aegic

Australian Export Grains Innovation Centre

Australian feed grains: barley and canola meal for cattle

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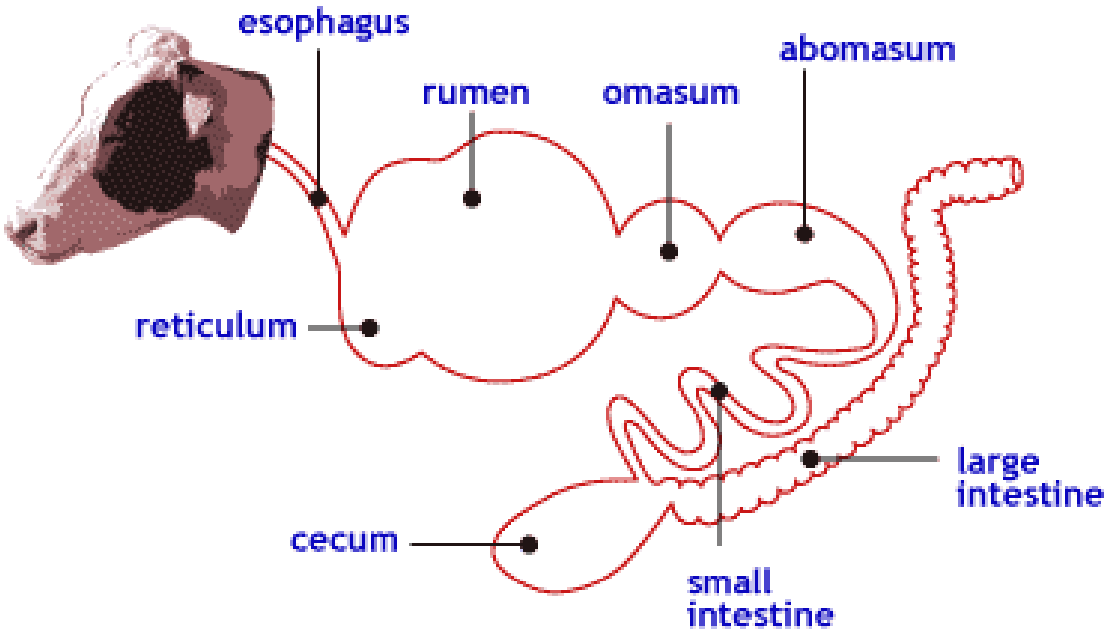
THE AUSTRALIAN GRAINS INDUSTRY CONFERENCE ASIA 2019

Cattle are ruminant animals

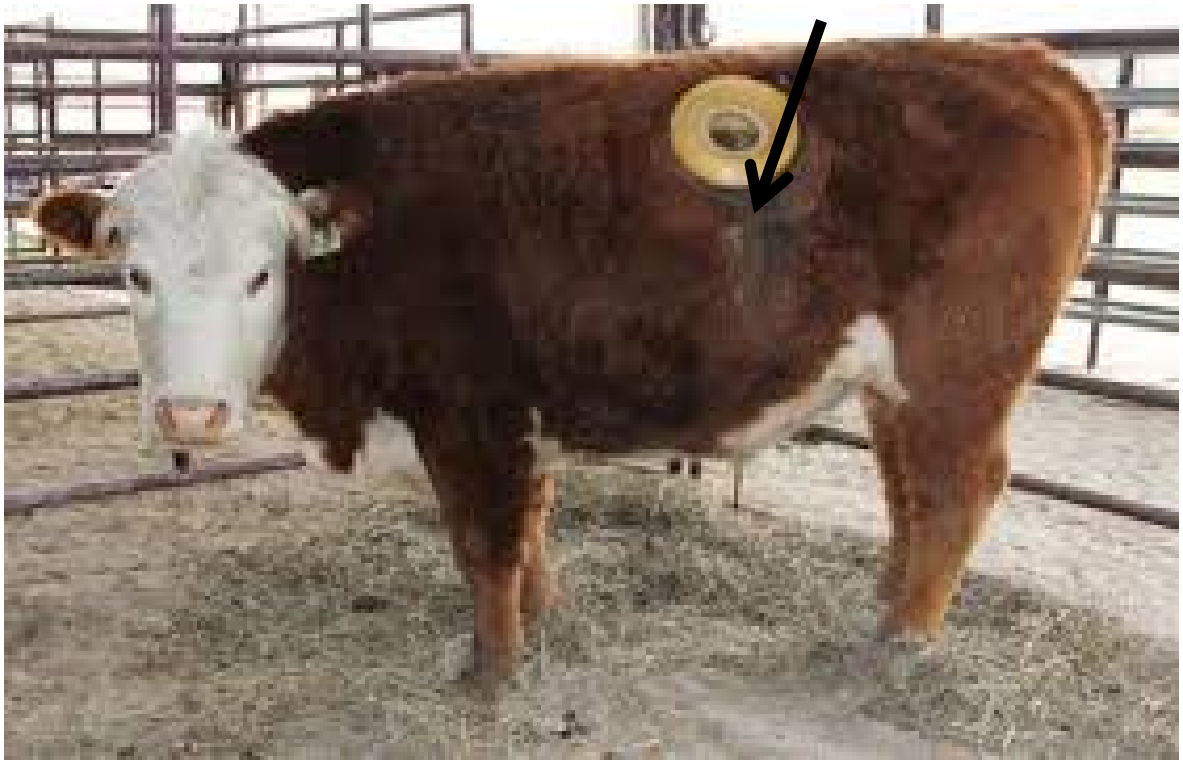
Rumen/reticulum:

- >200 litres
- Neutral pH
- Mixes, regurgitates, breaks down feed
- Serves as a continuous-flow fermentation vat
- Regulates feed intake



