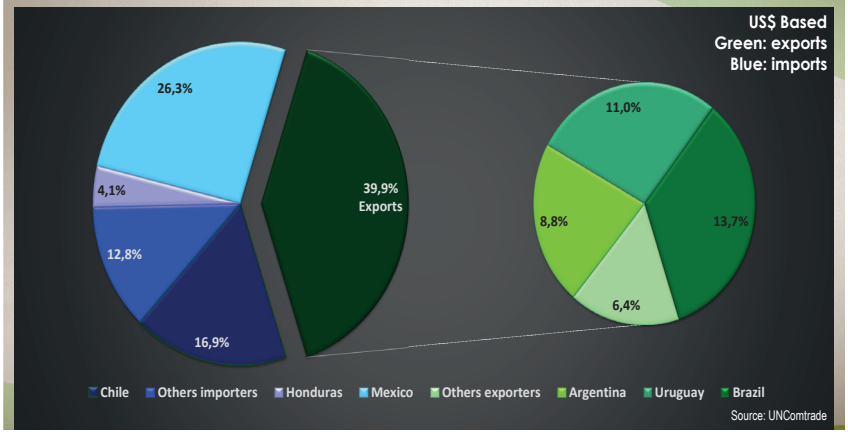
Land Animal Meal - Exporters

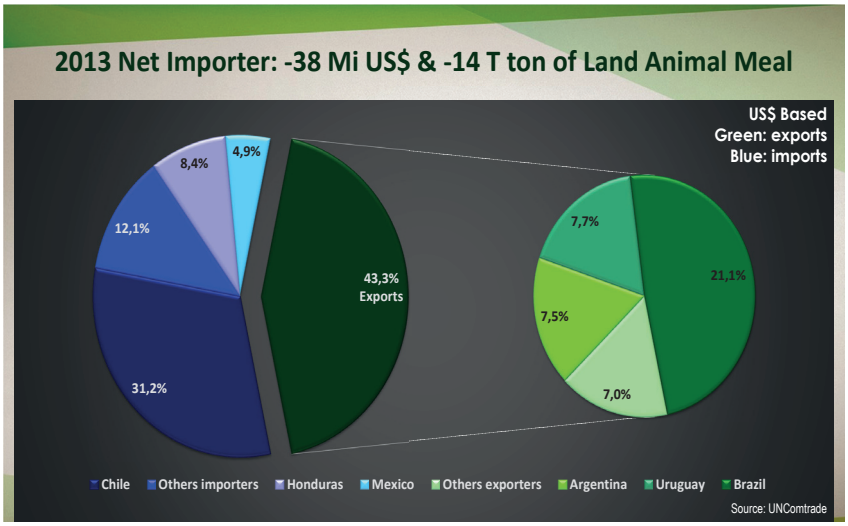


	Others exporters	Paraguay	Uruguay	Argentina	Brazil
2010 (187 thousand tons)	22.506	27.709	50.677	43.590	42.623
2013 (248 thousand tons)	15.133	36.389	41.419	55.383	99.961
2010 (91 Million US$)	18.286	7.140	20.316	19.539	25.978
2013 (145 Million US$)	13.554	14.408	22.249	32.970	61.887

