Which Grains and Why?

General

Cereal grains are a concentrated source of energy, with much of that energy stored as starch. They provide protein, vitamins, minerals and some fibre. Pulses are higher in protein than cereal grains but on an energy basis they are usually more expensive than cereals. They are commonly included to raise the protein content to required levels.

There is considerable variation in quality within grain types and between years. A feed analysis providing energy, protein, dry matter and digestibility values is recommended prior to starting a feedlotting program.

There is generally no advantage in cracking, rolling or flaking grains when feeding to sheep or lambs. Trial work has repeatedly shown that whole grain can increase intake and growth rates; improve feed conversion efficiency and reduce acidosis risk.

Grain poisoning or 'acidosis' is a common health issue within feedlots. It is caused by the accumulation of lactic acid within the rumen following the breakdown of highly fermentable carbohydrates such as starch.

Slowly introducing grain to lambs allows the rumen environment to adapt to the increase in acid production without acidosis developing. In addition pre-training of lambs prior to weaning can assist with lambs recognising the grain as a feed source, future uptake rates and fewer shy feeders when fed grain. Adequate 'effective' fibre (ensuring a stable, active rumen) and additives such as sodium bicarbonate and bentonite to aid in preventing acidosis must also be considered.

'Average' energy, protein, starch, fibre and oil contents of the common cereal and pulse grains are shown in the following table.

Average Values of Cereals and Pulse Grains					
Grain	**Energy (Mj/kgDM)**	**Protein (%)**	**Starch (%)**	**Fibre (%)**	**Oil *(%)**
Wheat	13.5	13 %	76%	2 - 3%	1- 2%
Triticale	13.0	13%	76%	2 - 3%	2 - 3%
Maize	13.0	8%	76%	2 - 3%	2 - 3%
Sorghum	13.0	12%	70%	3 - 5%	3- 4%
Barley	13.0	12%	61%	5 - 7%	1- 2%
Oats	12.0	10%	42%	12-25%	7-10%
Lupins	13.0	35%	<10%	10-15%	5- 9%
Peas	12.5	25%	48%	9%	0.5%
Beans	12.5	25%	37%	11%	1.5%
* oil has 2.25 times as much energy as starch, providing additional energy without an increased acidosis risk. Ruminants can handle up to 7-8% oil in a diet but levels beyond this may affect rumen function, the efficiency of digestion and palatability (the latter due to rancid flavours).					

Grain Specifics

Wheat and Triticale

- Most dangerous of cereals due to high starch and low fibre levels. Introduce slowly.
- High gluten levels in wheats may lead to 'pasty' digesta.
- Limit to 40% of ration if possible and/or ensure adequate fibre

Sorghum and Maize

- Lower levels of starch fermentation in rumen but higher fermentation in small intestine (up to 42% more energy extracted than starch digested in rumen) compared to other cereals
- Can cause 'hind-gut' acidosis, introduce slowly
- Tannins in sorghum seed coat may 'reduce' protein availability and fibre digestion.

Barley

- Not as dangerous (higher fibre and lower starch) than wheat or triticale
- Palatable and highest in Vitamin A and E of cereal grains
- Storage (weevils) may be a problem

Oats

- Is generally safer due to higher fibre levels and lower starch levels
- Generally have good energy levels due to additional energy stored as oil
- Digestibility's may be low (particularly Coolabah, Echidna and Mortlock) due to high lignin content in hulls (lignin digestibility <40%)

Lupins

- Safe feed as high fibre, low starch levels
- Usually the cheapest per unit of protein
- Energy from oil (5-9% depending on variety) helps keep total energy available high
- May be intake/palatability issues with 'narrow leaf' varieties due to *alkaloids* that impart a bitter taste. Soak overnight before use
- Recommendation is no more than 20% in a ration as have been known to cause yellowing of carcases and soft fat problems

Peas and Faba beans

- Generally safer than most cereal grains although a high percentage of their starch is digested in the hind-gut so there is an acidosis risk.
- Take care if cracking as doing so will increase acidosis risk
- May be some issues with tannins (affect protein availability) in beans

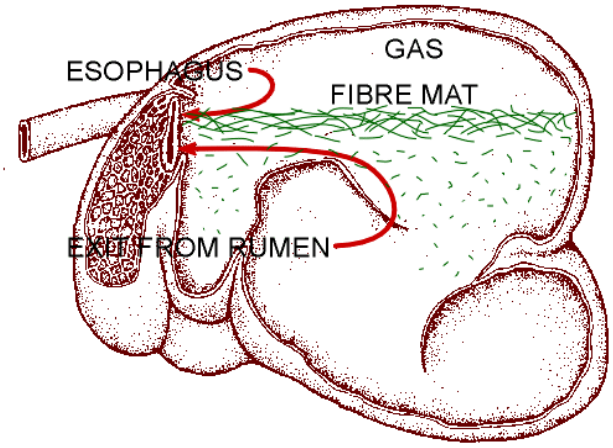
All cereal grains are low in **calcium** and **sodium.** These should be corrected for by adding fine limestone and fine salt at 1 to 2% on a weight basis (ie: 10-20 kg/tonne of grain or pellet fed).

Dolomite (limestone containing higher levels of magnesium) may be used instead of fine lime to provide additional magnesium

If the rations calcium to phosphorus ratio is not 1.5:1 or 2:1 (recommended level) there is a risk of urinary calculi (bladder stones). Increasing calcium levels should address this deficiency. Adding salt (sodium) will help by increasing gut flow due to higher water intakes, reducing stone formation. Acid salts may also be used as a feed additive and/or drench treatment (in early signs of bladder stones)

General Recommendations:

Introduce cereal grains slowly over a 10-14 day period so the rumen becomes accustomed to increasing acid levels



Provide at least 10% *'effective'* fibre in a lambs diet. Effective fibre is fibre that physically stimulates (scratches) the rumen, cleaning walls and stimulating digestion juice release.

Fibre 'forms' a rumen mat onto which starch rich grains initially fall and digestion rates are slowed. Below the 'mat' previous feed ingested is slowly mixed and broken down/digested, slowing digestion of high starch grains and maintaining a good rumen bug balance.

Figure 1 'Effective' fibre will ensure optimal rumen function through the formation of a floating rumen 'mat'

Inadequate fibre will lead to a reduction in rumen motility and possibly rumen stasis and ultimately acidosis.

Ground or fine fibre found in pellets and most cereal grains is not effective fibre. Intact grains or pellets swallowed whole by a lamb may however 'act' as small fibre particles and stimulate rumen walls prior to breakdown during the cud chewing process