Cattle are ruminant animals

Inside the rumen



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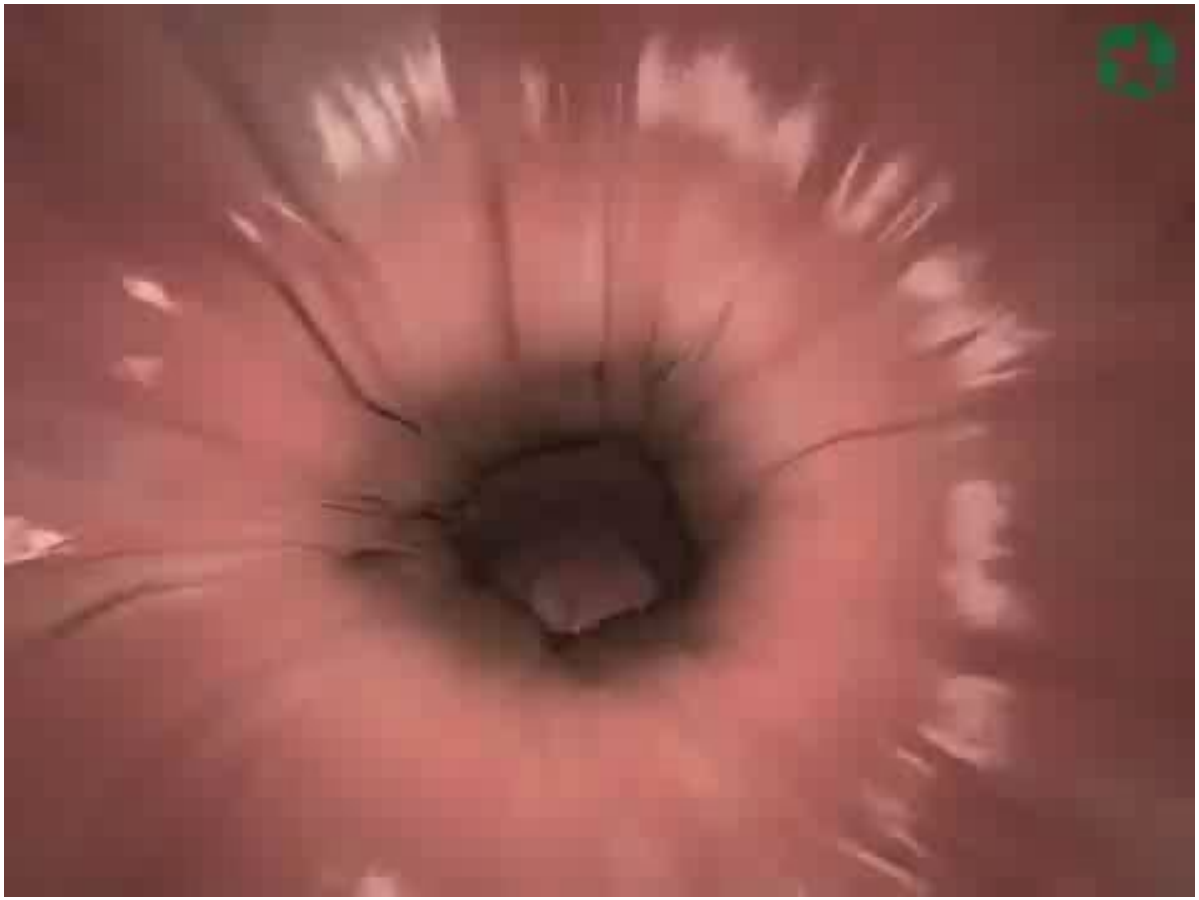
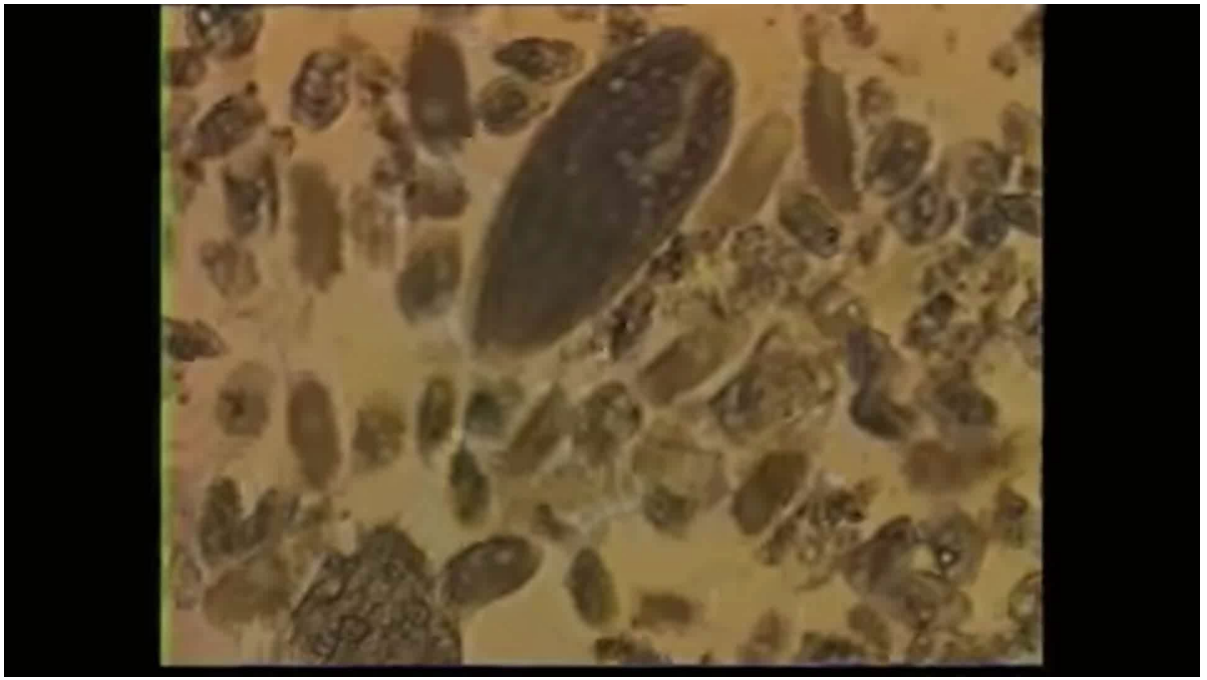


(Canadian Museum of Nature, 2011)

Cattle are ruminant animals

Inside the rumen

Rumen microbes



Cattle require nutrients, not specific ingredients

- Water
- Carbohydrates
  - Sugars, Starches
  - Fibre
- Fats
- Protein
- Minerals
- Vitamins

Starch is a major energy source for beef and dairy cattle

Feed type	Feeds such as	Starch content
Tubers	Potato, cassava	60-90%
Cereal grains	Barley, corn, rice	60-80%
Legumes	Peas, beans	25-70%
Green fruits	Bananas, mangos	Up to 70%

