



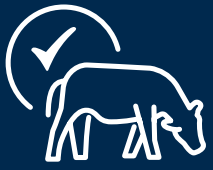
Australian Export Grains Innovation Centre



Australian sorghum

for dairy and
beef cattle

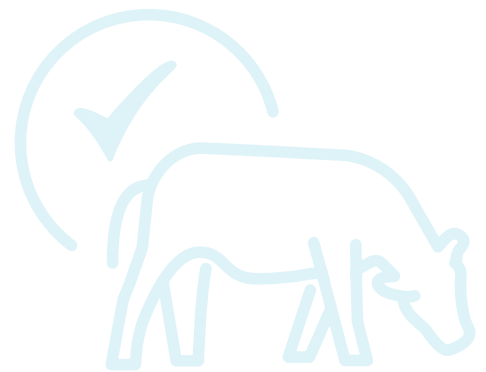
Australian sorghum is a proven, reliable, high-quality feed grain. Australian feed sorghum is suitable for all classes of cattle.



Key benefits of Australian sorghum

- ✓ **A proven, reliable starch source:** The starch content of Australian sorghum is intermediate between corn and wheat/barley.
- ✓ **High protein content:** Australian sorghum has a higher protein content than corn.
- ✓ **Low risk:** Australian sorghum has a lower risk of ruminal acidosis than other grains. Australian grains have a low risk of mycotoxin contamination due to dry harvest and high-quality storage.

Australian sorghum is a proven, reliable grain for cattle feed. It is nutritionally similar to corn but without the yellow pigments. Due to its inherent drought tolerance and short growing season, interest in sorghum is increasing, with red sorghum the main type grown in Australia for animal feed.





Production and export

Most of the world's sorghum grain is fed to animals, including poultry, and it is also used for food (Africa) and alcohol (ethanol, beer in Africa and baijiu in China).

Australian sorghum production averages around **1–1.5** million metric tonnes. Australian sorghum is mostly used for animal feed within Australia.

Australian sorghum is also exported, with most demand coming from China. Australian sorghum in China is mostly used for animal feed, and is also used in the baijiu distilling industry.

Other export markets include Philippines, New Zealand, Taiwan and Japan.



Storage and quality

From the grower to the exporter, the **Australian sorghum industry is committed to the highest standard** in product performance to meet the requirements of international customers.

Australian sorghum has **low moisture content, with low mycotoxin contamination and long storage viability.**



Nutrition

Dairy cows do not have a requirement for specific feed ingredients. Rather, they have requirements for nutrients, i.e. water, carbohydrates (sugars, starch, fibre), fats, proteins, minerals and some vitamins. Cows are remarkably flexible animals and are able to thrive on a wide variety of feed sources (e.g. forages, grains, protein meals, legumes) that differ markedly around the world.

The objective in dairy cow feeding is to meet the cows' nutrient needs without excesses and within the cows' intake limits to achieve good feed efficiency (converting feed to milk) and optimal feed cost.

Starch is the main component of, and contributor to, metabolisable energy (ME) in all grain types. Sorghum starch content is typically slightly lower than corn but higher than wheat or barley, commonly around 62% as fed. Phenols (in the pigmented seed coat), kafirin (the protein matrix encapsulating the starch granules), and phytate may all contribute to this lower starch digestibility.

The nutrient composition and energy value of Australian sorghum is generally less variable than that of other grains.

At typical crude protein levels sorghum contains similar standardised ileal digestible essential amino acid (SID-EAA) content to corn, but less than wheat or barley.

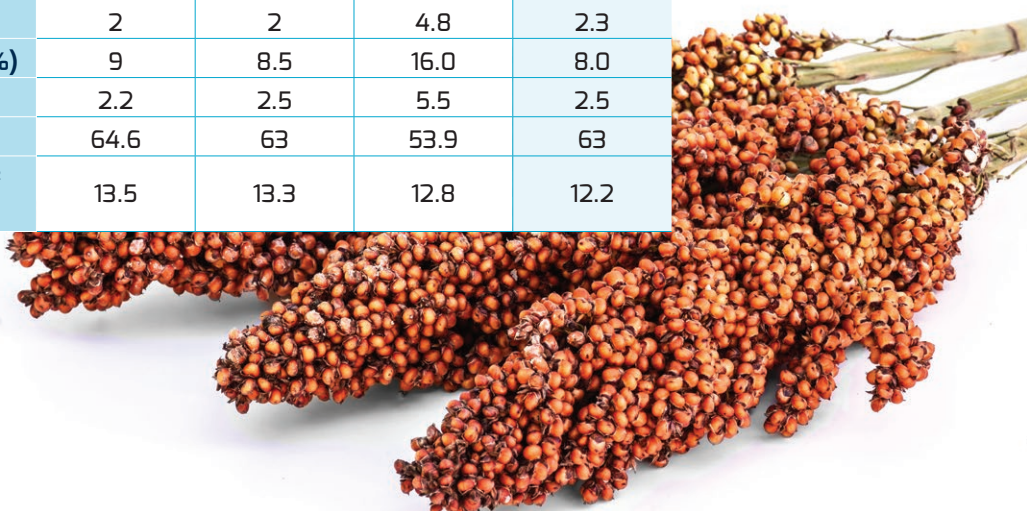
Table 1: Comparing grain nutritional value: typical proximate analyses¹