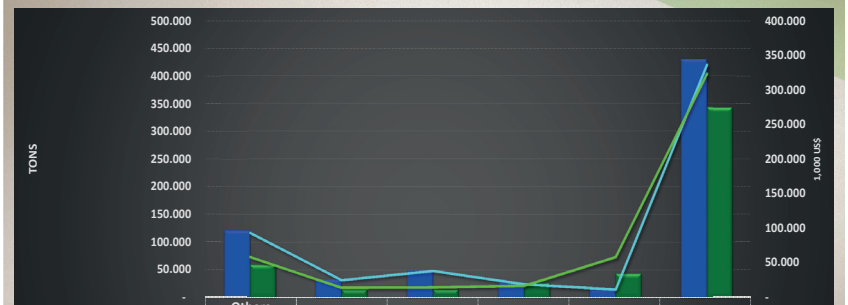
Source: UNComtrade

2010: Net Importer: -37 Mi US$ & -16 T ton of Land Animal Meal





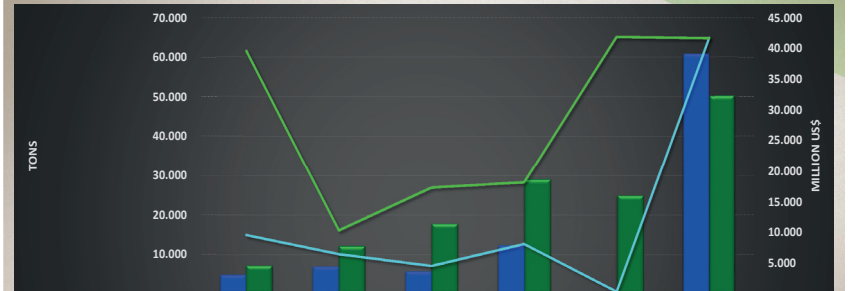
Land Animal Fat Importers



	Others importers	Honduras	Guatemala	Brazil	Venezuela	Mexico
2010 (677 Thousand Tons)	121.399	33.688	49.160	28.152	14.723	429.836
2013 (505 Thousand Tons)	59.788	15.011	15.310	27.016	43.916	343.606
2010 (525 Milion US$)	93.444	25.574	38.880	19.597	12.086	335.649
2013 (488 Million US$)	58.819	14.587	15.139	17.535	58.703	322.736