(Gomez et al., 2016)

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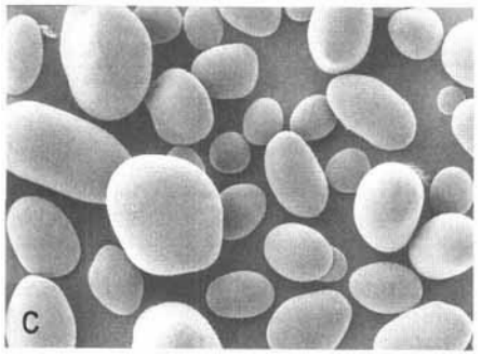
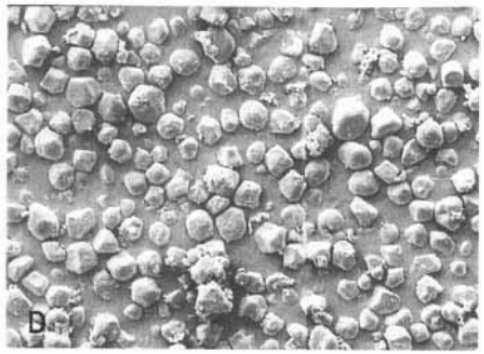
Starch granules in different feeds:

(under a high powered microscope)

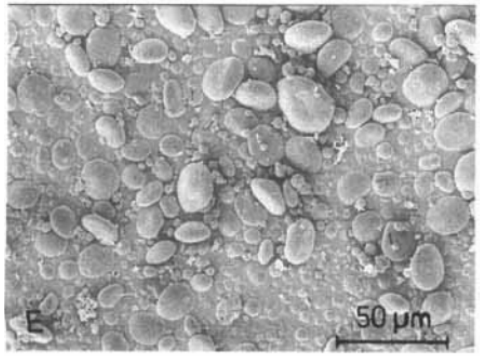
Potato

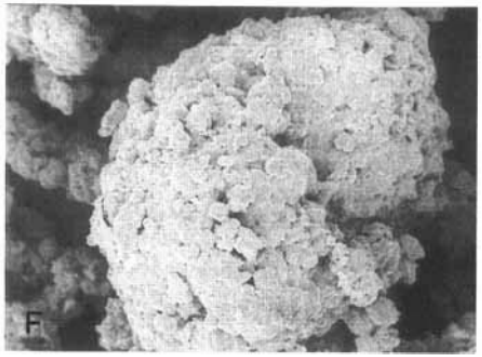




Maize

Wheat

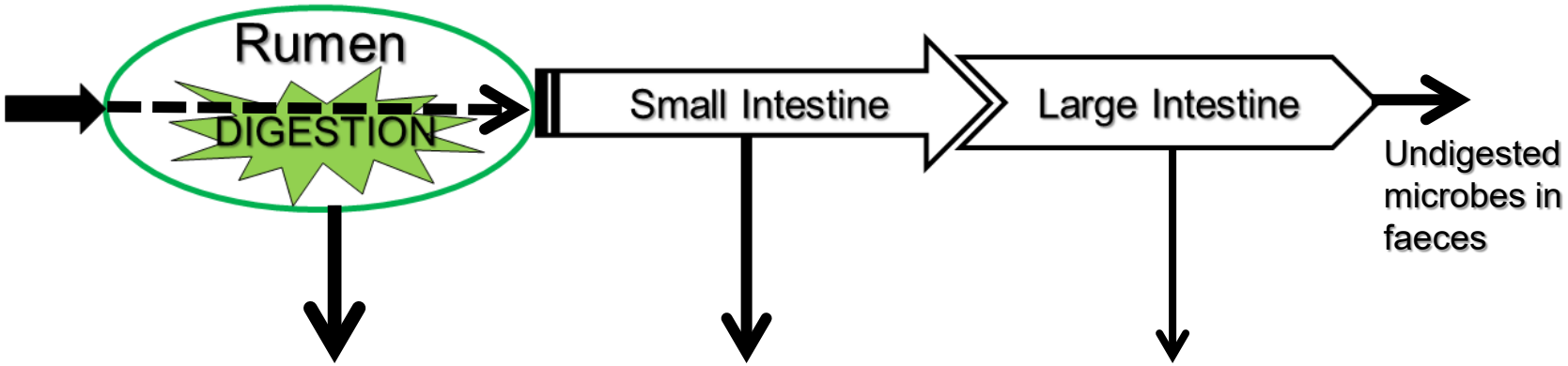




Rice

(Cone et al., 1990)

