Final report

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New products, Co-product and Value adding Innovation Training

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Co-products June 2014 workshop proceedings

Introduction

Is there a difference between a by-product and a co-product? This may seem like a semantic distinction, but the terminology reflects two different paradigms in thinking. “By-product” suggests a focus on some other product, with the by-product being more or less an unfortunate consequence of the main product. It is something to be handled, to be got rid of, an environmental burden. While there may be an awareness of the revenue that might be derived from sale of a by-product, there is likely to be little thought its value (to the customer), usefulness, functionality or performance.

“Co-product” on the other hand conjures up images of several products laid out side by side – each perhaps of different net value in dollar terms, each tailored for a specific market and each priced to reflect the value placed on it by the customer. For such products, usefulness, functionality and performance are key sales points and excelling in these characteristics can be rewarded by premium prices (and margins).

Conventional red meat co-products such as offal, skins and hides, meat and bone meal, blood meal and tallow can account for, in cattle processing for example, up to 20% of the value of a carcase. In an industry where the net margin of beef processing is reported to be as little as 2%, profitability is therefore critically dependent on the revenue from co-products. It has been estimated that these co-products enter more than 40 different value chains and tailoring co-products therefore requires an encyclopaedic understanding of customers’ needs in terms of product performance and functionality.

The aim of this workshop was to review a number of specific opportunities for increasing the value of conventional co-products by meeting the functionality and performance needs of the customers. The workshop focused on the Issues, Technologies and Markets for co-products. Issues were identified by industry experts, relevant technologies were reviewed by R&D providers and consultants and market needs were addressed by speakers from the (mono-gastric) stockfeed industry, the pet food industry and the aquaculture industry.

Conclusions and recommendations

Issues

- Yields are variable
- % recovery is variable
- Energy has grown from 7% of cost of rendered material to 33%
- A 1% decrease in protein content of dried meal can have a big impact on customer profitability
- Independent specialty renderers may be more efficient than processor renderers. (perhaps consider alternative rendering business models.
- Foreign bodies can end up in co-products if they are treated like waste products rather than valuable products.
- In stockfeed, microbiological quality, over-drying affecting digestibility, particle size (bone fragments) and batch to batch consistency are the key issues.
- Processors may be unaware of stickwater handling solutions already developed. MLA and AMPC resources and even conventional textbooks should be consulted.

Technologies

- Biogas production has reduced energy costs by 50% through pre-heating in rendering
- There is potential for segregating raw materials for rendering in order to produce differentiated products with different protein to ash contents. There is an MLA tool which allows this to be quantified.
- Avoid water addition to blood streams. Monitor and manage stickwater stream concentrations.

Markets

- Pets are very susceptible to off flavours such as are produced if product ages before chilling. Some protein breakdown products are toxic to pets.
- Excessive levels of ash detract from protein uptake and therefore pet health.
- Pet food manufacturers go to a lot of trouble to provide pet owners with complete and balanced formulations and batch to batch variability in co-product quality can destroy this balance.
- Foreign objects can result in harm to pets and product recall.
- In stockfeed, microbiological quality, over-drying affecting digestibility, particle size (bone fragments) and batch to batch consistency can impact for example poultry growth rate, muscle distribution, egg quality, all of which in turn impact profitability. High quality consistent rendered meals are therefore valued by the industry.
- Animal protein meals >60% protein may attract 15 to 20% premium per unit of digestible protein, but only if fat is <10%

Biodiesel landscape – impact on the tallow market

June 17 2014

- **Domestic vs Export**

- **Global policy initiatives to reduce carbon emissions:**
- **EU – Renewable Energy Directive (RED)**
- **USA – Renewable Fuel Standard (RFS2) and California's Low Carbon Fuel Standard (LCFS). California around 11% of US transportation fuel market.**

- **Renewable fuels generate Renewable Identification Numbers (RINs) – market based mechanism to enable obligated parties to meet mandated biofuel volumes. Tallow generate D4 and D6 RIN's.**

- **California's Low Carbon Fuel Standard – requires a 10% reduction in the carbon intensity of transportation fuels by 2020, as measured on a lifecycle basis.**

- **Fuels that have lower carbon intensity than gasoline or diesel generate LCFS credits.**

Fuel/Feedstock	Carbon Intensity (gCO2e/MJ)
Biodiesel, soy oil	83.25
Biodiesel, waste grease	13.80
Biodiesel, corn oil	4.00
Biodiesel, canola oil	83.25
Renewable diesel, US tallow	19.65
Renewable diesel, Aus tallow	33.00
LNG	77.76

- **2014 proposal 15.21 billion gal of total renewable fuel (down from 18.15 billion gal as originally expected).**

- **The biodiesel tax credit expired at the end of 2013 – extension of this credit is before the senate and may be applied retrospectively. For renewable diesel, EPA would maintain the target at last year's level of 1.28 billion gal – despite the industry producing above that in 2013.**

- **80% of National Biodiesel Board producer members have scaled back production in 2014 – impact in our local region.**

- Implication’s for the Australian renderer – credit to the ARA for work done on the carbon intensity.

- Traceability back to rendering plant.

- Specification – plastics, Nitrogen, Phosphorus along with previously important specifications moisture and FFA.

- EU Renewable Energy Directive (RED) – plant audit required, no direct access to EU market due to perceived BSE risk – work is continuing on market access.

- <u>Market drivers:</u>
- Energy markets
- Government mandates – Australia/USA/EU
- Competing origins
- Competing feedstocks

Blood stickwater yield recovery -Learn from history

Philip Franks

Manager, Value Adding, MLA

Blood stickwater yield recovery

- Previous studies –
  - What did they tell us?
  - Did we listen?
- You can’t manage what you can’t measure

Past studies

- A.BIT.0005 Influence of operating conditions on blood recovery. Single plant.
- ENV 2003 Electrocoagulation process for wastewater treatment
- PRENV028 Membrane technologies for meat processing waste streams
- Stickwater recovery – Meat technology update (2001)
- M734a Evaluation of stickwater evaporation process (1996)

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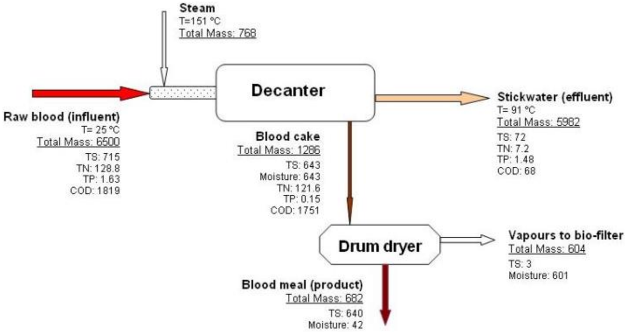
Exec summary A.BIT.0005

- Stickwater ≠ Stickwater
- Blood decanter mass balance
  - All streams
  - Volume, composition



- Organic nitrogen (in study)
  - 5.6% of the blood
  - 1 tonne blood meal lost / 140 tonne daily blood intake
- Laboratory supernatant
  - Ultrafiltration → 40% of the COD removed; 40% of the nitrogen (TKN)
- Decanter was not efficient, some suspended solids remained (50% of which could be settled out)

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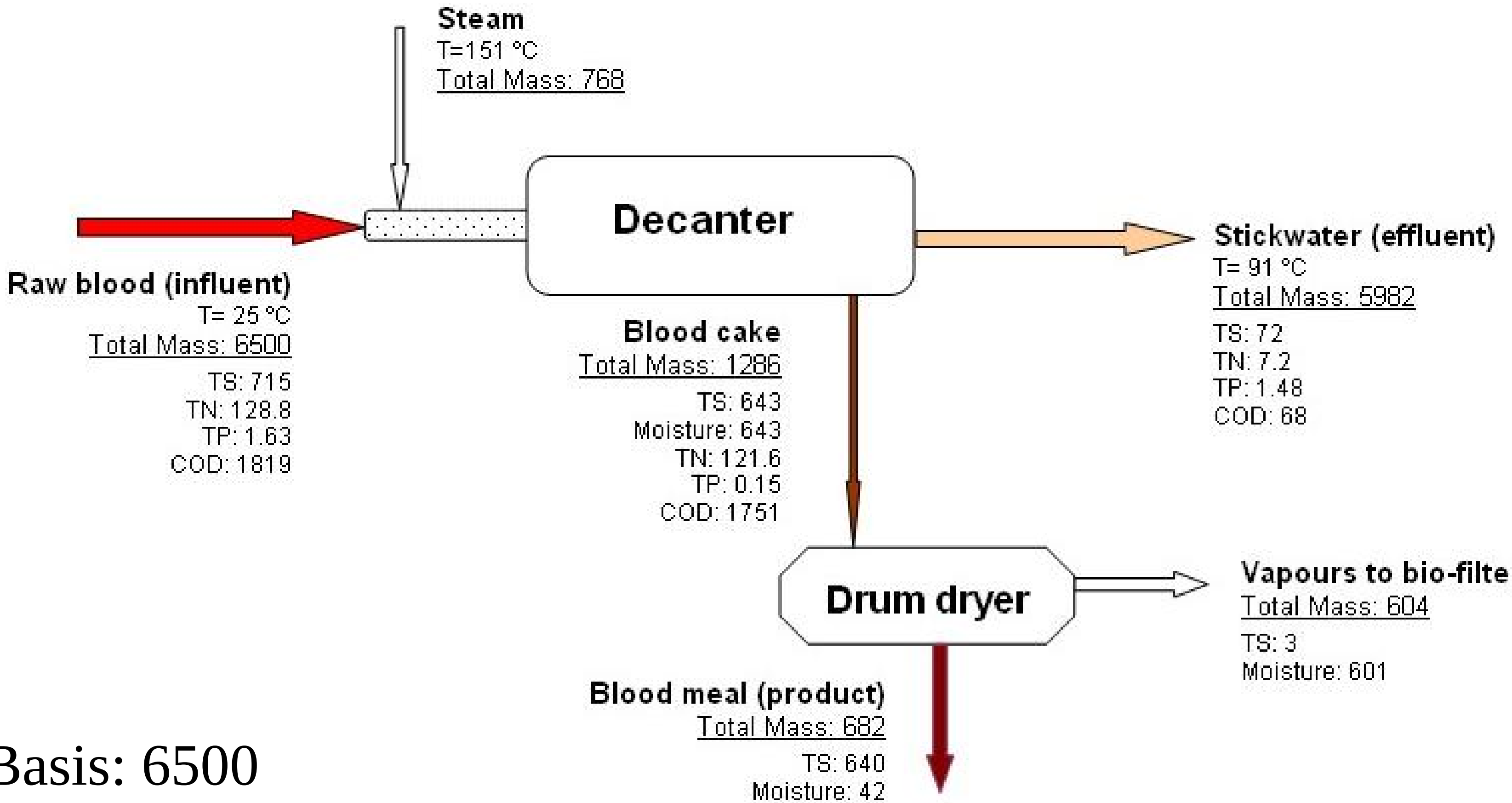
Mass balance

Figure 1 Diagram of mass flow around decanter at the rendering site (unit: kg/h)



Basis: 6500 kg/h

Nutrient recovery

- Nitrogen capture:
  - Decanter captured 94% of the blood protein
  - Settling captured another 3%
  - Ultrafiltration captures another 1%

- Phosphorous (phosphate) capture
  - Decanter captured only 9% of blood phosphate
  - Settling captured 0% of P
  - Ultrafiltration captured another 7%
  - 83% of the Phosphate in the original blood ends up in the stickwater

Factors affecting nutrient loss

- Blood age, solids content at time of processing
- Microbial spoilage turning protein into ammonium ions and nitrate.
- Coagulation temperature and feed rate
- Cleanliness of decanter

Possible solutions to proteins in the stickwater

- Adding acid to lower the pH removed almost 20% of the protein in settled stickwater

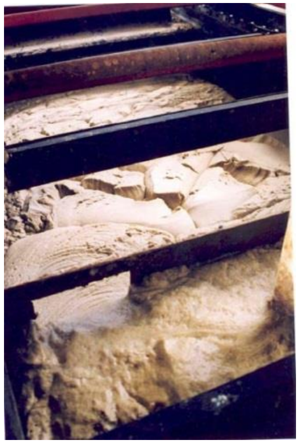
- Increasing the temperature to 100deg C had no effect on stickwater nutrients

Recommendations

- Need good data. Monitor multiple batches.
- Install settling unit
- pH adjustment for protein recovery.
- Ultrafiltration good but expensive, capital, fouling, cooling to <50deg C necessary.
- There is potential to optimise recovery of nutrients beyond what was found. Should do systematic study in lab and small pilot plant.
- Phosphate essentially untouched.
- Running decanter slower may reduce s/w N,P.

Electrocoagulation ENV 2003

- Direct current through aluminium electrode results in flocculation – thick foam
- P reduced to 50 mg/L (compared to 250 in standard stickwater)
- Large amount of foam may be a problem all of its own.
- Stickwater had to be diluted 1:4, another problem ?
- Is this why P is ¼ level?



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PRENV028 Membrane report

- Membranes can save boiler costs- dewatering
- Concentration up to about 20-25% solids before fouling reduces flux

Scenario 1 – Options	Capital cost (A$K for 30kL/d)	(Total) Processing cost (A$/kL)
VSEP	285	3.9 (down to 2.1)
Rotary (type R2)	270	3.8
Ceramic	215	3.2 (down to 1.5)
(Capillary polymeric)		< 0.5

- Small scale testing is possible. Modular scale-up

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Double effect evaporator (2001)

- DEE has low operating cost but high capex.
- Biological treatment was a better (2001) option
- Concentrated stickwater tends to gel
- Still energy intensive

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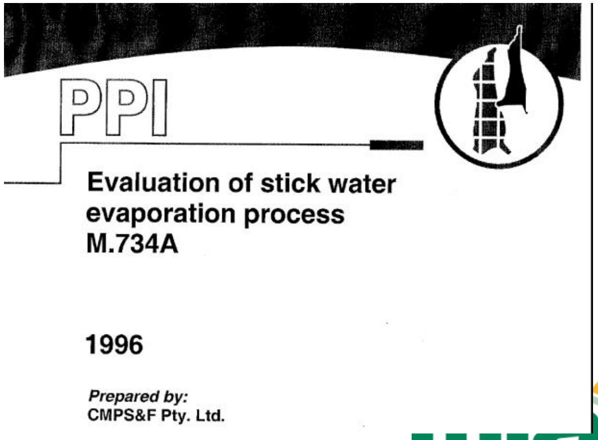
M734a Evaluation of stickwater evaporation process (1996)

- Stickwater was very impure (8% solids)
- Condensate very pure with some COD left in it.
- Seed nuclei of Calcium phosphate suggested
- 1.4kW/hr operating cost plus energy
- Savings of about $300k/yr with 1996 energy costs


PPI

Evaluation of stick water evaporation process
M.734A

1996

Prepared by:
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Commodity to branding - Case Studies

Philip Franks – Manager, Value Adding, MLA

June 2014

Commodity definition

- Kotler and Keller (2006) define a commodity as a product that is so basic that it cannot be physically differentiated in the mind of the consumer.
- Theodore Levitt (1980) “Marketing success through differentiation – of anything” → *There is no such thing as a commodity. All goods and services are differentiable.*

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Marketing as defined by the American Marketing Association

- Marketing is the activity, set of institutions, and processes for creating, communicating, delivering and exchanging offerings that have value for customers, clients, partners and society at large. (AMA Oct 2007)

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High value coproducts case study
Dairy

- Large multinationals
  - Nestle, Danone, Parmalat, Fonterra, Murray Golburn
- OLD PARADIGM
  - Primary products - milk, butter, cream
  - Consumer focused final products
  - Waste product – whey sprayed back on fields

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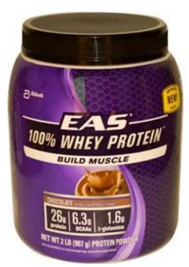
High value coproducts case study
Dairy

- NEW PARADIGM
  - Primary products - milk, butter, cream
  - Fancy Milk 30% in UK
  - Multiple whey products
  - Multiple milk products
  - Dairy products as ingredients



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High value coproducts case study Dairy

- NEW PARADIGM Australia
- Domestic dairy grew 1.1% pa over 10 yrs
- Export value grew 10.1% pa over 10 yrs
- Farmgate $4b, Wholesale $12b -> VA $8b
- $VA / employee increased 12%
  - Milk and cream 28%
  - Other dairy products 11%

High value coproducts case study Dairy

- NEW PARADIGM New Zealand
- 80% of NZ dairy products VA and differentiated
- Milk powder
- Butter and cheese
- Ice cream
- Spray dried milk proteins
- Protein hydrolysates
- Freeze dried bioactive proteins (40% of lactoferrin market)

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High value coproducts case study
Dairy

- Is milk special?
- Lends itself to fractionation – fats sugars proteins (food use)
- Changed compositions
  - Low fat
  - Low cholesterol
  - High calcium
  - High fibre
  - Active cultures

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High value coproducts case study
Dairy

- Successfully diversified products and markets
- Successfully added plant sterols, stanols, omega3, CLA
- Successfully produced protein concentrates
- Successful as ingredients in bread (milk protein isolate, whey protein isolate, casein, caseinate, whey protein concentrate)
- Anlene, + Ca, vit D, vit K1, Mg, Zn, protein

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High value coproducts case study Dairy

- Why bother?

- Murray Goulburn – needed specialised products to provide consistently high prices / margins to balance large price variations in commodities like milk.

- “The change from consumer products to ingredients often requires different technologies, marketing structure and distribution channels”

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High value coproducts case study
Wheat

- Commodity – Global trade
- Some differentiation, main application is bread and bakery products

- OLD PARADIGM
  - White bread 90% in the 1980's
  - Some variety in UK, Aus, USA, Canada, Europe but…
  - Still basic traditional and commodity product
  - Price was the basis of competition

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High value coproducts case study
Wheat

- Changing market environment
  - Consumer interest in health
  - Healthier ingredients
  - Functional food trend
  - Functional white bread

Table 2. The types and levels of NSP present in some cereal grains (% dry matter)

Cereal	Arabinoxylan	ß-Glucan	Cellulose	Man	Gal	Uronic Acid	Total
Wheat[1]							
Soluble	1.8	0.4		t	0.2	t	2.4
Insoluble	6.3	0.4	2.0	t	0.1	0.2	9.0
Barley[1]							
Soluble	0.8	3.6		t	0.1	t	4.5
Insoluble	7.1	0.7	3.9	0.2	0.1	0.2	12.2
Rye[1]							
Soluble	3.4	0.9		0.1	0.1	0.1	4.6
Insoluble	5.5	1.1	1.5	0.2	0.2	0.1	8.6
Oats[2]							
Soluble	0.8	2.8		t	0.1	0.1	3.8
Insoluble	14.7		10.1	0.2	0.1	t	24.5
Triticale[2]							
Soluble	1.3	0.2		0.02	0.1	0.1	1.7
Insoluble	9.5	1.5	2.5	0.6	0.4	0.1	14.6
Sorghum[2]							
Soluble	0.1	0.1		t	t	t	0.2
Insoluble	2.0	0.1	2.2	0.1	0.15	t	4.6
Corn[2]							
Soluble	0.1	t		t	t	t	0.1
Insoluble	5.1		2.0	0.2	0.6	t	8.0
Rice (pearled)[2]							
Soluble	t	0.1		t	0.1	0.1	0.3
Insoluble	0.2		0.3	t	t	t	0.5

[1] Englyst (1989); [2] University of New England, Australia

- NEW PARADIGM
  - Healthier breads
  - "Bread +"
  - Non price competition (e.g organic, enriched, quality)
  - Wheat fractionation – new industries

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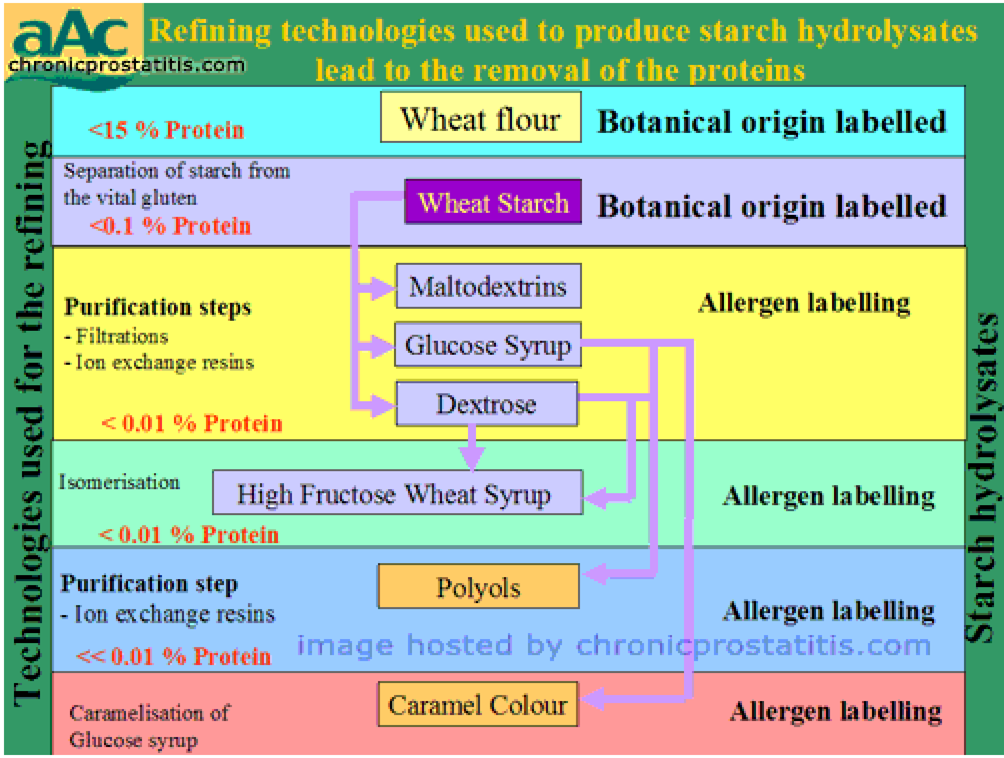
High value coproducts case study Wheat

- $407b pa bakery products market (48% bread)
- White bread dropped from 1980's 90% to 2010's level of 60%
- Functional bread uptake strong in Australia – good branding and communication
- Weak in Germany and UK because of weak marketing efforts
- Support from R&D in bread products (2% of bakery sales)

High value coproducts case study
Wheat

- Novel wheat applications
  - Bran as ingredient, antioxidant
  - Starch as ingredient, modified starches, resistant starches
  - Starch to alcohol
  - Gluten as ingredient
  - Noodles
  - Breadcrumbs
  - Whole grain softened



High value coproducts case studies Learnings

- New VA products need above average levels of R&D, marketing and innovation
- Need to focus on specific applications where the products exceed the performance of substitutes and create barriers to entry.
- Need appropriate partners and need to provide technical support in early stages.
- Need awareness of other industries' needs and opportunities. Opportunities as ingredients. B2B
- ………..?

Effluent streams from rendering and blood processing

Ron Brooks

&

Bill Spooncer

AMPC Project

- Characterise effluent streams
- Look at the contribution of rendering to effluent treatments and GHG
- Look at potential product loss in effluent
- Suggest methods to reduce contribution to effluent load and to reduce or recover losses.

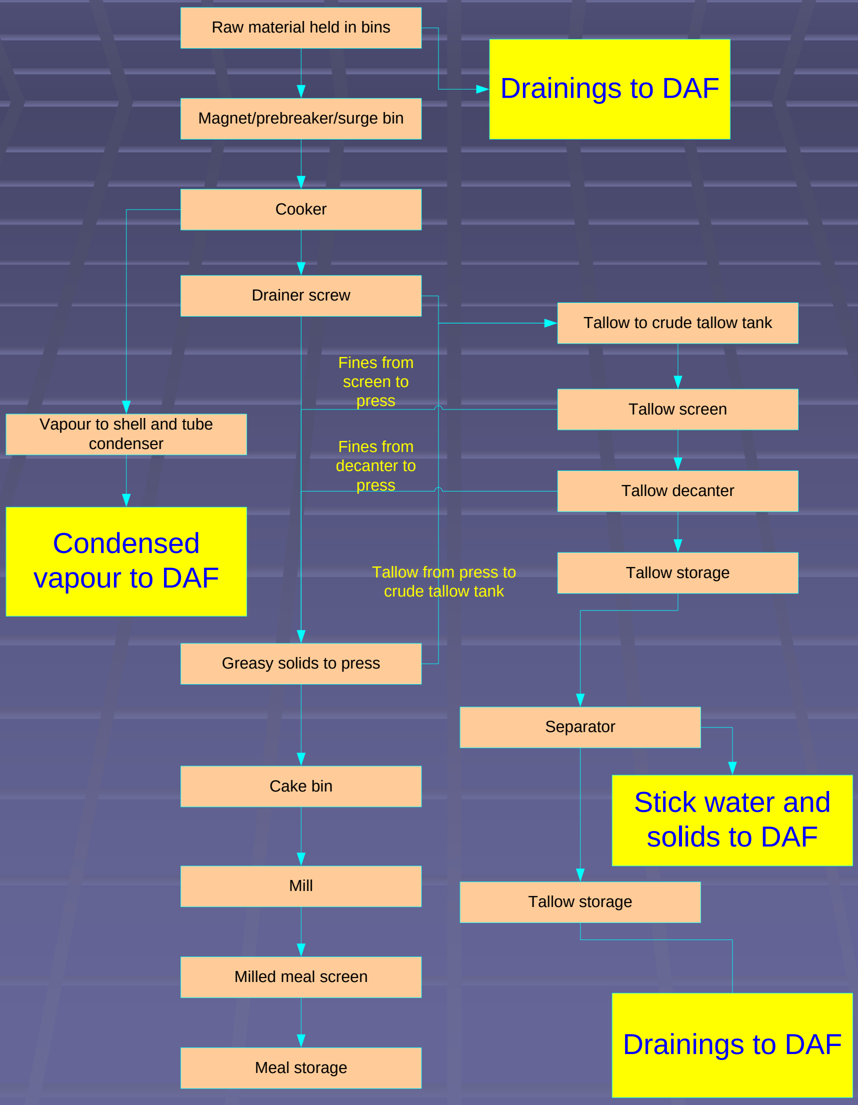
AMPC Project

- 2 x Beef dry-rendering
- 1 x Sheep dry-rendering
- 1 x Mixed species dry-rendering
- 1 x Beef wet-rendering

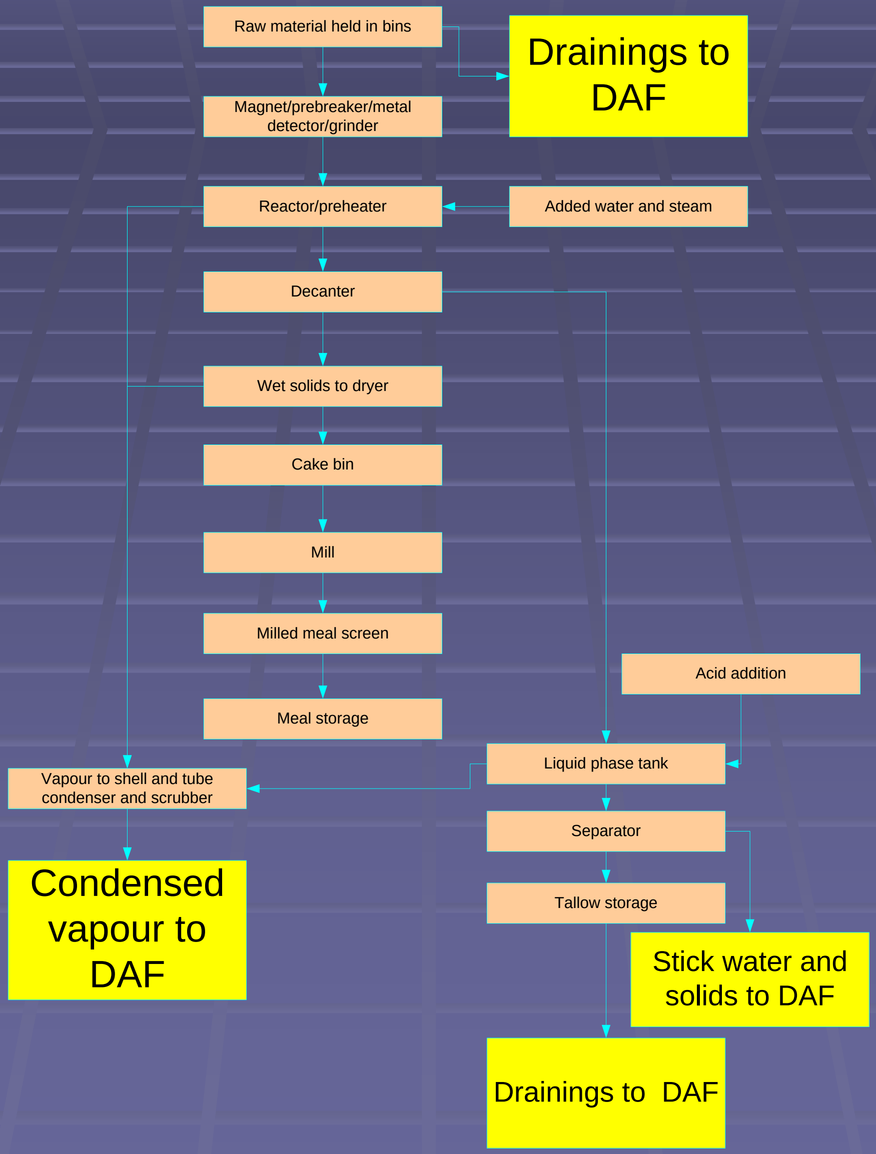

Flo-Dry


Flo-Dry

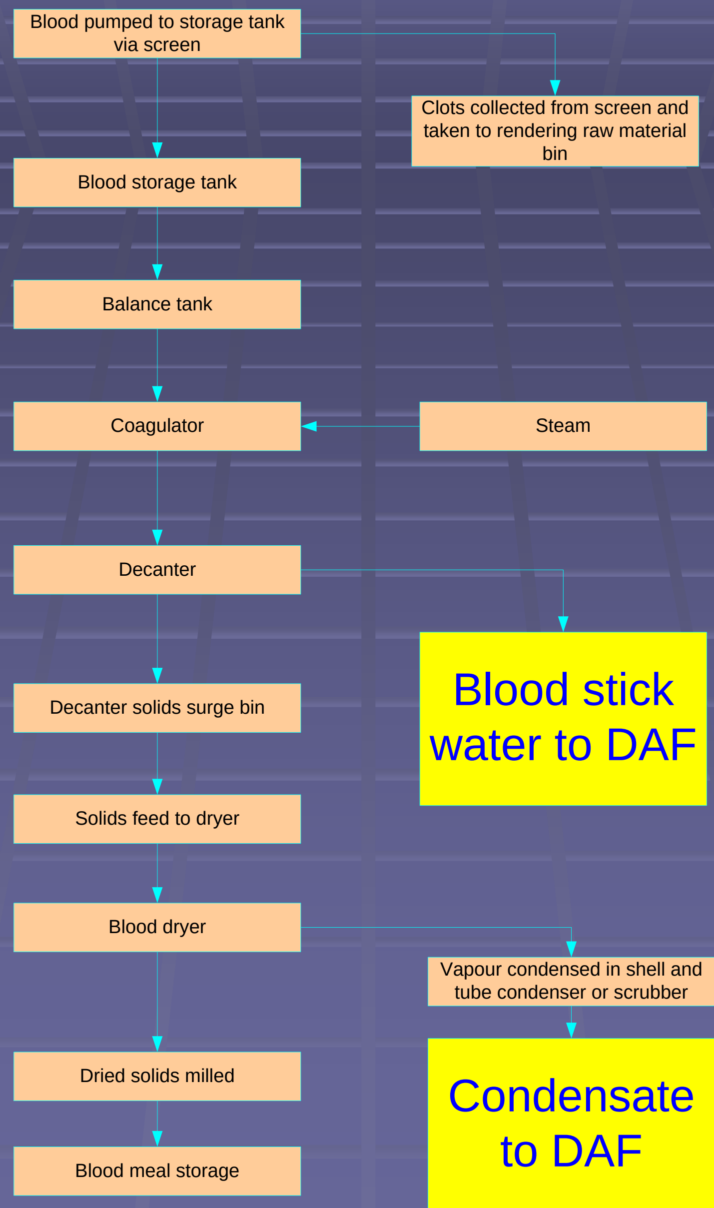
Dry Rendering



Wet rendering



Blood processing



Findings

- No pattern to focus on
- Each establishment had different idiosyncrasies resulting in losses and inefficiencies.
- Keep an eye on the effluent streams and measure volume and composition.

Values

- 2011, 2012, 2013 averages
  - MBM $582 per tonne
  - 2% tallow $881 per tonne
  - Blood meal $911 per tonne

Raw material drainings

	High	Low
Volume	16,678 m^3/y	1,187 m^3/y (ovine)
% of raw material	42.8	8.25 (ovine)
Tallow loss	170 tonnes	-20 tonnes
Tallow value	$150,000	-17,000
MBM Loss	866 tonnes	80 tonnes (bovine)
MBM value	$504,000	$31,000 (bovine)

Tallow separator

	High	Low
Volume	45,800 m^3/y	111 m^3/y
% of tallow prod$^{\underline{n}}$	538	1.6
Tallow loss	27 tonnes	1 tonnes
Tallow value	$24,100	$686
MBM Loss	155 tonnes	2 tonnes
MBM value	$90,315	$1,071 tonnes

Wet rendering liquid phase

Stick water volume	26,000 m^3/y
% of liquid phase	75
Tallow in stick water	34 t/y
Value of tallow	$30,000
MBM in stick water	375 t/y
Value of MBM	$218,000

Separator cleaning cycle

	Dry rendering	Wet rendering
Volume	873 m^3/y	5,000 m^3/y
Tallow loss	6 t/y	141 t/y
Tallow value	$5,000	$123,000
MBM Loss	2 t/y	132 t/y
MBM value	$1,400	$76,600
Total tallow		$153,000 (2%)
Total MBM		$293,000 (9%)

Condensate

	High	Low
Volume	24,393 m^3/y	7,097 m^3/y
% of raw material	62.6	49.3
Tallow loss	0.6 tonnes	-1 tonnes
Tallow value	$579	-$924
MBM Loss	13 tonnes	2 tonnes
MBM value	$ 4,033	$1,173

Blood stick water

	High	Low
Volume	4,914 m^3/y	792 m^3/y
% of blood	80	50
% solids in blood	14	9
% solids in stick water	3.6	1.2
Blood meal loss	167 t/y	10 t/y
Blood meal value	$165,000 (28%)	$9,000

Blood condensate

Volume	1,760 m^3/y	587 m^3/y
% of blood	18	37
Blood meal loss	1 t/y	0.2 t/y
Blood meal value	$911	$182

Benchmarks

- Raw material drainings:
  - 9% of raw material
  - 8% solids
  - 0.2% O&G
- Blood
  - Blood solids 14% (35% added water)
  - Stick water solids 1.2% (<1% is possible)
  - <12% reduction in stick water solids after centrifuging.

What to do?

- Raw material drainings
  - The only consistent source of effluent load and product loss at all plants
  - High volume and losses due to blowing raw material from several sources
  - Estimate volume by timed collection in a bucket or tub. (Flow rate is not consistent).
  - Measure T.S. O&G and protein to estimate losses

What to do?

1. Don’t add water
2. Don’t add water
3. Don’t add water
4. Could add drainings to blood before coagulator bit only if protein in drainings is high i.e. >6% solids

What to do?

- Separators
  - Keep an eye on tallow and water phases
  - 5 to 10% water addition should be plenty

What to do?

- Measure condensate flow and compare with evaporation capacity
- e.g. 3,000kg/hr measured c.f. 4,000kg/hr capacity.

What to do?

- Blood:
  - Don’t add water (more water, more stick water)
  - Measure stick water solids before and after centrifuging
  - Age blood 12 hours

Effluent contribution

	Low	High
Total volume	5.1%	23.2
COD	14.2%	40%
TN	28%	55%
O&G	23.2%	37.2%

Value Chain Hide, Skin & Leather Industry

Dennis King
Executive Officer
Australian Hide Skin and Leather Exporters Association Inc

Overview

- The world's hide, skins and leather industry has changed significantly over the past 20 to 25 years.
  - During this time there has been a considerable shift in the location of the tanning and leather manufacturing industries to developing countries where manufacturing costs are lower.
  - Many developing countries, being aware of the economic potential of their raw hides and skins, have made considerable efforts to develop these industries.
- Hides and skins are primarily produced as by-products of the meat industry.
  - Consequently, their output is generally inelastic to changes in demand for hides and skins.
  - Imbalances between supply and demand of hides and skins have often resulted in considerable price fluctuations.
  - In 2012 the global value of trade in hides and skins, leather and leather products amounted to almost US$80,000 million. Raw Value globally represents around 12% of that value - US$7,000 million. This does not include the value of any international internal domestic use of hides skins and leather. (Source FAO)
  - Beef and Veal global trade for that period totalled US $24,000 million (Source FAO)

Overview

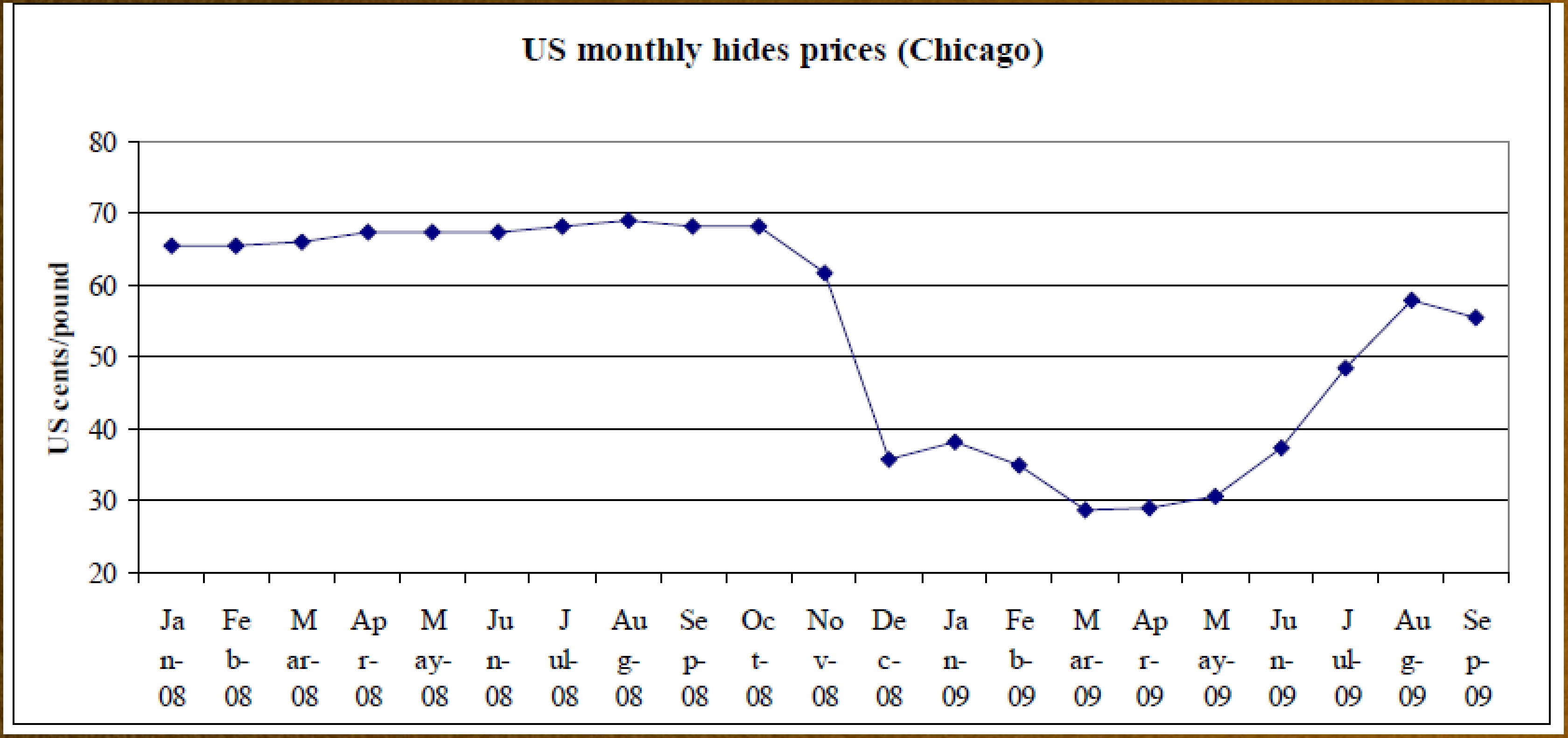
- World production of bovine hides and skins is 360 million pieces at 6,500 thousand wet salted tonnes
- Australian production of bovine hides and skins is 8.5 million pieces at 175 thousand wet salted tonnes
- World production sheep and lamb skins is 531 million pieces at 400 thousand dry tonnes
- Australian production of sheep and lambskins is 28 million at 37 thousand dry tonnes
- World production of goat and kid skins is 480 million pieces at 340 thousand dry tonnes
- Australian production of goat and kid skins is 1.1 million pieces at 1.1 thousand dry tonnes
- Value of Hide and skin export from Australia has risen from around A$800 million in 2010 to around A$1,200 million in 2013

(Source FAO 2013 Compendium)

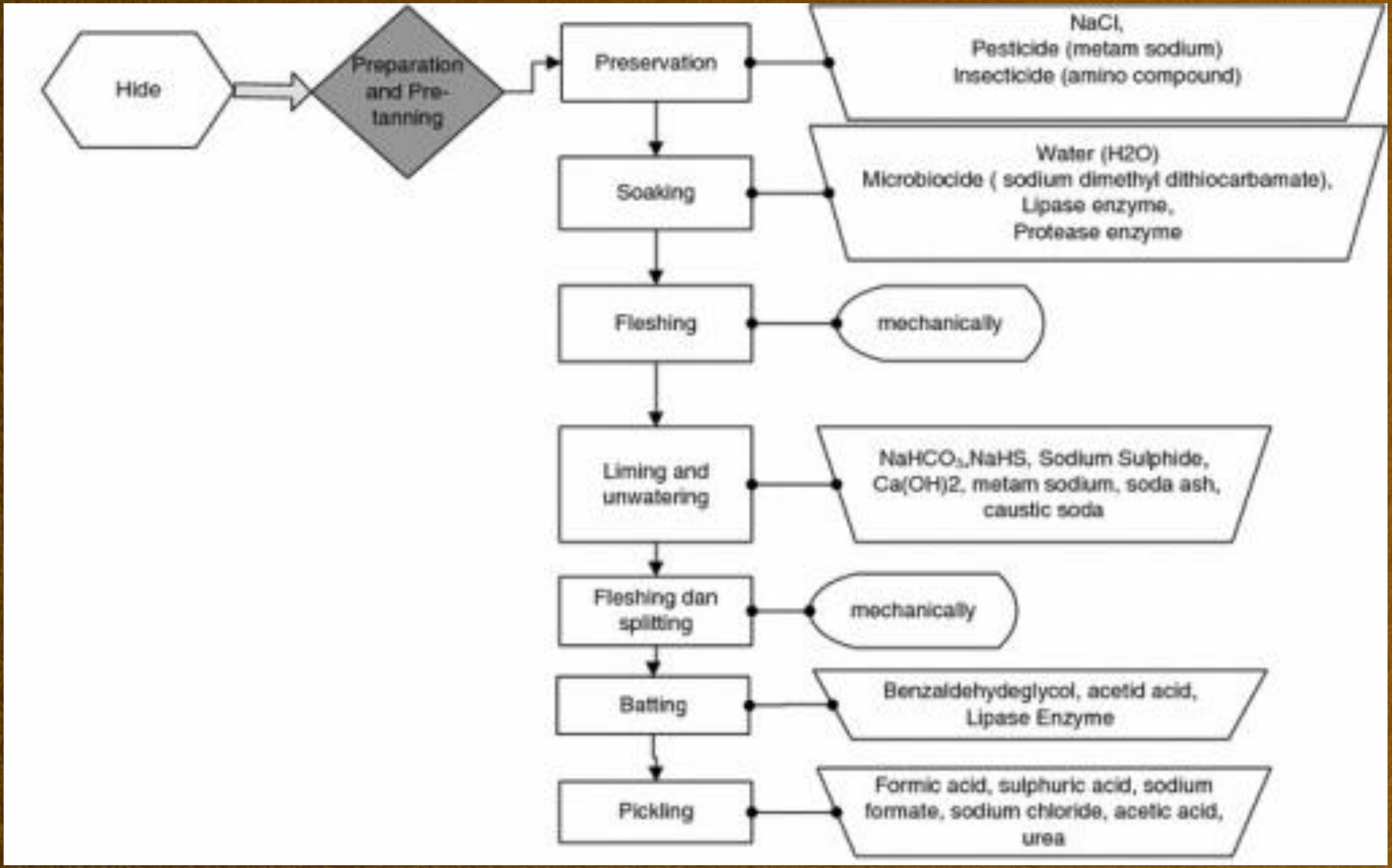
Global Financial Crisis

- During much of 2008 and 2009 the global hides and skins market was deeply affected by the widespread economic downturn following the international financial crisis.
- The abrupt slowdown in global leather purchases and bleak prospects for demand was especially felt by important buyers of leather and related products, such as the shoe, automobile and furniture industries.
- In the period between November and December 2008 quotations collapsed as much as 42% and continued to decline until April 2009
- Prices began to recover through 2009 and by 2010 had recovered to pre-GFC levels
- Strong demand from shoe and automobile industries has outstripped supply of finished leather which has driven current record prices.