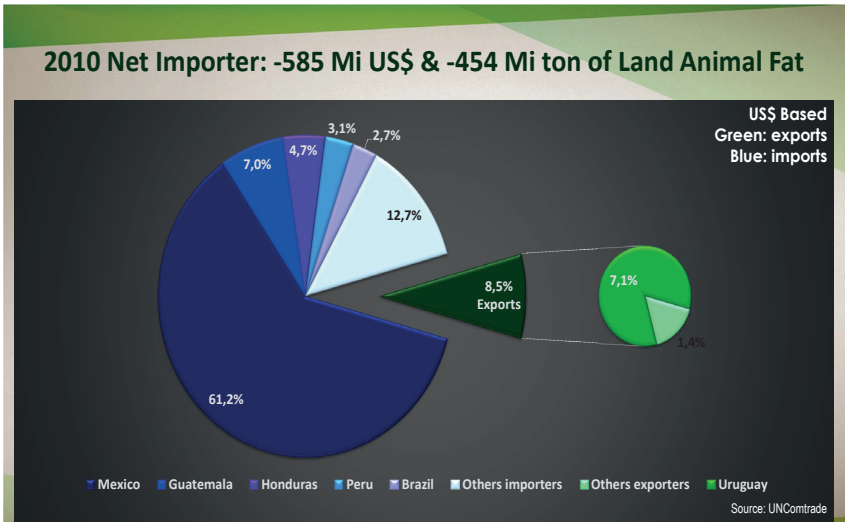
Source: UNComtrade

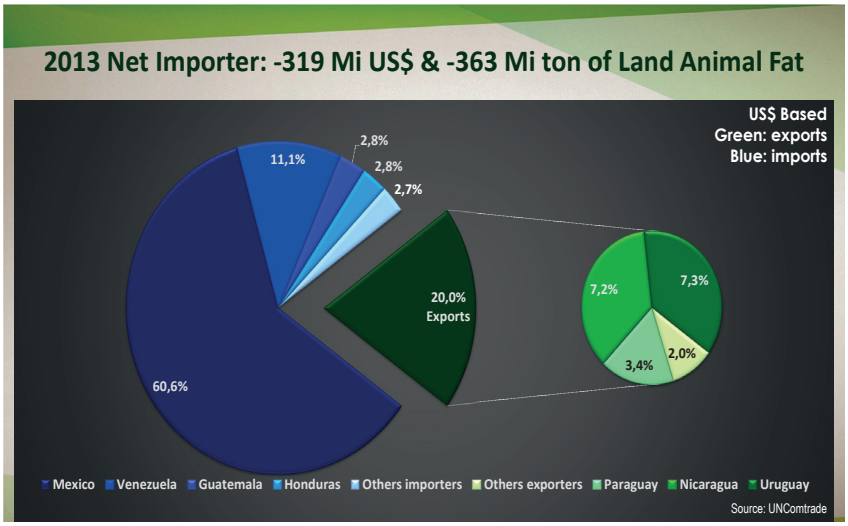
Land Animal Fat Exporters



	Others exporters	Argentina	Brazil	Paraguay	Nicaragua	Uruguay
2010 (92 thousand tons)	4.964	6.986	5.814	12.332	726	60.833
2013 (142 thousand tons)	7.321	12.328	17.923	29.141	25.038	50.218
2010 (71 Million US$)	9.649	6.550	4.627	8.195	464	41.666
2013 (167 Million US$)	39.543	10.399	17.368	18.202	41.832	41.612

Source: UNComtrade


2010 Net Importer: -585 Mi US$ & -454 Mi ton of Land Animal Fat
US$ Based
Green: exports
Blue: imports
3,1%
2,7%
4,7%
7,0%
12,7%
8,5%
Exports
7,1%
1,4%
61,2%
Mexico
Guatemala
Honduras
Peru
Brazil
Others importers
Others exporters
Uruguay
Source: UNComtrade


2013 Net Importer: -319 Mi US$ & -363 Mi ton of Land Animal Fat
US$ Based
Green: exports
Blue: imports
2,8%
11,1%
2,8%
2,7%
20,0%
Exports
7,2%
7,3%
2,0%
3,4%
60,6%
Mexico
Venezuela
Guatemala
Honduras
Others importers
Others exporters
Paraguay
Nicaragua
Uruguay
Source: UNComtrade


Thanks for your attention!!!

Bruce Rountree

Bruce graduated from Massey University with a Bachelor of Science in chemistry and entered the meat industry as an industrial chemist for Thos Borthwick & Sons in 1976 where he was charged with the monitoring and testing of rendered products. In 1984 Bruce established Waitaki International Ltd as a service renderer at the Imlay plant in Wanganui. He worked through the meat industry for a number of companies holding positions from Quality Assurance through to Plant Manager, but always maintained rendering responsibilities. In 1997 Bruce joined the fledgling service renderer Hawkes Bay Protein as General Manager, the position still help by Bruce. He has been active within the NZ Renderer's Group and has help the industry in the world. Bruce also has a strong interest in military history and is happy to talk to anyone about this subject!

International Outlook: Australasia

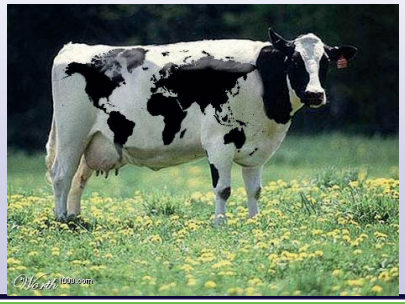
Bruce Rountree
Chairman
New Zealand Renderers Group
(A subcommittee of the Meat Industry Association of NZ)

Overview

- On Farm Production Trends –NZ and Australia
- New Zealand Production and Market
- Industry Structure
- Industry Issues
- Looking Forward
- NZRG Workshop