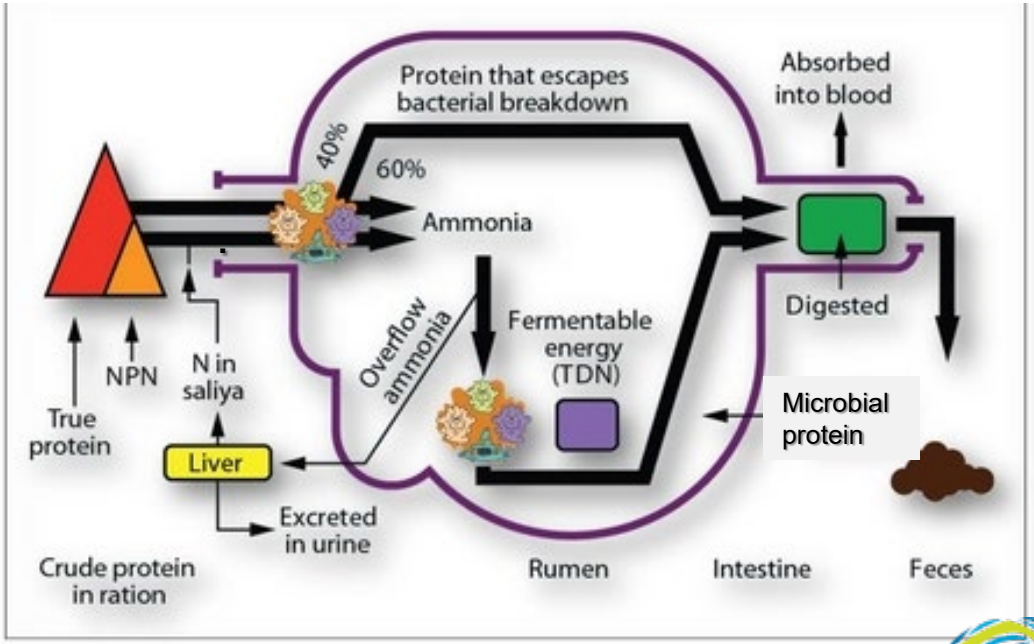
Feeding cattle is all about balance



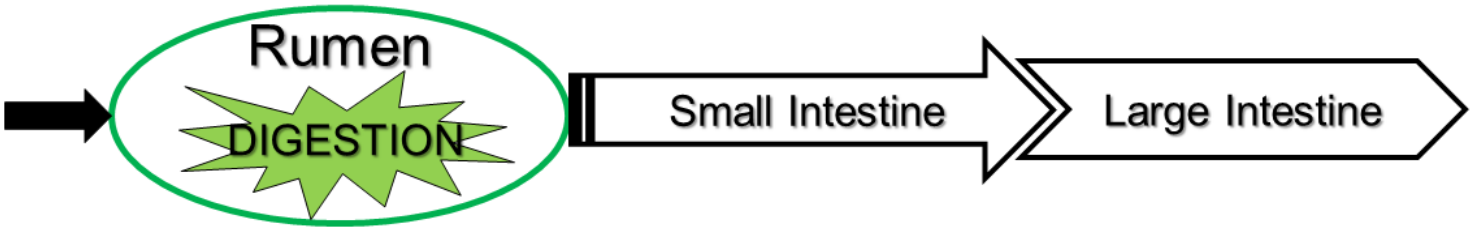
Ruminal vs. intestinal digestion of dietary starch

Feeding cattle is all about balance

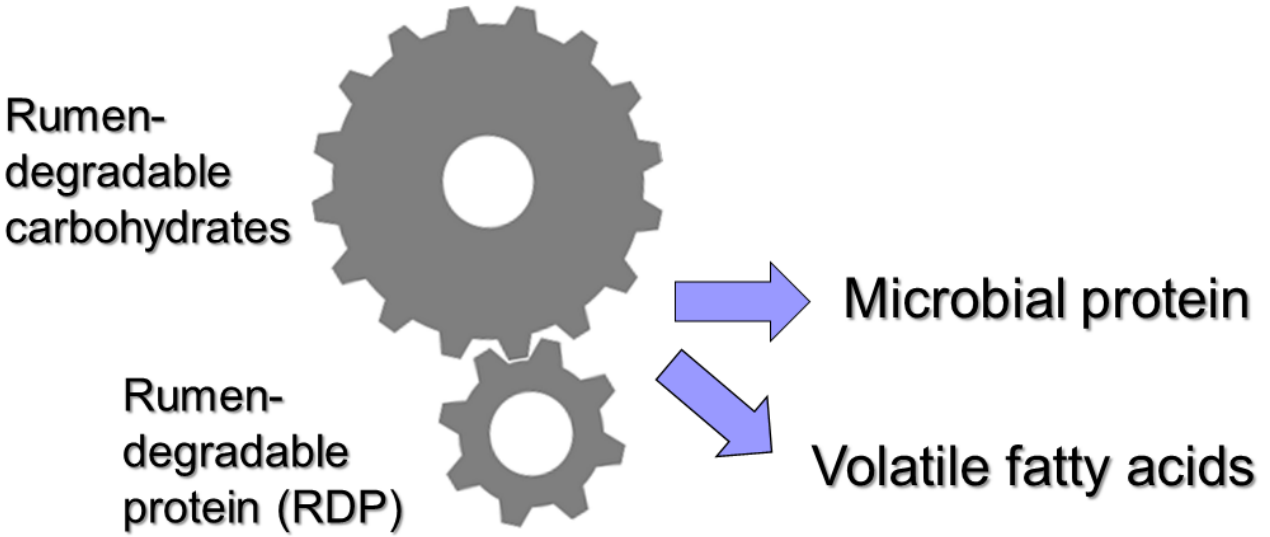
Ruminal vs. intestinal digestion of dietary protein



Feeding cattle is all about balance



Dietary supply of rumen-degradable carbohydrates vs. rumen-degradable protein



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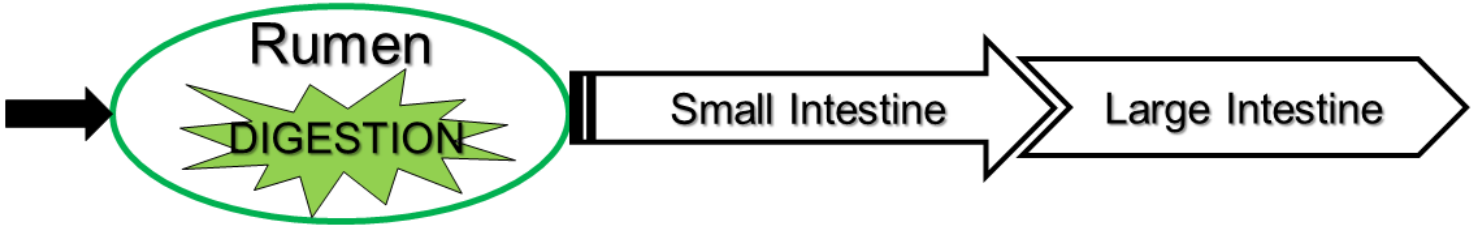
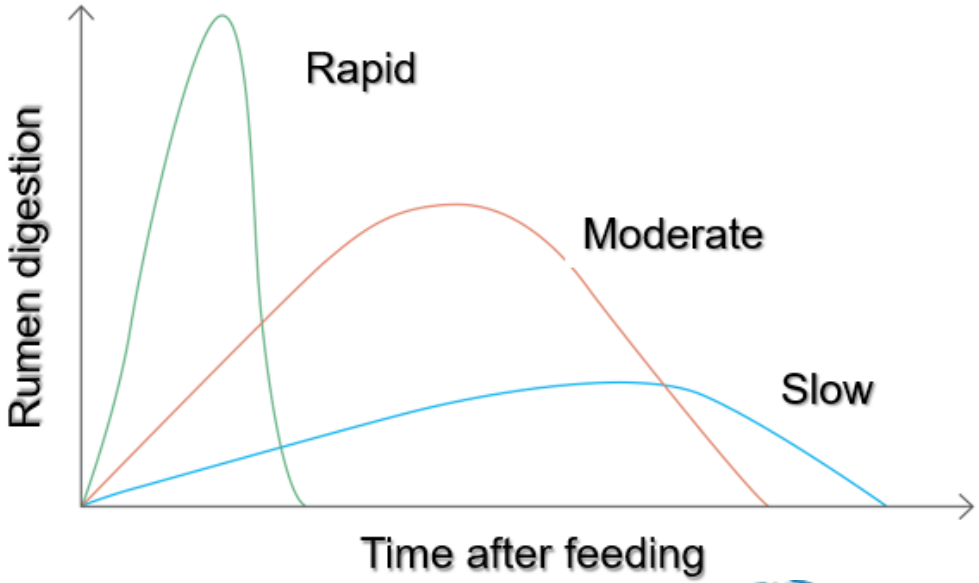