Global Financial Crisis



Tanning Process



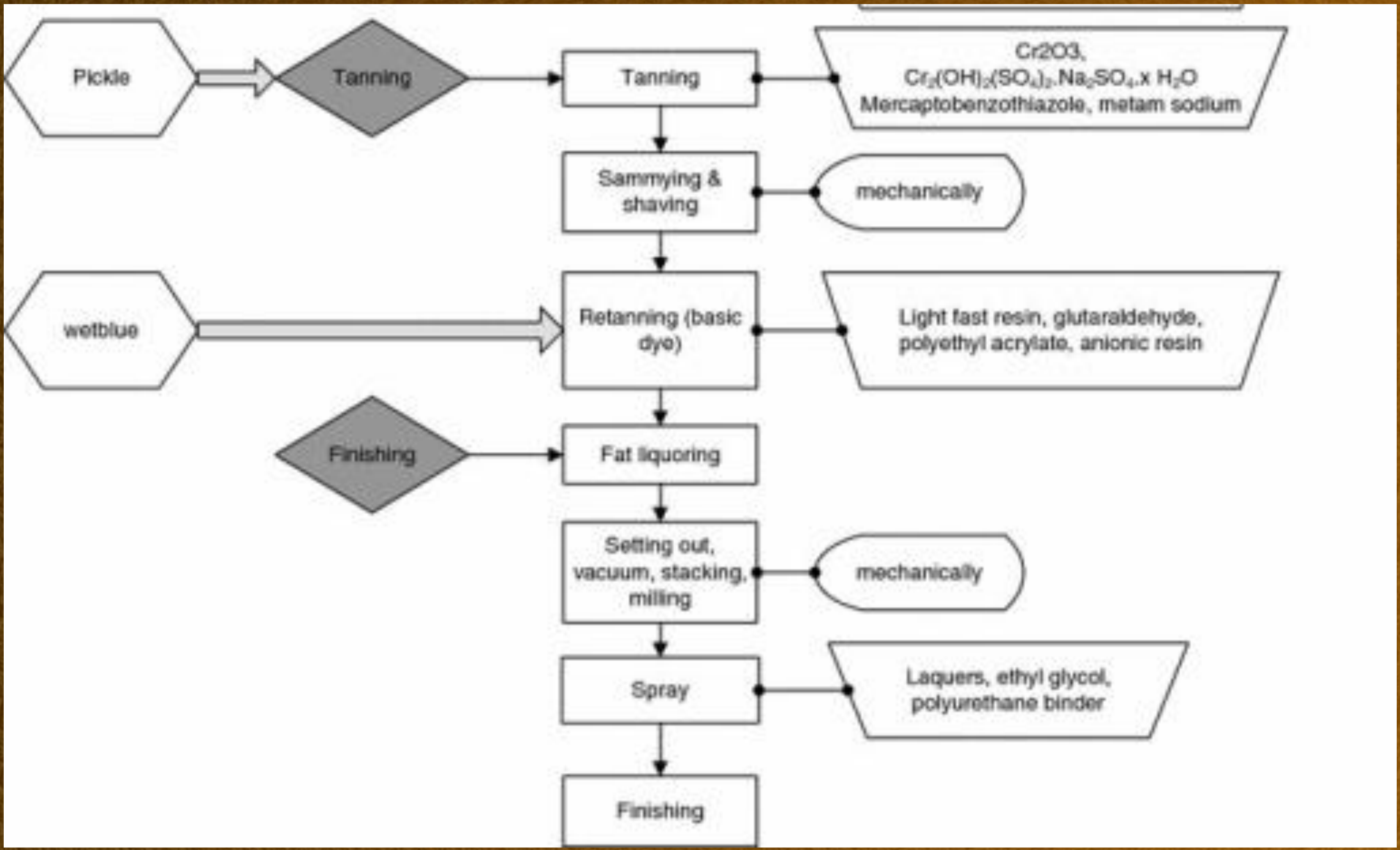
Preservation

- Hides and skins are usually salted to preserve them for export of if there is a delay of more than a few hours before tanning
  - Cattle hides are generally preserved by a process known as brine curing which is a process in which hides are treated with common salt to arrest bacterial and enzymatic decomposition to which they are subject within a few hours of the death of the animals. The most common type of brine curing employs an oval vat with an oval island in the centre, making what has been aptly described as a "raceway vat". Two paddles at opposite sides cause the hides to move slowly around and around. This system requires approximately 2 kilograms of saturated brine for each kilogram of green uncured hide. Bactericides and Insecticides are also included in the brine.
  - Sheep skins are generally preserved by a process known as drum salting. The skins are loaded into a rotating drum (concrete mixer) and slowly tumbled for one and a half to two hours to ensure positive penetration of the salt, bactericides and insecticides into the pelt. After tumbling, the skins are stacked in flat piles for approximately 3 to 5 days while excess body fluids drain from the skins. Stored correctly drum salted skins will keep for at least two years.

Pre-Tanning

- Soaking:
  The preserved raw hides regain their normal water contents. Dirt, manure, blood, preservatives (sodium chloride, bactericides) etc. are removed.
- Fleshing and trimming:
  Extraneous tissue is removed. Unhairing is done by chemical dissolution of the hair and epidermis with an alkaline medium of sulphide and lime. When after skinning at the slaughterhouse, the hide appears to contain excessive meat, fleshing usually precedes unhairing and liming.
- Bating:
  The unhaired, fleshed and alkaline hides are neutralised (deliming) with acid ammonium salts and treated with enzymes, similar to those found in the digestive system, to remove hair remnants and to degrade proteins. During this process hair roots and pigments are removed. The hides become somewhat softer by this enzyme treatment.
- Pickling:
  Pickling increases the acidity of the hide to a pH of 3, enabling chromium tannins to enter the hide. Salts are added to prevent the hide from swelling. For preservation purposes, 0.03 – 2% weight of fungicides and bactericides are applied.

Tanning Process



Tanning

There are two possible processes:

1: Chrome tanning:
After pickling, when the pH is low, chromium salts (Cr^{3+}) are added. To fixate the chromium, the pH is slowly increased through addition of a base.
The process of chromium tanning is based on the cross-linkage of chromium ions with free carboxyl groups in the collagen. It makes the hide resistant to bacteria and high temperature. The chromium-tanned hide contains about 2-3 dry weight percent of Cr^{3+}.

This results in a Wetblue hide which after the chrome-tanning process, which will have about 40 percent of dry matter.

Tanning

2: Vegetable tanning:
Vegetable tanning is usually accomplished in a series of vats (first the rocker-section vats in which the liquor is agitated and second the lay-away vats without agitation) with increasing concentrations of tanning liquor.

Vegetable tannins are polyphenolic compounds of two types:

- Hydrolysable tannins (i.e. chestnut and myrobalan) which are derivatives of pyrogallols
- Condensed tannins (i.e. hemlock and wattle) which are derivatives from catechol.

Vegetable tanning probably results from hydrogen bonding of the tanning phenolic groups to the peptide bonds of the protein chains. In some cases as much as 50% by weight of tannin is incorporated into the hide.

Finishing

From Wetblue:
Chromium tanned hides are often retanned - during which process the desirable properties of more than one tanning agent are combined - and treated with dye and fat to obtain the proper filling, smoothness and colour. Before actual drying is allowed to take place, the surplus water is removed to make the hides suitable for splitting and shaving. Splitting and shaving is done to obtain the desired thickness of the hide. The most common way of drying is vacuum drying.
Cooling water used in this process is usually circulated and is not contaminated.

From Crust:
The crust that results after retanning and drying, is subjected to a number of finishing operations. The purpose of these operations is to make the hide softer and to mask small mistakes. The hide is treated with an organic solvent or water based dye and varnish.

The finished end product has between 66 and 85 weight percent of dry matter.

Offal recovery- Best practice

by

Eddie Andriessen

Meat Safety Quality and Veterinary Public Health in Australia

EDDIE ANDRIESSEN BVSc

A new revised edition about food safety in the meat industry

AIM:

To show how offal yield can be maximised based on the MLA study- Best practice for offal collection

This study was conducted by Chris Sentance and myself about 7 years ago for MLA

The findings are still relevant today

The initial aim was to develop benchmark data on quality and yield in edible offal collection, but this proved difficult as there was no consistent recording of data between abattoirs and AQIS does not record condemnation of offal unless it is associated with carcase condemnation

"If you cannot measure you cannot control"

All companies were using some method of measuring yield.

Some were based on weight

Some were based on piece count

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Some were based on weight

Some were based on piece count

All were fairly inaccurate

What to do?

What to do?

We developed an excel based management tool that could be used to benchmark data

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We developed an excel based management tool that could be used to benchmark data

We trialled it and proved it would work and it is available for use by the industry

With the tool we were able to finally start the benchmarking exercise

Findings

Findings

The potential value of offal collection was about $75 for a 240 Kg steer at the abattoirs in the study

Findings

The potential value of offal collection was about $75 for a 240 Kg steer at the abattoirs in the study

But the actual value of offal collected was about 20-30% less than that

Why?

Why?

1 Condemnation rates

Why?

1 Condemnation rates

2 Collection efficiency

Condemnation rates

Condemnation rates

Not due to bastardry by meat inspectors but due to disease

Beef livers and lungs

Beef livers and lungs

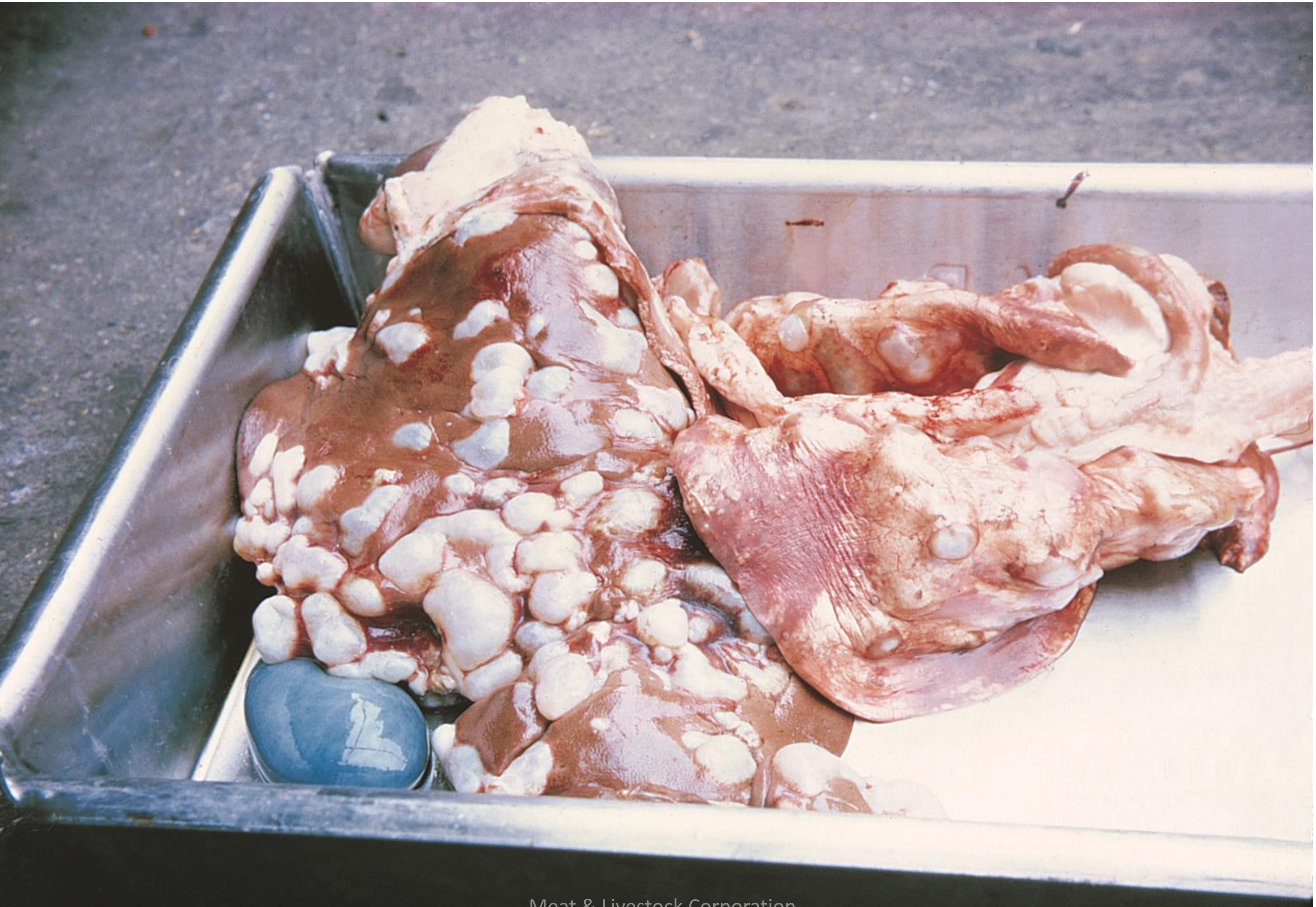
60-90% condemnation in Qld abattoirs

Beef livers and lungs

60-90% condemnation in Qld abattoirs

Due to Hydatids

Virtually uncontrollable- dingoes the cause



Meat & Livestock Corporation

Liver fluke

Liver fluke

Beef & sheep livers and lungs- 40-80%

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Adult cattle usually milking cows and sheep on irrigated pastures and close to rivers and streams in NSW/Vic

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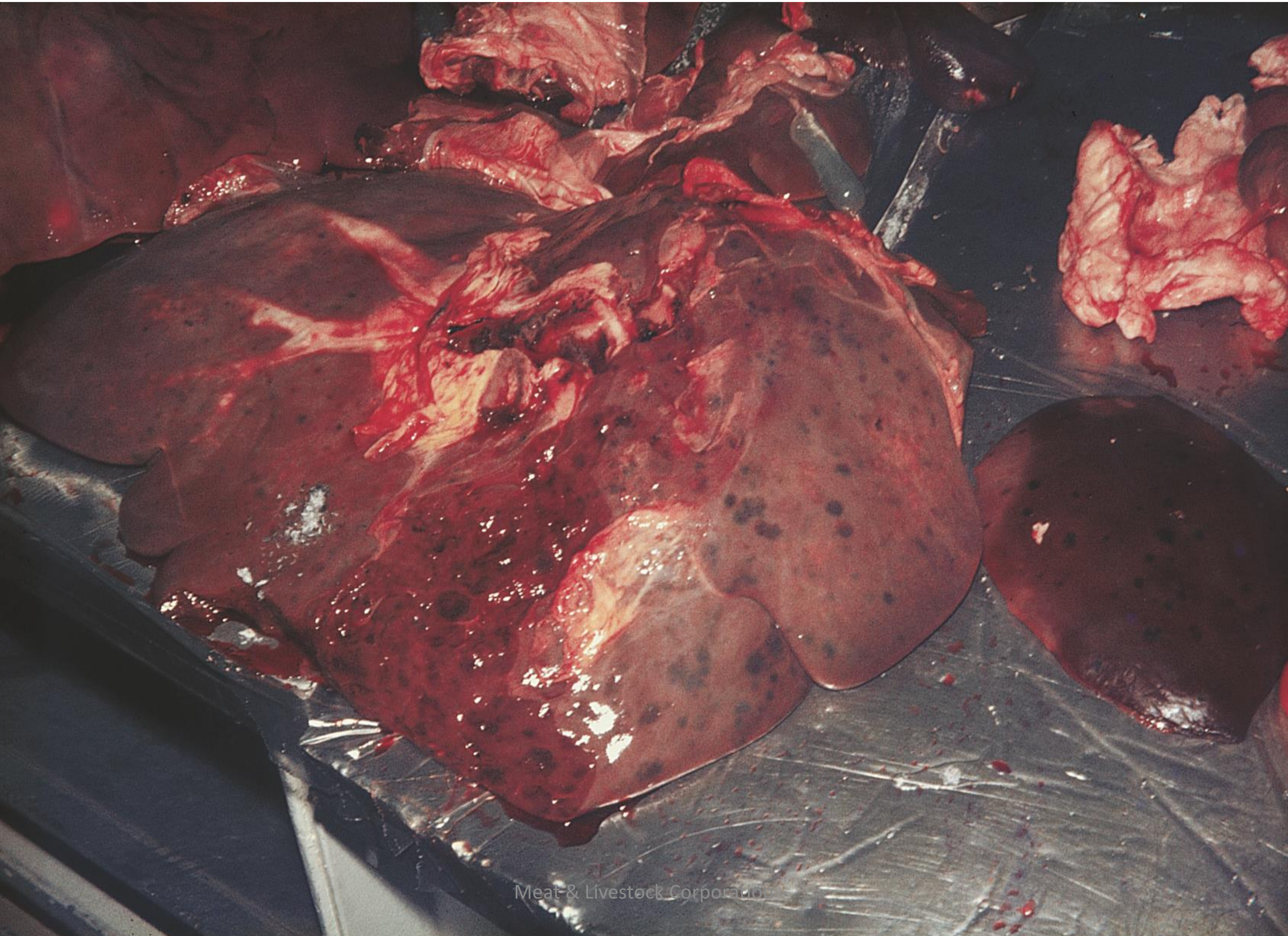
Beef & sheep livers and lungs- 40-80%

Adult cattle usually milking cows and sheep on irrigated pastures and close to rivers and streams in NSW/Vic

Marginally controllable



Sheep measles

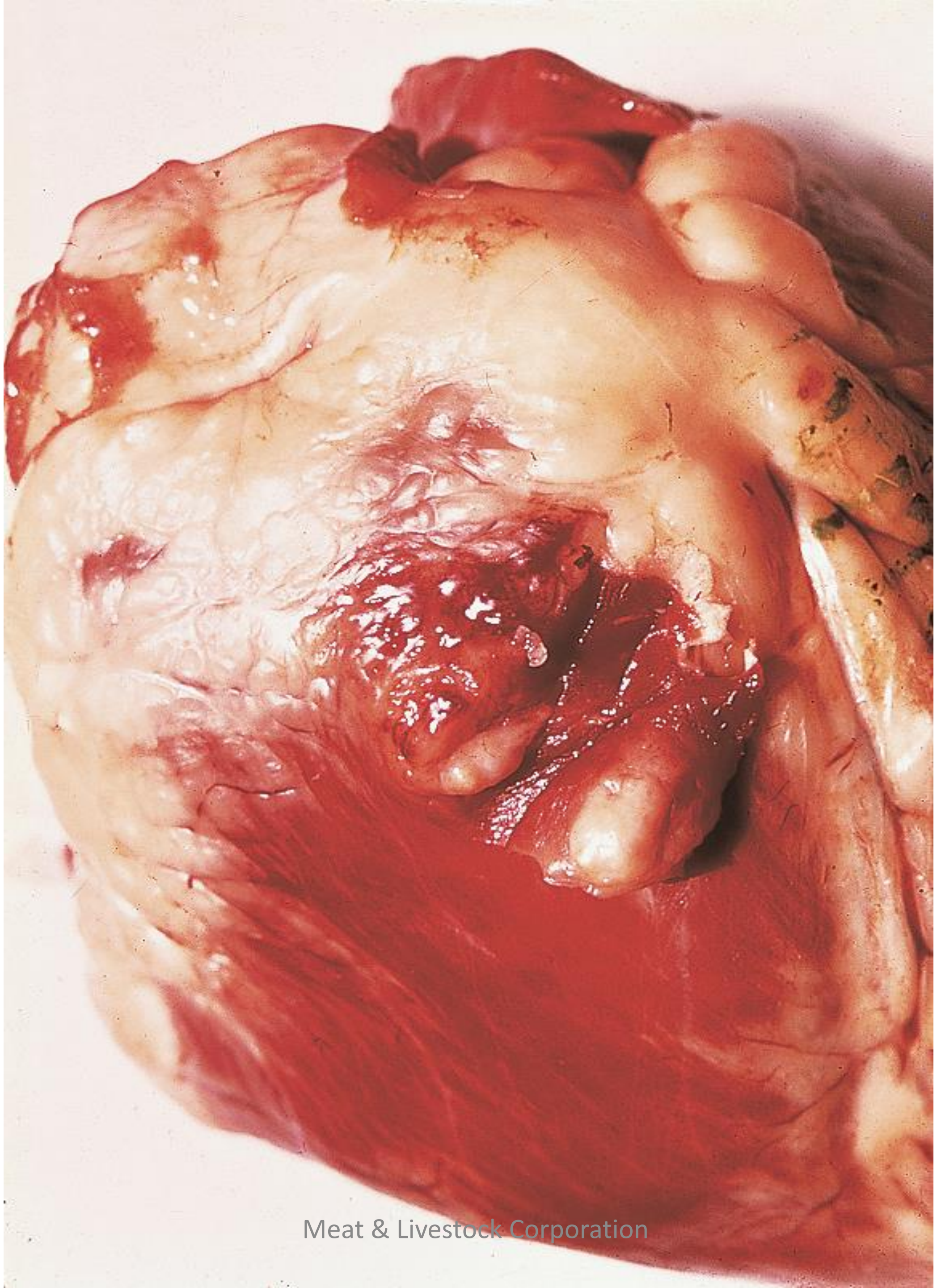
Sheep measles

Sheep hearts

Sheep measles

Sheep hearts

All states variable % depending on how well farm dogs are wormed


Meat & Livestock Corporation

Bladder worm cysts and tracks

Bladder worm cysts and tracks

All southern states

Controllable by good worming of farm dogs


Meat & Livestock Corporation

Condemnation rates were high for these products but their value was low- generally less than $2 per Kg

So there is little encouragement to farmers to address these issues through prices!!

On the other hand high value offal (co products) were rarely diseased or condemned

- Beef tails
- Beef tongues
- Cheek meat
- Beef rumen pillars
- Tendons
- Skirts- thin & thick

These products comprised 70-80% of the returns on offal for most abattoirs

Collection efficiency

Collection efficiency

This was the second main reason for not collecting offal

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Due to structural deficiency such as lack of space for collection and restricted further processing areas

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Labour supply issues

Labour supply was a universal issue

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Since offal was generally a low value product people were taken from the offal rooms to man the slaughter floor

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Since offal was generally a low value product people were taken from the offal rooms to man the slaughter floor

The move of labour to the mines was a major contributing factor

This is still a major issue today for most abattoirs

We designed an excel tool to help improve decision making by better identifying trends in yield on individual plants

We designed an excel tool to help improve decision making by better identifying trends in yield on individual plants

It also helps supervisors ensure maximum recovery of offal

Tool requires 5 inputs

Tool requires 5 inputs

1 Daily number of animals processed by category

Tool requires 5 inputs

1 Daily number of animals processed by category

2 Daily total HSCW by category

Tool requires 5 inputs

1 Daily number of animals processed by category

2 Daily total HSCW by category

3 Daily packed weight of individual offal

Tool requires 5 inputs

1 Daily number of animals processed by category

2 Daily total HSCW by category

3 Daily packed weight of individual offal

4 If available condemnations

Tool requires 5 inputs

1 Daily number of animals processed by category

2 Daily total HSCW by category

3 Daily packed weight of individual offal

4 If available condemnations

5 Where available daily number of pieces packed

Companies can develop charts to track trends on production

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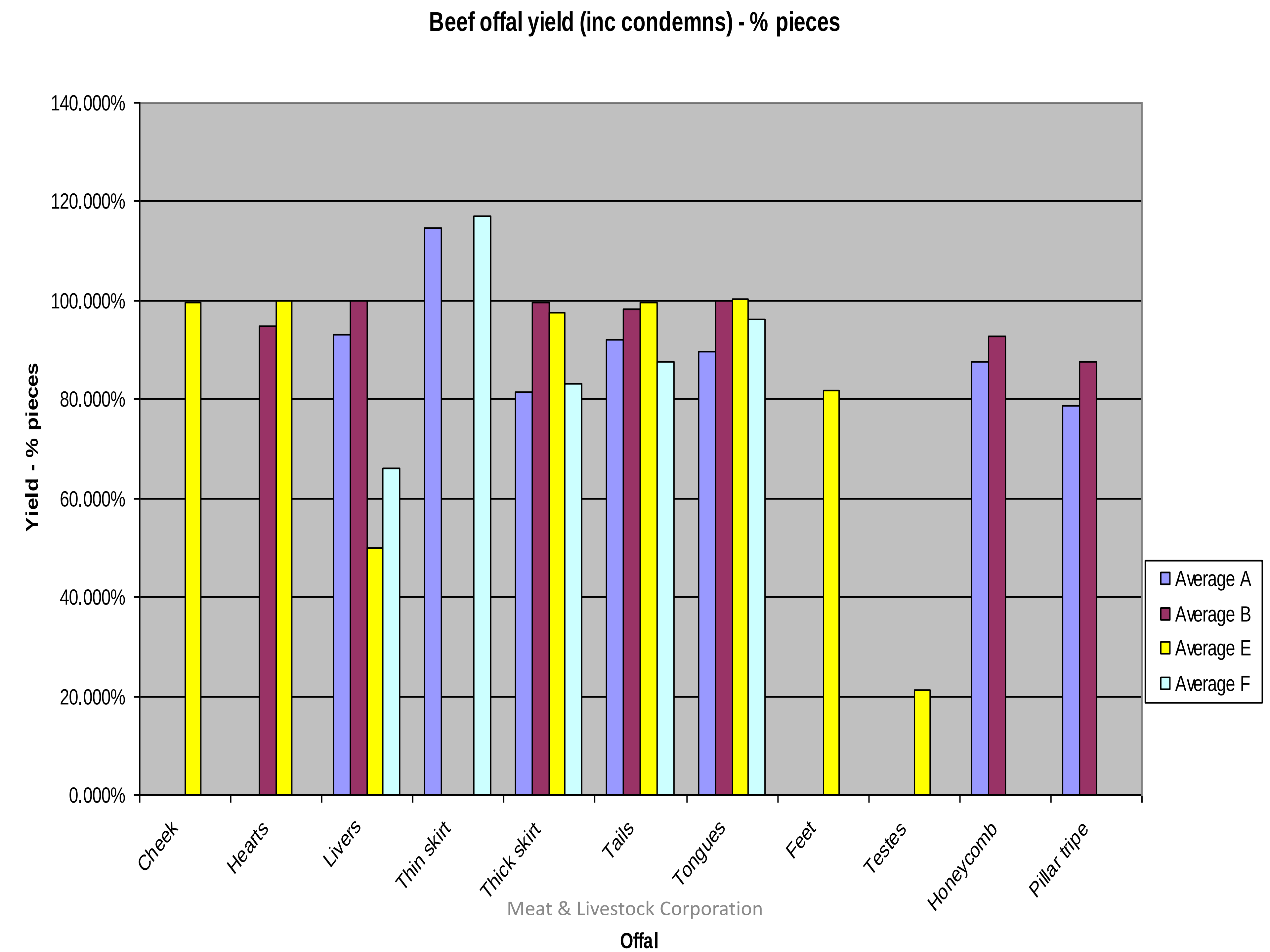
Due to uncertainties inherent in the system accuracy improves over time

Companies can develop charts to track trends on production

Due to uncertainties inherent in the system accuracy improves over time

Can be used to benchmark both within the plant and between plants


Beef offal yield (inc condemns) - % pieces
Yield - % pieces
140.000%
120.000%
100.000%
80.000%
60.000%
40.000%
20.000%
0.000%
Cheek
Hearts
Livers
Thin skirt
Thick skirt
Tails
Tongues
Feet
Testes
Honeycomb
Pillar tripe
Average A
Average B
Average E
Average F
Meat & Livestock Corporation
Offal

Full report can be downloaded from

www.meatupdate.csiro.com.au

Excel tool can be down loaded from MLA client innovation services

www.mla.com.au

We estimated that use of the tool could improve yield by 5%

We estimated that use of the tool could improve yield by 5%

i.e. $2 a head for beef on a 500 head per day kill this is $250,000 a year

For sheep on 4,000 kill per day

$140,000 per year improved yield

Questions?

Rendered products for aquaculture and speciality uses

Bill Spooncer
Kurrajong Meat Technologies

Findings of MLA aquaculture projects

- Meat meals well digested by silver perch, barramundi and tiger prawns. (seems to be doubted by aquaculture nutritionists)
- Digestibility of low ash meal similar to fish meal
- High-ash meal is an environmental concern and only low-ash can be used.
- Must be competitively prices with veg protein meals

Findings of MLA aquaculture projects

- Ideal composition of MBM:
  - >60% protein
  - <20% ash
  - <7% fat
- Animal protein meals <55% protein no more value than protein in veg meal
- Animal protein meals >60% protein 15 to 20% premium per unit of digestible protein but only if fat is <10%

Other points

- Consistency important
- Consistency of fat content particularly important
- Use fresh raw material i.e. low biogenic amines
- No plastic

Pet food ingredients

- No plastic
- No plastic
- Low ash (usually means good digestibility)
- Consistent fat and other components
- Fresh raw material i.e. low biogenic amines
- Add anti-oxidant

Conditions for producing meal for petfood

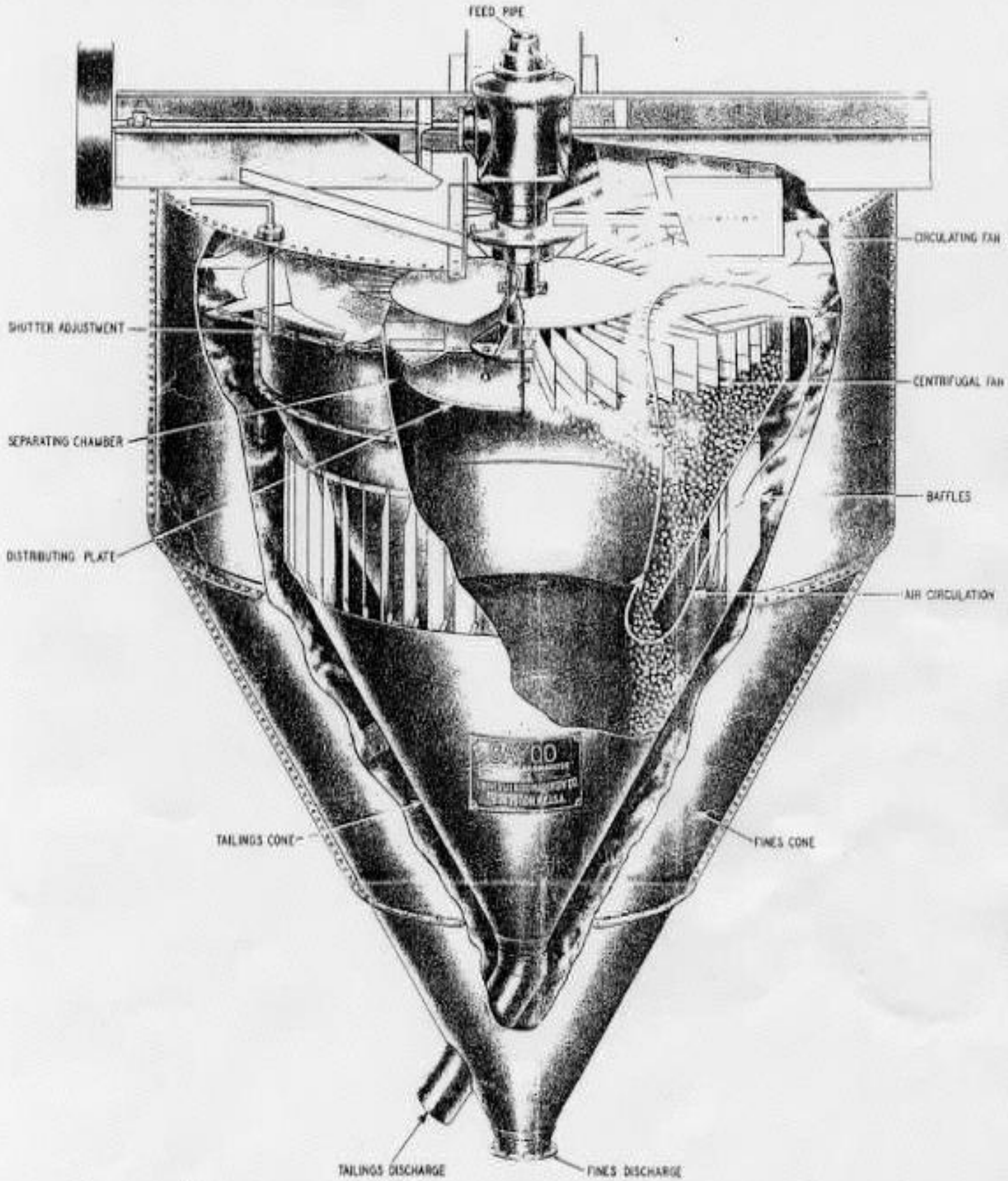
- To make meal palatable
  - Raw material must be fresh (< 6 hours old)
  - Dead stock excluded
  - Gut material must be well cleaned. Paunch contents and intestinal material contribute unattractive odours and undigestible material.

Product differentiation

- Species specific meals, e.g. lamb, veal, chicken help petfood manufacturers differentiate their products.
- Some specialty meals (ultra low-ash, single species) and liver powders may be worth in excess of $2000 per tonne but markets are very limited.

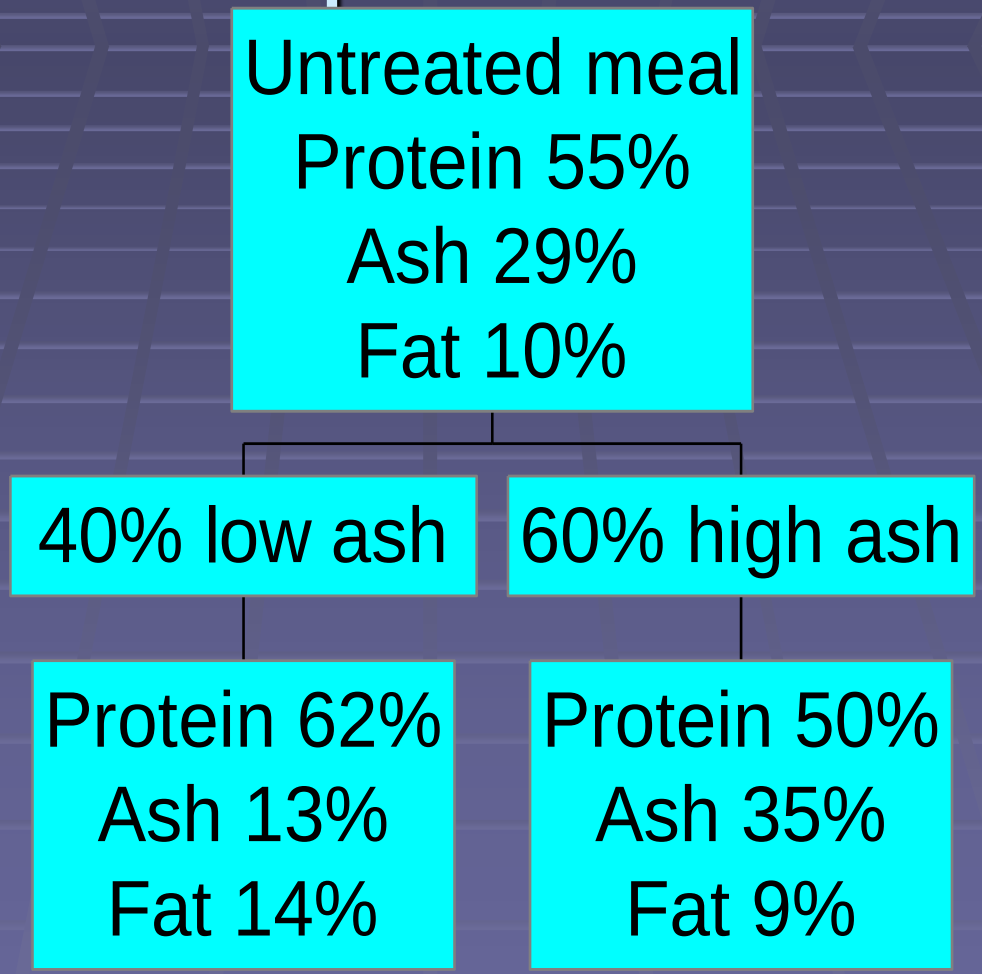
Reduced ash meals

- Necessary for aquaculture
- Calcium in finished pet food must be less than 1.5%.
- The less ash in the meal, the more scope for higher inclusion rates
- Options are:
  - Low bone content in raw material
  - Remove ash from finished meal



GAYCO CENTRIFUGAL SEPARATOR

Fractionation by Centrifugal Separator



Raw material segregation

- Slaughter floor selected soft offal:
  - 75-80% protein, 2-6% ash
- All slaughter floor offal excluding head and feet:
  - 64-68% protein, 7-10% ash
- Slaughter floor offal including heads and feet:
  - 56% protein, 24% ash

Microsoft Excel - protein calc.xls

File Edit View Insert Format Tools Data Window Help

D9 =

Enter Carcase Weights and Kill number

	Carcase wt (kg)	No. Head
Vealer 70-110 kg	100	
Yearling 110-220 kg	180	
Steer 220-340 kg	220	300
Steer grain fed 300-400 kg	380	
Cow 150-300 kg	200	200
Bull 220-420 kg	300	

Enter proportion of material sent for rendering

Offal type	% rendered	Offal type	% rendered
Tongue	10	Spleen	100
SC Tongue	0	Paunch	40
Root	100	Bible	100
Cheek	20	Intestine	100
Lips	30	Caul	100
Liver	40	Ausmeat trim	100
Lung	100	Feet	100
Trachea	100	Tail	10
Heart	20	Head	100
Skirt	10	Bone	0
Kidney	10	Fat	0

Press Ctrl + p to print report

Estimated Production

Meal production options	Meal yield (kg)	% Protein in meal	% Ash	Assumed fat content (%)	Meal from remaining material (kg)	% Protein in remaining meal	Tallow (kg)
Meal from all slaughter floor soft offal (excludes heads and feet)	4135	72.7	5.3	15.00	4646	42.9	9562
Meal from all available soft offal (includes boning room fat)	4136	72.7	5.3	15.00	4536	44.0	9572
Meal from all slaughter floor offal (includes heads and feet)	8897	56.2	23.8	13.00	12	45.7	9489
Meal from all slaughter floor offal plus boning room fats	8899	56.2	23.8	14.00	10	42.2	9311
Meal from all available material	**8909**	**56.1**	**23.9**	**10**			**9755**

Sheet2 / Sheet3 /

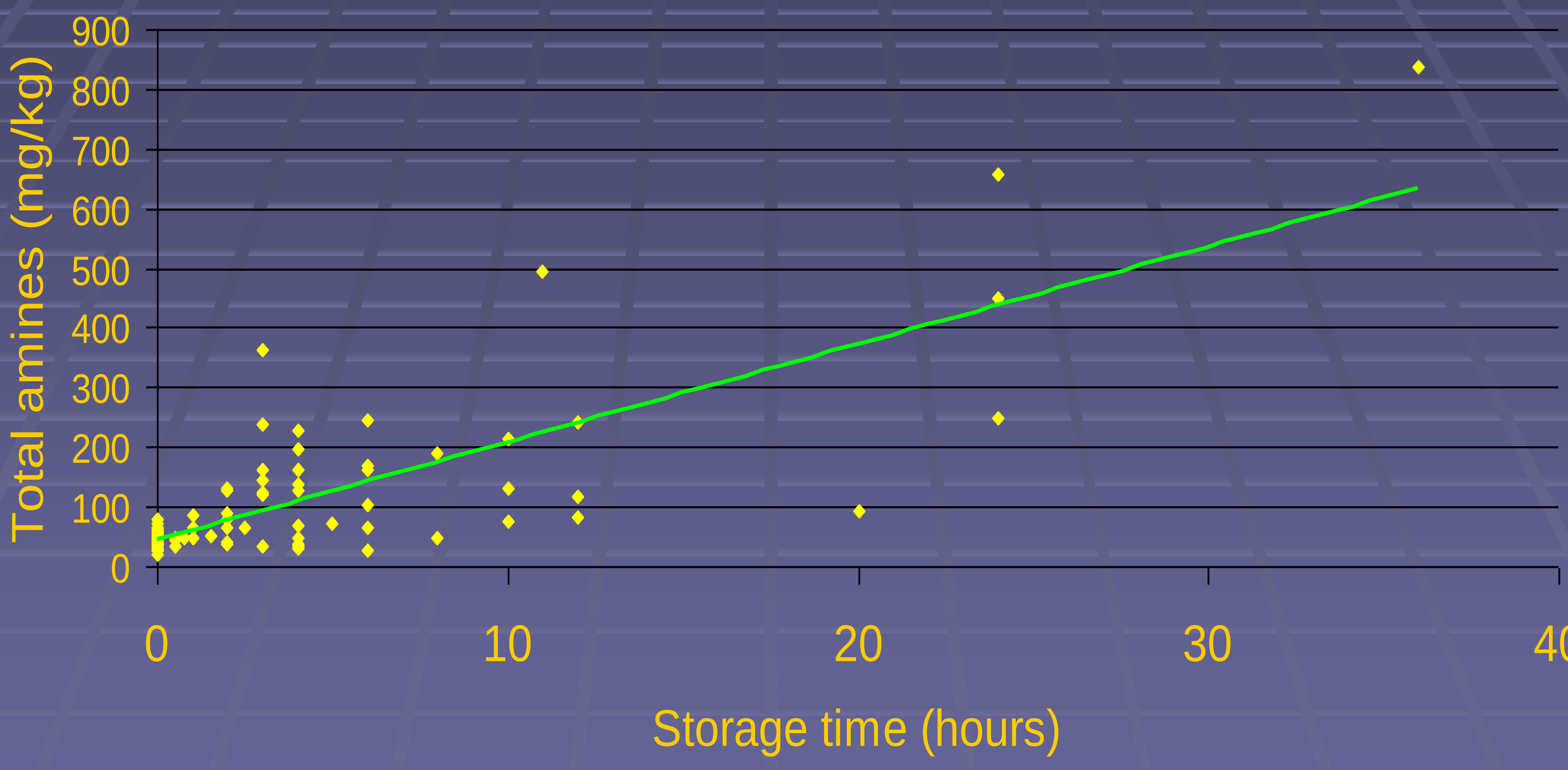
Biogenic amines

- No specific effects in salmon feed although weight gain is affected by age of raw material used to produce LAP.
- No specific effects in pet food but age of raw material affects palatability.
- Hard to pin down levels and effects but biogenic amines widely used as indicators of R.M. freshness.