Australasia

Australasia =
Australia and New Zealand



mia
New Zealand Renderers

Australasia

Rendered Products from Australasia are predominantly from beef and sheep

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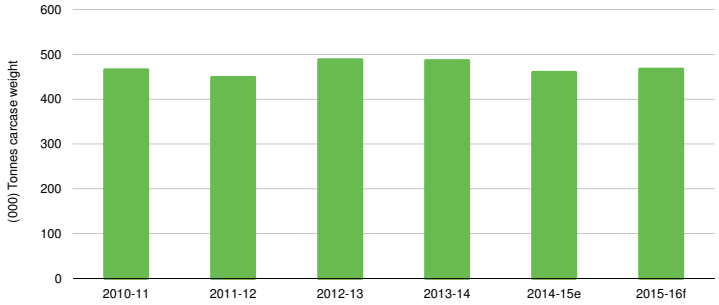
Sheepmeat production

New Zealand

beef+lamb new zealand



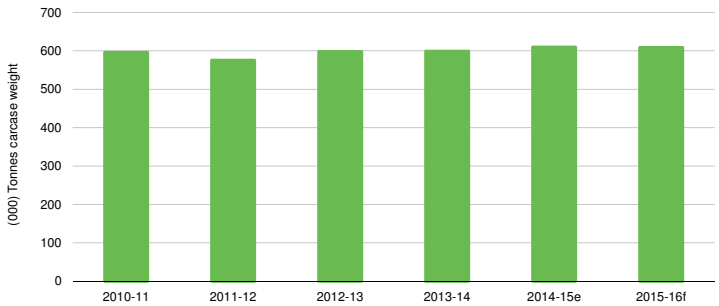
Source: Beef + Lamb New Zealand Economic Service | Ministry for Primary Industries

0800 BEEFLAMB (0800 233 352) | WWW.BEEFLAMBNZ.COM | BY FARMERS. FOR FARMERS

Beef production

New Zealand – Excluding Veal

beef+lamb new zealand

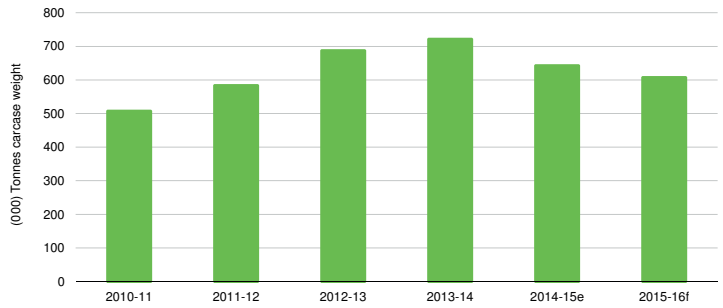


Source: Beef + Lamb New Zealand Economic Service | Ministry for Primary Industries

0800 BEEFLAMB (0800 233 352) | WWW.BEEFLAMBNZ.COM | BY FARMERS. FOR FARMERS

Sheepmeat production

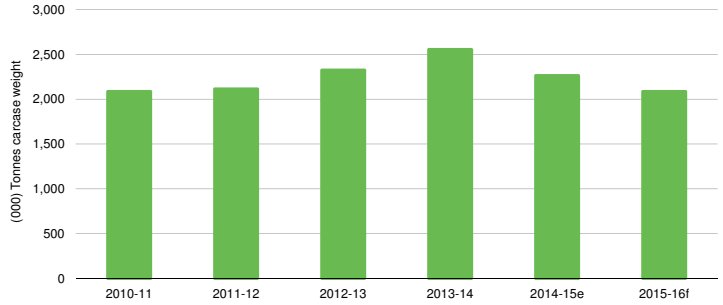
Australia



Source: Beef + Lamb New Zealand Economic Service | Meat and Livestock Australia

Beef production

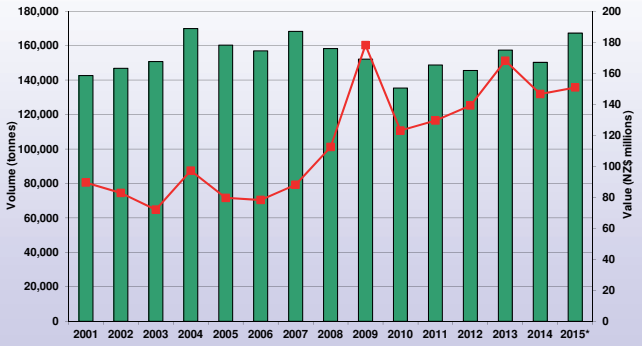
Australia – Excluding Veal



Source: Beef + Lamb New Zealand Economic Service | Meat and Livestock Australia

MBM Exports

(years ended June)