Rapidly, moderately and slowly degrading dietary starch sources in the rumen



Feeding cattle is all about balance

Stable, healthy rumens = Healthy, productive animals

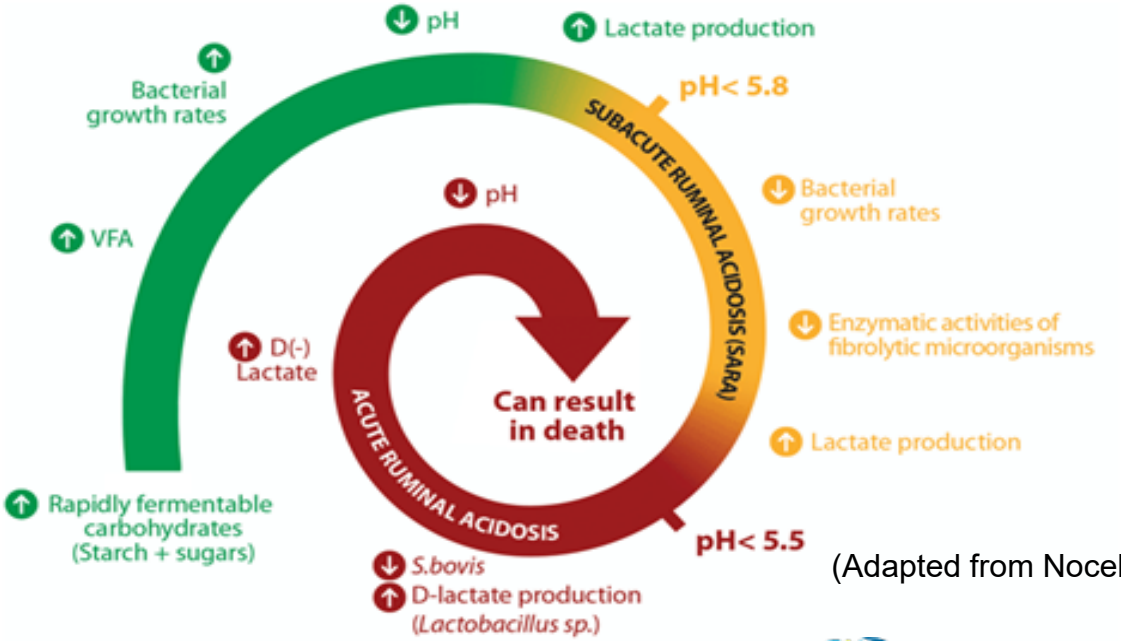
- Daily feed intake
- Daily weight gain
- Daily milk yield
- Feed conversion efficiency
- Removals and deaths

(Source: www.beefcentral.com)

Feeding cattle is all about balance

Rumen dysfunction leads to many problems

Descent from healthy rumen function into ruminal acidosis



(Adapted from Nocek, 1997)

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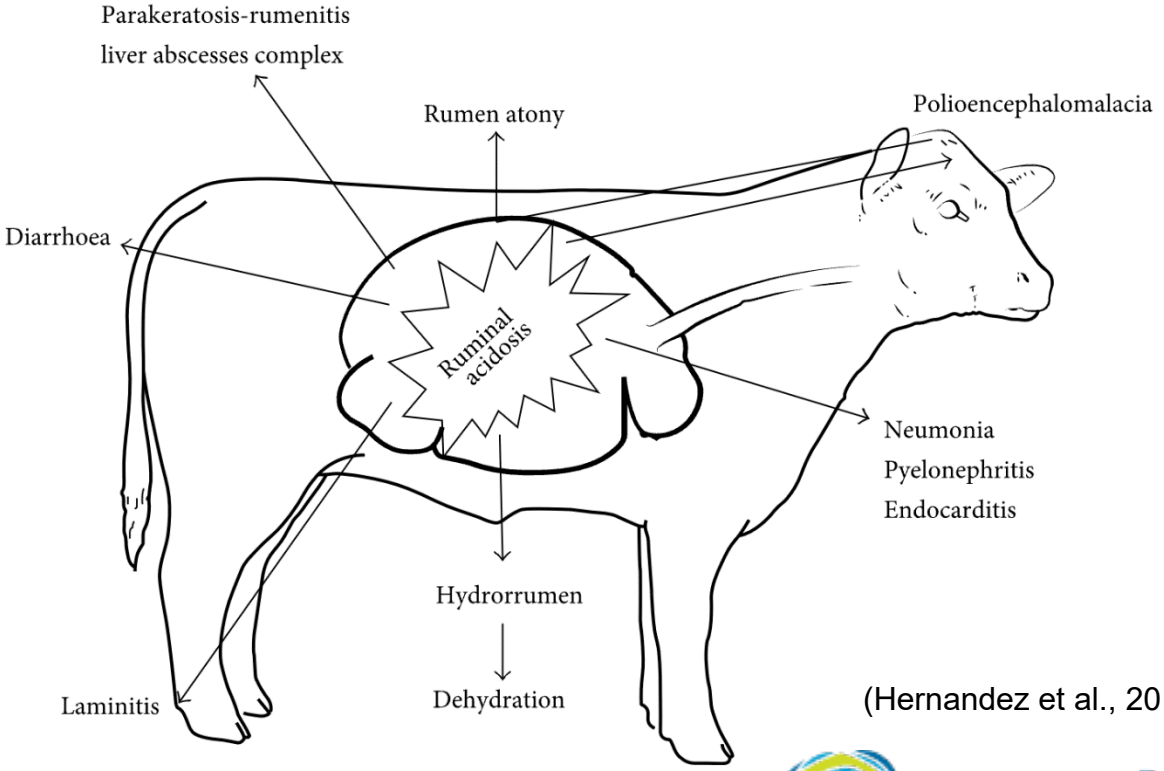