Biogenic amines

- Specification maximum 100 to 200 mg/kg total amines.
- Amines are total of histamine, putrescine, cadaverine and phenethylamine

Storage time of raw material and biogenic amines in meat meal



Conclusion

- Specialty uses can attract premiums but:
  - there is nothing special about run of the mill MBM.
  - effort in investment, production and marketing is required.
  - premiums hard to come by and must be justified, especially if there are competing commodities.
- All customers want consistency.
- Communicate with the customer and let them know of problems.
- Customers know a lot more about the quality of a supplier’s product than the renderer.

Aquaculture

MLA Co-Products Workshop – June 2014

Dr Richard Smullen

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Introduction

- ✓ Who are Ridley
- ✓ Growth of Aquaculture
- ✓ Global raw material use
- ✓ Use of meat products
- ✓ Impact of quality of raw materials
  - ✓ Case study of blood meal

RIDLEY
AQUA FEED

WHO ARE RIDLEY AQUA-FEED

- Ridley Group - Largest Australian commercial provider of high performance animal nutrition solutions – 1.7mt
- Value proposition: close collaboration with farms to meet unique requirements
- Produce about 50 000 tonnes of feed per year
- Assured Quality:
  - Certified to ISO 9001:2000
  - Fully integrated HACCP system
  - GlobalGap accredited
- Rendered animal products

Camilleri Stockfeeds Pty. Ltd.

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

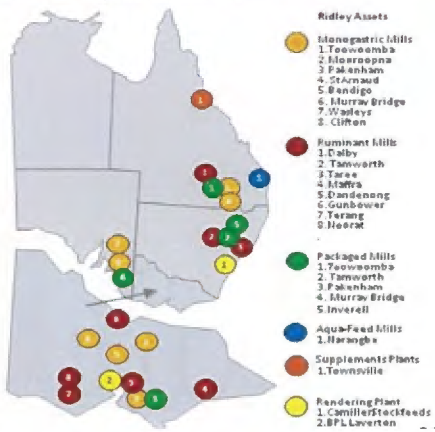
LOCATIONS & SECTORS

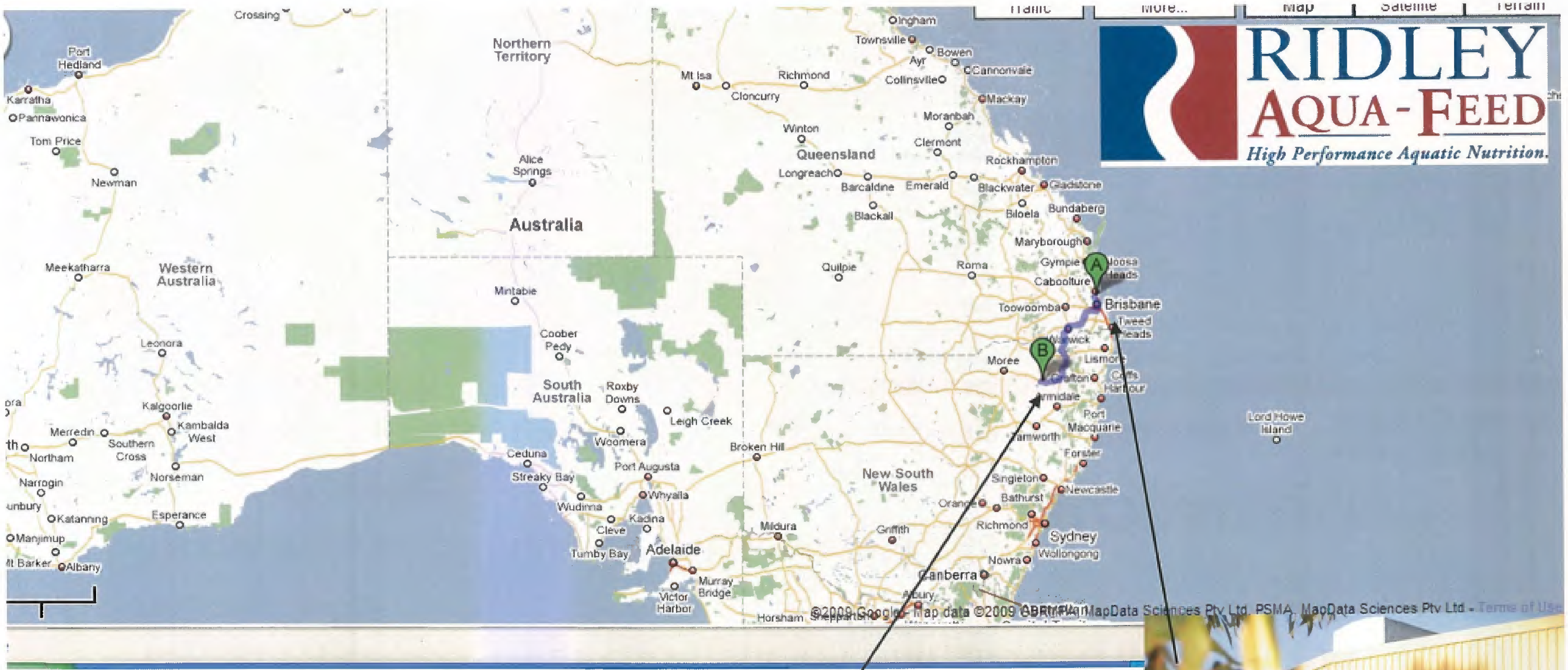
RIDLEY AGRIPRODUCTS

INTRODUCTION	AGRIPRODUCTS	PROPERTY	FINANCIALS	OUTLOOK

Operationally, the business is structured to support its six key market sectors:

Monogastric	Pellets, meals, concentrates and premixes for poultry and pigs.
Ruminant	Pellets, meals, concentrates and premixes for dairy cattle, beef cattle, lambs, ewes and rams.
Packaged Products	Bagged poultry, dairy, dog and horse feed.
Aqua Feeds	Extruded and steam pelleted products and advice for all major fin-fish and prawns.
Supplements	Block and loose lick ruminant supplements business.
Rendering	Rendered poultry and fish animal meal products for the petfood and aquaculture sectors.




Traffic
More...
Map
Satellite
Terrain
RIDLEY
AQUA-FEED
High Performance Aquatic Nutrition.
Northern Territory
Queensland
Western Australia
South Australia
New South Wales
Australia
Port Hedland
Karratha
Pannawonica
Tom Price
Newman
Meekatharra
Leonora
Kalgoorlie
Kambalda West
Merredin
Southern Cross
Northam
Narrogin
Katanning
Norseman
Esperance
Manjimup
Albany
Alice Springs
Mintabie
Coober Pedy
Roxby Downs
Leigh Creek
Woomera
Port Augusta
Ceduna
Streaky Bay
Whyalla
Wudinna
Kadina
Cleve
Tumby Bay
Adelaide
Murray Bridge
Victor Harbor
Broken Hill
Mildura
Griffith
Mt Isa
Cloncurry
Richmond
Winton
Longreach
Barcaldine
Blackall
Emerald
Quilpie
Roma
Ingham
Townsville
Ayr
Bowen
Collinsville
Cannonvale
Mackay
Moranbah
Clermont
Rockhampton
Blackwater
Gladstone
Biloela
Bundaberg
Maryborough
Gympie
Caboolture
Brisbane
Toowoomba
Tweed Heads
Moree
Lismore
Port Macquarie
Forster
Singleton
Newcastle
Bathurst
Orange
Richmond
Sydney
Wollongong
Nowra
Canberra
Lord Howe Island
Horsham

enga


RIDLEY
AQUA-FEED
NARANGBA MILL

WHO ARE RIDLEY AQUA-FEED

Salmon

Pacific Salmon

Kingfish

Tuna

Barramundi

Trout

Prawns

Mulloway

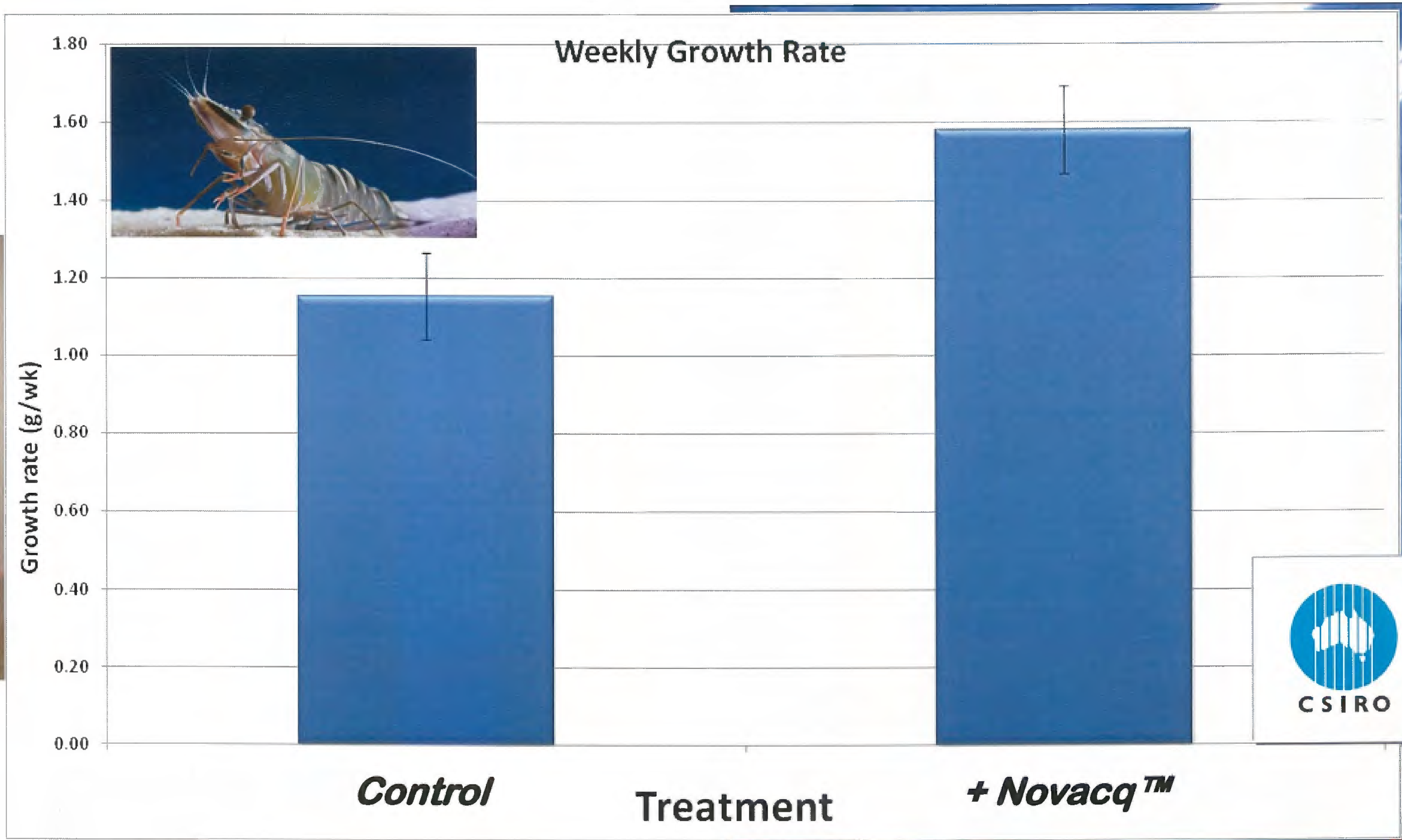
Grouper

Murray Cod

Cobia

Silver Perch

RIDLEY
AQUA FEED

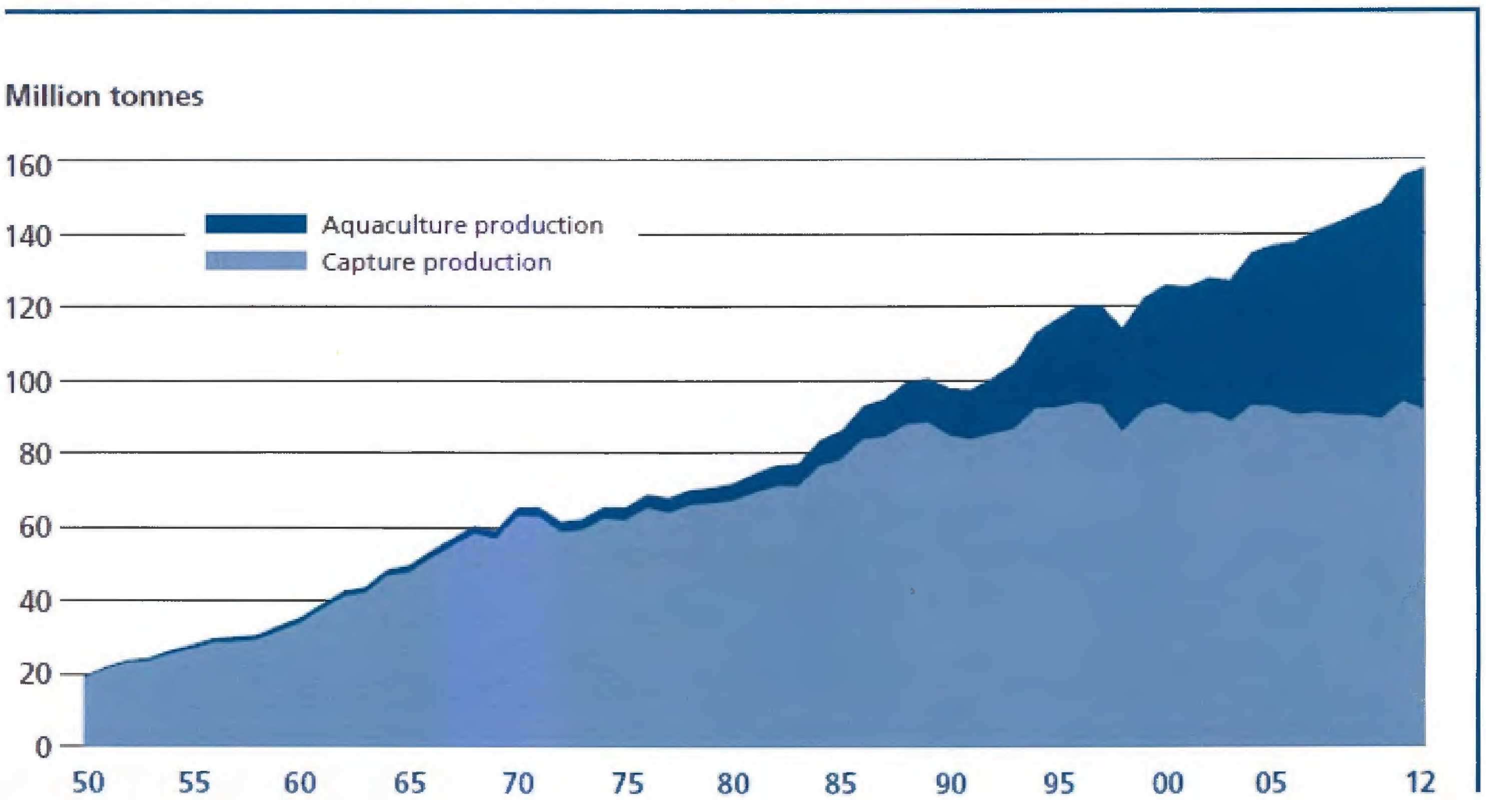


CSIRO

RIDLEY AQUA FEED

Growth of Aquaculture

World capture fisheries and aquaculture production



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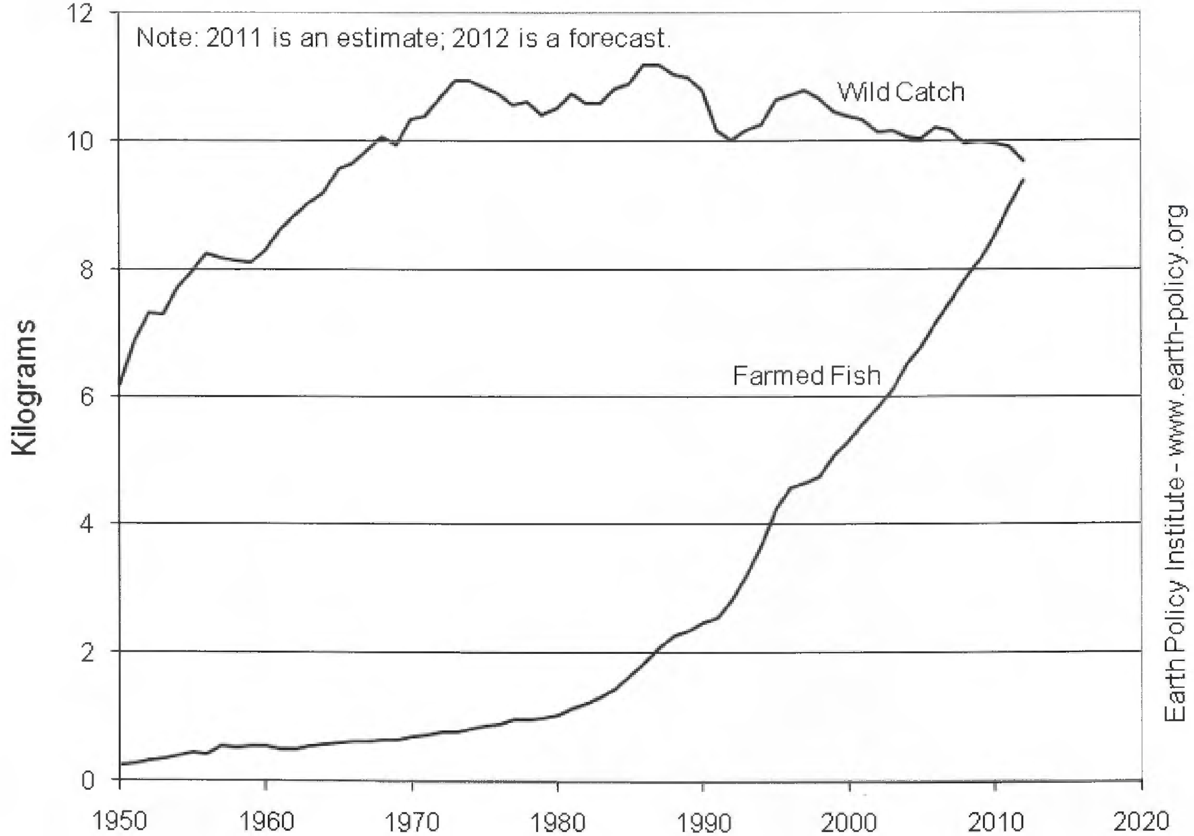
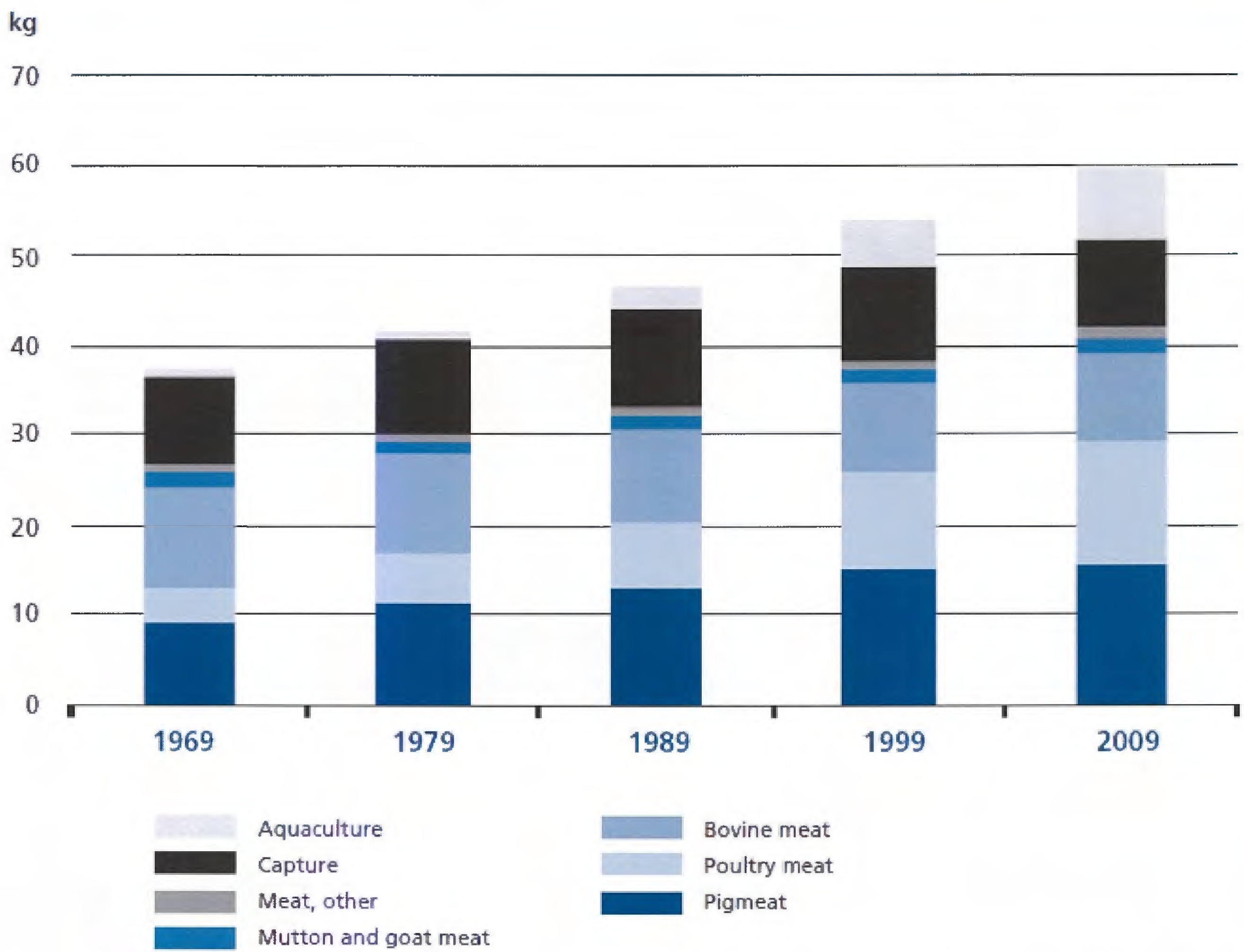
World Wild Fish and Farmed Fish Consumption Per Person, 1950-2012



Source: FAO

RIDLEY AQUA FEED

World per capita meat and fish food supply



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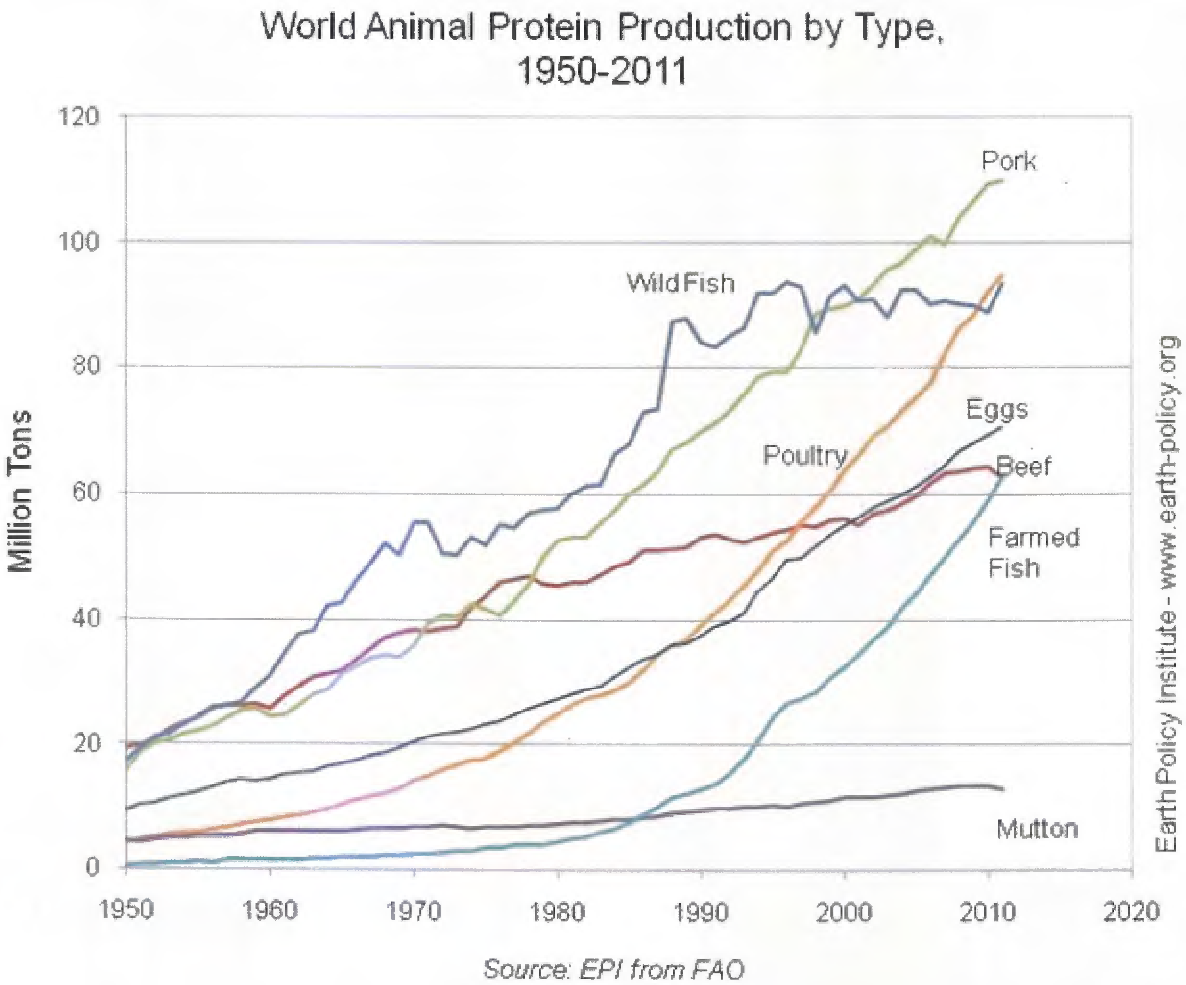

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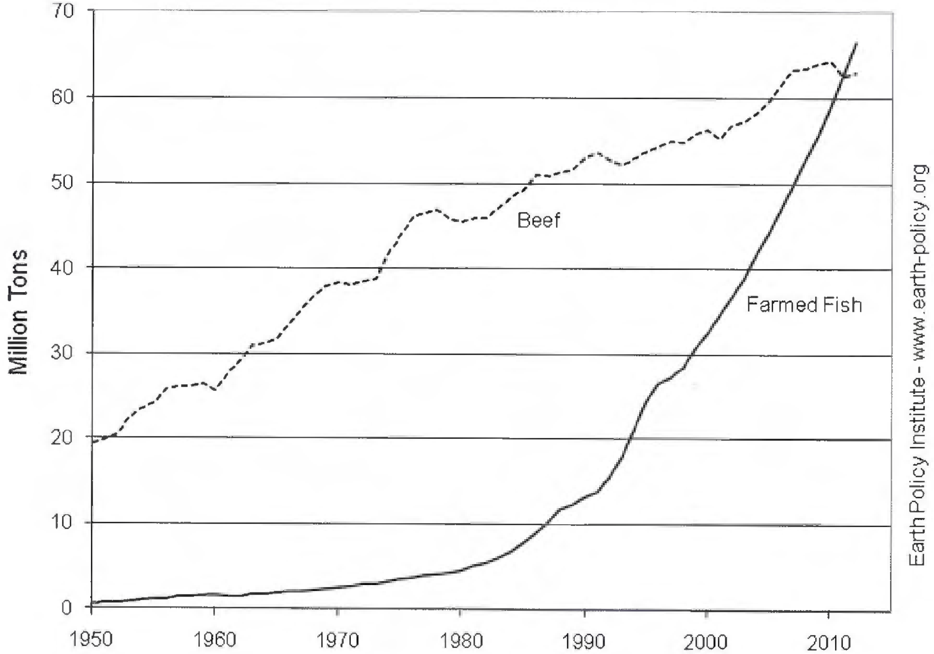
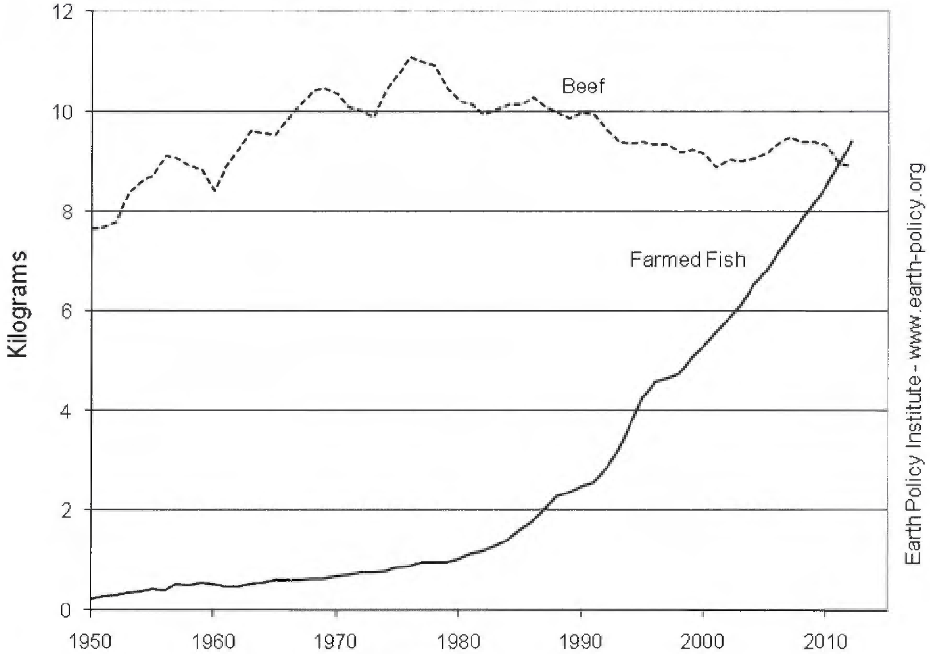
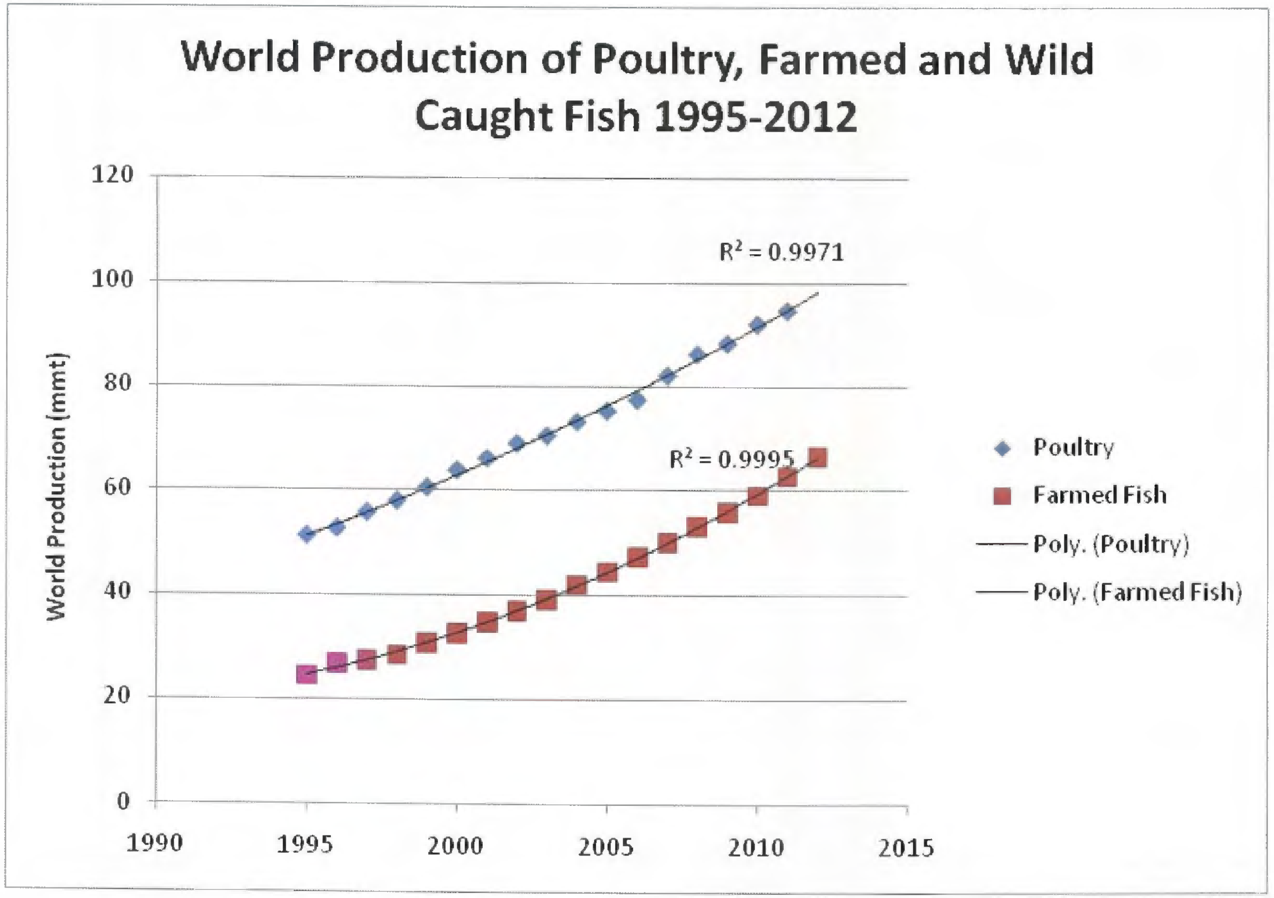


Source: EPI based on FAO, USDA



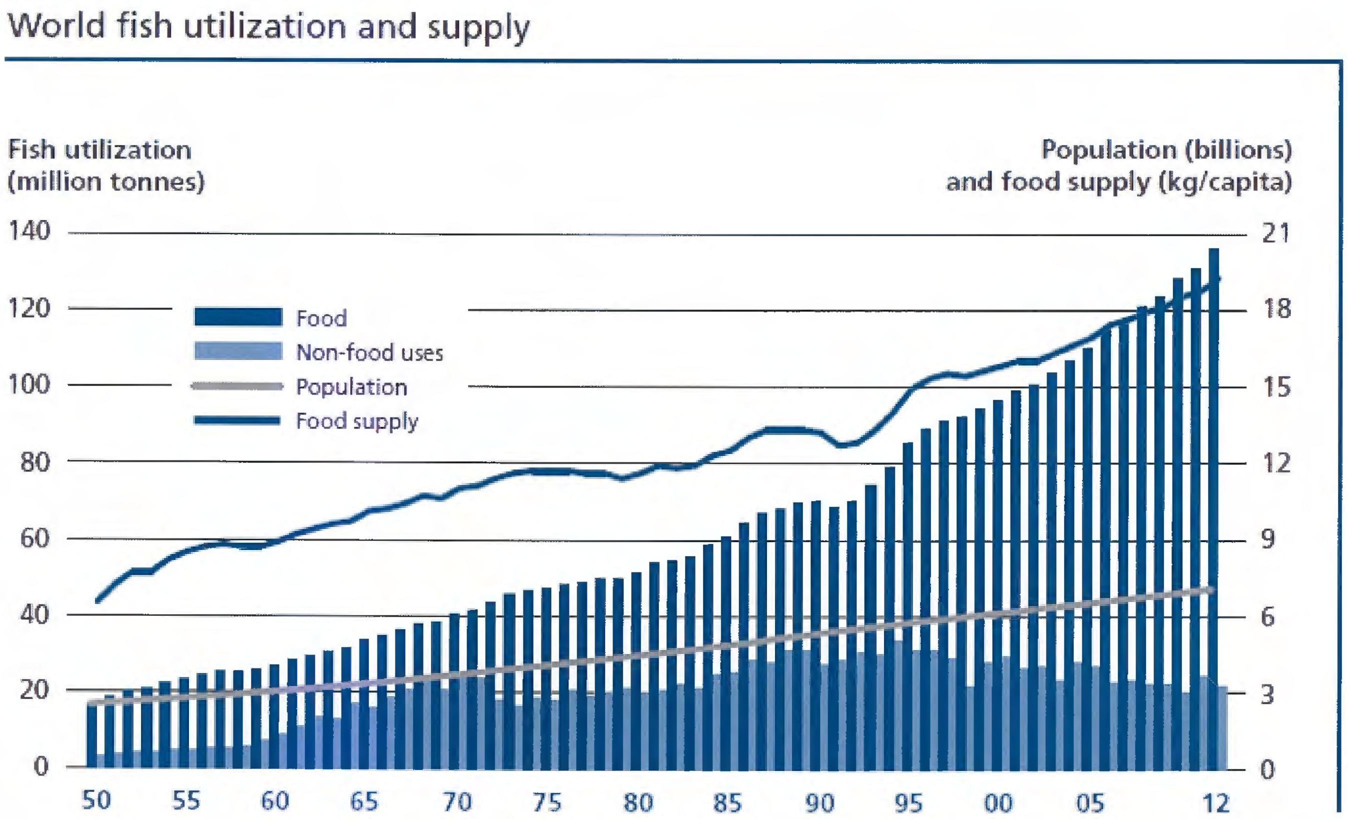
Source: EPI based on FAO USDA, UNPop



R. Smullen 2013 modified from
Earth Policy Institute data 2013

RIDLEY AQUA FEED

Global Fish Use



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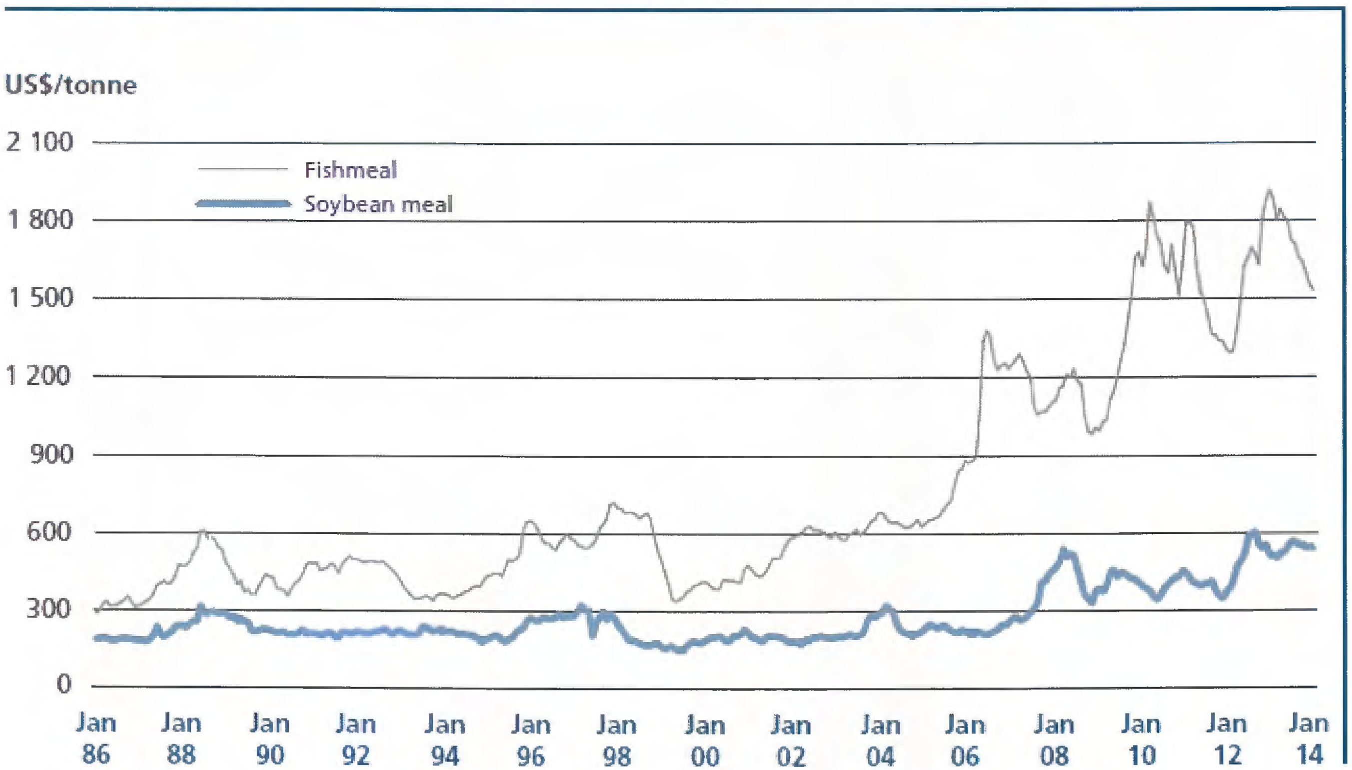
Growth of Aquaculture

Fishmeal and soybean meal prices in Germany and the Netherlands



Note: Data refer to c.i.f. prices.
Fishmeal: all origins, 64–65 percent, Hamburg, Germany.
Soybean meal: 44 percent, Rotterdam, Netherlands.