Specification		Corn	Wheat	Barley	Sorghum
Moisture (%)		13	12	12	13
Protein (%)		8	11	11	9.5
Fat (%)		4	2.3	2.6	3.5
Ash (%)		1.15	1.7	2.2	2.0
Fibre	Crude (%)	2	2	4.8	2.3
	Neutral Detergent Fibre (%)	9	8.5	16.0	8.0
	Acid Detergent Fibre (%)	2.2	2.5	5.5	2.5
Starch + sugar		64.6	63	53.9	63
Ruminant Metabolisable Energy ² (MJ/kg)		13.5	13.3	12.8	12.2

¹ Source: Premier Atlas (2008)

² Source: Rumen8 (2021)

Note – Typical value only – composition can vary widely with different agronomic conditions





Processing Australian sorghum for feed

Processing sorghum enhances starch digestibility

The aim of grain processing is to optimise energy (starch) digestion in the animal's rumen and small intestine. This leads to increased daily gain/milk yield and higher feed conversion efficiency.

Sorghum and corn are high in starch, but due to their structure require a higher degree of processing than other grains to optimise starch availability to the animal's rumen microbes. This is due to the strong protein matrix in which the starch granules are embedded.

Two main ways to process grains:

1. Reduce particle size

- Roller mill
- Disc mill
- Hammer mill

2. Apply moisture and/or heat (often with some mechanical force and pressure)

- **Moisture only:** steeping, tempering
- **Heat only:** micronising, microwaving, roasting, popping, extruding
- **Moisture and heat:** Steam rolling, steam pelleting, steam flaking, pressure flaking

Starch digestibility is improved through gelatinisation, in which the crystalline starch granules, which are encased within a protein matrix in the endosperm of the grain kernel, swell and break apart.

Getting the most from sorghum

Sorghum grain responds differently to different processing methods.

Steam flaking can increase the feeding value of sorghum by up to 20% over dry-rolling.

Flake thickness affects the performance of beef cattle fed flaked grains (average daily gain, daily dry matter intake and feed gain). An intermediate flake thickness is best.

To optimise flake thickness (density), four factors are important during the flaking process

- Steam chest temperature
- Steaming duration
- Roller adjustment
- Roller corrugation

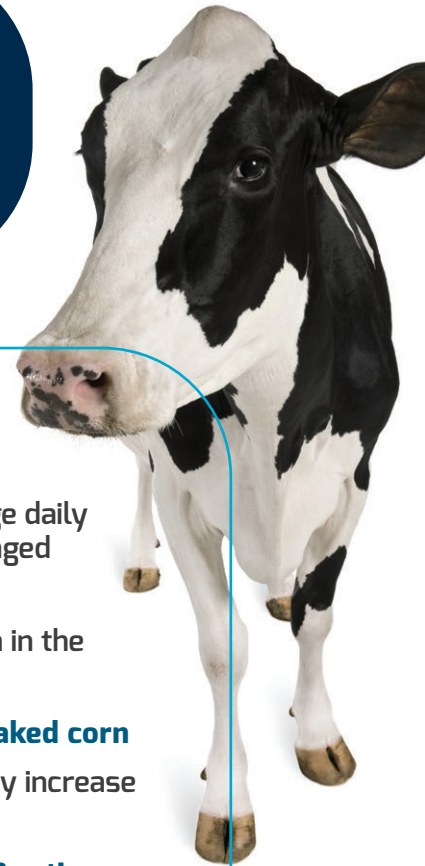
Table 2: Effects of different processing methods on the in vitro enzyme digestion of sorghum starch

Method	In-vitro enzyme digestion of starch (% starch)
Unprocessed normal sorghum	23-43
Steeping (24 hrs to 30% moisture)	27
Fine grinding	42
Grinding and steam pelleting	54-64
Steam flaking	70-84
Microwaving	70-82
Extrusion	89-94

Source: Black, 2008



Opportunities to use sorghum in cattle diets



- ✓ **Replace corn with sorghum**
 - Many studies have shown that when well processed, sorghum replaces corn in beef and dairy cattle diets. Average daily gain, carcass characteristics and milk production are unchanged (except subcutaneous fat is lighter in colour).
 - Substituting corn with sorghum in diet may enable reduction in the inclusion rate of protein sources.
- ✓ **Use a 2:1 grain blend of steam flaked sorghum and steam flaked corn**
 - A blend of steam flaked sorghum and steam flaked corn may increase ADG and FCR vs. either grain alone (Huck *et al.*, 1998)
- ✓ **Use sorghum in combination with barley or wheat e.g: 50:50 ratio**
 - Balances 'rapid' and 'slow' digesting grains, for a smoother rumen starch fermentation pattern, and greater assimilation of rumen degradable protein (RDP) in the diet to microbial protein.
- ✓ **Feed sorghum meal to calves**
 - Suitable for newly weaned calves as is very palatable.

When transitioning from corn grain to sorghum grain in diets of cattle, do so gradually in steps to provide their rumen microbes sufficient time to adapt.



AEGIC is an initiative of the Western Australian State Government and Australia's Grains Research and Development Corporation

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Australian Export Grains Innovation Centre

Perth (head office)

3 Baron-Hay Court
South Perth, WA 6151, Australia
P +61 (08) 6168 9900
E admin@aegic.org.au

Sydney

1 Rivett Road, Riverside Corporate Park
North Ryde, NSW 2113, Australia
P +61 (02) 8025 3200

aegic.org.au



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