(Hernandez et al., 2014)

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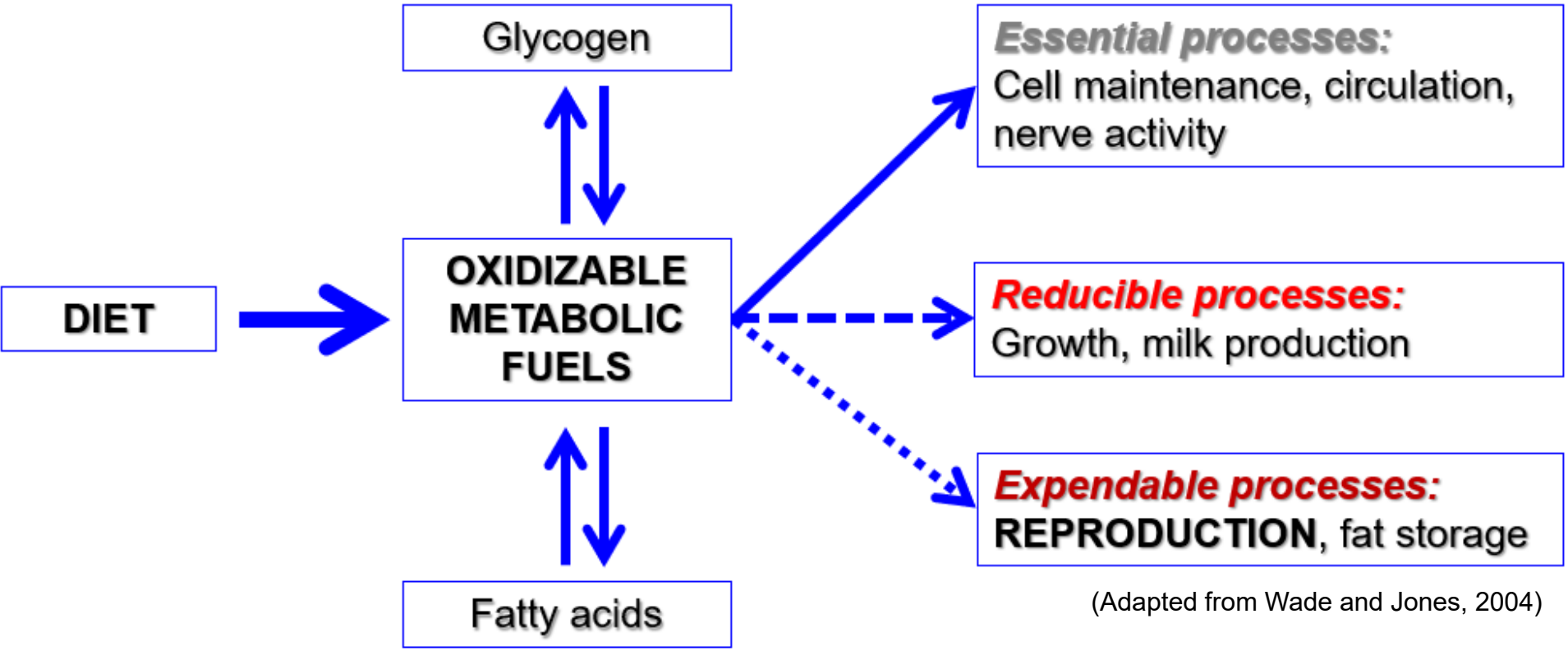

(Adapted from Wade and Jones, 2004)

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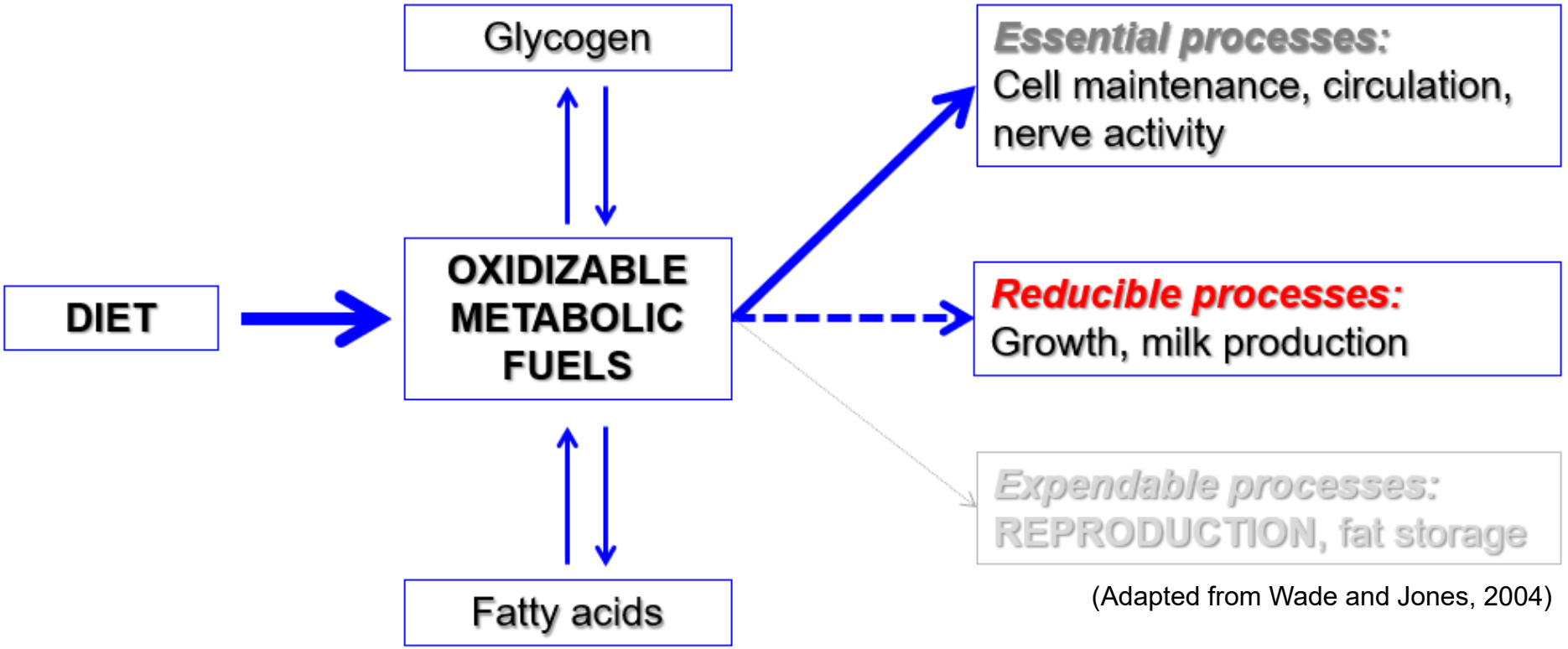