Source: Oil World; FAO GLOBEFISH.

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AQUA FEED

Growth of Aquaculture

Fish oil and soybean oil prices in the Netherlands

Note: Data refer to c.i.f. prices.
Origin: South America; Rotterdam, Netherlands.

Source: Oil World; FAO GLOBEFISH.

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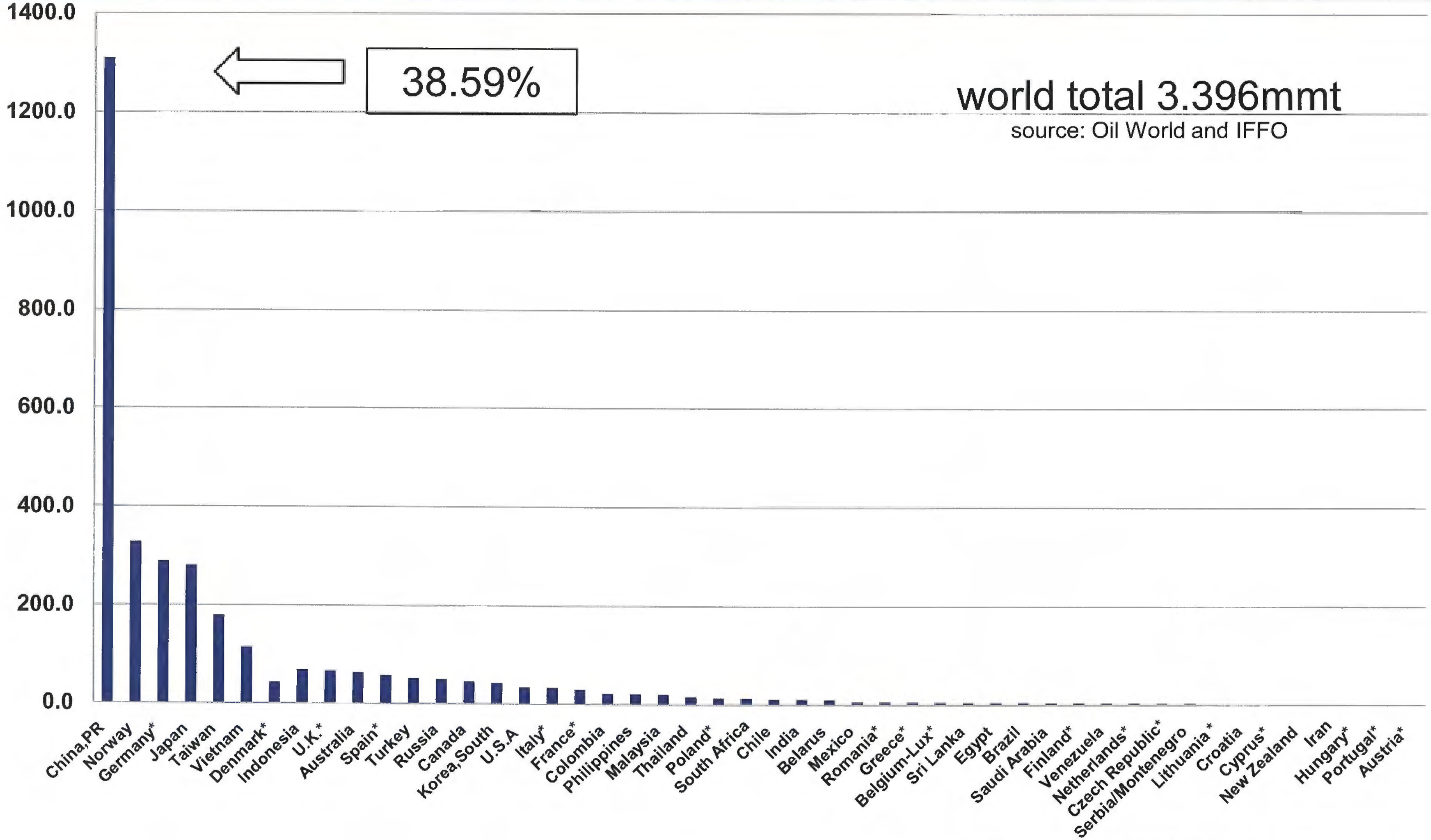
RIDLEY AQUA FEED

Producer	Finfish: Inland aquaculture	Finfish: Mariculture	Crustaceans	Molluscs	Other species	National total	Share in world total
	(Tonnes)			(Tonnes)			(Percentage)
China	23 341 134	1 028 399	3 592 588	12 343 169	803 016	41 108 306	61.7
India	3 812 420	84 164	299 926	12 905	...	4 209 415	6.3
Viet Nam	2 091 200	51 000	513 100	400 000	30 200	3 085 500	4.6
Indonesia	2 097 407	582 077	387 698	...	477	3 067 660	4.6
Bangladesh	1 525 672	63 220	137 174	...	...	1 726 066	2.6
Norway	85	1 319 033	...	2 001	...	1 321 119	2.0
Thailand	380 986	19 994	623 660	205 192	4 045	1 233 877	1.9
Chile	59 527	758 587	...	253 307	...	1 071 421	1.6
Egypt	1 016 629	...	1 109	...	...	1 017 738	1.5
Myanmar	822 589	1 868	58 981	...	1 731	885 169	1.3
Philippines	310 042	361 722	72 822	46 308	...	790 894	1.2
Brazil	611 343	...	74 415	20 699	1 005	707 461	1.1
Japan	33 957	250 472	1 596	345 914	1 108	633 047	1.0
Republic of Korea	14 099	76 307	2 838	373 488	17 672	484 404	0.7
United States of America	185 598	21 169	44 928	168 329	...	420 024	0.6
Top 15 subtotal	**36 302 688**	**4 618 012**	**5 810 835**	**14 171 312**	**859 254**	**61 762 101**	**92.7**
Rest of world	2 296 562	933 893	635 983	999 426	5 288	4 871 152	7.3
World	**38 599 250**	**5 551 905**	**6 446 818**	**15 170 738**	**864 542**	**66 633 253**	**100**

Fishmeal World Imports 2009 (000mt)



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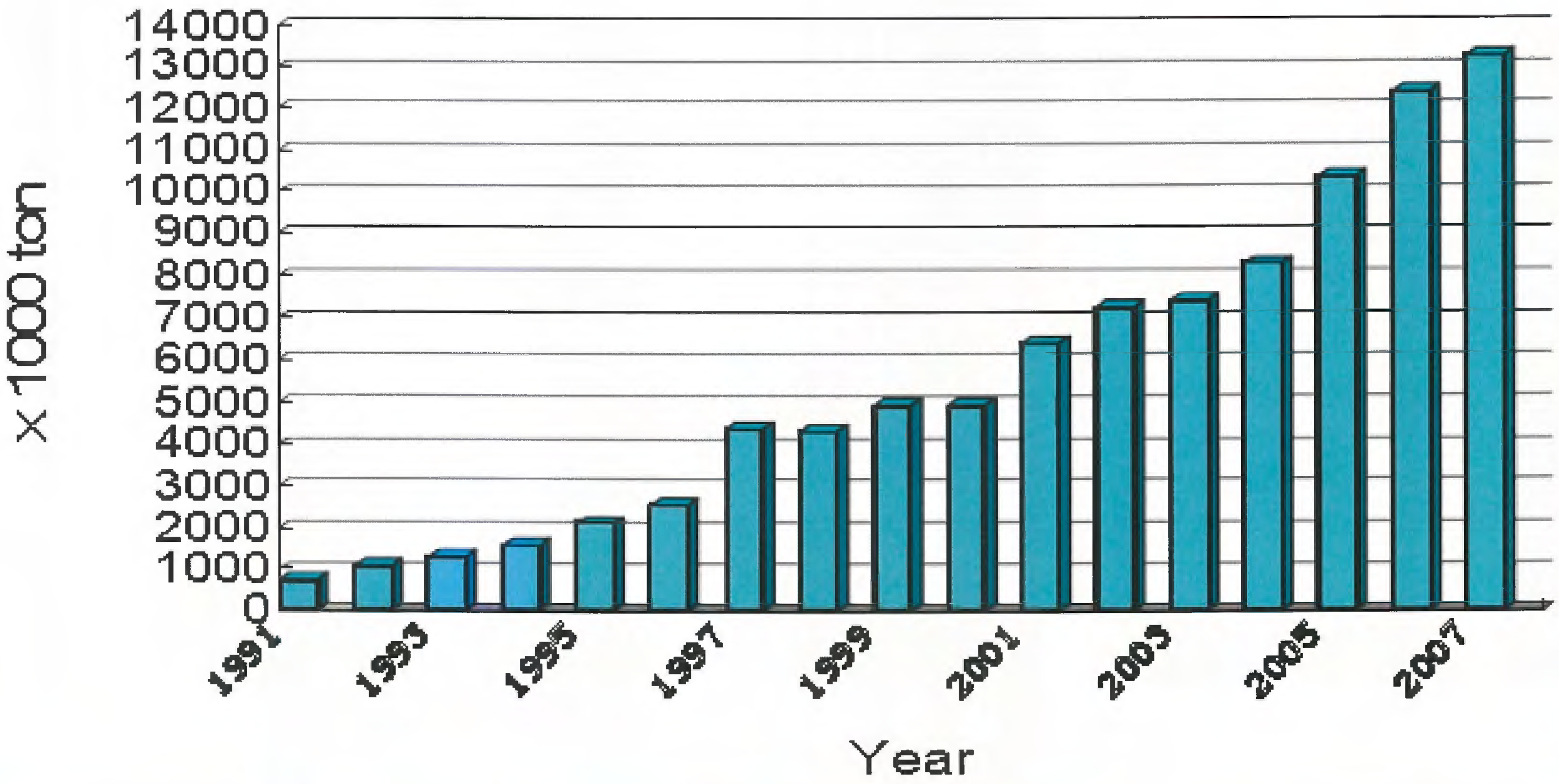
Aquafeed production in China 1991 - 2007

RIDLEY AQUA FEED



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

/e

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2006 八月 26
12°11'49.33" 北 109°17'49.73" 東 海拔高度 0 英呎


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12°11'18.55" 北 109°16'24.55" 東 海拔高度 76 英呎
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湛江特呈岛现况

Current Status @ Zhanjiang
Te-Cheng Island Cage Site

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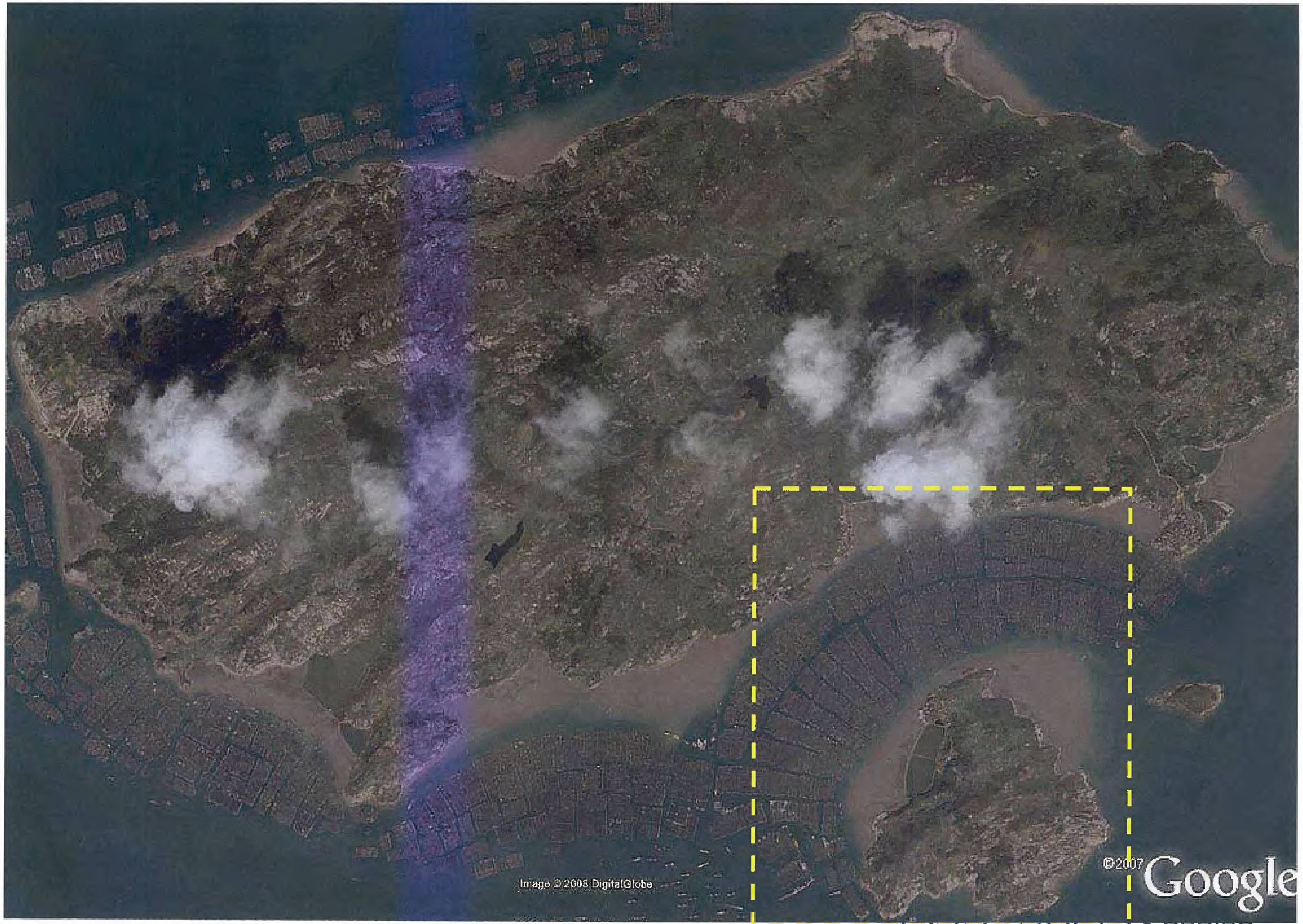
Image © 2008 DigitalGlobe
©2007 Google

Global significance

- ✓ 150g of fish = 50-60% of an adults daily protein intake
- ✓ In 2010 fish accounted for 16.7% of global production intake of animal protein and 6.5% of all protein consumed
- ✓ Fish provided 2.9 billion people with almost 20% of their intake of their animal protein and a further 4.3 billion people with 15% of such protein
- ✓ Fish protein is a crucial nutritional component especially in densely populated countries where protein intake is low.

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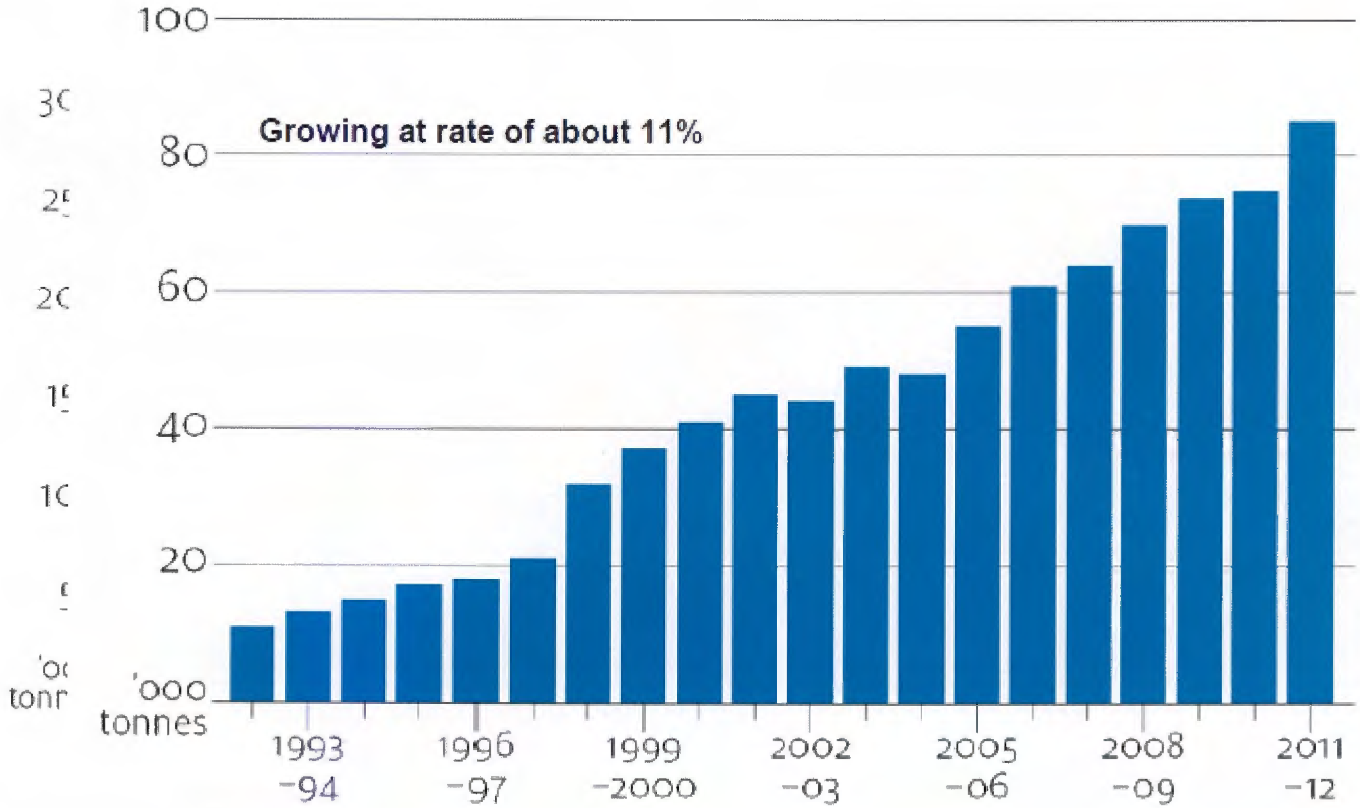
Australian Aquaculture Industry



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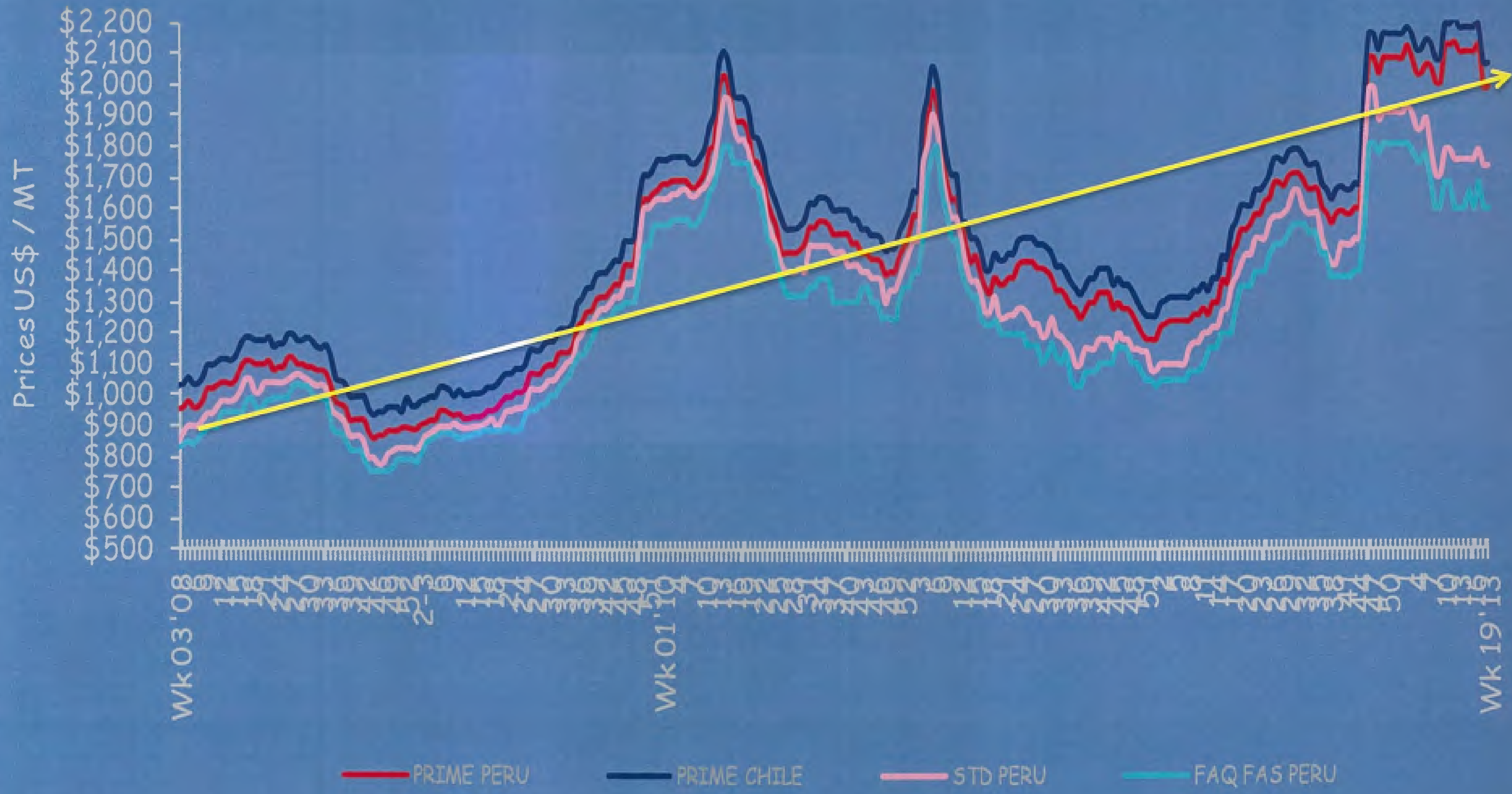
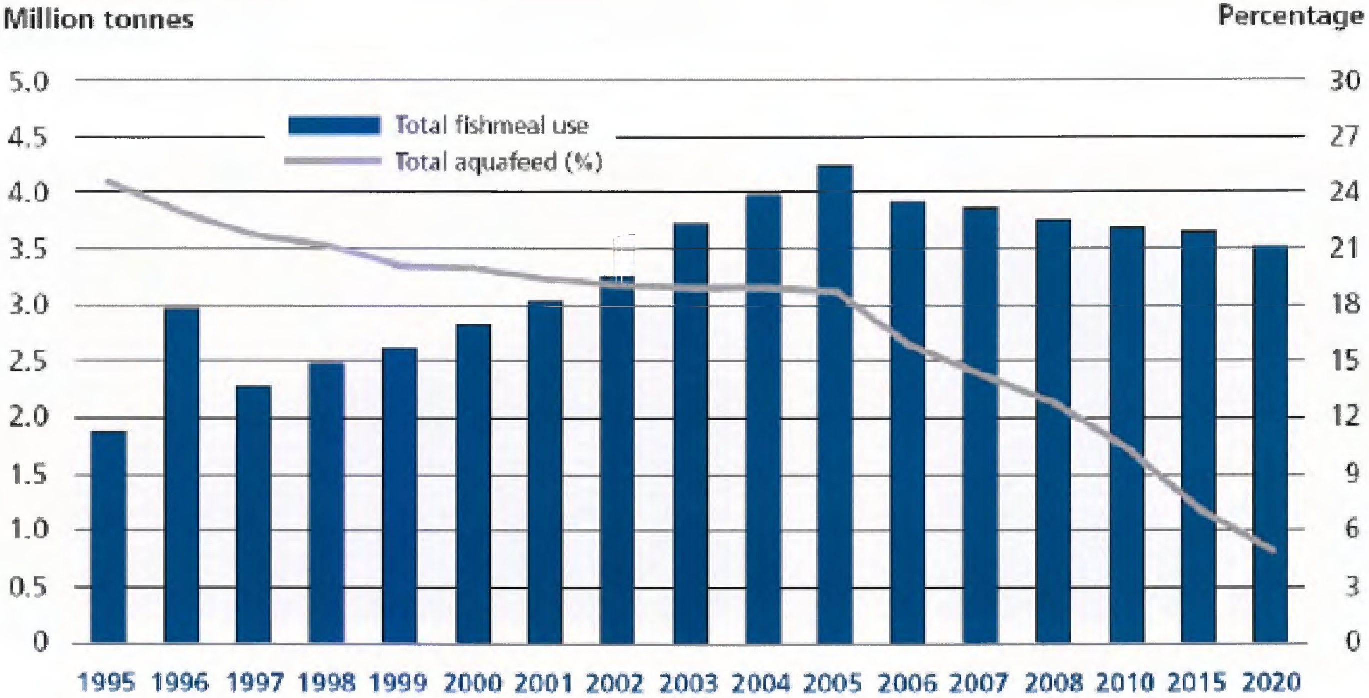


Actual and predicted reduction in fishmeal use relative to the global production of compound aquafeed



Source: Adapted from Tacon, A.G.J., Hasan, M.R. and Metian, M. 2011. *Demand and supply of feed ingredients for farmed fish and crustaceans: trends and prospects.* FAO Fisheries and Aquaculture Technical Paper No. 564. Rome, FAO. 87 pp.

Aquafeed protein sources

Fishmeal?

Plant proteins?

Land animal protein?

Microbial protein?

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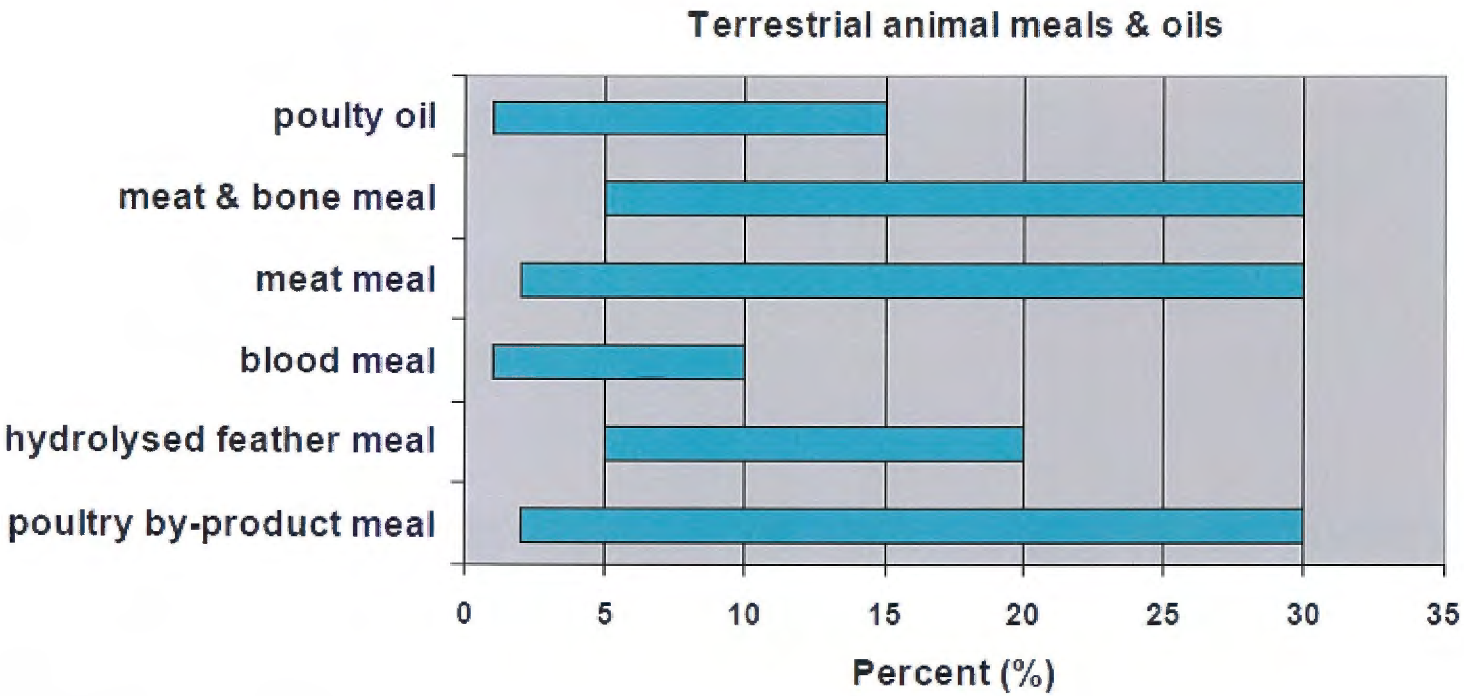
Typical Ranges of Terrestrial meals and oils in aquafeeds



However, there are many challenges and pitfalls

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Case Study - Blood Meal Quality Data

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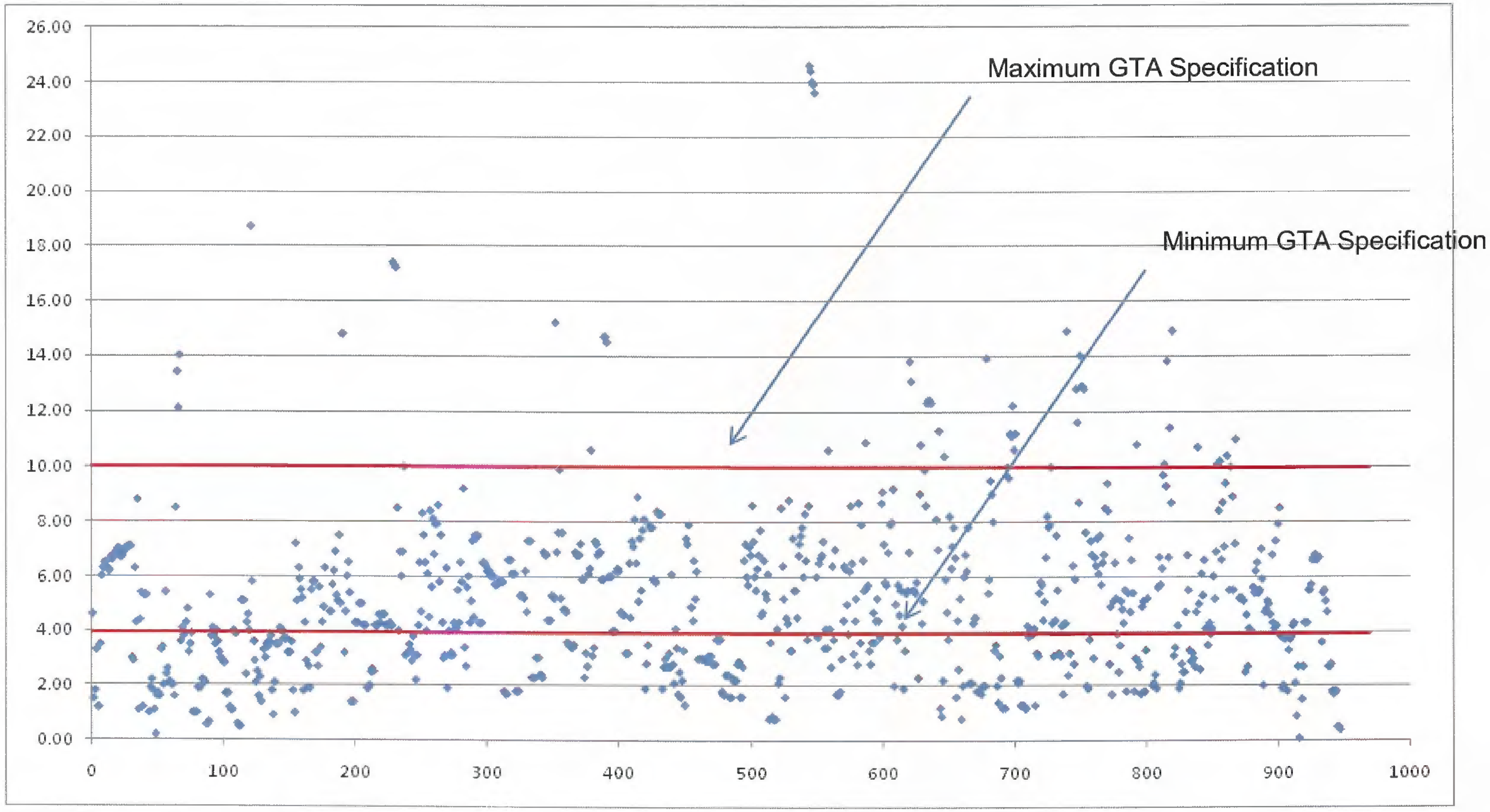
Blood meal quality – moisture content



45% fail
40% fail for low moisture

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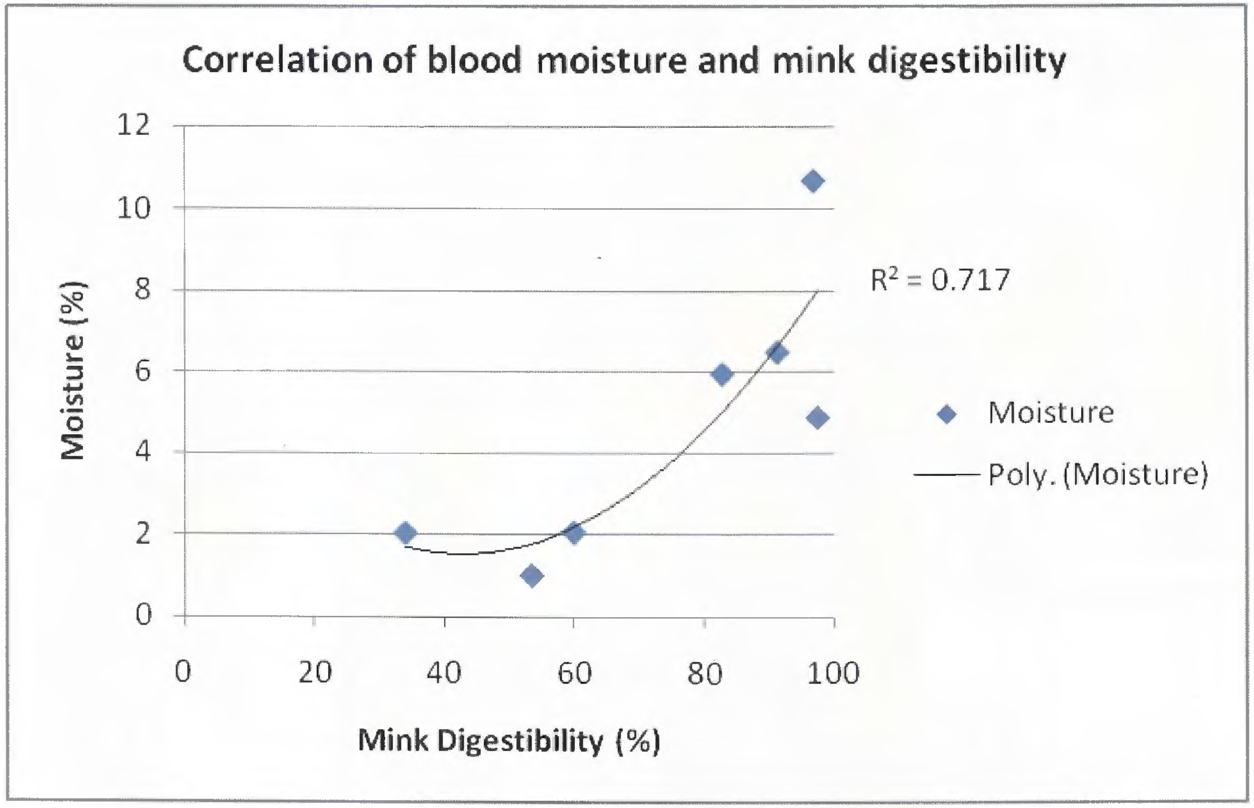
Blood meal quality – Mink digestibility



Mink is a good correlation for moisture digestibility

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 Government Industry & Investment

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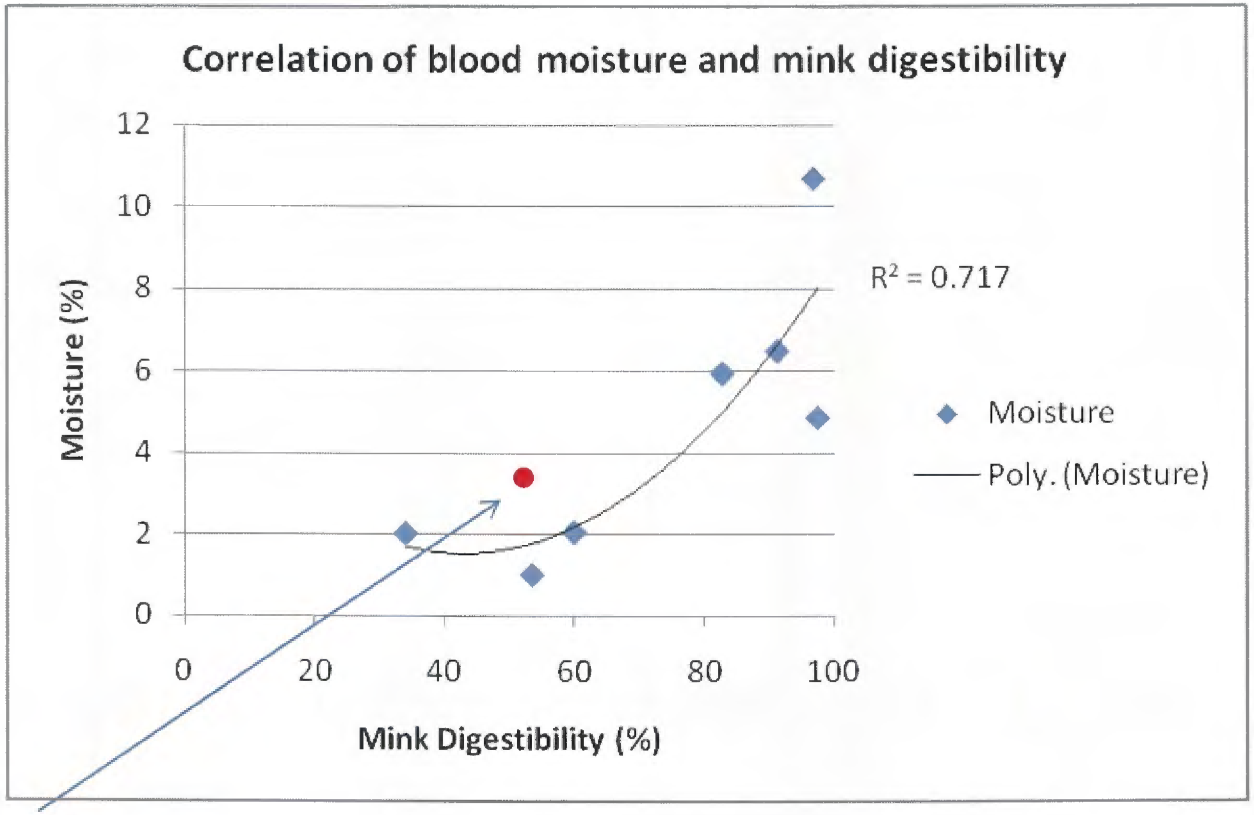
Blood meal quality – Mink digestibility



Barramundi digestibility

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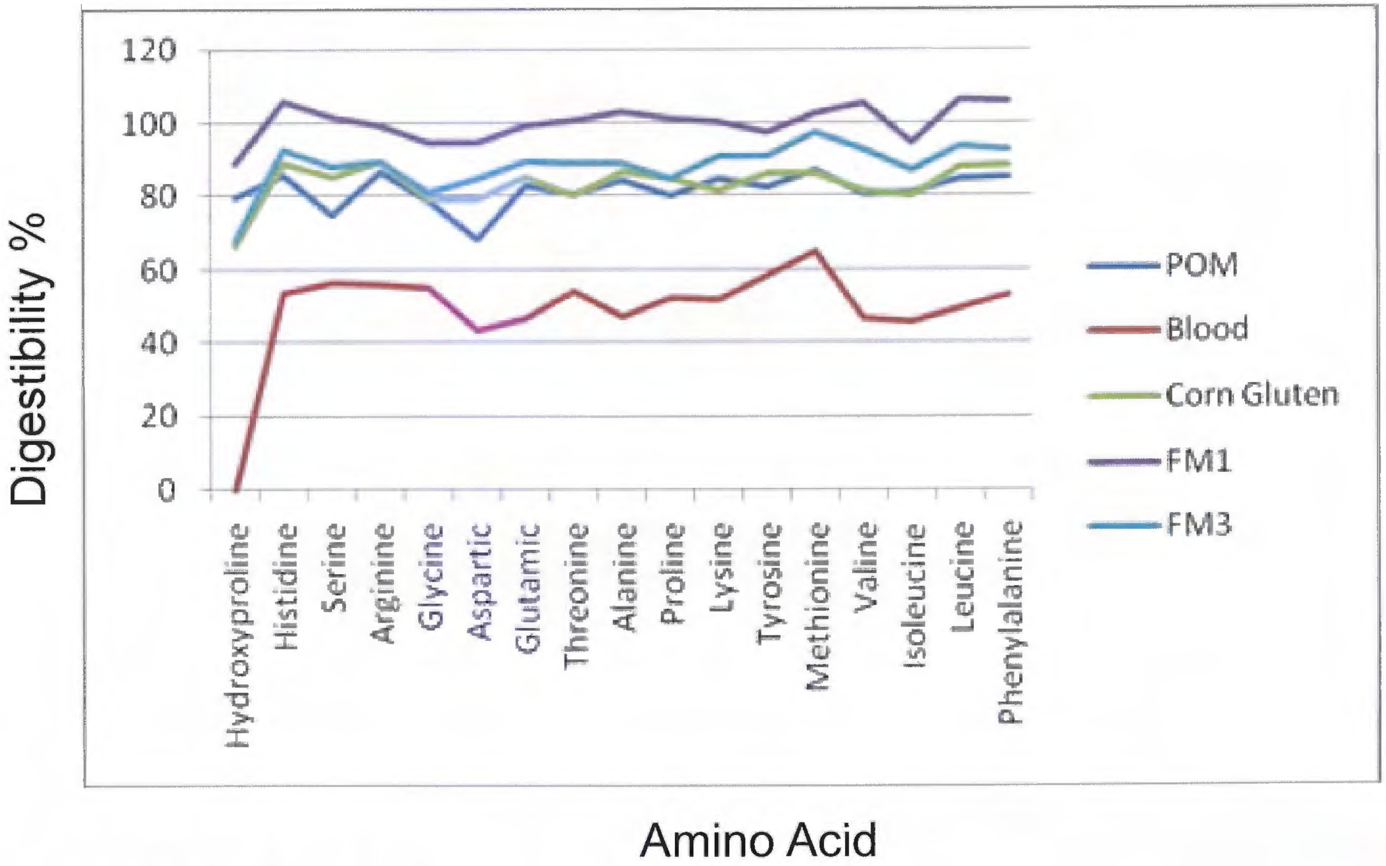
Blood meal quality – amino acid digestibility in Barramundi



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Blood meal quality - impact on growth and feed intake

Growth and feed conversion of rainbow trout after 8 wk of feeding experimental diets in the growth study

Diet[1]	Gain	Feed consumed	Feed efficiency[2]	Protein deposited[3]
	%	g	%	
0D	110	1085	106.4	45.7
20D	82	1032	84.0	27.2
40D	51	797	65.4	16.7
40D + Lys	90	1107	84.0	29.6
40D + Lys + Arg	92	1173	82.0	31.6

[1]Symbols indicate a storage time of 0 (0D), 20 (20D) or 40 d (40D) of the fish protein isolate and glucose mixture used in the diet, and the supplementation of 0.7% lysine (40D + Lys) or 0.7% lysine plus 0.5% arginine (40D + Lys + Arg) to the 40D diet. There were duplicate tanks for each dietary group. [2]Feed efficiency is 100 × [(total wet weight of fish gain)/(total dry weight of feed consumed)]. [3]Protein deposited is 100 × [(total final whole-body protein − total initial whole-body protein)/(total protein fed)].