* 2015 covers 12 month period ended 30 April

Source: Compiled by MIA from Statistics New Zealand overseas merchandise trade data

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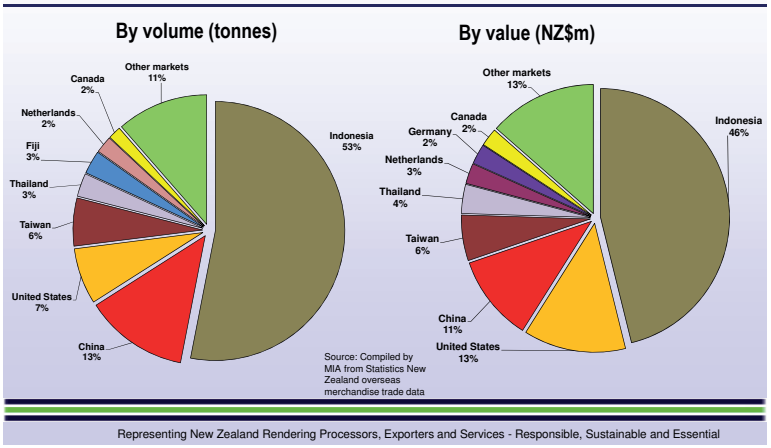
Exports of MBM to major markets

(year end April 2015)



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Tallow Exports: Volume and value

(years ended June*)

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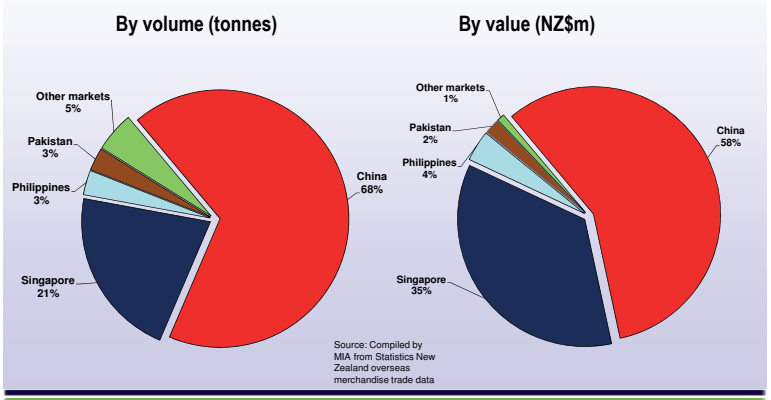
Exports of Tallow to major Markets

(year ended April 2015)



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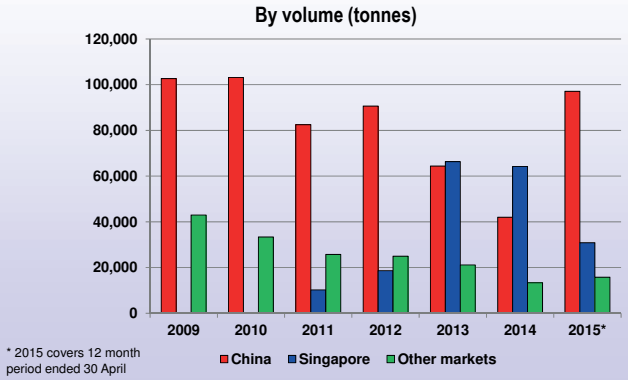
Change in Tallow Exports