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Feeding cattle is all about balance

Lifetime reproductive performance of cows depends largely on:

- Age at attainment of puberty
- First ovulation post-calving
- Heat expression and detection
- Insemination and conception

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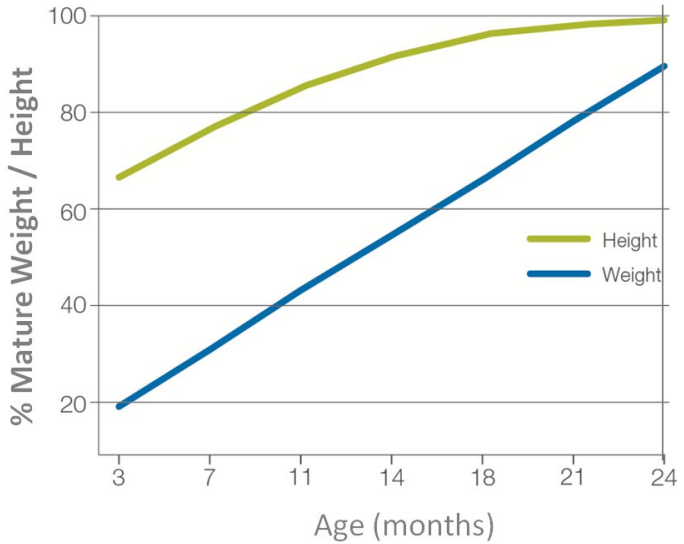
In beef heifers, puberty occurs at approx. 55-65% of mature cow bodyweight



Weigh heifers regularly and compare to weight-for-age targets

(Dairy Australia, 2018)

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Body condition at calving and body condition loss post calving are critical

Provide adequate feed and water quality, quantity and access
Aim to calve at BCS 2.5 to 3.0 (1 to 5 scale)

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It seems that Bos indicus cattle are more difficult to detect in heat

If artificial insemination (AI) or hand-mating is used, consider heat detection aids, or heat synchronisation or fixed time insemination programs

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Use the ‘am-pm’ rule
Test bulls for fertility

Barley vs. Tapioca

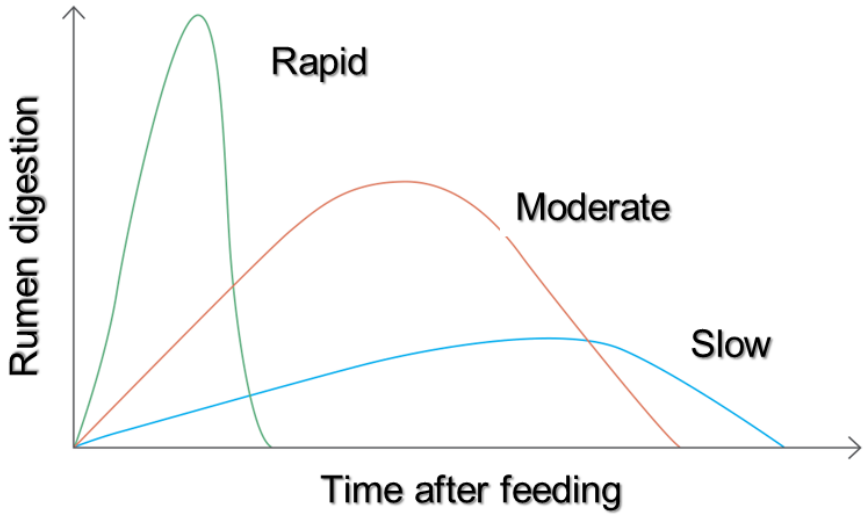
Approximate nutrient specifications

Grain type	Metabolisable Energy (MJ ME/kg DM)	Starch (% DM)	Starch degradation in rumen	Crude Protein (% DM)
Barley	12.5	60	Varies with processing method	12.2
Dried Tapioca pulp (Onggok)	11.0	73	Rapid	2.5
Dried Tapioca chips (Gaplek)	12.3	73	Rapid	3.0

Opportunities to use barley in cattle diets

Feed as the primary starch source or as a complementary starch source with tapioca pulp or chips.

- Achieve a better balance of rapidly, moderately and slowly degrading starch sources in the rumen