Heat damaged protein (40D) when included in trout diets gives 50% less weight gain than undamaged protein

Addition of amino acids to damaged protein the weight gain recovers to 90 and 92%.

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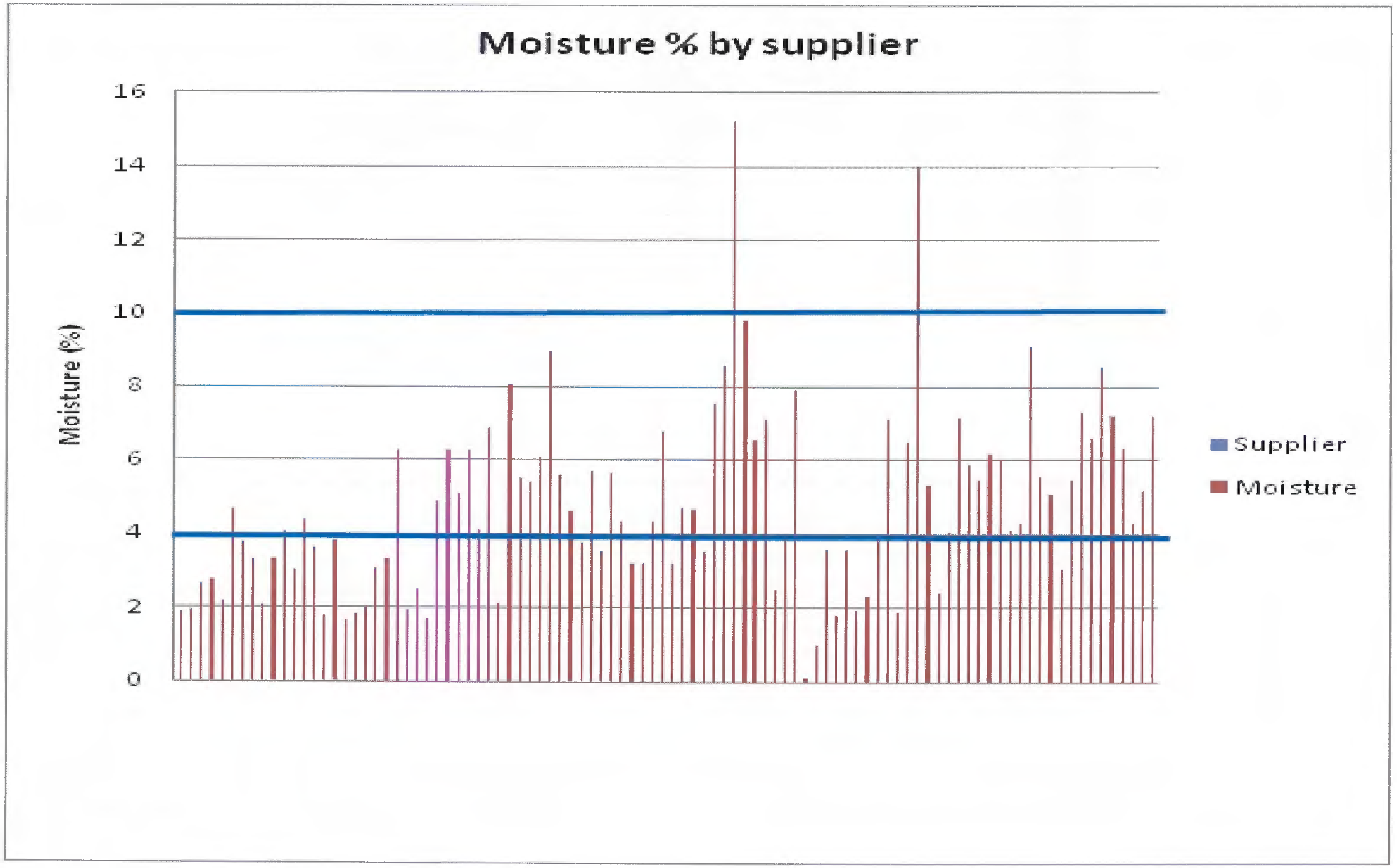
Blood meal quality – moisture by supplier



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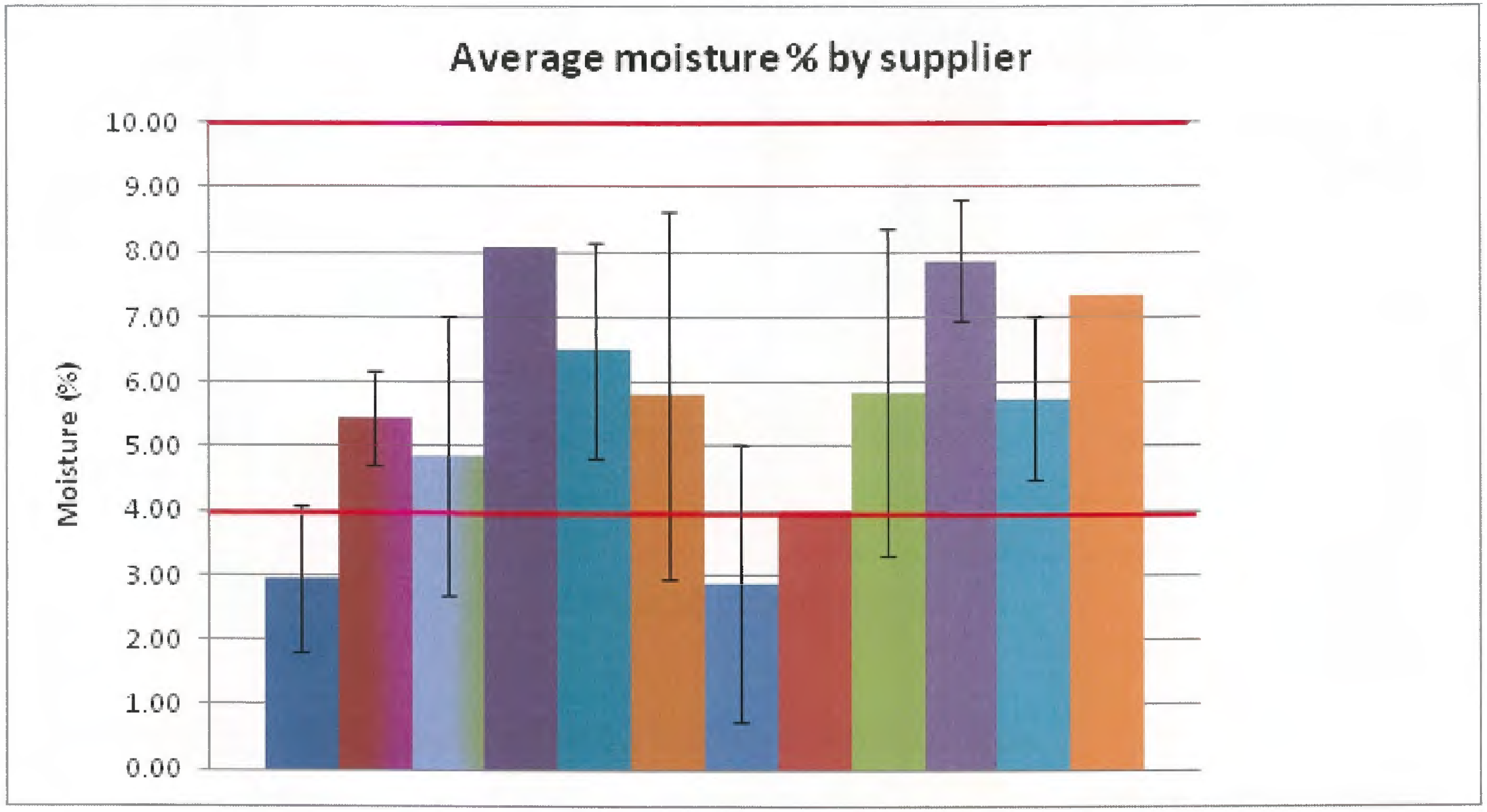
Blood meal quality – moisture by supplier



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Commercial and environmental Implications

Base Information

Feed Price - $/kg	1.50
HOG Price - $/kg	15.00
FCR	1.45
Average Weight HOG (g)	5000

Relative Information

Feed Price - $/kg	1.50
HOG Price - $/kg	15.00
FCR	1.35
Average Weight HOG (g)	5250

Commercial and environmental Implications

- Reduced growth and increased FCR results in
  - Increased costs to farm just in extra feed
  - Does not include loss of growth
  - Increase of environmental pollution
  - Loss of protein as food
- Aquaculture is the fastest growing sector of agriculture
- We can produce very sustainable fish feed, but we need good quality raw materials

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The Global Partnership for Good Agricultural Practice

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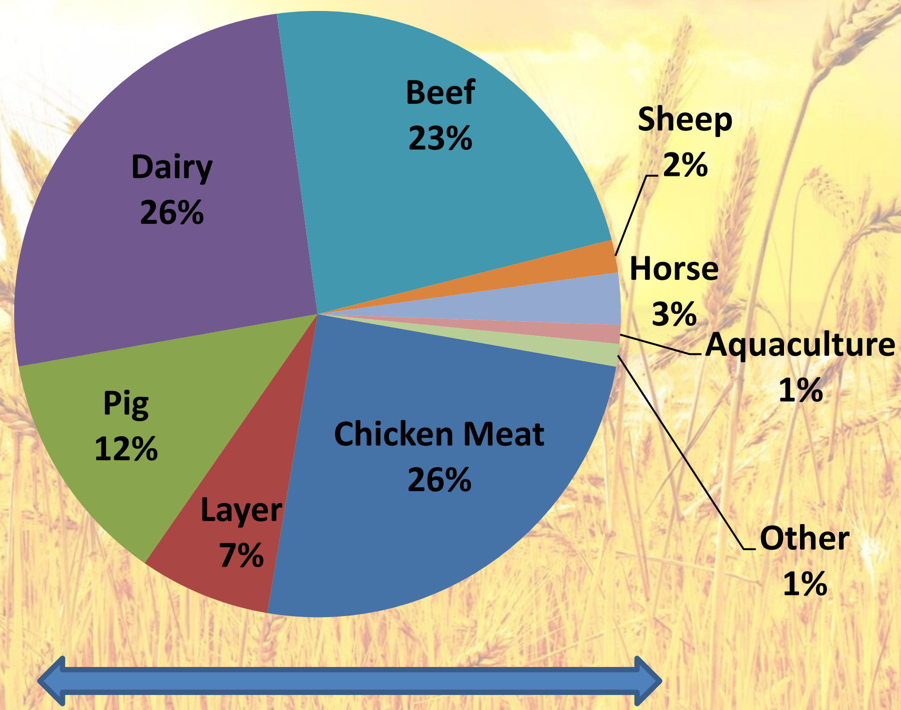
Stock Feed Manufacturers' Council of Australia

David Bray – President SFMCA

Stockfeed – A day in the life ………

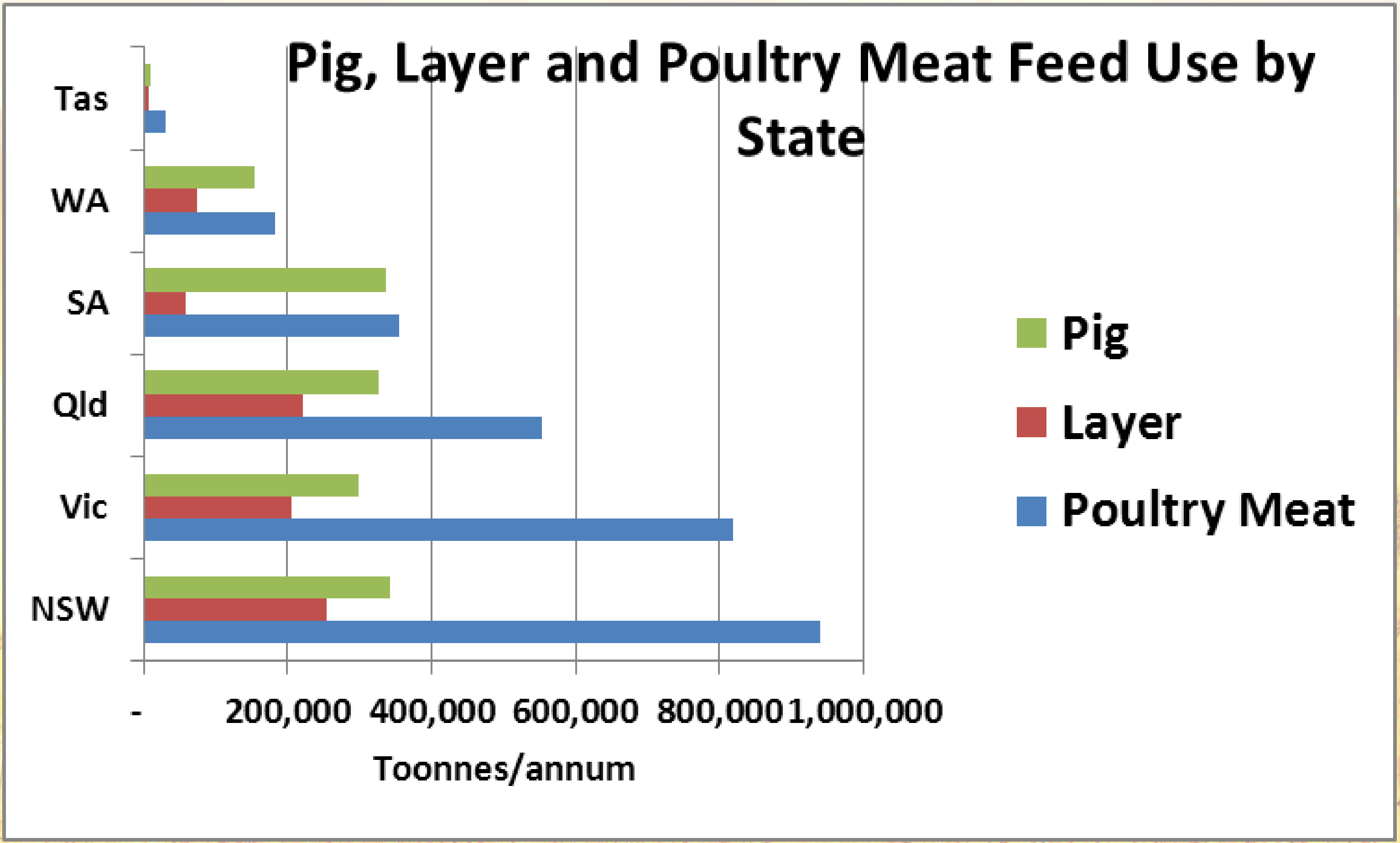
What does the stockfeed industry look like?

Driven by livestock industry growth and demand
12 million tonnes used annually



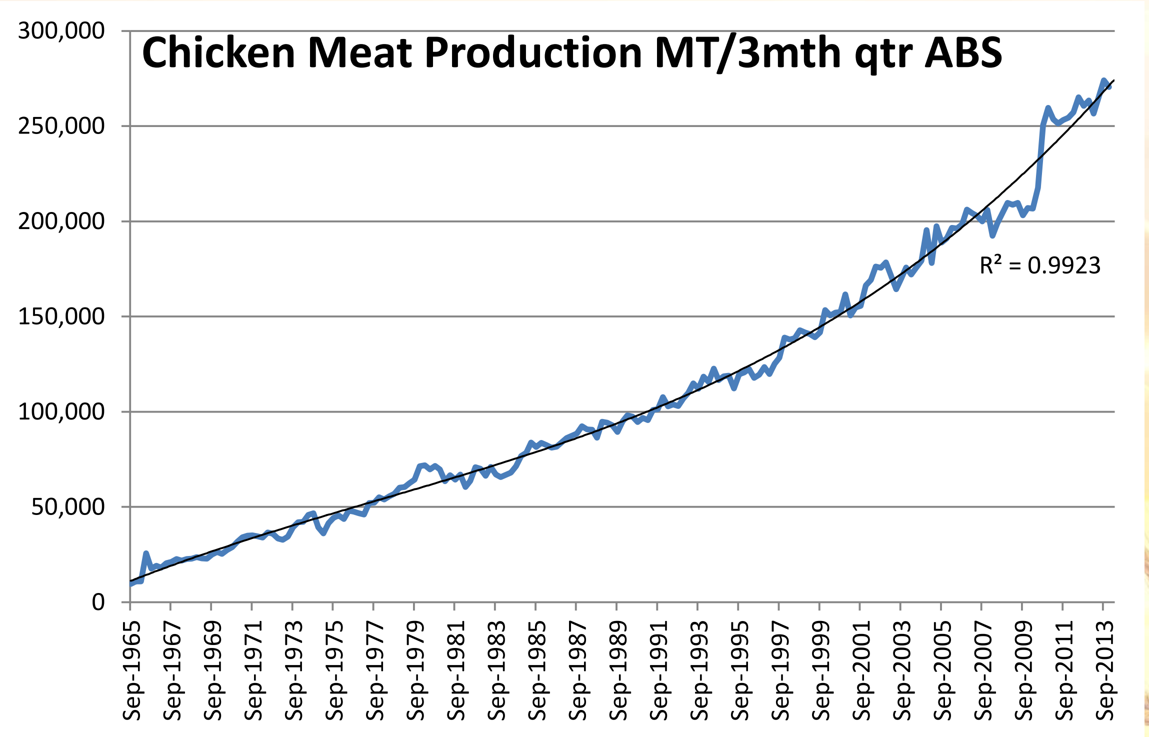
Pig & Poultry = 45%

Stock Feed Manufacturers' Council of Australia



East coast major pig and poultry feed use demand

Stock Feed Manufacturers' Council of Australia



- **Chicken meat production exceeds 1MMT annually**
- **Annual ave growth rate ave 6.9%/year**
- **Lower feed use growth – genetics, health, housing, nutrition**

Australians ate more chicken meat in 2012-13 than the combined total of beef and lamb.
44.6 kg of chicken meat per person, compared to 32.8 kg of beef and 9.5 kg of lamb.

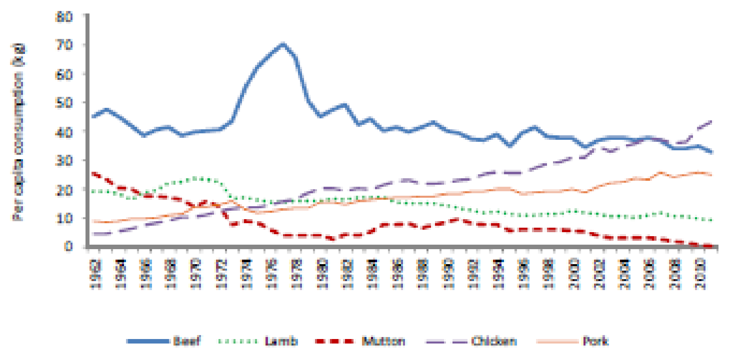
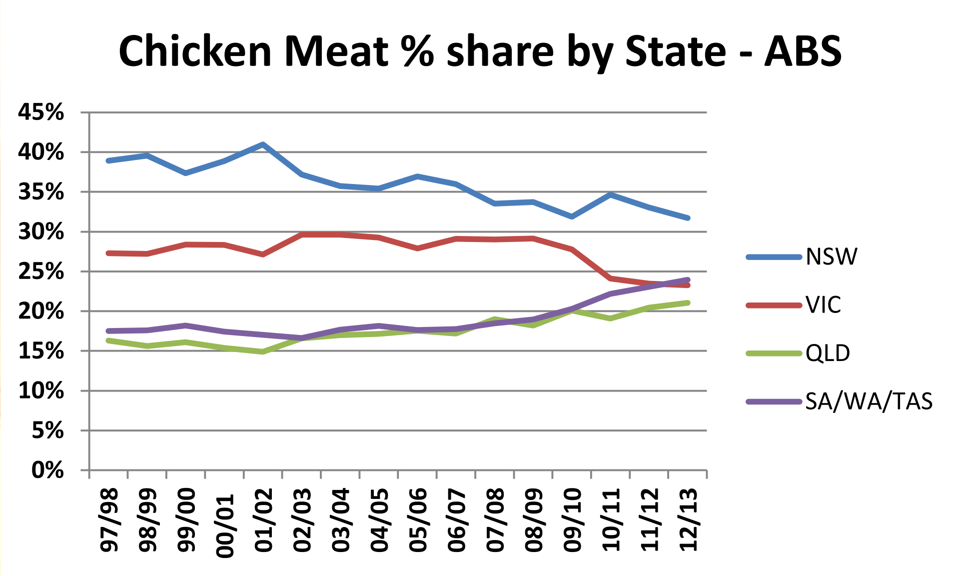
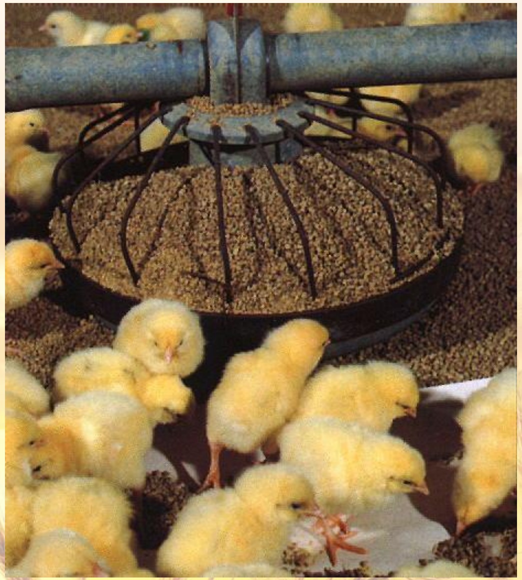


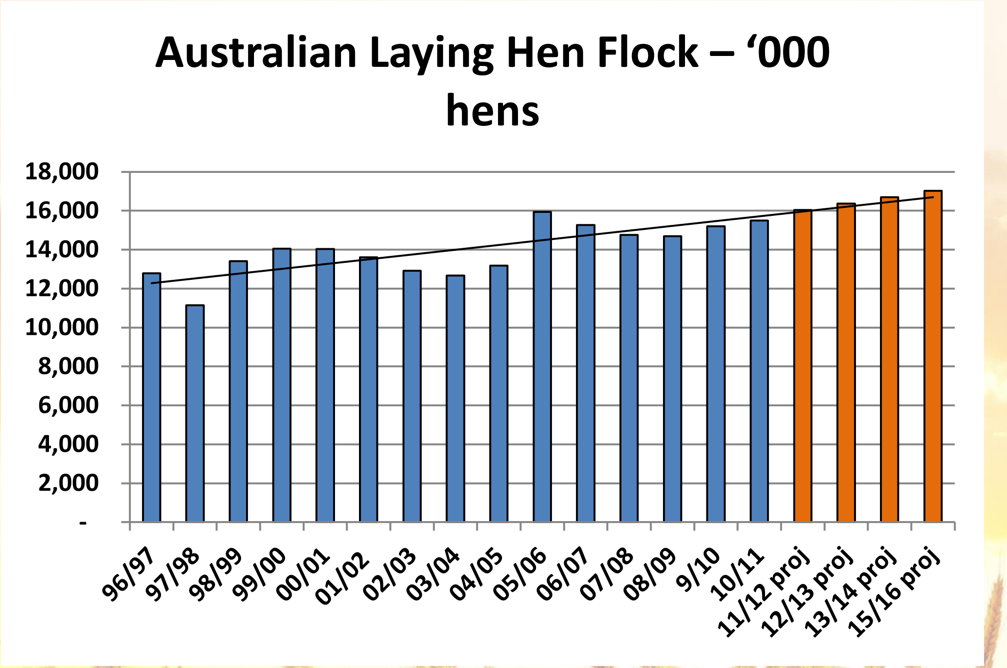
Figure 1 Per capita consumption of meat in Australia, Five meat types, 1962-2011





- Major growth in Qld and SA
- NSW and Vic declining share of production
- Major NSW development projects Griffith and Tamworth to take place

Stock Feed Manufacturers' Council of Australia


Australian Laying Hen Flock – '000 hens
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
-
96/97
97/98
98/99
99/00
00/01
01/02
02/03
03/04
04/05
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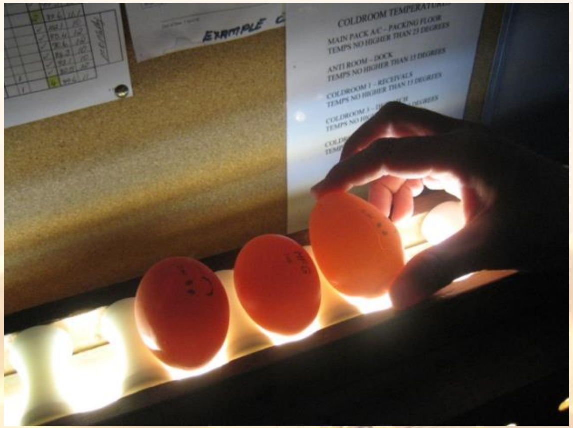
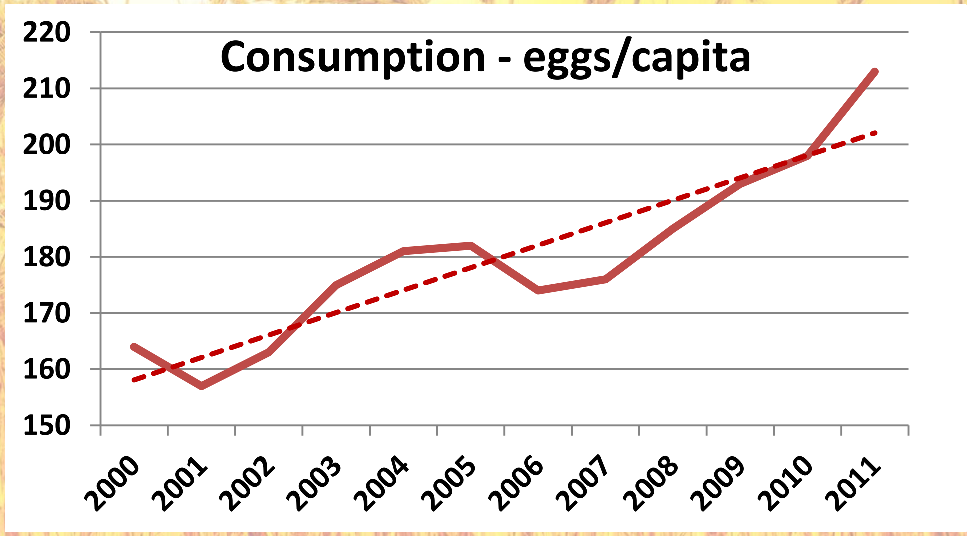
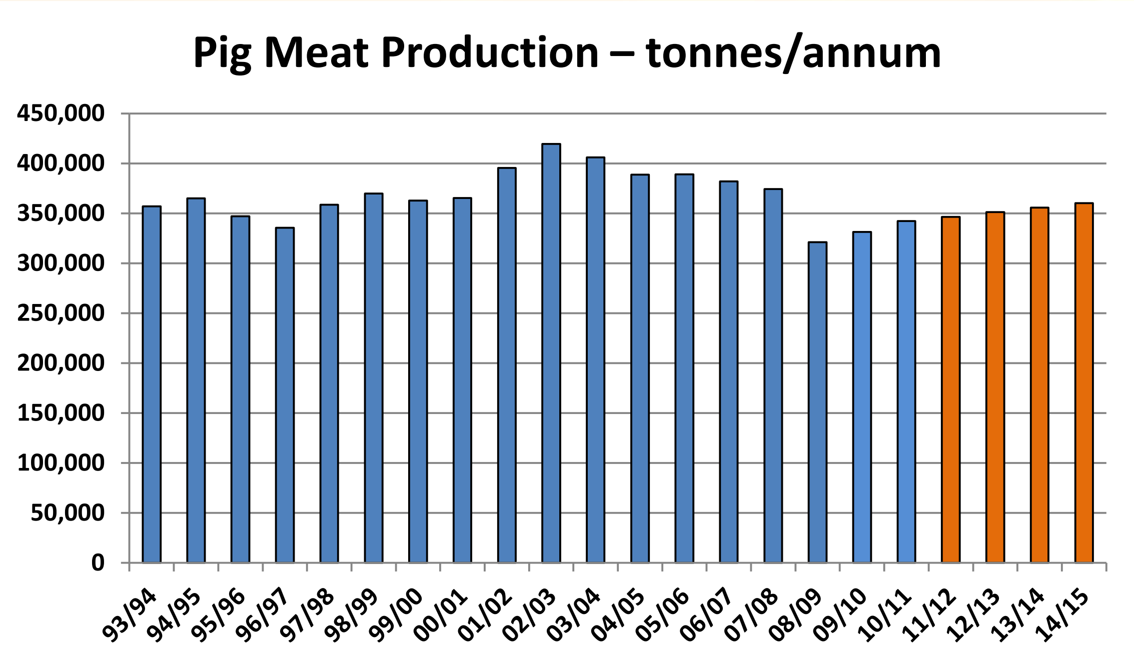
13/14 proj
15/16 proj

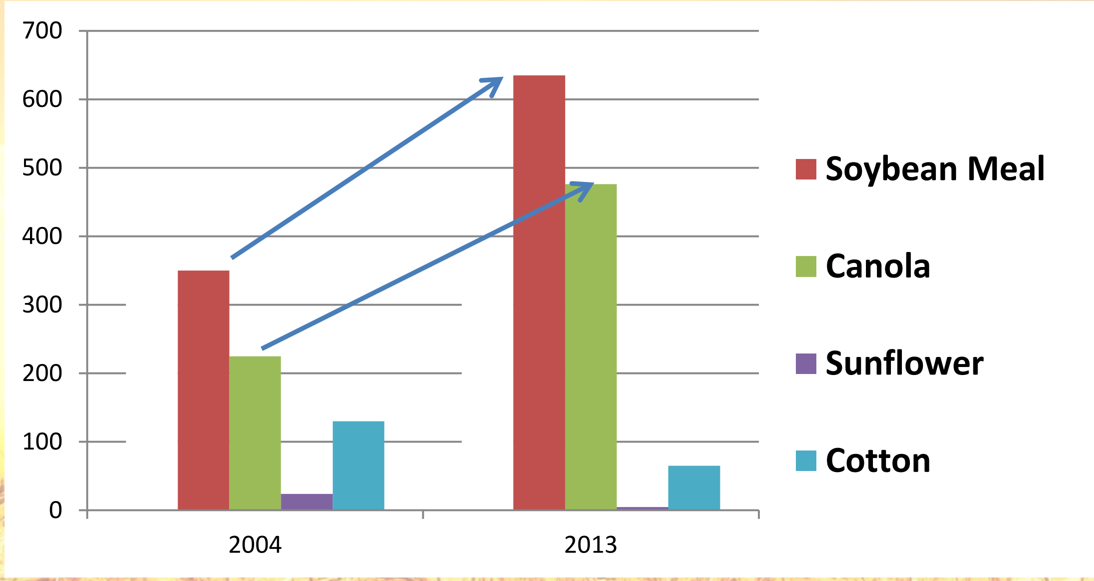



Consumption - eggs/capita
220
210
200
190
180
170
160
150
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011



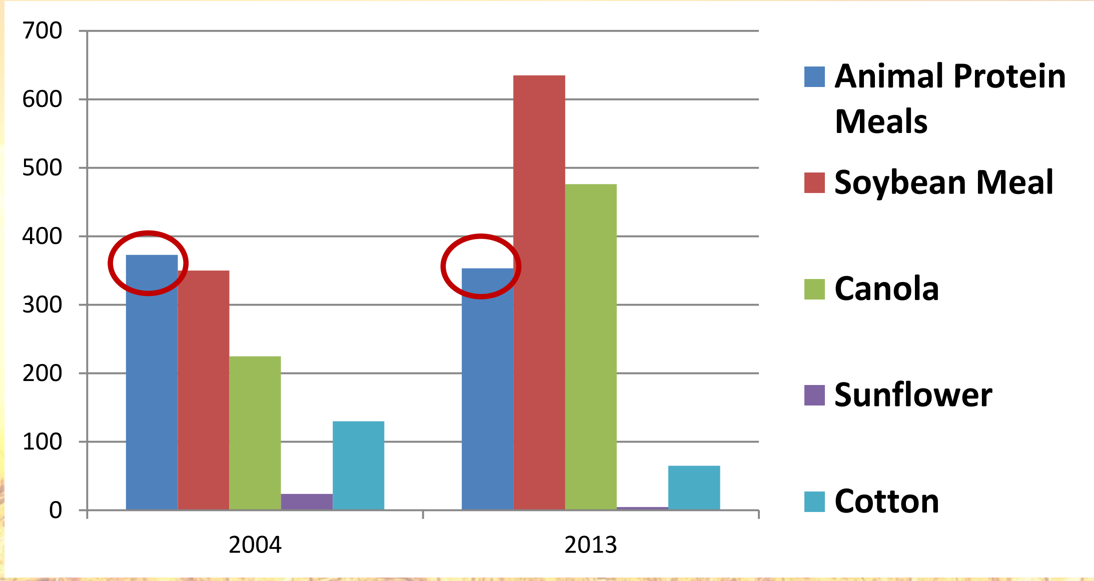
- Flat line production
- Imports for processing – Canada, USA and Denmark
- Increased production SA and Qld
- Decline in production NSW

Place of meat industry co-products in stockfeed?



- **Soybean meal imports increased to 636,000 tonnes**
- **Doubling of canola meal use, almost 500,000 tonnes**

Place of meat industry co-products in stockfeed?



2013 Animal protein meal figure from ARA 2011 Fact Book.

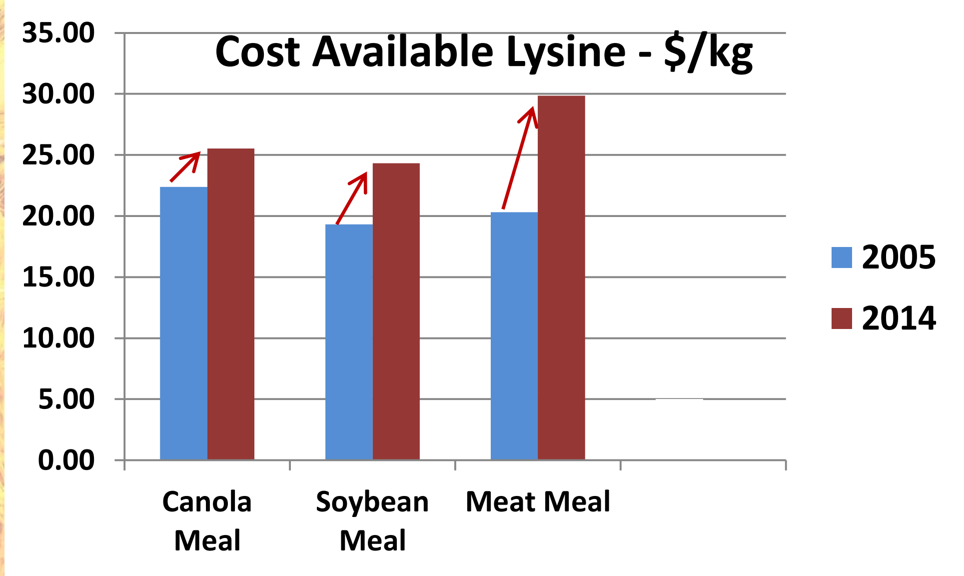
- Soybean meal imports increased to 636,000 tonnes
- Doubling of canola meal use, almost 500,000 tonnes
- **Animal protein meal use flat**
- **Decline in use relative to soya and canola**
- **Ave 6.2% inclusion in poultry and pig feeds**

What has been affecting co-products use in stockfeed?

- **Pressure in mixed species mills and RAM use – easiest option for some mills to go RAM free i.e. veggie protein only pig and poultry.**

What has been affecting co-products use in stockfeed?

- Pressure in mixed species mills and RAM use – easiest option for some mills to go RAM free i.e. veggie protein only pig and poultry.
- **Cost relativity – "lower cost" South American soybean meal.**
- **Domestic canola meal being priced relative to soy price.**

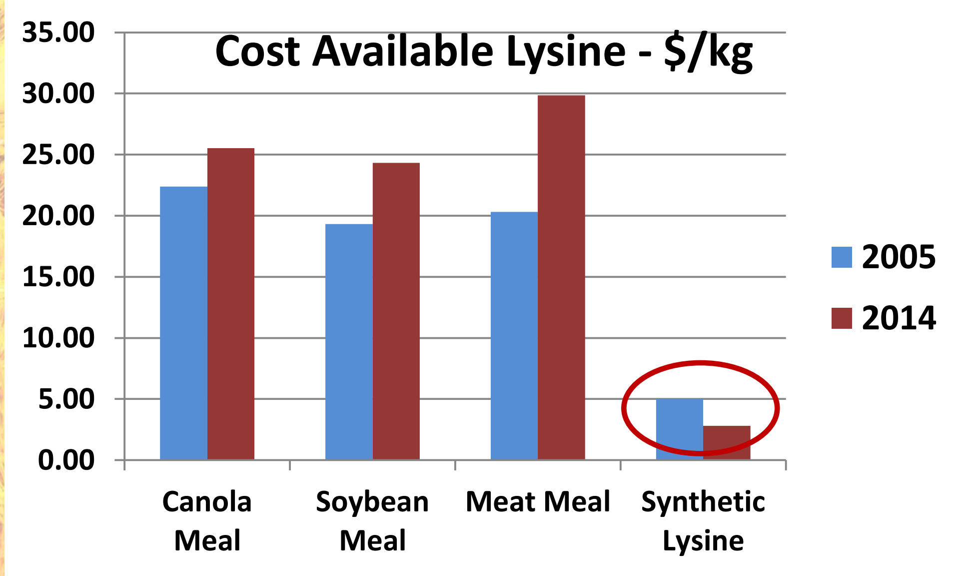


<u>$/kg available lysine</u>

- Increased cost 2005 to 2014
- Greater cost increase for meat meal

What has been affecting co-products use in stockfeed?

- Pressure in mixed species mills and RAM use – easiest option for some mills to go RAM free i.e. veggie protein only pig and poultry.
- Cost relativity – "lower cost" South American soybean meal and domestic canola meal being priced relative to soy price.
- **Reduced cost of synthetic amino acids and increased availability**



- **Synthetic lysine is now half the cost vs 2005**
- **In addition to methionine, threonine and tryptophan; valine and isoleucine can now be bought in a bag!**

If meat industry co-products are over priced as amino acid sources then why are they still used?