(Years ended June*)



* 2015 covers 12 month period ended 30 April

Source: Compiled by MIA from Statistics New Zealand overseas merchandise trade data

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Ovine Processing

- Additional ovine meal processing plants in Australia
- Has impacted on ovine meal price
- Caused some NZ producers to withdraw from ovine market

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Industry Structure

- NZ Meat Processors are rationalising their rendering assets
- Either by divesting or consolidating
- 4 Plants closed in past two years
- Trend for product to be produced by independent rendering companies
- Plants searching for a point of difference

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INDUSTRY ISSUES

- Changing Land Use
- Contamination
- Species Verification
- Avian Influenza (Australia)
- Health and Safety

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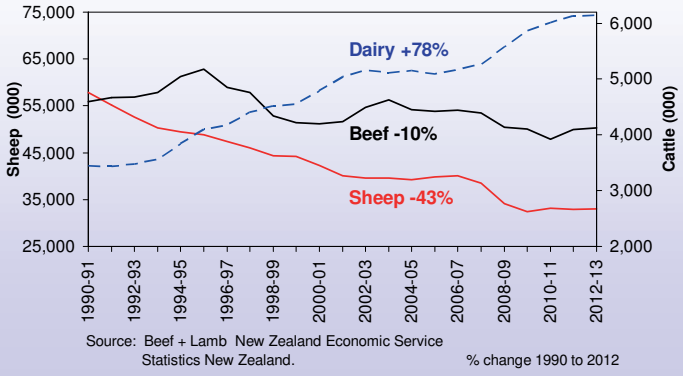
Changing Land Use in NZ



Source: Beef + Lamb New Zealand Economic Service
Statistics New Zealand. % change 1990 to 2012

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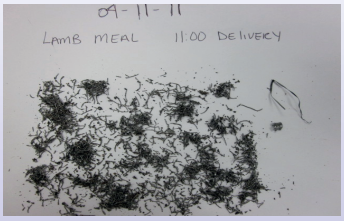
Contamination

- Plastic
- Metal



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Species Verification

- Testing becoming more prevalent
- Religious (Halal) / Feeding like to like
- MBM processed at high temperatures which damages target DNA and impacts on test sensitivity
- Need to understand importing countries methods, detection limits, species of concern and impact of detection

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Avian Influenza

- Australia only
- AI incident 2 years ago
- Taiwan, Indonesia and China introduced market restrictions
- Free from HPAI for over one year
- Taiwan and Indonesia lifted restrictions
- China still does not recognise Australia as free and maintains restrictions

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Health and Safety

- Increased regulatory awareness on company health and safety
- Concern that MBM has been considered a dangerous good by one shipping company

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LOOKING FORWARD

- China
- Aquafeed
- Food Safety and Nutrition
- Shipping
- Non-traditional markets
- Training Workshops

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Feed the fish..feed the world

- World is hungry for protein
- MBM in aqua feed is an efficient way to produce more protein food
- Compound aqua feed production ⇑ 10% pa

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Looking Forward

- Increasing focus on Food Safety and Nutrition
  - Chemicals/Pesticides
  - Pathogens
  - Nutritional Analyses
- New shipping lines providing more competitive service and rates
- Enquiries from non-traditional markets
  -Russia, -Brazil, -Mexico. -Latvia

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2015 NZRG Workshop

31 August -3 September

Invercargill, South Island, New Zealand

- Stage II workshop with a focus to build knowledge on targeted topics.
- For 2015 the workshop has a special emphasis on identifying the root cause of problems.
- Visit 4 Rendering Premises –with different processes.
- Group discussions to foster learning, knowledge sharing and networking.
- Concludes with NZRG Seminar and Dinner.
- Further Information: NZRG@mia.co.nz

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Acknowledgements

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Haarslev Industries is the world's largest manufacturer of equipment for the rendering industry.

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