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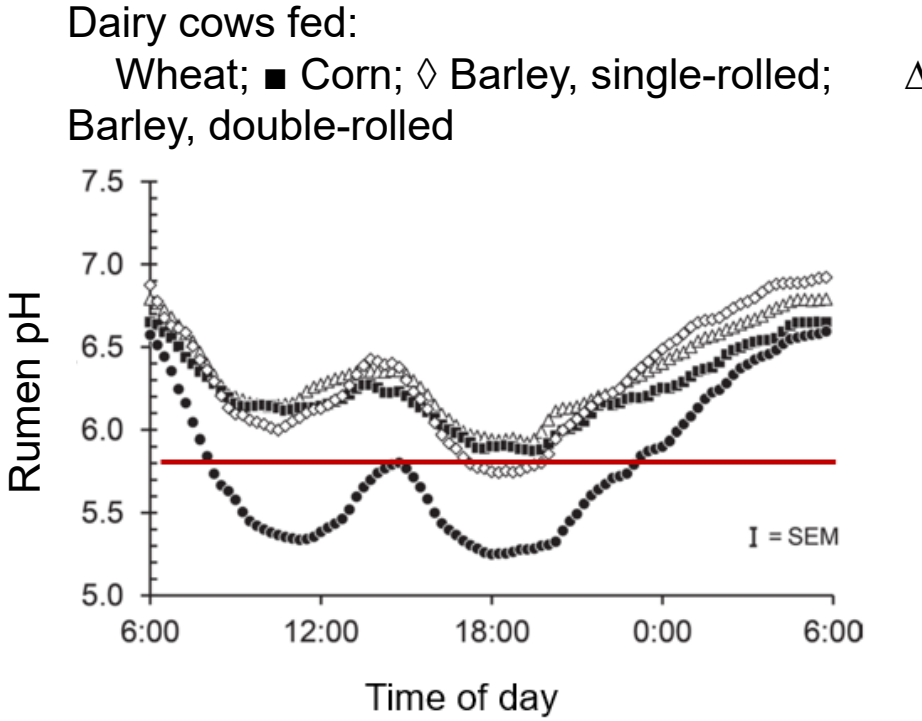

(Moate et al., 2017)

Opportunities to use barley in cattle diets

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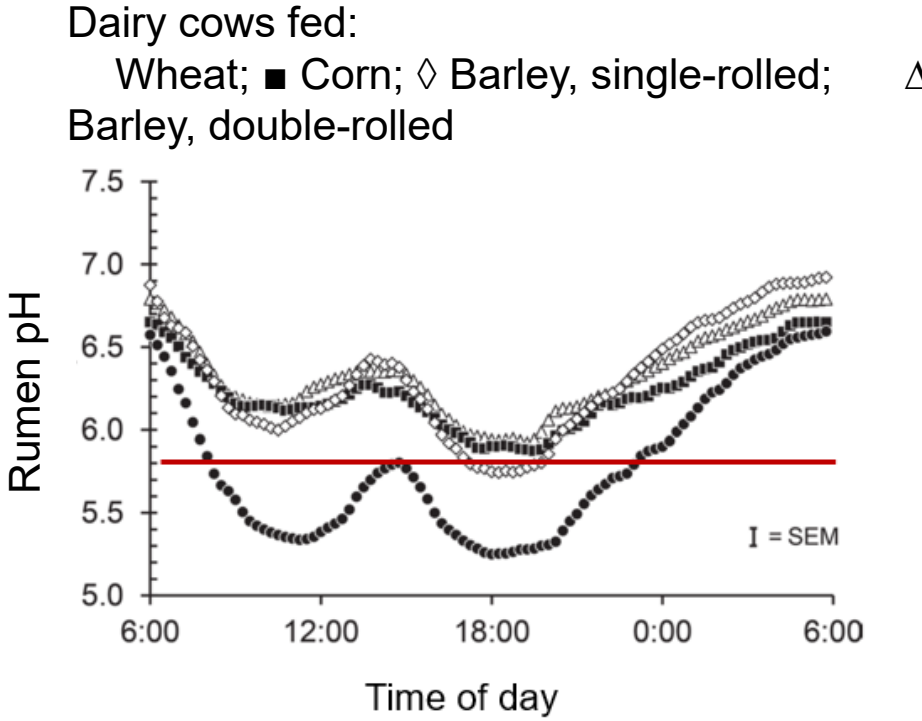
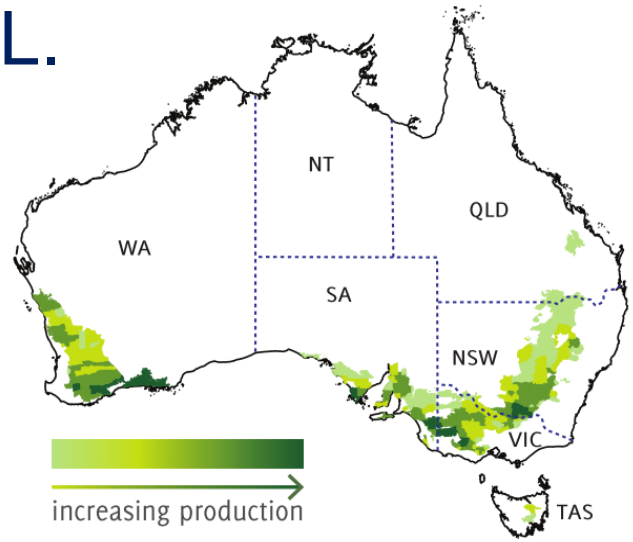
- Achieve a better balance of rapidly, moderately and slowly degrading starch sources in the rumen
- ↓ inclusion rate of protein meals necessary in diet



(Moate et al., 2017)

Australian canola

- Botanical name: *Brassica napus* L.
- Australia's major oilseed crop.
- Canola production is increasing.
  - Now averages 3-4 Mmt/year
  - 85% non-GM, 15% GM
  - 15-20% of world's export trade



- Products: food-grade oil, biofuel and canola meal. (75% solvent extracted and 25% expeller)
- Canola meal is a primary protein source for cattle in Australia and globally.

Opportunities to use canola meal in cattle diets

Feed as an alternative to other protein meals such as copra meal, palm kernel meal, soybean meal

- Supply a well balanced source of rumen-undegradable (RDP) and dietary undegradable protein (DUP)
  - Canola meal's RDP stimulates microbial protein synthesis in the rumen (with its Amino Acid profile being very similar to milk)
  - While supplying less DUP than some other protein sources, canola meal contains relatively high concentrations of essential Amino Acids: Lysine, Methionine, Histidine
- Increase rumen's buffering capacity
- Stimulate feed intake → ↑ growth and milk production

Key take-home messages

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  - Dietary supply of rumen-degradable carbohydrates vs. protein
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  - Supply of metabolic fuels for reproduction as well as maintenance, growth and milk production

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  - Rapidly, moderately and slowly degrading starch sources in rumen
  - Supply of metabolic fuels for reproduction as well as maintenance, growth and milk production
- Australian barley and canola meal are proven, reliable, high quality cattle feeds
- Consider opportunities to use barley as starch source
- Consider opportunities to use canola meal as protein source


Acknowledge support of
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The end
Thank you
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