- **Provides additional energy from fat content**
- **Assist in stimulating feed intake – palatability, especially in pig feeds**
- **Associated with improved animal performance**
- **Spreads nutritional formulation risk over more raw materials**
- **Supplies phosphorus – although enzymes have reduced the added value**

Other issues considered in using co-products

MINIMISING RISK

- **SALMONELLA – varying company/mill view on significance, presence in other raw materials.**
- **CONSISTENCY – variation between suppliers, consistency of offal being rendered.**
- **DIGESTIBILITY – heat damage/over processing and freshness of offal being processed**
- **PARTICLE SIZE – bone fragments**

DRIVERS OF DECISION MAKING SUMMARY

- **PRICE – assessed by best cost feed formulation**
- **CONSISTENCY – knowing what will be delivered**
- **QUALITY – nutritional content and physical nature**
- **EASE OF USE – delivery, worth the effort**
- **RELATIONSHIP – supply history experience**

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FEED MANUFACTURER

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International Feed Industry Federation

Feed the world

World Protein Production 2012-2013

Million metric tons

	Bovine	Poultry	Pigs	Aqua	Milk	Total
2012	67.0	105.4	112.4	66.6	762.3	1113.7
2013	67.7	107.0	114.3	70.5	767.2	1126.7
Var.	1.0%	1.5%	1.6%	5.8%	0.6%	1.1%

Source: FAO Global Food Outlook ***May 2014***

IFIF

International Feed Industry Federation

Feed the world

FAO Outlook 2010 to 2050: times 1.6!

Animal protein / million metric tons





	Bovine	Poultry	Pigs	Aqua	Milk	Total
2010	66.7	98.9	109.3	59.9	722.9	1,057.7
2050	107.5	201.9	150.3	113.7	1,119.7	1,693.1

1.6X

In 2050:

meats 433.1 million tonnes - + 1,3% APR
aqua 113.7 million tonnes - + 1.6 % APR
milk 1119.7 million tonnes - + 1.1 % APR

Source: FAO Global Food Outlook November 2012/ FAO World agriculture towards 2030/2050 - 2012 Rev / OECD FAO Ag Outlook 2013

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International Feed Industry Federation

Maintaining last 40 years APR

Animal protein / million metric tons

APR by product (1970-2010)

	Bovine	Poultry	Pigs	Aqua	Milk	Total
						
2010	66.7	98.9	109.3	59.9	722.9	1,057.7
2050	112.2	650.0	329.9	1,767.5	1,325.9	4,185.5

In 2050:

meats 1,092 million tonnes - + 3.52 % APR
aqua 1,767 million tonnes - + 8.83 % APR
milk 1,325 million tonnes - + 1.52 % APR

4 x !

*Source: 2010 data: FAO Global Food Outlook **November 2012** / FAO STAT database production data 1970-2010*

International Feed Industry Federation

IFIF Feed the world

For example : Nutrition + Genetics = Animal Performance?

Parameters	1940	1965	1985	2005	
Body weight (kg)	1.4	1.6	1.9	2.4	*+171%*
Age at slaugther (days)	84	63	49	42	*-50%*
Feed conversion rate	4.0	2.4	2.0	1.7	
Protein deposition (g/day)	**2.5**	**3.8**	**5.8**	**8.6**	*+344%*

Sanity

Feedstuffs Quality Control

Management

Feed Production

Economics

Nutrition

IFIF
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International Feed Industry Federation

Genetics Improvement

1957	1977	Ross 308

Day 42

International Feed Industry Federation

Selection for LeanMass Growth

Growth rate has tripled in recent decades

50 years ago **30 years ago** **Nowadays**

(Havenstein et al. 2003)

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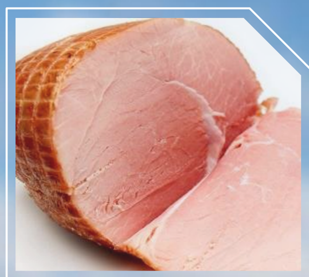
Price of animal proteins at retail





	Swine Pernil	Beef Round top	Shrimp shells on 89/90	Poultry whole frozen	Tilapia Frozen fillets
Highest price	$13,98	$16,00	$21,48	$5,21	$16,83
Lowest price	$3,88	$9,16	$6,77	$2,18	$6,03
Store price variation amounts up to	260%	92%	130%	146%	250%

Meat Meal in Poultry Rations

- Valued ingredient providing nutrients
  - Essential amino acids
    - 1st limiting is Methionine
    - 2nd limiting is Lysine
    - 3rd limiting is Threonine
    - Required for growth, feather cover, meat production, egg production, egg weight.
  - Calcium
    - Required for bone development, egg shell formation.
  - Phosphorus
    - Required for bone development.

Broiler Requirements

		Starter		Grower		Finisher 1		Finisher 2	
Age fed	days	0-10		11-24		25-42		43-slaughter	
Energy	kcal	3,025		3,150		3,200		3,225	
	MJ	12.65		13.20		13.40		13.50	
AMINO ACIDS		**Total**	**Digest**[1]	**Total**	**Digest**[1]	**Total**	**Digest**[1]	**Total**	**Digest**[1]
Lysine	%	1.43	1.27	1.24	1.10	1.06	0.94	1.00	0.89
Methionine & Cystine	%	1.07	0.94	0.95	0.84	0.83	0.73	0.79	0.69
Methionine	%	0.51	0.47	0.45	0.42	0.40	0.37	0.38	0.35
Threonine	%	0.94	0.83	0.83	0.73	0.72	0.63	0.68	0.60
Valine	%	1.09	0.95	0.96	0.84	0.83	0.72	0.79	0.69
iso-Leucine	%	0.97	0.85	0.85	0.75	0.74	0.65	0.70	0.61
Arginine	%	1.45	1.31	1.27	1.14	1.10	0.99	1.04	0.93
Tryptophan	%	0.24	0.20	0.20	0.18	0.17	0.15	0.17	0.14
Crude Protein	%	22-25		21-23		19-22		17-21	
For optimal portions margin it is recommended that amino acid density be increased up to 5% in all diets									
MINERALS									
Calcium	%	1.05		0.90		0.85		0.80	
Available Phosphorus	%	0.50		0.45		0.42		0.40	
Magnesium	%	0.05-0.50		0.05-0.50		0.05-0.50		0.05-0.50	
Sodium	%	0.16-0.23		0.16-0.23		0.16-0.20		0.16-0.20	
Chloride	%	0.16-0.23		0.16-0.23		0.16-0.23		0.16-0.23	
Potassium	%	0.40-1.00		0.40-0.90		0.40-0.90		0.40-0.90	

Broiler Grower Ration

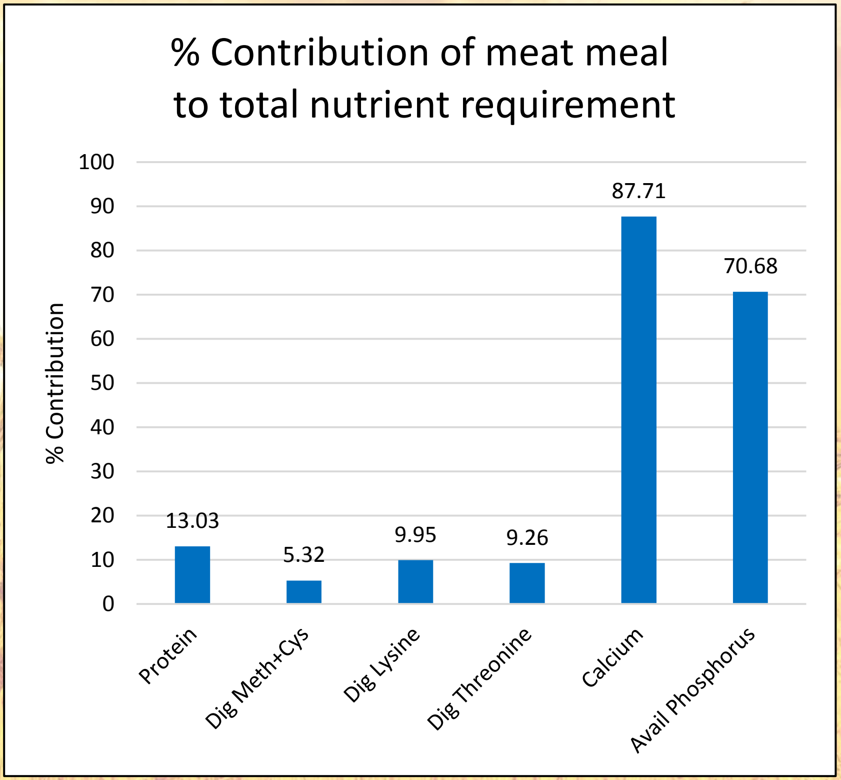
PRODUCTION FORMULA Date: 06/11/2014

Product: Broiler Grower

Ingr Code	Ingredient Name	Kgs	Pct
771012	Wheat	810.000	27.000
771636	Sorghum	1,140.581	38.019
772229	Meat Meal	172.859	5.762
772468	Poultry Oil	45.000	1.500
772469	Poultry Oil	79.122	2.637
772623	Soybean Meal	704.500	23.483
773209	Kynophos	3.113	0.104
773225	Salt	1.874	0.062
773230	Sodium Bicarbonate	8.040	0.268
773235	Choline Chloride 75%	0.990	0.033
773275	Lysine	10.024	0.334
773287	Threonine	3.834	0.128
773289	Liquid Methionine	10.763	0.359
774074	Xylanase enzyme	0.300	0.010
775004	Mineral Premix	1.500	0.050
775066	Vitamin Premix	7.500	0.250
	Formula Totals:	3,000.00	

Nutrient Composition: (Class 1)

Nutr	Nutrient Name	Amount	Units
2	PROTEIN	21.227	%
6	CALCIUM	0.900	%
7	AVAILABLE PHOSPHORUS	0.450	%
44	DIGEST METH+CYST	0.836	%
45	DIGEST LYSINE	1.100	%
107	DIGEST THREONINE	0.726	%



Layer Production Requirements

FEEDING PHASE	**PEAKING**						**LAYER 2[1]**					**LAYER 3**					**LAYER 4**				
PRODUCTION	First egg to peak						Above 93 to 89%					88–85%					Less than 85%				
NUTRITION	**RECOMMENDED CONCENTRATION[1,2]**																				
Metabolizable energy[3], kcal/kg	2778-2911						2734–2867					2679–2867					2558–2833				
Metabolizable energy[3], MJ/kg	11.63–12.18						11.44–12.00					11.21–12.00					10.71–11.86				
	FEED CONSUMPTION (*Typical Feed Consumption)																				
g/day per bird	88	93	98	**103***	108	113	100	105	**110***	115	120	100	105	**110***	115	120	99	104	**109**	114	119
	Standardized Ileal Digestible Amino Acids																				
Lysine, %	0.94	0.89	0.85	**0.81**	0.77	0.73	0.80	0.76	**0.73**	0.70	0.67	0.78	0.74	**0.71**	0.68	0.65	0.76	0.72	**0.69**	0.66	0.63
Methionine, %	0.46	0.44	0.42	**0.40**	0.38	0.36	0.39	0.37	**0.36**	0.34	0.33	0.38	0.36	**0.35**	0.33	0.32	0.36	0.35	**0.33**	0.32	0.30
Methionine+cystine,%	0.81	0.77	0.73	**0.69**	0.66	0.63	0.69	0.66	**0.63**	0.60	0.57	0.66	0.63	**0.60**	0.58	0.55	0.64	0.61	**0.58**	0.55	0.53
Threonine, %	0.66	0.62	0.59	**0.56**	0.54	0.51	0.56	0.53	**0.51**	0.49	0.47	0.55	0.52	**0.50**	0.47	0.46	0.53	0.50	**0.48**	0.46	0.44
Crude protein[5], %	19.32	18.28	17.35	**16.50**	15.74	15.04	16.75	15.95	**15.23**	14.57	13.96	16.00	15.24	**14.55**	13.91	13.33	15.66	14.90	**14.22**	13.60	13.03
Calcium[6,8], %	4.77	4.52	4.29	**4.08**	3.89	3.72	4.30	4.10	**3.91**	3.74	3.58	4.50	4.29	**4.09**	3.91	3.75	4.65	4.42	**4.22**	4.04	3.87
Phosphorus (available)[7,8], %	0.52	0.49	0.47	**0.45**	0.43	0.41	0.42	0.40	**0.38**	0.37	0.35	0.38	0.36	**0.35**	0.33	0.32	0.37	0.36	**0.34**	0.32	0.31

Layer 1 Ration – to Peak Production

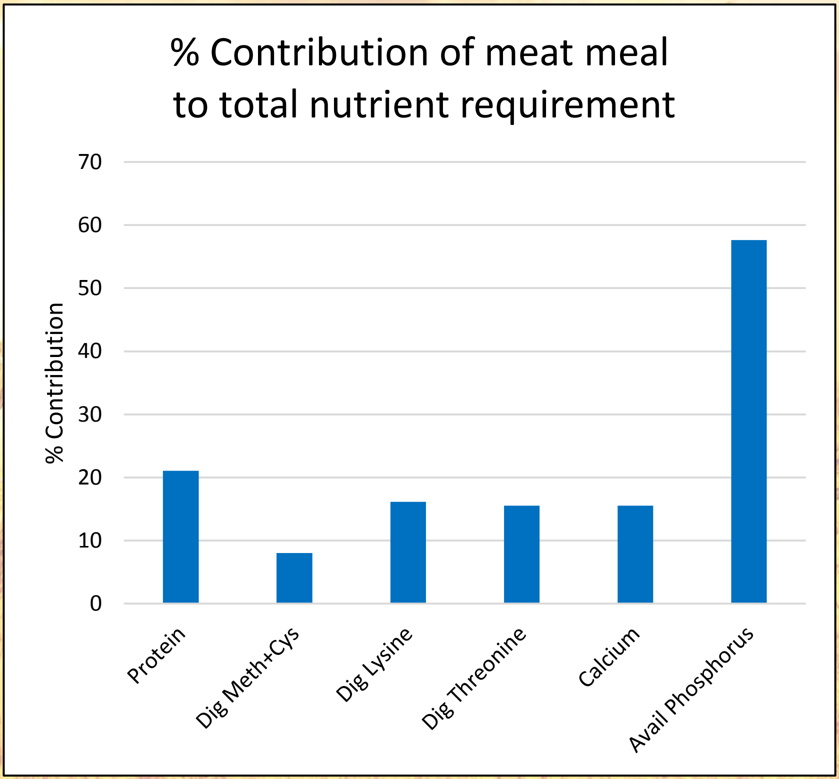
PRODUCTION FORMULA Date: 05/18/2014

Product: Layer 1

Ingr Code	Ingredient Name	Kgs	Pct
771037	Wheat	1,061.964	53.098
771368	Barley	200.000	10.000
772225	Meat Meal 50.0 LPC	160.000	8.000
772345	Blood Meal	25.303	1.265
772479	Tallow (adult)	38.418	1.921
772588	Canola Meal	120.000	6.000
772623	Soybean Meal	184.300	9.215
773173	Limestone Grit	140.000	7.000
773179	Limestone	38.591	1.930
773225	Salt	3.000	0.150
773230	Sodium Bicarbonate	4.925	0.246
773235	Choline Chloride 75%	0.741	0.037
773263	Rhodimet	7.566	0.378
773275	Lysine	6.231	0.312
773287	Threonine	2.340	0.117
773389	Yolk colouring	2.000	0.100
773394	Vitamin/Mineral premix	4.000	0.200
773402	Enzymes	0.620	0.006
	Formula Totals:	2,000.00	

Nutrient Composition: (Class 2)

Nutr	Nutrient Name	Amount	Units
2	PROTEIN	19.000	%
6	CALCIUM	4.200	%
7	AVAILABLE PHOSPHORUS	0.562	%
44	DIGEST METH+CYST	0.815	%
45	DIGEST LYSINE	0.981	%
107	DIGEST THREONINE	0.626	%



Differences Between Broiler and Layer Amino Acid Requirements

Nutrient	Broiler at peak growing (11-24days)	Layer at peak production (>93%)
Feeding program	Ad lib	110gm/bird/day
% Crude Protein	21-23	15.23
% Methionine + cystine (digestible)	0.84	0.63
% Lysine (digestible)	1.10	0.73
% Threonine (digestible)	0.73	0.51

Meat Meal Quality

- Key Criteria
  - Nutritional value
  - Consistency of product
  - Freshness of supply

- When key criteria are not met
  - Alternative protein sources (vegetable proteins)
  - Phytase enzyme

Impact of Meat Meal Variability on Productivity

Problem	Effect	Consequence
Variable product – protein & amino acids	Imbalance in Ideal Protein Ratio	Poor feather cover, reduced egg production, reduced egg weight, growth depression, loss of performance
Variable product – calcium and phosphorus	Imbalance in Calcium:Phosphorus ratio	Leg deformaties, mortality from starvation, both welfare issues egg shell deterioration
Rancid fat	Feed intake suppression	Growth depression, loss of performance
Biogenic amines	Intestinal lesions, gizzard erosion	Growth depression, loss of performance, black vomit
Inclusion of hair	Increased fibre in ration	Dilute the nutrient density of the ration, may cause milling problems
Salt included	Increases water intake	Wet droppings, wet litter and welfare issues
Overcooking	Destruction of amino acids	Growth depression, loss of performance

Pet Food Industry Assoc of Aust

The Role of Meat Co-Products in Pet Food

John Karslake

Mars Petcare Australia

Pet Food Industry Association of Australia – Technical Committee

The Role of Meat Co-Products in Pet Food

The Pet Food Industry Association of Australia

The Global Alliance of Pet Food Associations

Pet Nutrition – the basics

Importance of Meat to pet nutrition

Ingredient impacts on pet food

Pet Food Industry Assoc of Aust

40+ members, 27 years,

Active representation to Government & stakeholders

Petfood "Guidelines" developed from UK-Europe.
In 2011 developed a formal Australian Standard
AS:5812 that requires member compliance,
confirmed by Annual Audit by Third Party

Safety/GMP

Nutrition Requirements

Labelling & Claims

Government recognises compliance with
AS:5812 as the basis for Export accreditation

GAPFA

Global Alliance of Pet Food Associations

Concieved by the Associations from major markets with a Mission Statement:

"To support the health and wellbeing of pets and to promote the benefits of living with them, through the ***development of consensus based guidance for the global pet food industry****, thereby enhancing its sustainability and credibility."*

Develop & promote best practice guidelines and standards, and consistent and appropriate regulations
Focus is Pet Dogs and Cats

Pet Nutrition

Pet Foods and Animal feeds are different

- Lifespan
- Source of food

Pet Nutrition – Complete & Balanced

Macronutrients

- Focus on proteins, fats and carbohydrates

Micronutrients

- Essential nutrients

Nutritional profile for cat and dog foods

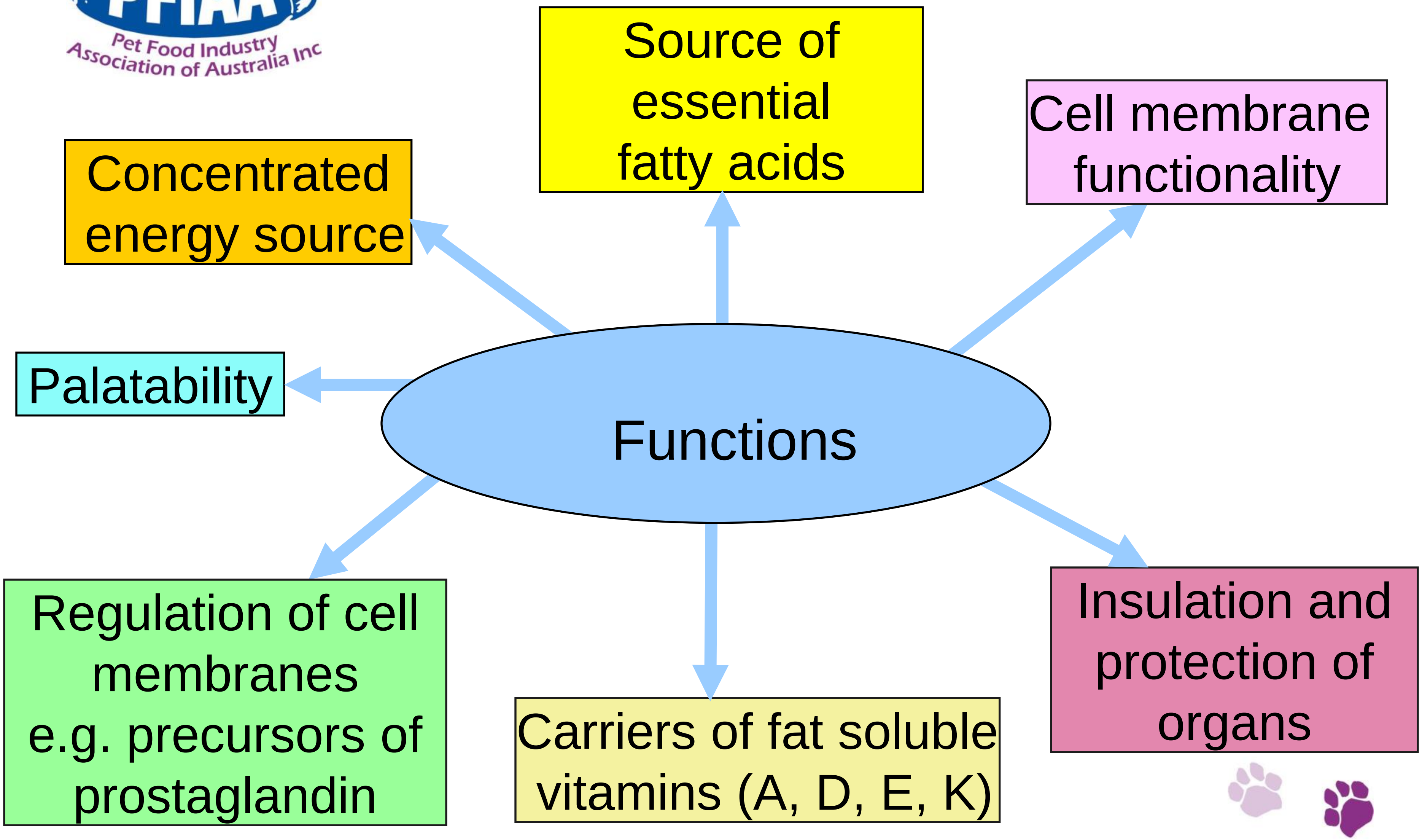
Protein: quality

Protein quality depends upon …

digestibility + AA profile

Eggs & milk	*Contains right balance of all EAA's & highly digestible*
Meat (fish, bird, mammal)	
tendon, hair, connective tissue	*Not easily digestible*
Vegetable / plant	*Lacking in some EAA's*

Fats and fatty acids



Essential fatty acids

Essential fatty acids are those that must be supplied in the diet since the body cannot synthesise them from other sources

ALA	✓	✗
EPA	✓	✓
DHA	✓	✓
LA	✓	✓
AA	✗	✓

NRC, 2006

Meat = ONLY source of ARACHIDONIC ACID

Carbohydrate

Carbohydrate classification

1. Absorbable
2. Digestible
3. Fermentable
4. Non-fermentable

Micronutrients

- Vitamins & Minerals

Micronutrients: minerals

The inorganic element of food (ash)

Cannot be synthesised so if required by body, must be in diet

In excess, most are toxic

Micronutrients: vitamins

Organic compounds which help to regulate body processes (not used to build body components nor used for energy)

Generally cannot be synthesised so are essential in the diet

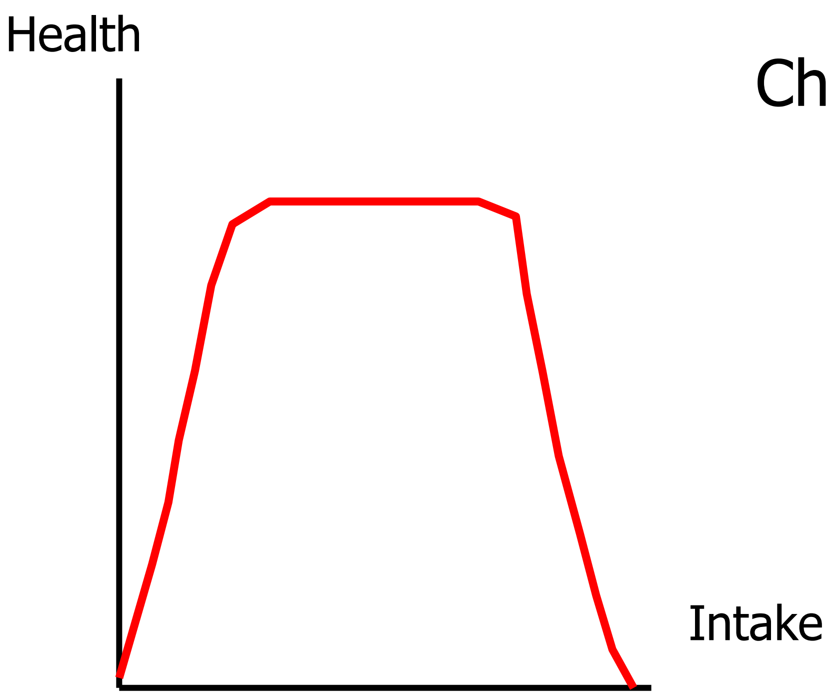
Two types:

- fat soluble e.g. A, D, E, K (generally stored in the body)
- water soluble e.g. B, C (excess generally excreted)

Functions:

- Components or catalysts for body enzyme systems
- Help resist disease and infection

Essential nutrition and health



Challenges:

- Recipe correct balance of ingredients and nutrition
- Maintain consistency and "complete and balanced" status

What the owner might see

It depends on nutrients..

Skin problems

Hair loss

Hair colour change

Bone problems

Lethargy

Poor appetite

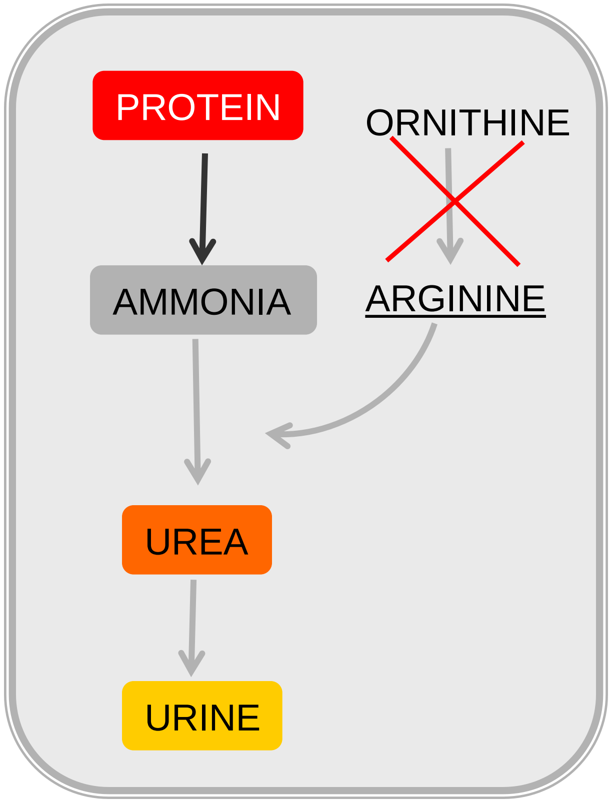
Weight loss

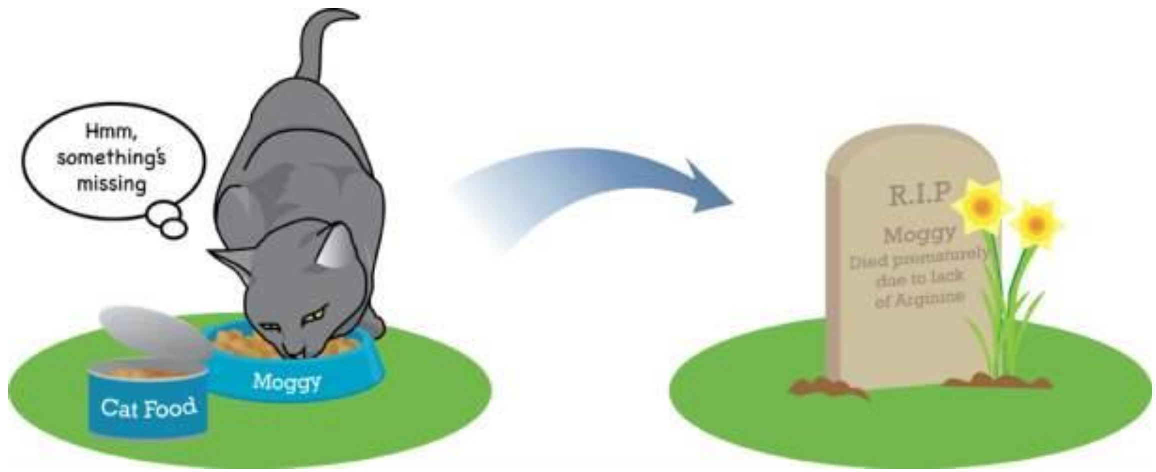
Digestion problems

Poor immune system = more health issues

Breeding problems

Arginine requirement

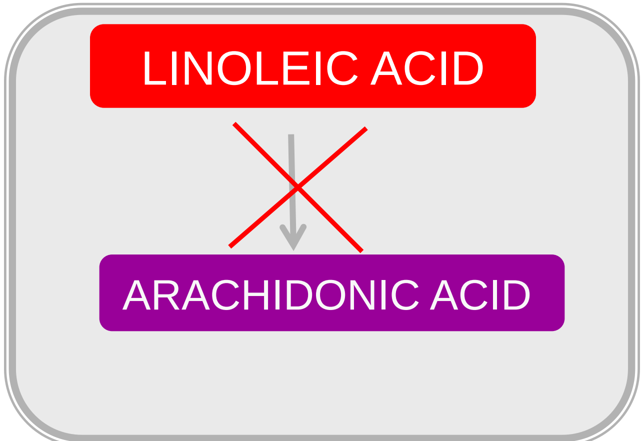




Meat = Source of Arginine

Effect of incorrect dietary protein source

Arachidonic acid requirement



Arachidonic Acid is an essential fatty acid involved in the reproductive system and skin and coat health.

Meat = ONLY source of ARACHIDONIC ACID

Meat Co-Products in Pet Food

- ✓ Very important Ingredient
- ✓ High Quality Protein
- ✓ Fats
- ✓ Vitamins and Minerals
- ✓ Essential for Cats

Ingredient Impacts on Pet Food

Ingredient Impacts on Pet Food

PV & Biogenic Amines

- Indication of age, freshness, supply chain, (antioxidant efficacy)
- Negative Impacts: Palatability, smell/odour

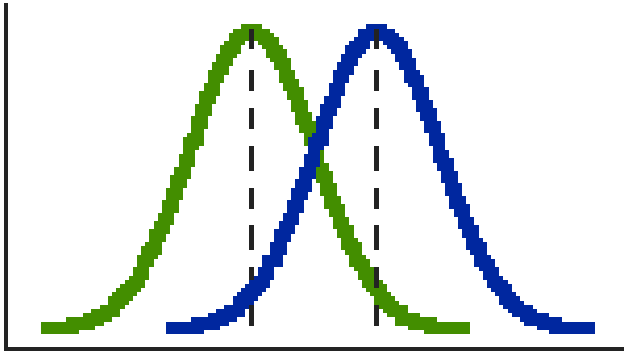
PFIAA
Pet Food Industry Association of Australia Inc

Ingredient Impacts on Pet Food

Protein & Ash contents

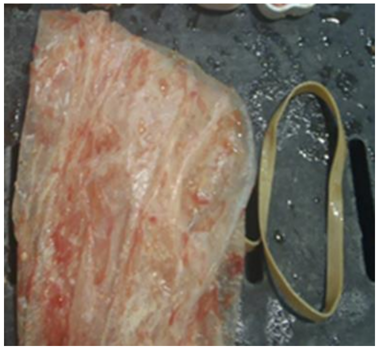
- Ideally – Meat level
- If high ash, then levels are limited

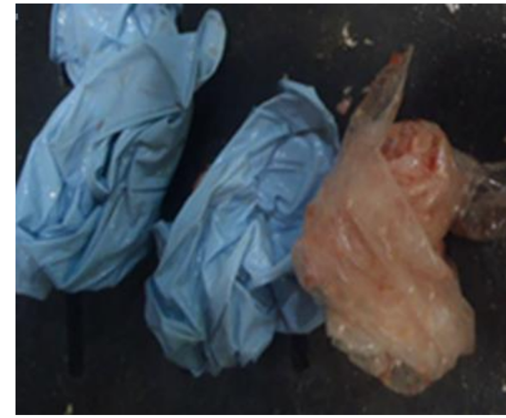
- Variability can put "complete & balanced" status at risk

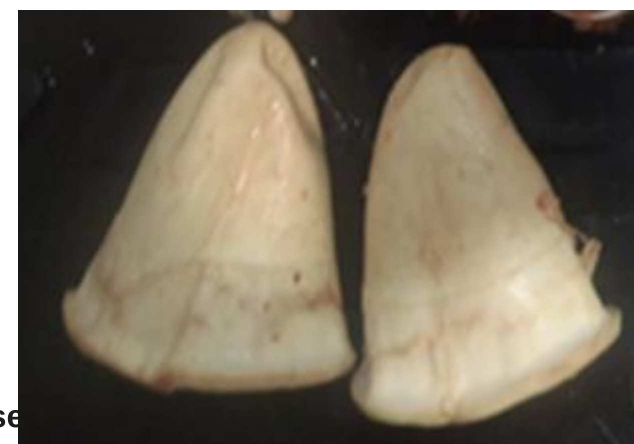


Ingredient Impacts on Pet Food

Foreign Objects







Pet Food Industry Association of Australia Inc

Product Safety Recall

WHISKAS® ADULT AGED 1-7 YEARS CHICKEN & RABBIT FLAVOUR DRY CAT FOOD 1kg box

Best Before date code 010215

Mars Petcare Australia advises its customers of a recall on the above product. The product has been sold in Woolworths, Coles, Bi-Lo and Independent Grocery Retailer stores nationwide.

Problem: The product is being recalled because a small number of boxes may contain pieces of hard plastic between 5 to 25mm in size.

Food safety hazard: If the plastic is consumed it may pose a food safety risk, with the potential to cause harm to animals including choking and/or lacerations.

What to do: Consumers should not feed the WHISKAS® ADULT AGED 1-7 YEARS CHICKEN & RABBIT FLAVOUR DRY CAT FOOD 1kg box with Best Before date code 010215 to their pet and should return the product to the point of purchase for a full refund.

The recall only relates to the above product with this best before date. No other WHISKAS® products are affected by this recall.

Mars Petcare Australia apologises to its consumers for any inconvenience caused. If further information is required about the recall, consumers may also call our toll free Consumer Services number below: Phone: 1800 640 111

See www.recalls.gov.au for Australian Product Recall Information

18 June 2014

PFIAA Position statement on food safe technologies for petfood ingredients

"The PFIAA supports more research into, and increased use of more food safe devices… to increase the value of products from both the food and pet food industries, ultimately helping to protect the health and wellbeing of Australia's pets."

Pet Food Industry Assoc of Aust

Health and well-being of pets

High quality food

Meat Co-Products = VERY important to us

Pet Food = profitable use of Meat Co-Products

Increase value for both industries

www.pfiaa.com.au

John Karslake

Mars Petcare Australia

Pet Food Industry Association of Australia – Technical Committee

18 June 2014

MLA Co-products Workshop presentation

Trends in co-products markets

Philip Franks, Ben Thomas MLA

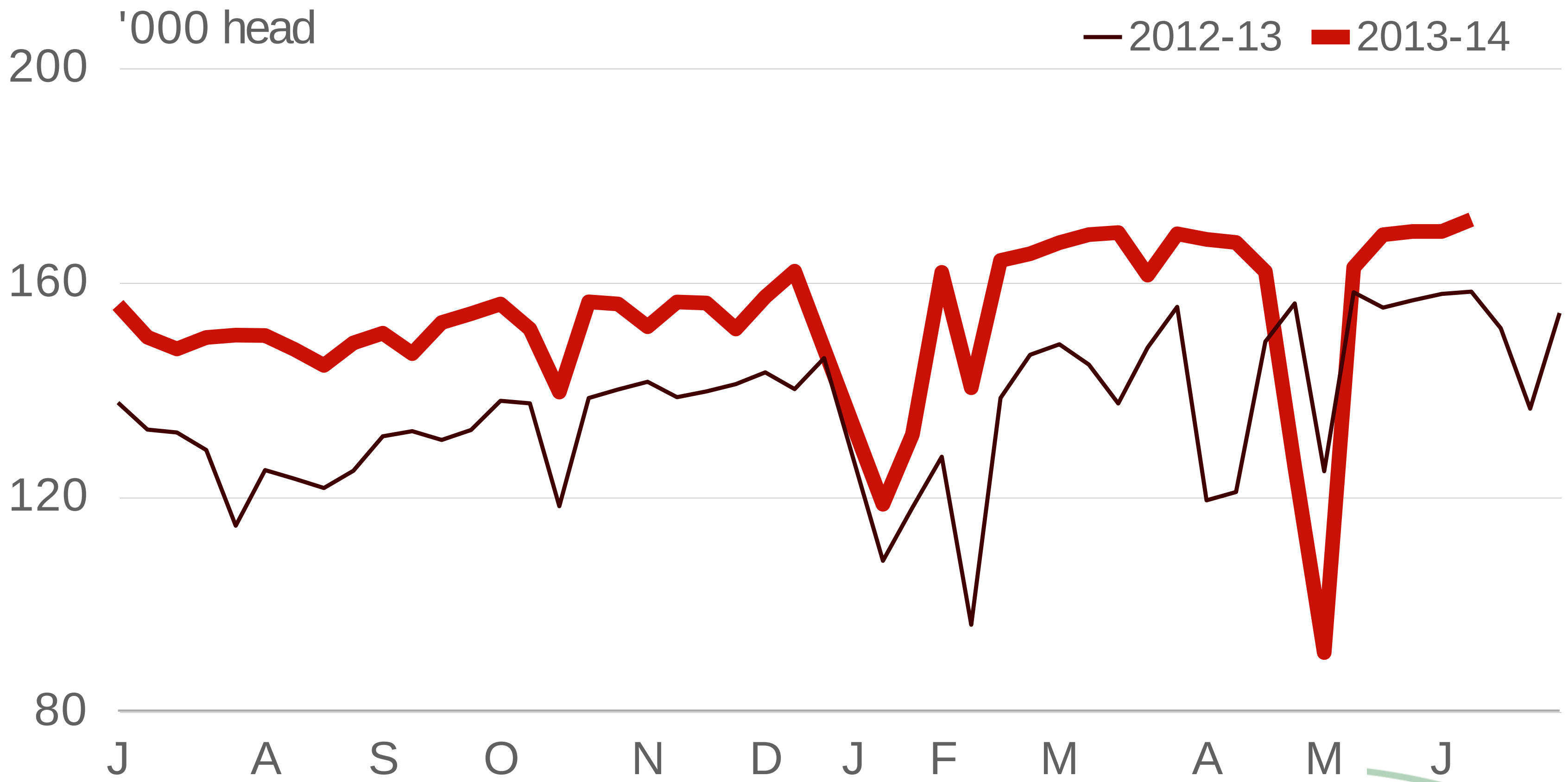
June, 2014

Trends in coproduct markets

- Processors
- ABS , other databases
- Trend analysis
- Year on year
- 5 year comparisons

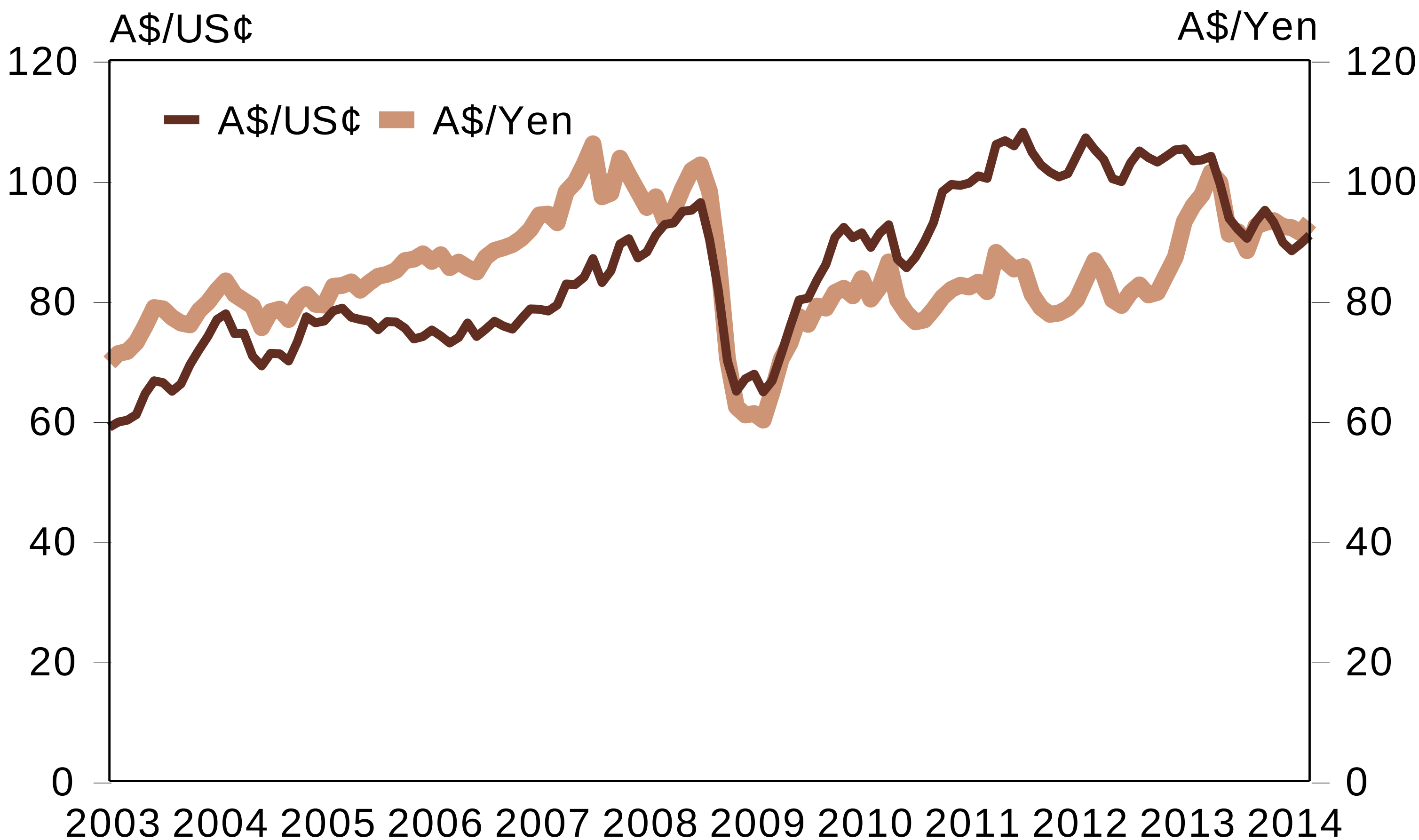
MEAT & LIVESTOCK AUSTRALIA

Eastern states cattle slaughter



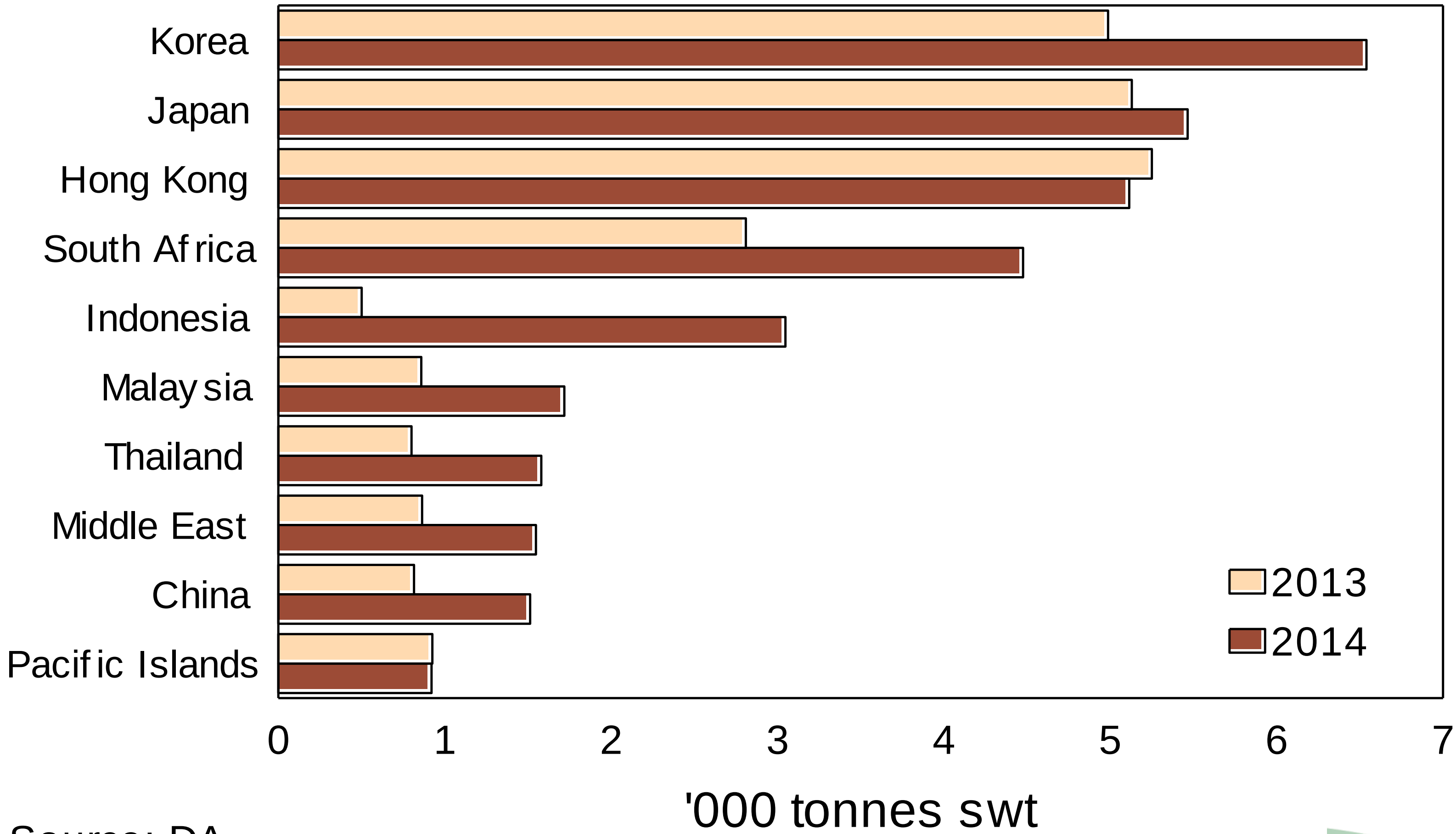
Source: MLA's NLRS

Australian exchange rate



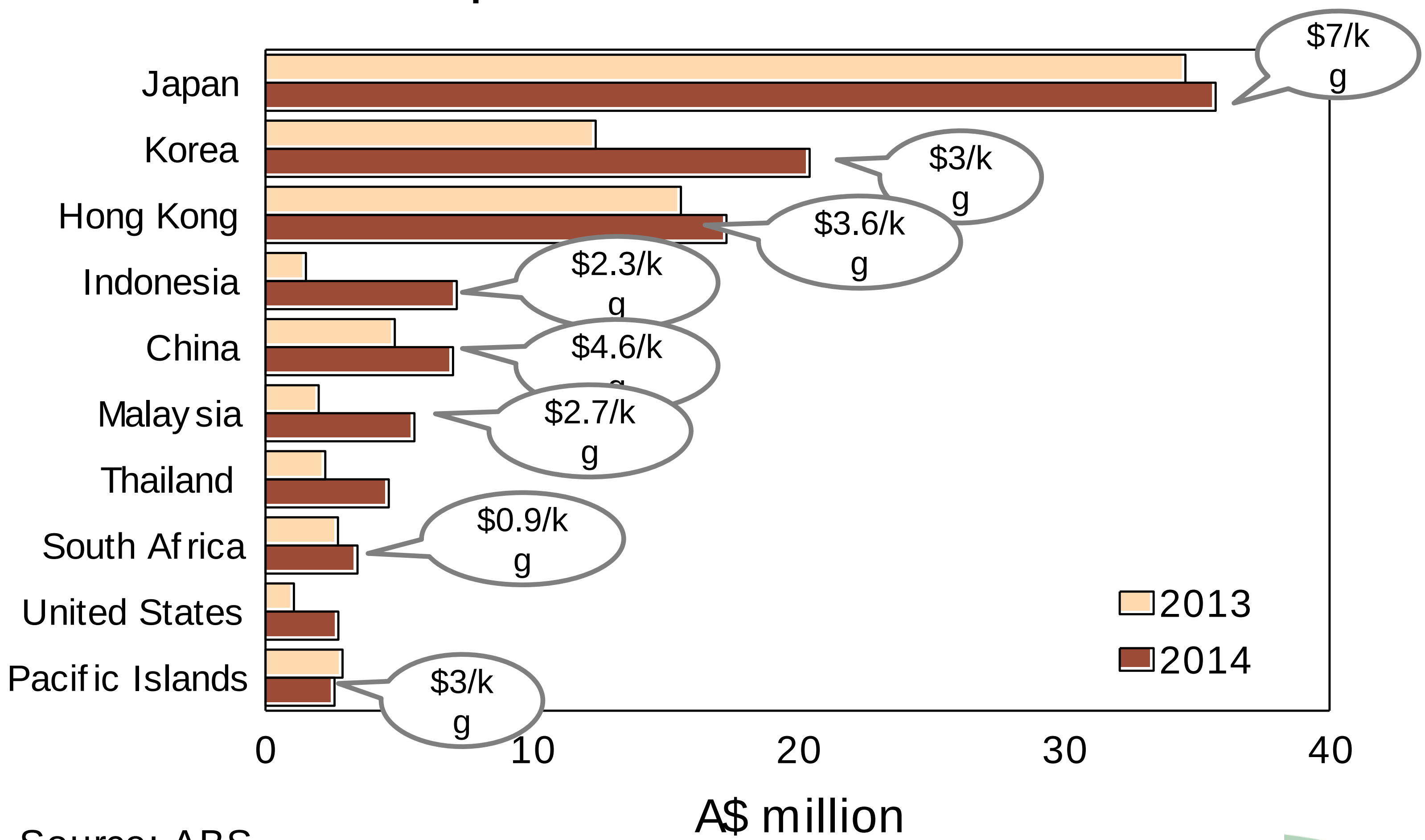
Source: Infoscan

Total beef and veal offal exports Jan - Mar



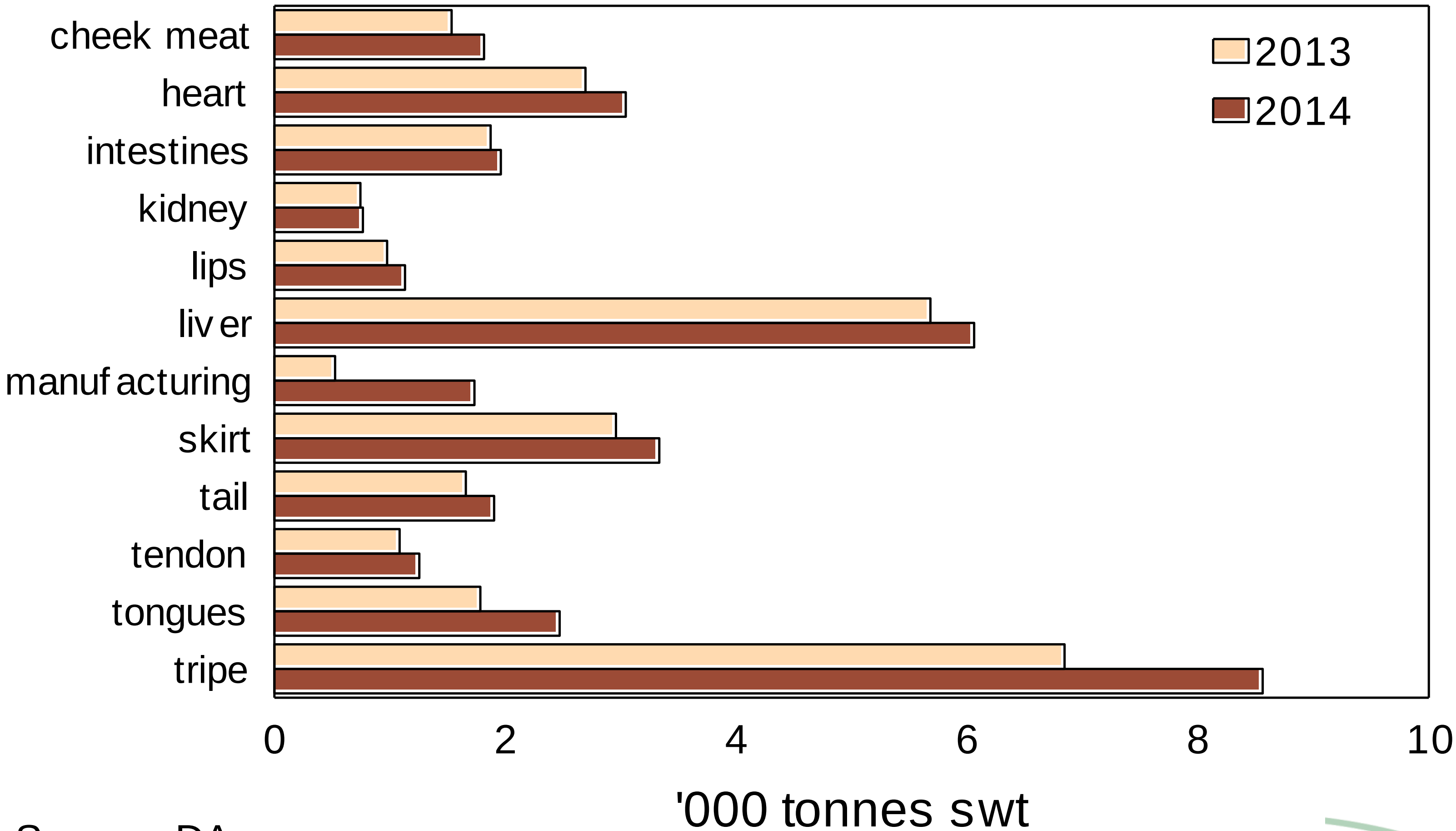
Source: DA

Total beef offal export values Jan - Mar



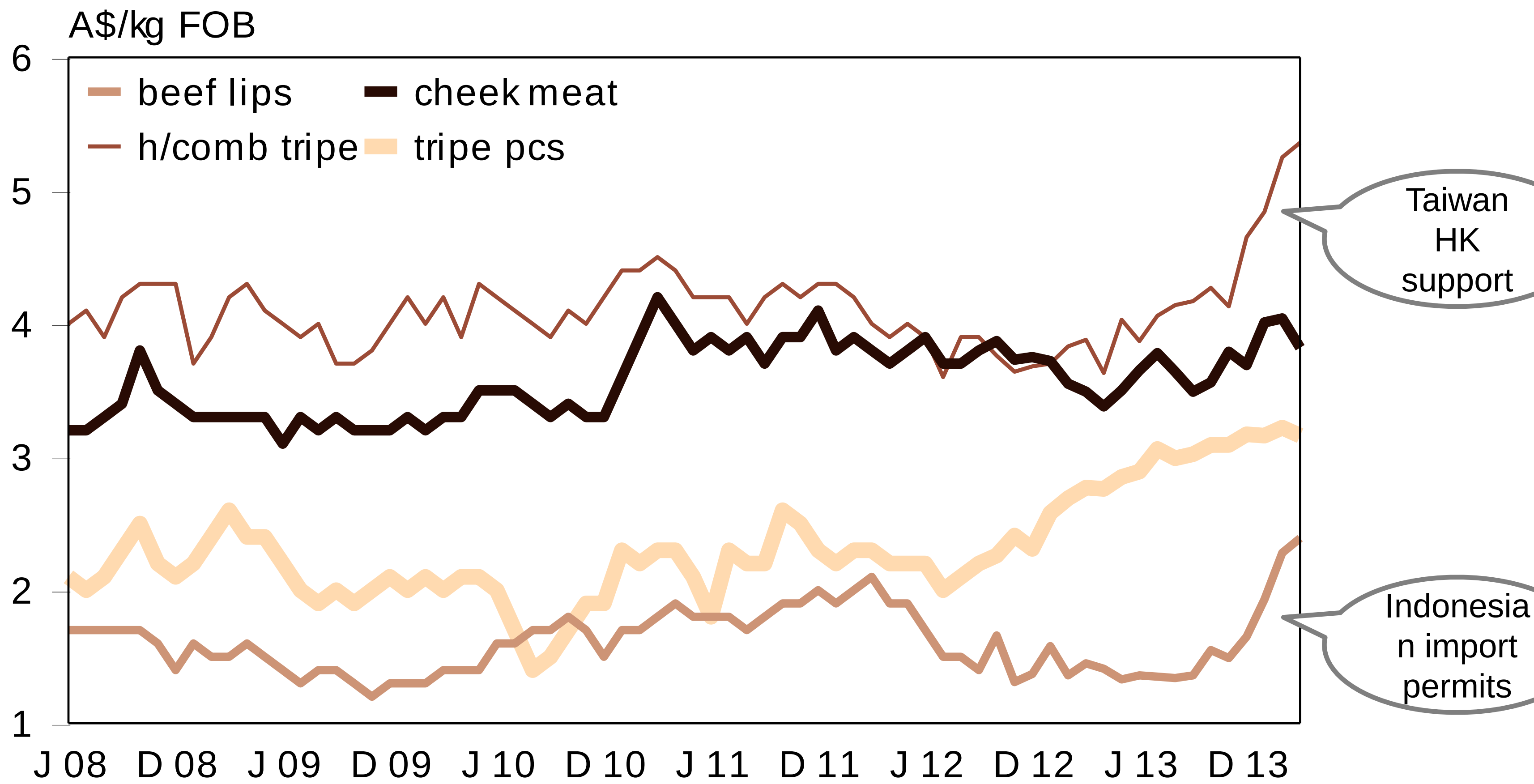
Source: ABS

Beef and veal offal exports Jan - Mar by cut



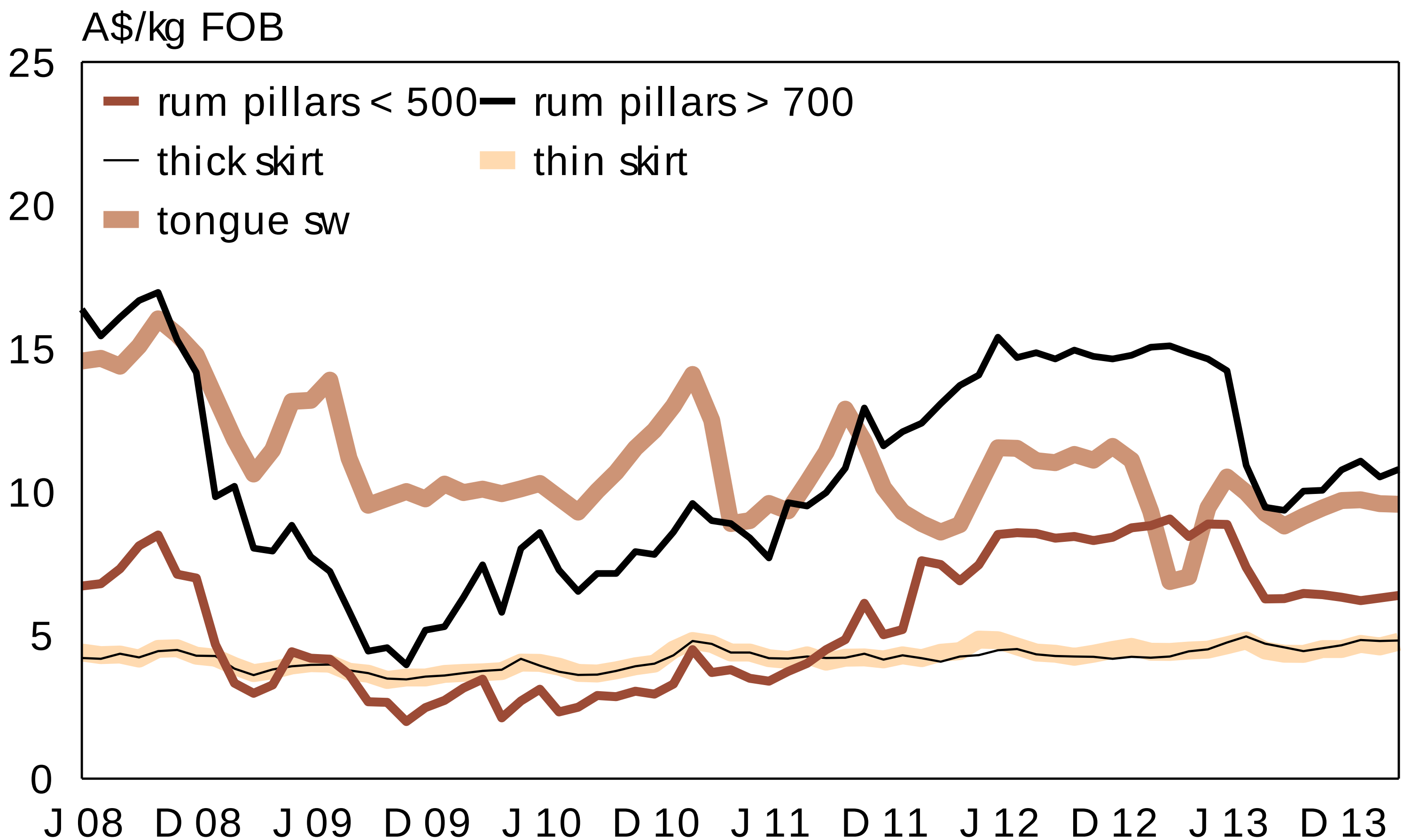
Source: DA

Trends in beef offal prices



Source: Kurrajong Meat Technology

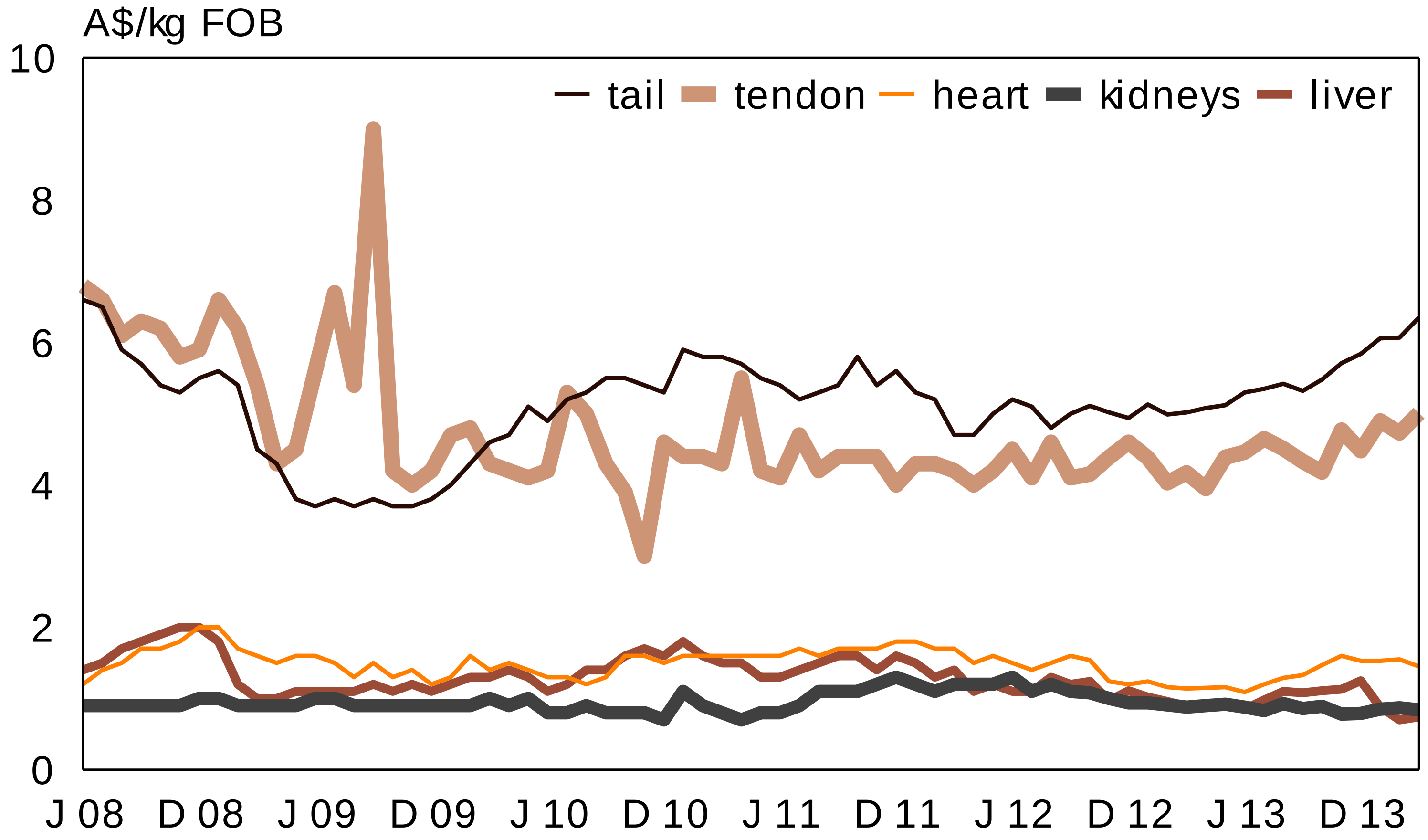
Trends in pillar, skirt and tongue prices



Source: Kurrajong Meat Technology

MEAT & LIVESTOCK AUSTRALIA

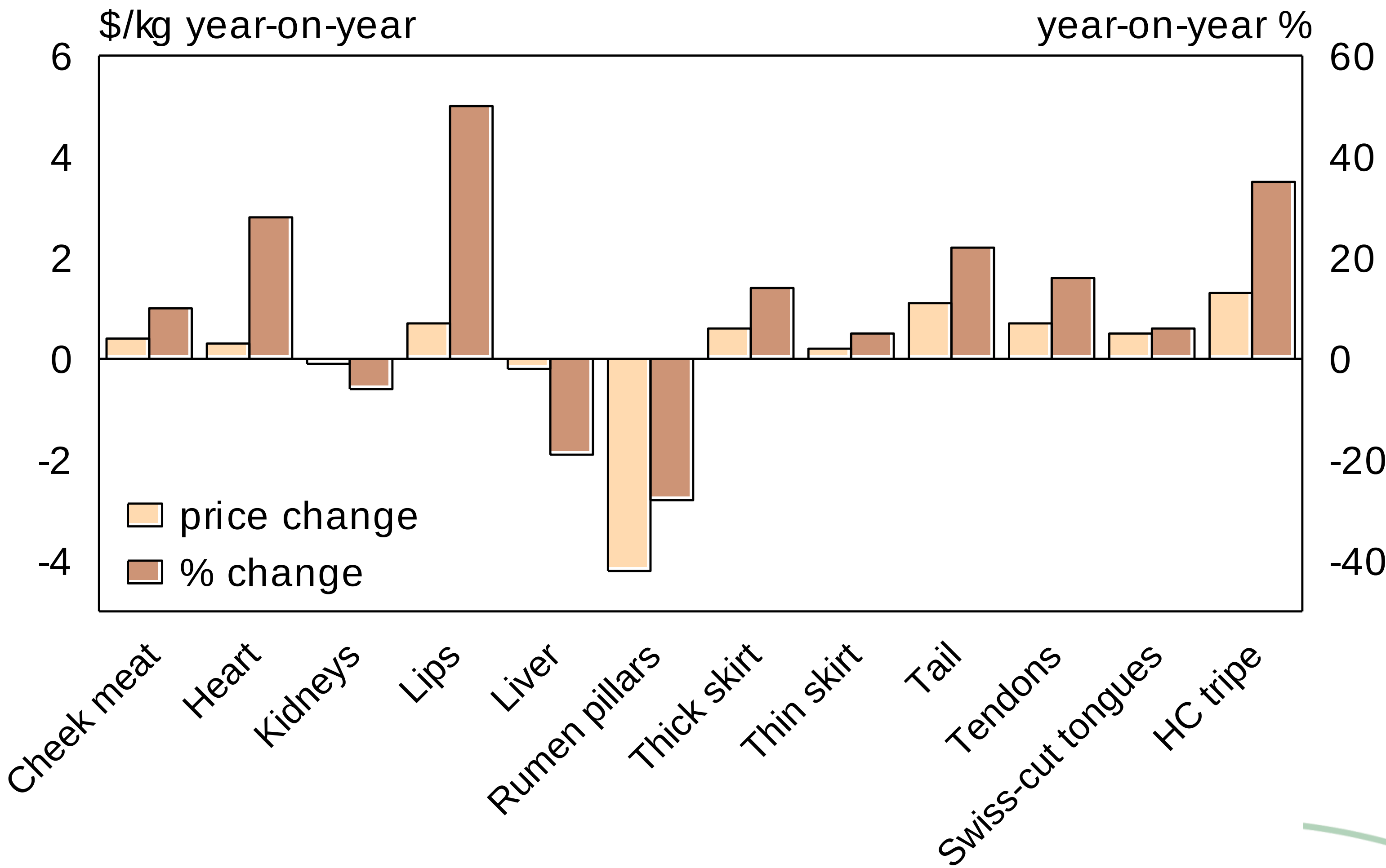
Trends in tail and tendon prices



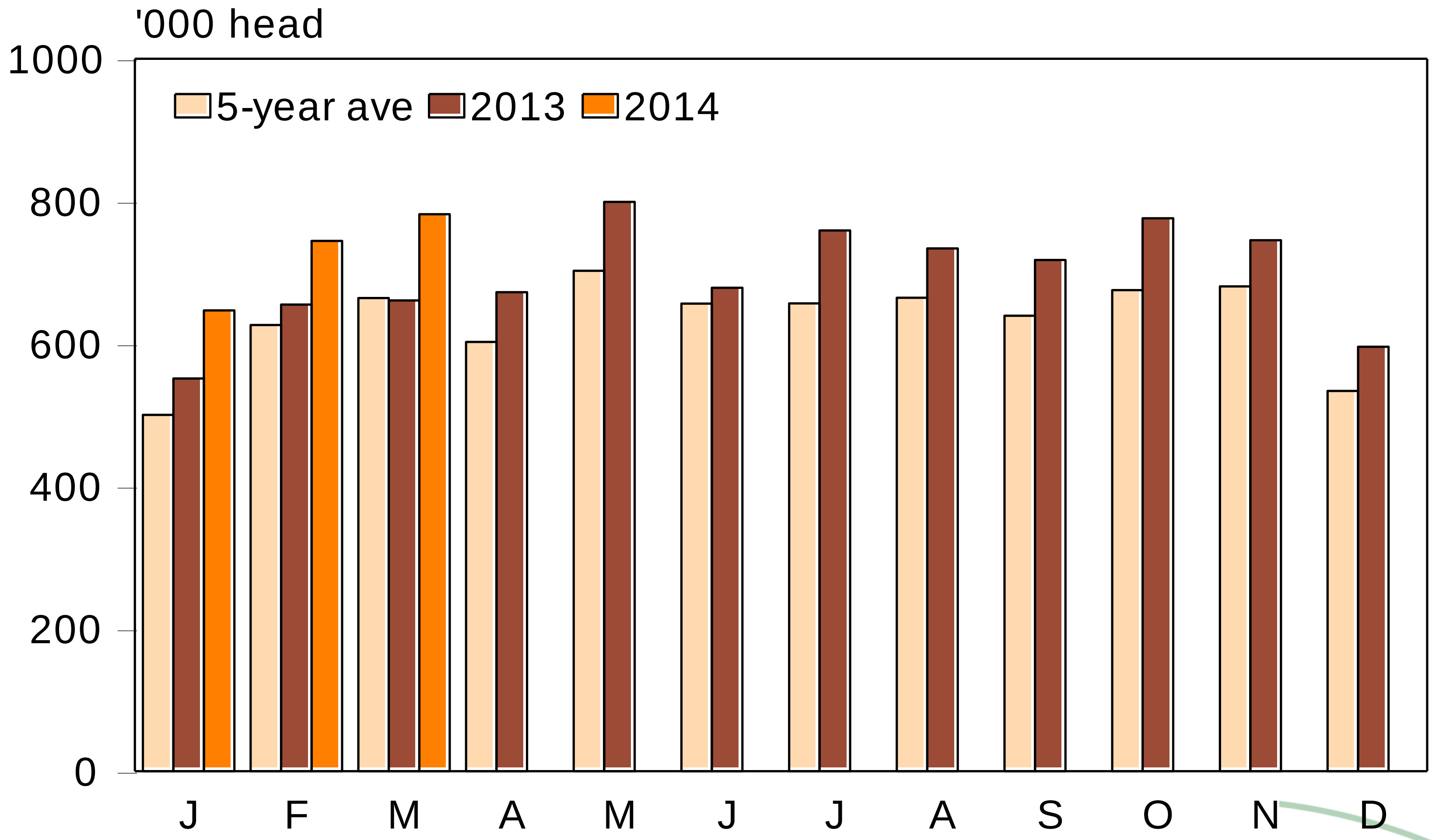
Source: Kurrajong Meat Technology

MEAT & LIVESTOCK AUSTRALIA

Change in beef offal prices - March quarter

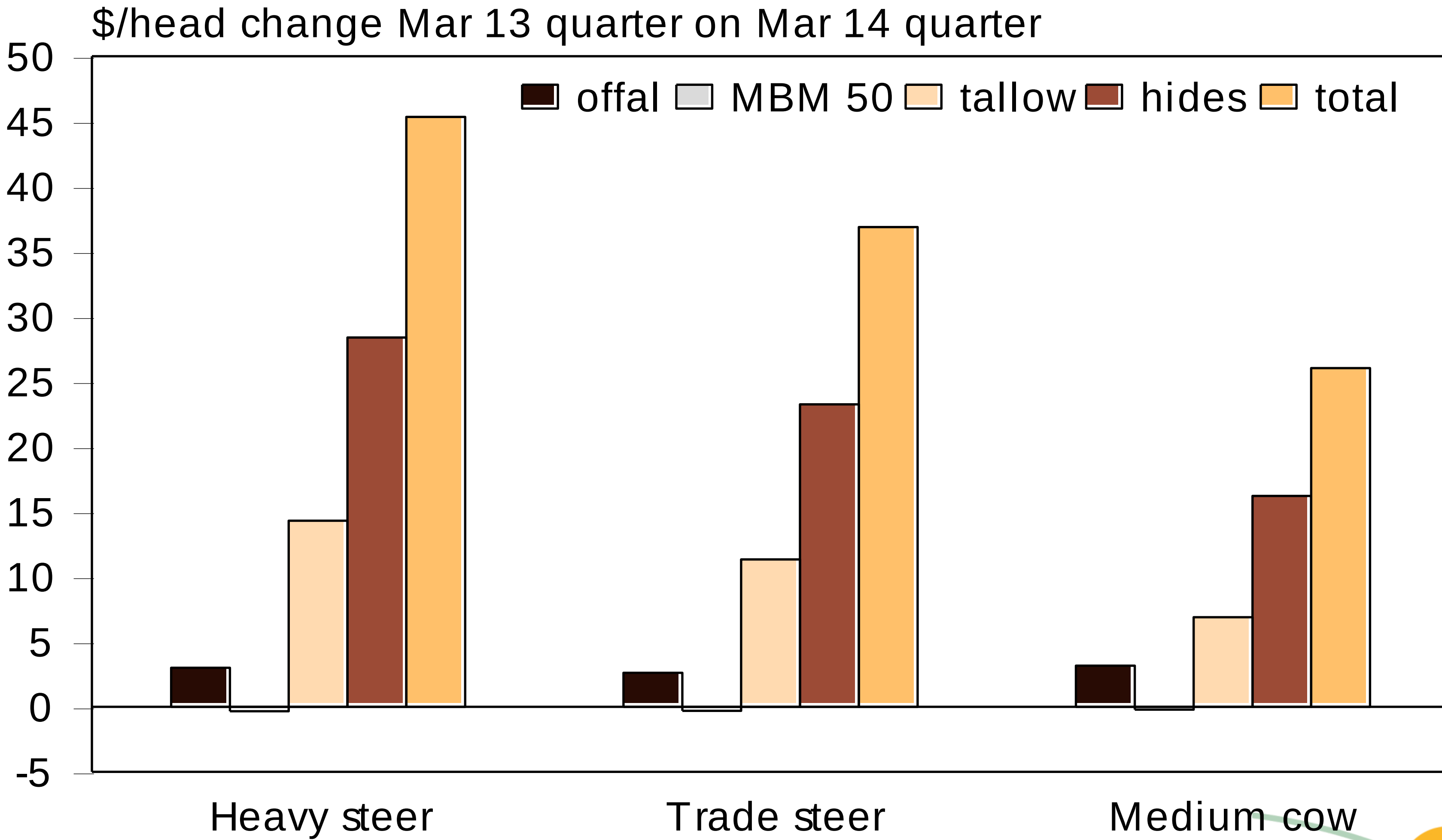


Australian adult cattle slaughter



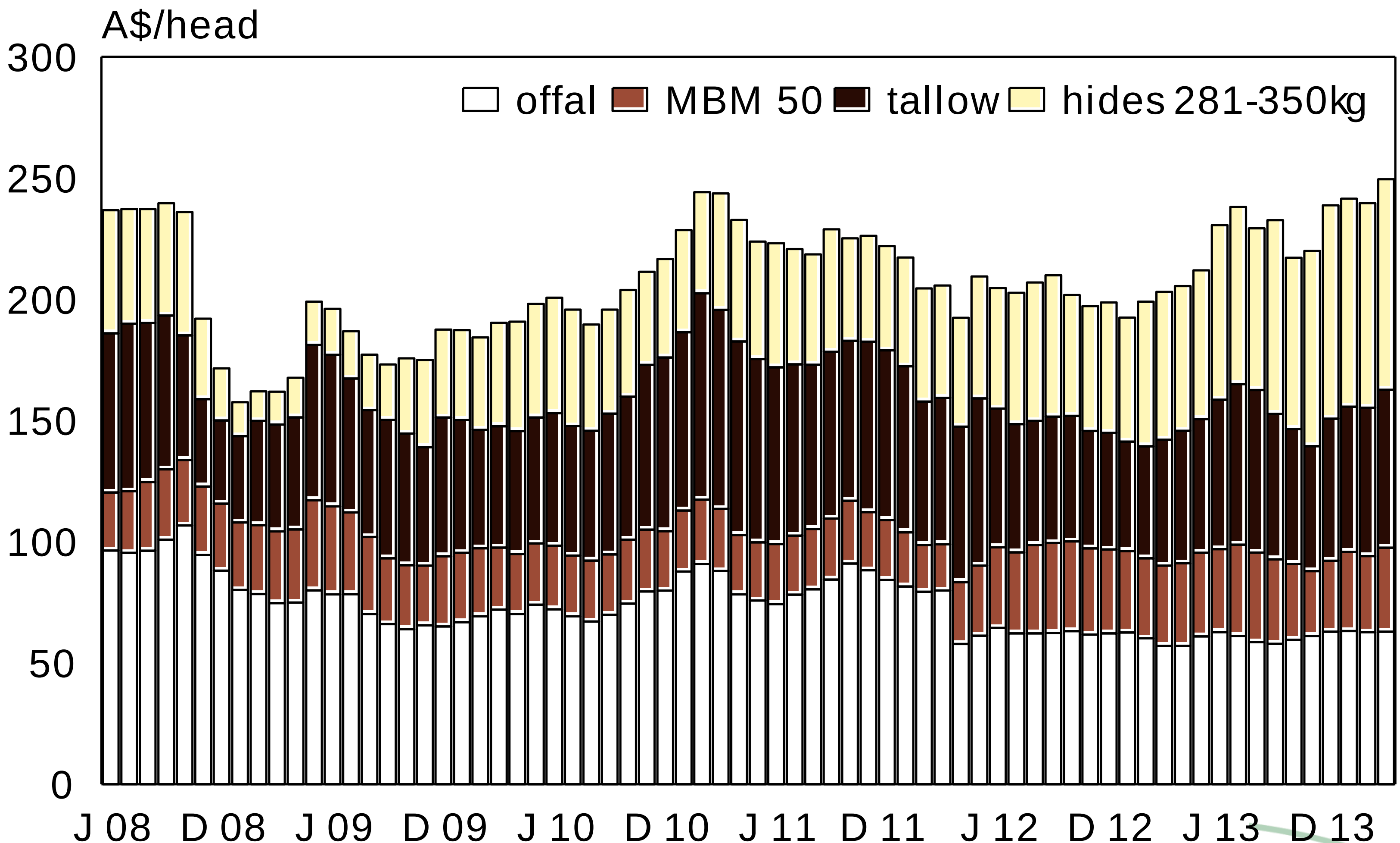
Source: ABS

Change in potential co-products values



Source: Kurrajong Meat Technology, MLA's NLRS

Co-product values for heavy steers



$243

$74

$62

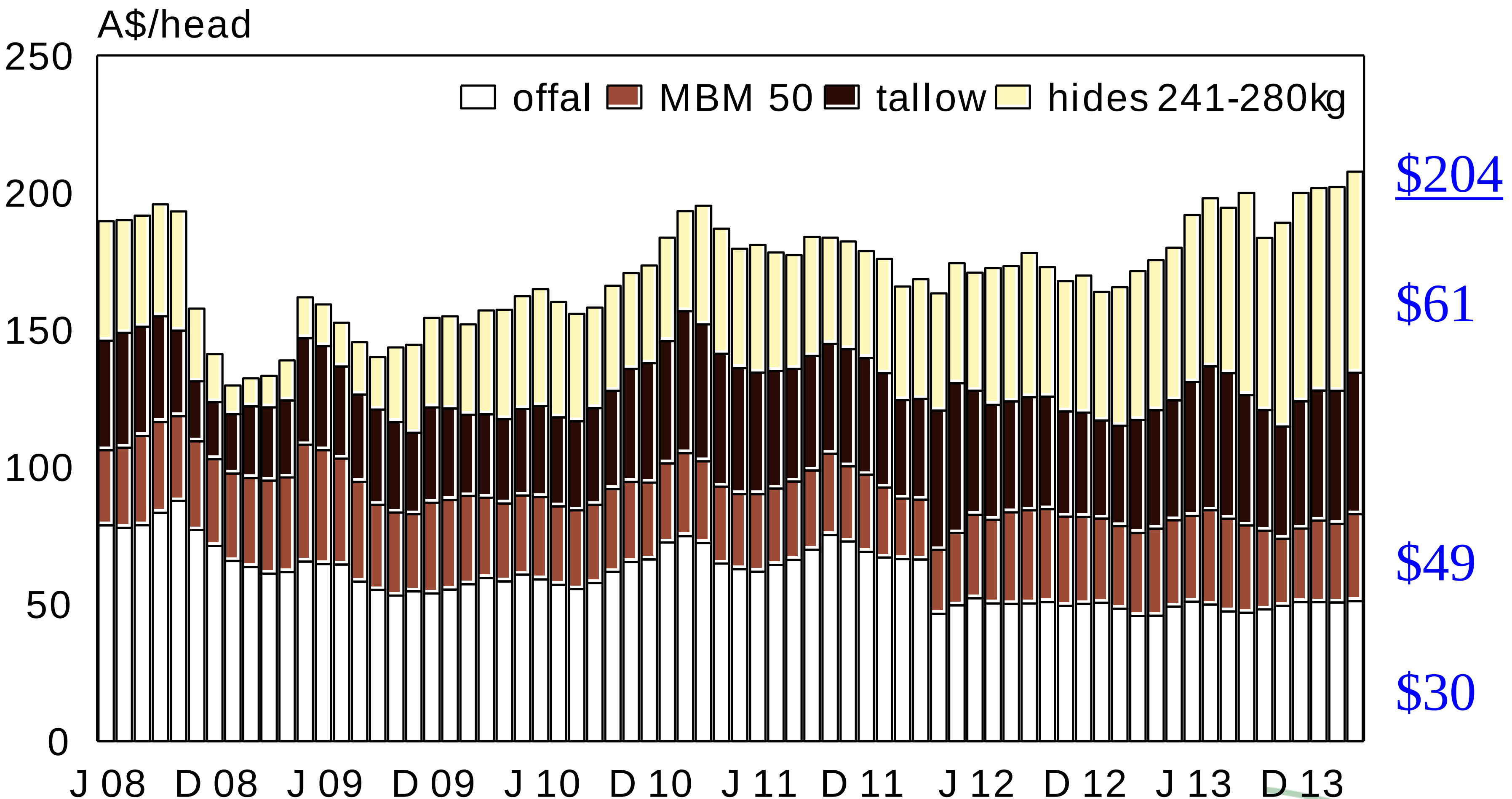
$33

$63

Source: Kurrajong Meat Technology

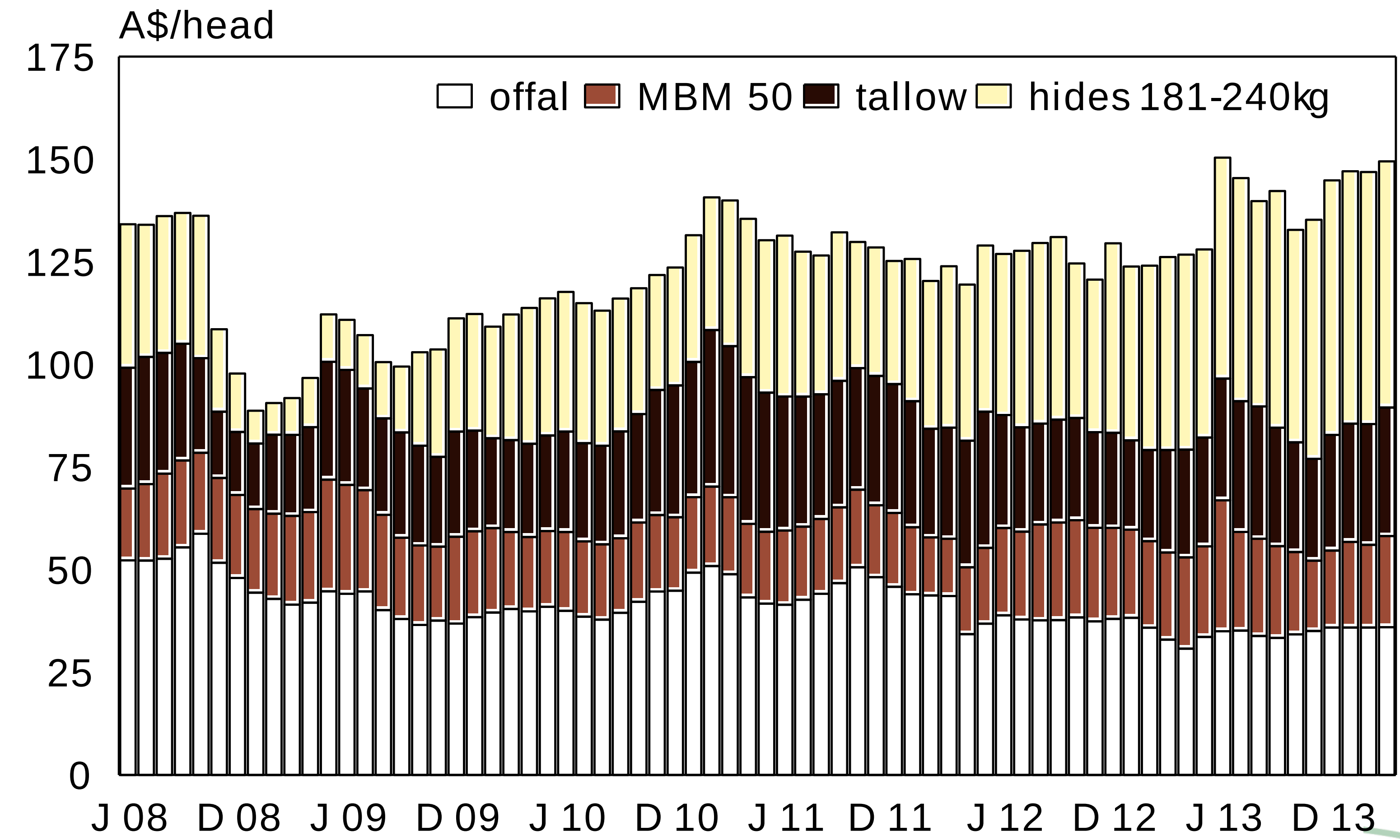
MEAT & LIVESTOCK AUSTRALIA

Co-product values for trade steers



Source: Kurrajong Meat Technology

Co-product values for medium cows



Source: Kurrajong Meat Technology

$148

$61

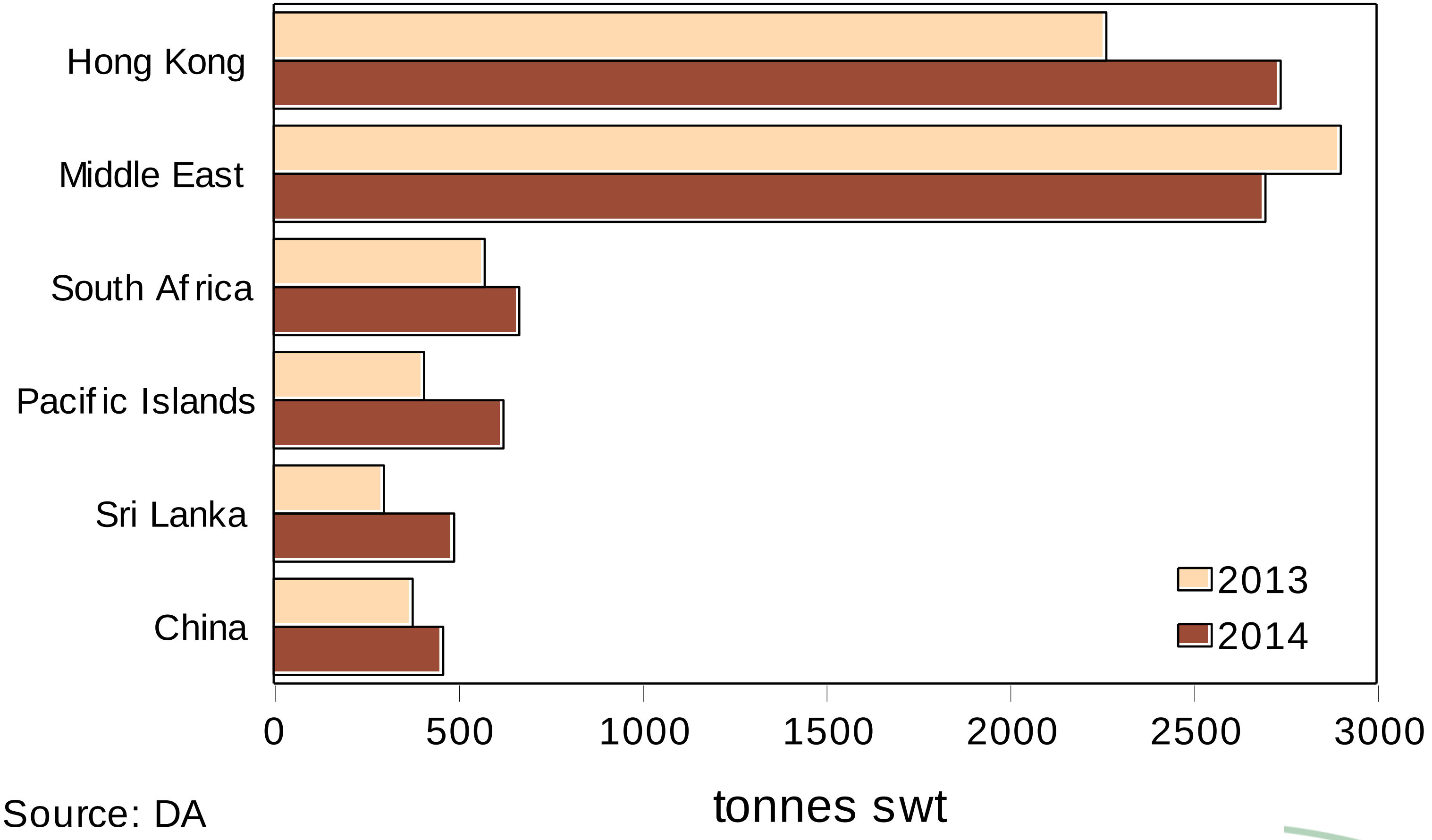
$30

$21

$36

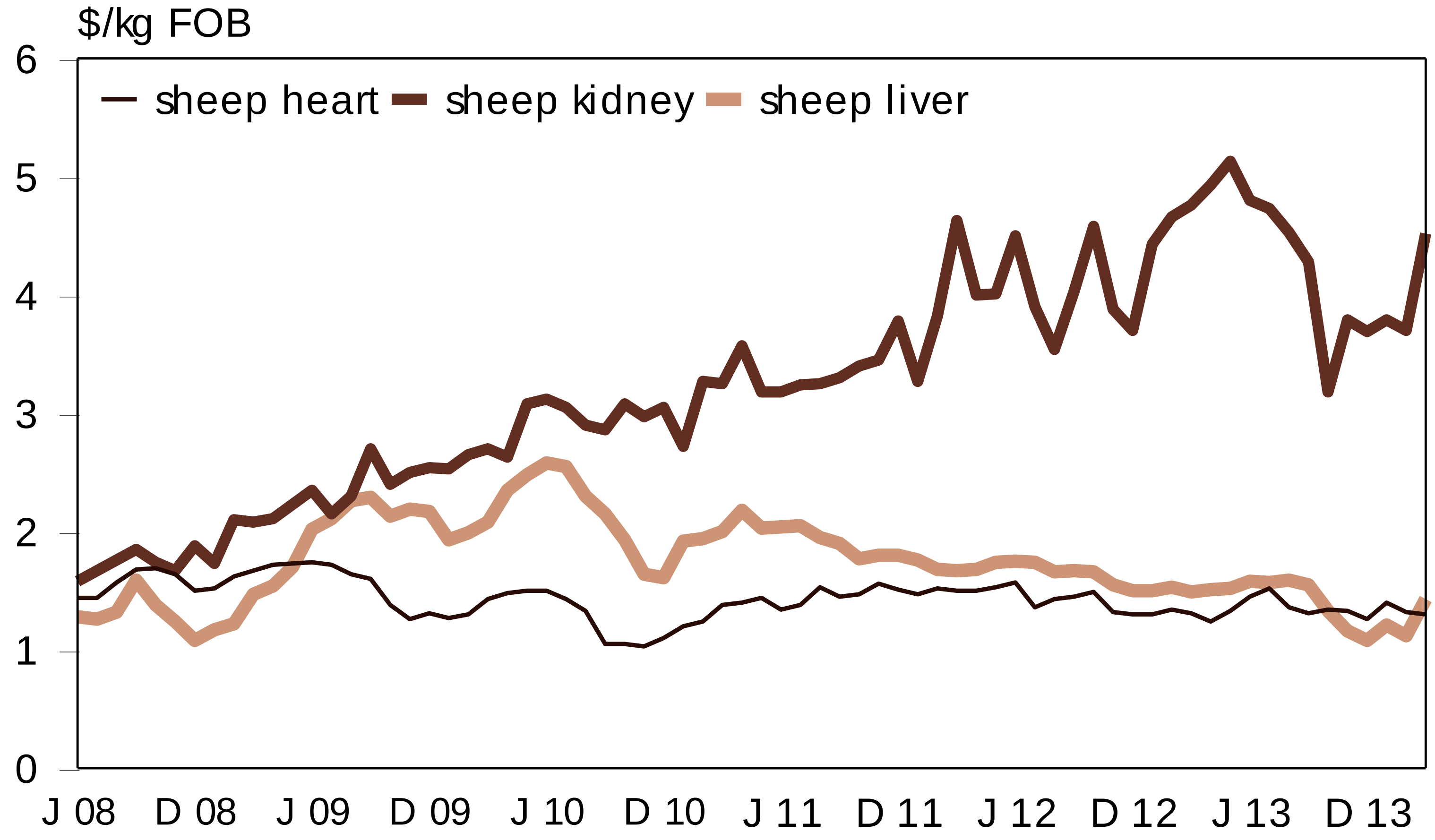
MEAT & LIVESTOCK AUSTRALIA

Australian sheep and goat offal exports Jan - Mar



Source: DA

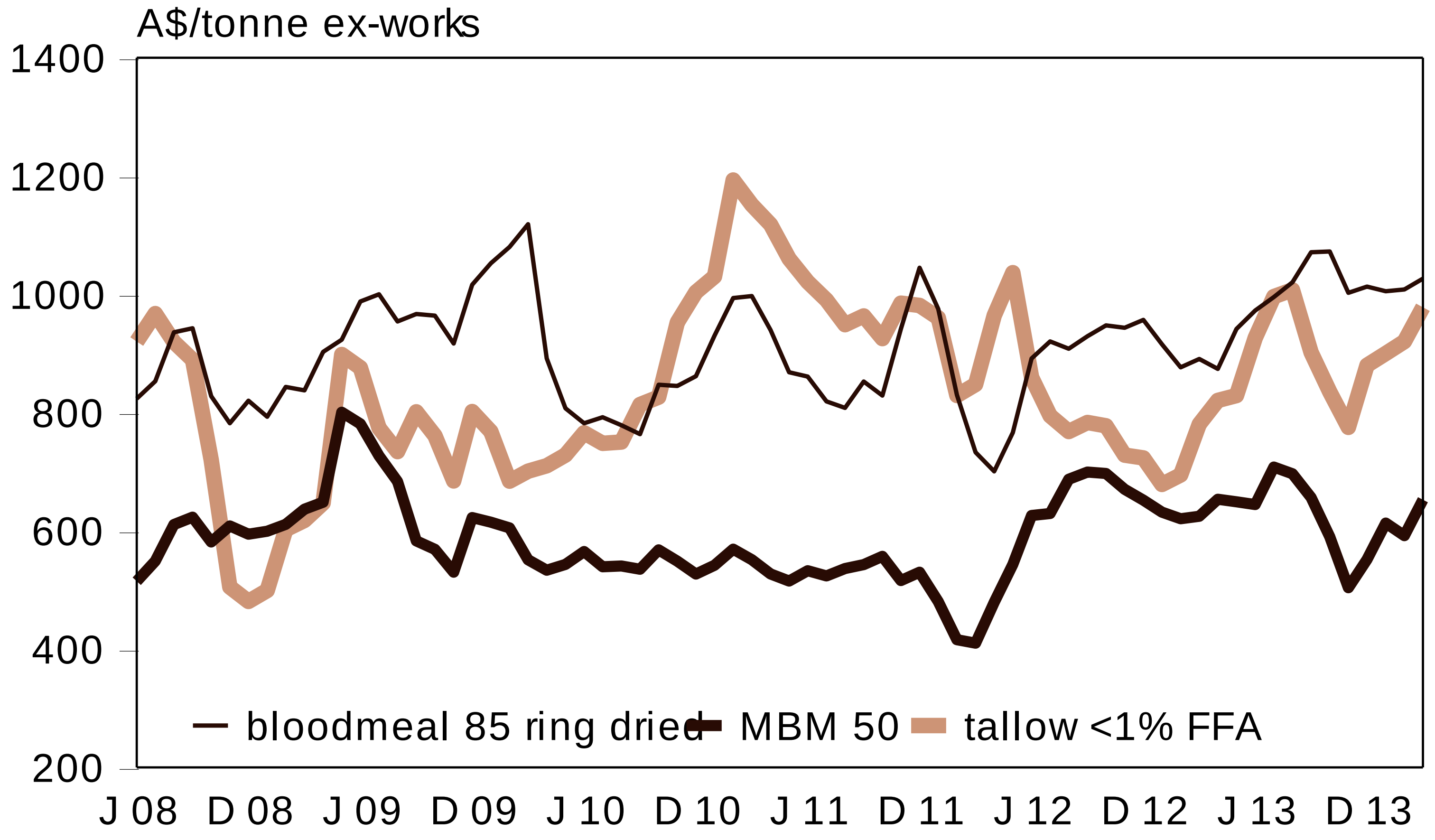
Trends in sheep offal prices



Source: Kurrajong Meat Technology

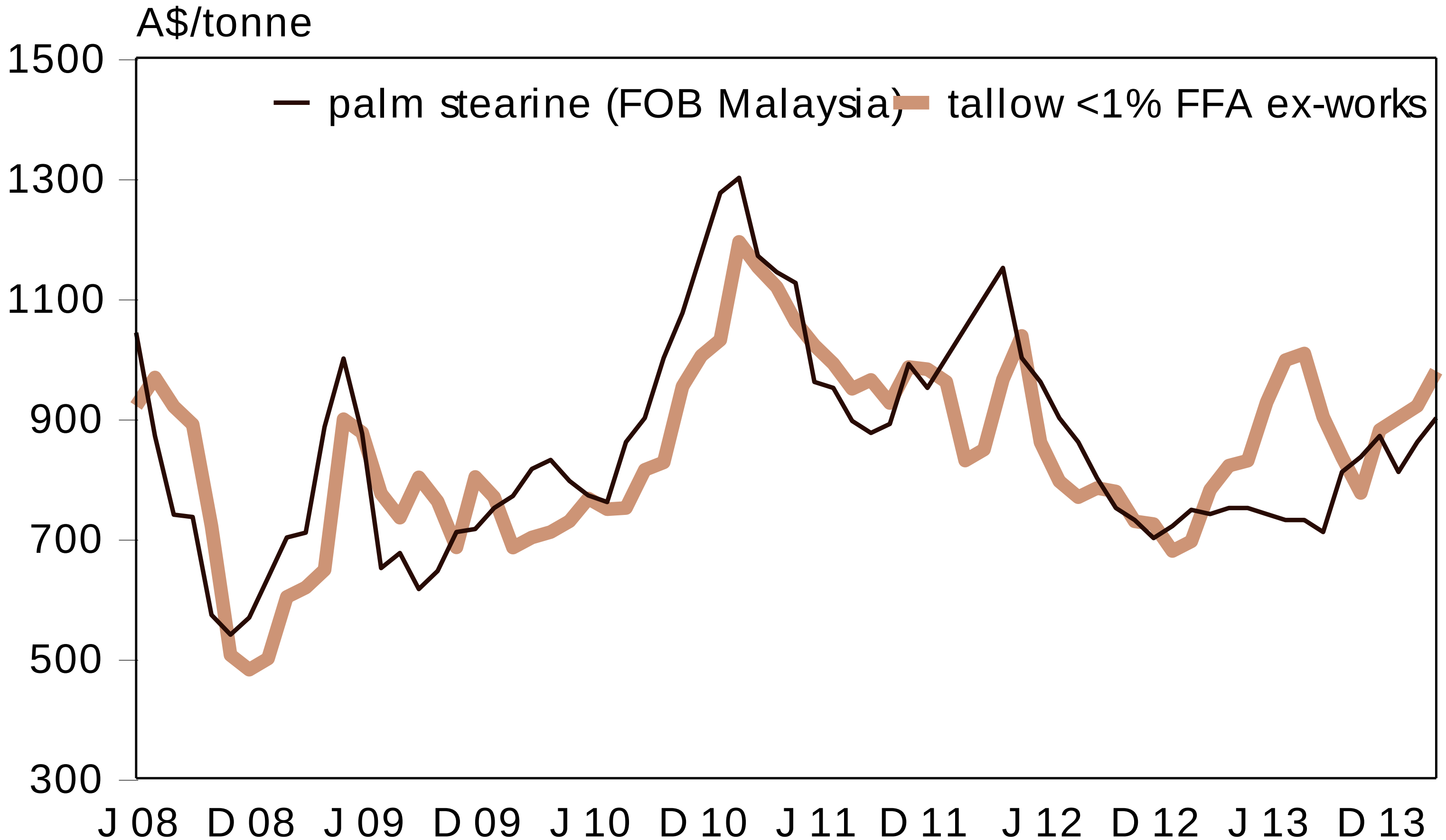
mla MEAT & LIVESTOCK AUSTRALIA

Trends in rendered co-products prices



Source: Kurrajong Meat Technology

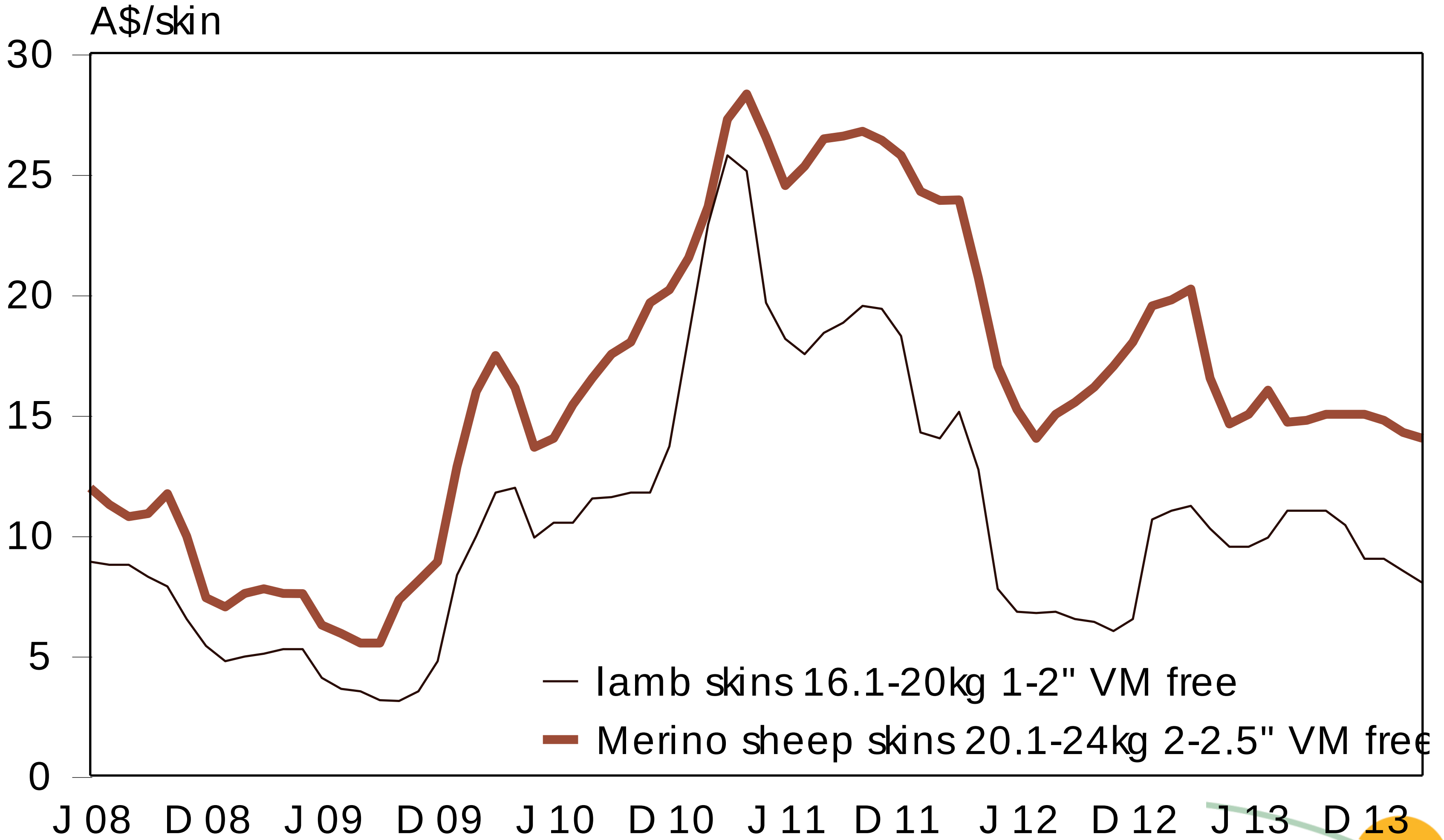
Palm stearine vs tallow price



Source: Kurrajong Meat Technology

MEAT & LIVESTOCK AUSTRALIA

Trends in skin prices



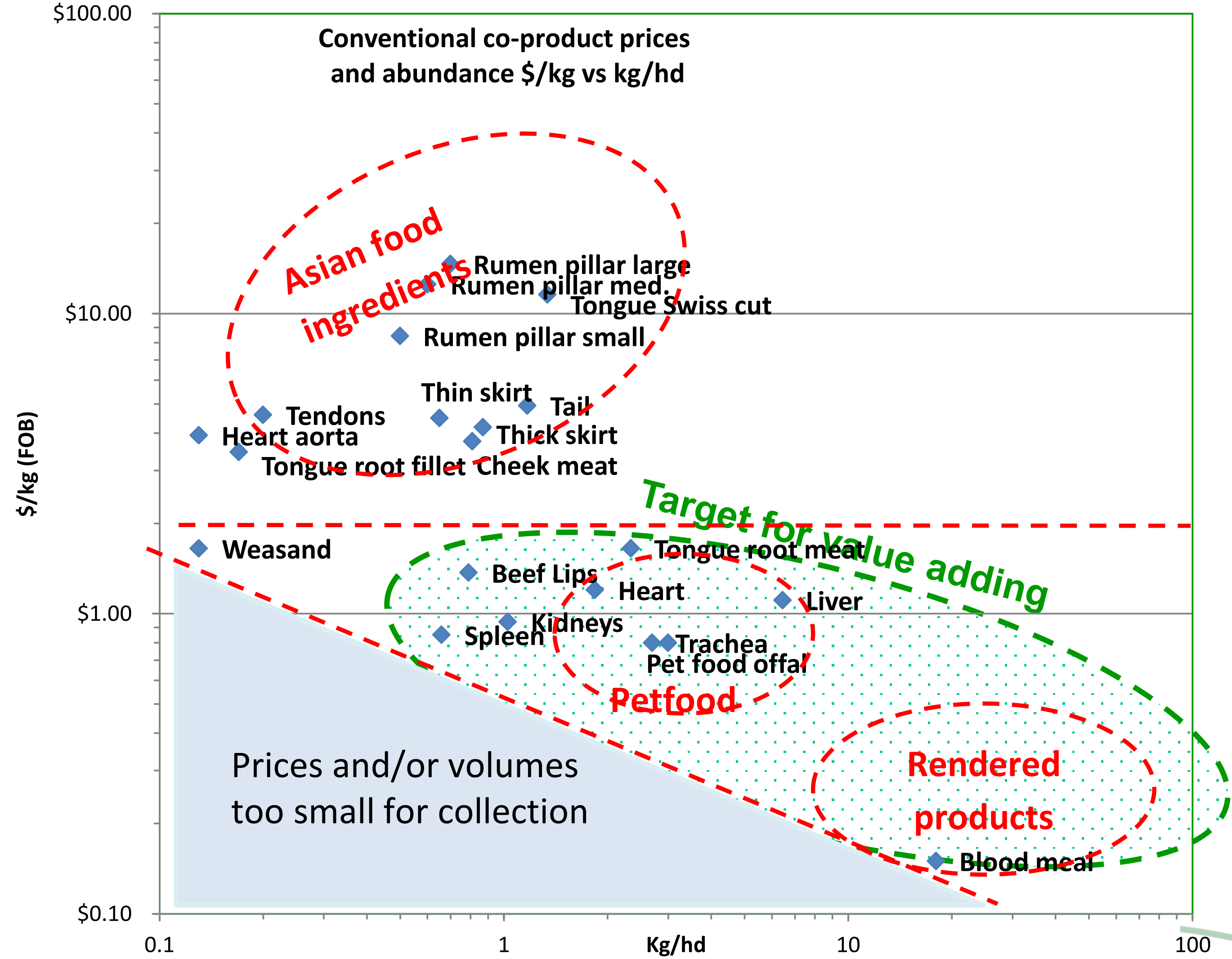
Source: MLA's NLRS

MEAT & LIVESTOCK AUSTRALIA

Summary of the Analysis

- Cattle prices are relatively low, and will remain low through winter, although with an improvement in the season, prices are expected to rise.
- Not much restocker interest in the north due to poor seasonal conditions.
- This year's average eastern states (incl. Qld, NSW, Vic, SA, Tas) weekly cattle slaughter currently around 150,000 head per week, mostly due to high cattle kills in Qld.

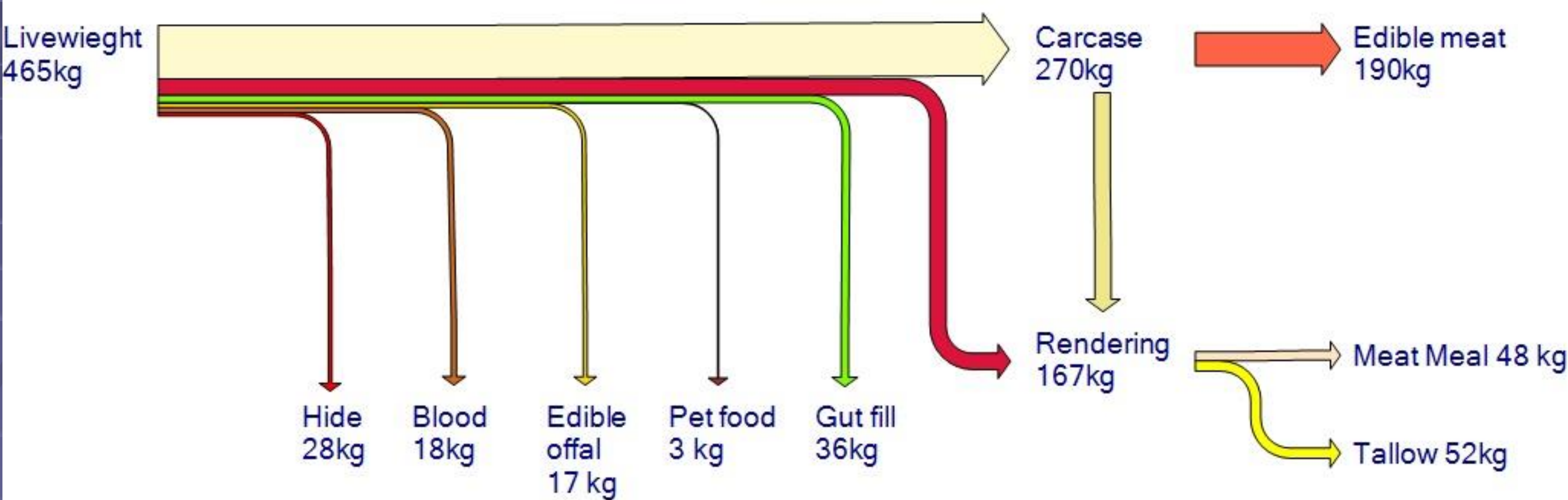
Co-products targets for value adding



MEAT & LIVESTOCK AUSTRALIA

Value of Rendering

Bill Spooncer


Livewieght
465kg
Carcase
270kg
Edible meat
190kg
Rendering
167kg
Meat Meal 48 kg
Tallow 52kg
Hide
28kg
Blood
18kg
Edible
offal
17 kg
Pet food
3 kg
Gut fill
36kg

Value per head (270 kg)

Meat	$1050	81%
Hide	$66	5%
Edible offal	$61	4.7%
Tallow + MBM	$83.5 (May price)	6.5%
Blood meal	$2.5	0.2%
Pet food	$3	0.23%
Total	$1266	Co-prod = 19%
(Foetal blood 700 ml = $420)		

Value of rendered product

- 48 kg MBM at $638 (2 year average)
- 52 kg tallow at $835 (2 year average)
- Revenue = $74 per head 270 kg
- Costs $100 per tonne raw material = $16.7
- Value of raw material = 34 cents per kg

Raw material breakdown 270 kg

	Kg/head	MBM $	Tallow $	R.M. Value cents/kg
All R.M.	165	31	43	34 (26)
Sl.fl.	83.4	11	22	29 (16)
Fat	28.6	2	14	48
Bone	53.2	18	7	36

Improving revenue (quality and yield)

- Differential between 1% FFA and 2% FFA about $10 per tonne
- Differential between 2% FFA and 4% FFA about $15 per tonne.
- For production of 5,000 tonnes PA difference between 1 and 2% = $50,000

Maintaining FFA

- Render fresh – do not have breakdowns.
- Keep material whole – do not pulverise it in cutters and screws then store it.
- Clean bins and transfer equipment.

Protein/ash in meat meal

- What goes comes out
- Low protein is not a rendering problem. It means that protein is going to other uses e.g. edible/pet food.
- Low protein is a good sign – it means you are making better use of protein than rendering it.

Protein/ash

- Low protein meal may be discounted pro-rata for the value of protein.
- The important point is consistency
- Don’t sell 48% protein as 50%.

Effect of fat/moisture

MBM at 2% moisture		Equivalent MBM at 6% moisture	
5000 t	$3,190,000	5212 t	$1,325,256 ($135,256)
If 50% protein	$3,190,000	48% protein	$3,190,000

Moisture content

- Do not exceed 6% moisture

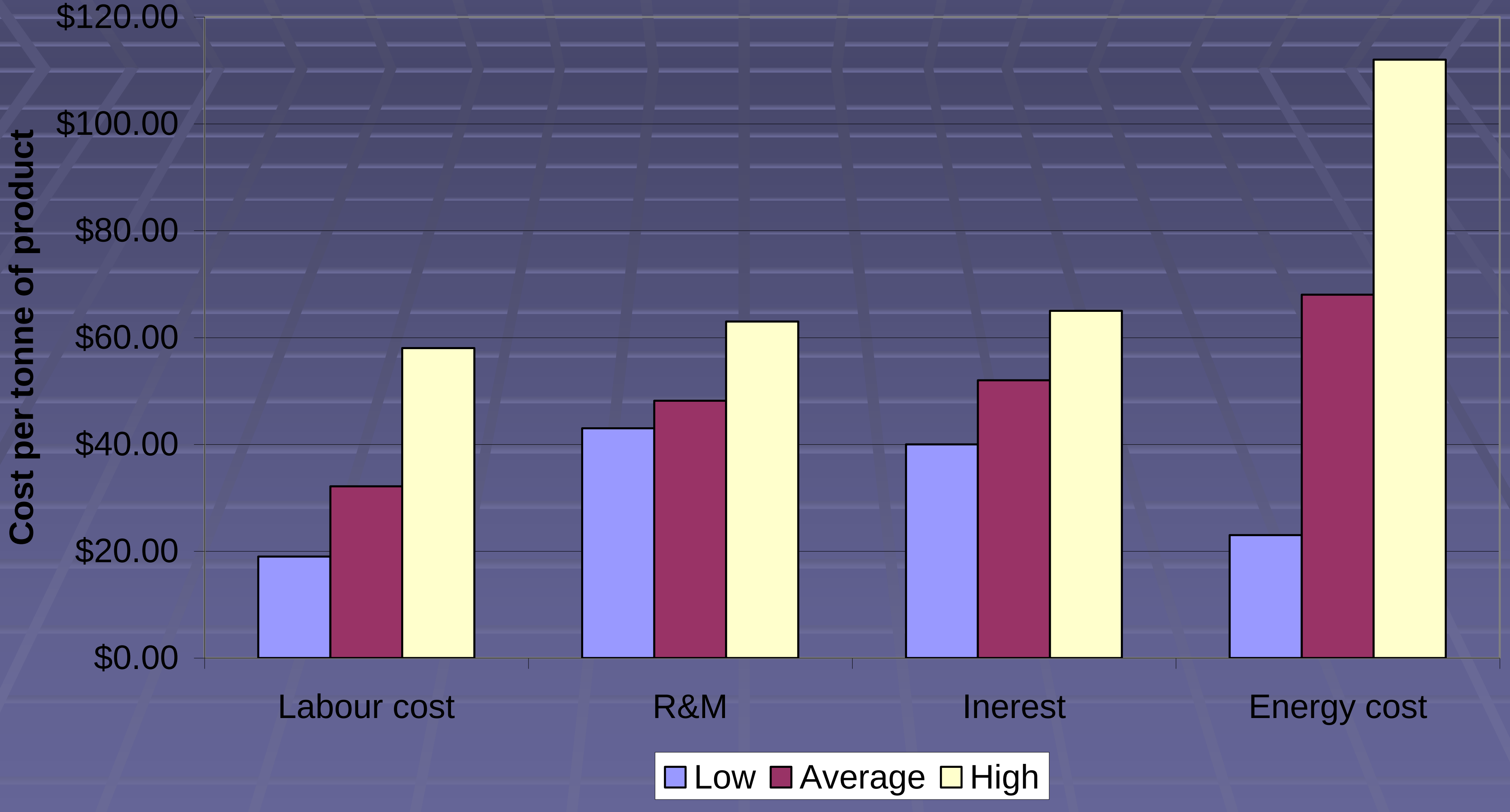
Effect of moisture/fat

MBM at 13% fat		MBM at 10% fat	
5000 t MBM	$3,190,000	4833 t MBM	$3,083,454
5000 t tallow	$4,175,000	5167 t tallow	$4,314,445
Total	$7,365,000		$7,397,899
Difference	$32,899		

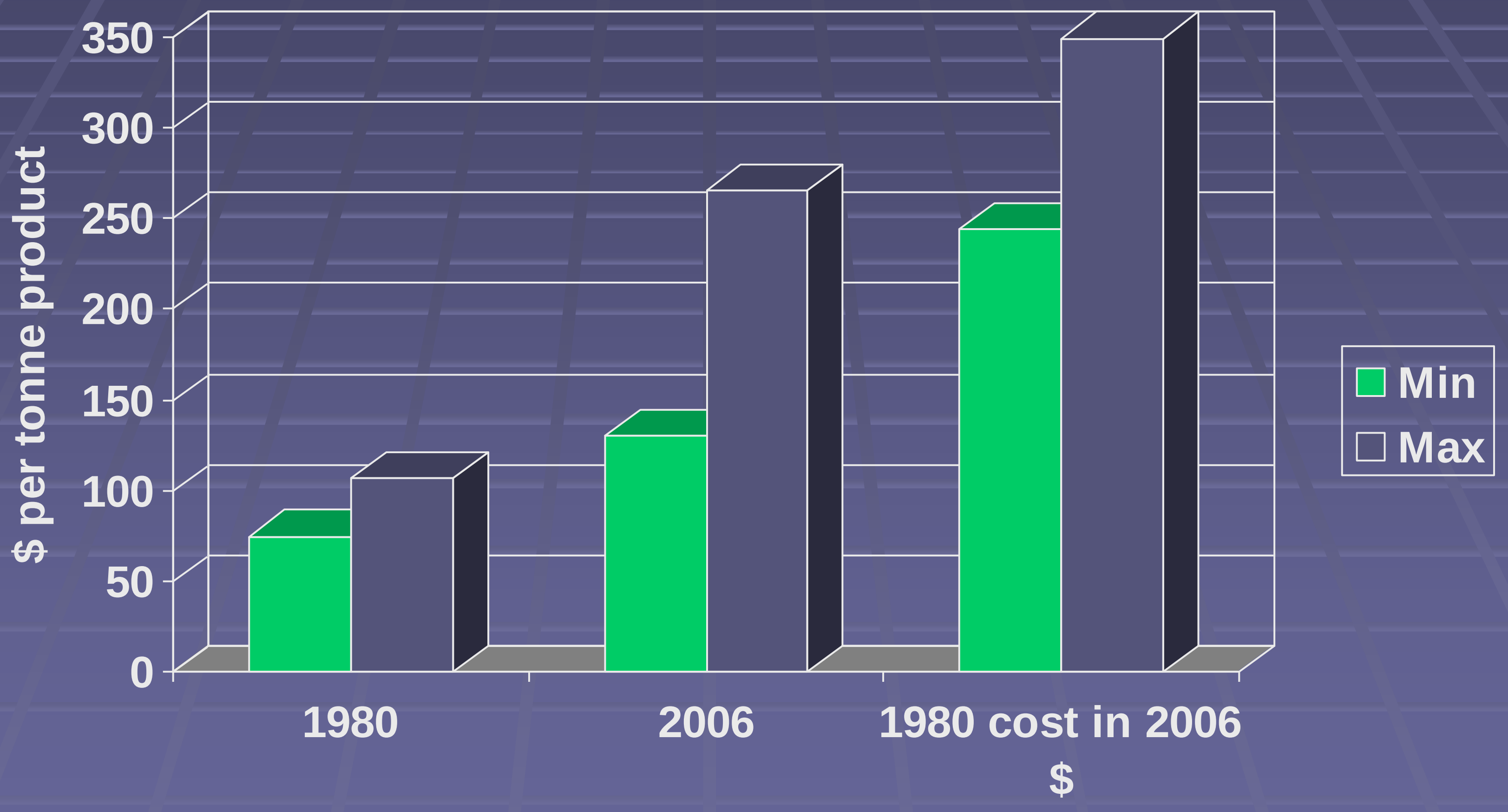
Costs according to MLA 2006

- Average cost $210 per tonne finished product (about $105 per tonne R.M.)
- Energy average $68 per tonne
- In 2006 energy 33% of costs
- In 1980 energy 6-8% of costs
- In 2006 labour 15% of cost
- In 1980 labour 50% of cost

Figure 2: Relative contribution of rendering costs



Comparison of 1980 and 2006 costs



Opportunities for cost reduction

- Energy
  - Heat recovery
  - Preheating
  - WHE
  - Biogas
- Added water
  - 10% added water = $15 per tonne of product
  - 10% added water = 1% loss of product from continuous wet rendering

Cost reduction

- Independent renderers under pressure from carbon tax and government grants have cut energy costs by almost 50%.
- Main saving is biogas production for use in boilers or electricity generation.

Conclusion

- Revenue seems high but so are costs.
- Raw material value may be matched by independent renderer and rendering on-site does not add much value.
- Try to isolate rendering costs and reduce energy costs.
- Struggling with yield and quality does not make much difference - know your quality and supply accordingly
- Holes in the argument:
  - No allowance for hot water
  - Some specific aspects of quality e.g. low ash ovine meal may add substantially to income.