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RICE NOTES
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THE QUALITY OF RICE HAY, RICE SILAGE & RICE STRAW

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Under drought conditions, in the absence of normal feed supplies for livestock, the demand for alternate sources of feed are high. As a drought feed rice hay, silage and straw are often considered during these times.

Water supplies in the irrigation areas during dry times depend on inflows into the catchment dams. Where inflows are low it has an impact on water allocations. In these circumstances growers are often short of water and forced to reassess the future of their rice crops. Decisions have to be made whether to cut crops for hay or silage or carry them through to harvest. In dry times relatively high prices are often on offer for fodder, which also needs to be factored into the equation.

The demand for rice straw to be baled after harvest increases in dry conditions, as it is used as a source of roughage in livestock rations. Whilst rice straw may be regarded as either a resource or waste product, environmental pressures on burning stubble may see its use increase in the future.

The main factors, which need to be considered before using rice hay, silage or straw for stockfeed, include the nutritive value of the feed and the risks of residues of pesticides.

FODDER QUALITY

There are quality standards for hay and silage, developed by AFIA, that allow both the buyer and seller to recognise quality by means of a simple alpha-numeric code. This grade can appear on fodder analysis reports and on the Vendor Declaration Forms.

These national hay grades relate to the quality of hay and silage and hence livestock performance. Table 1 shows the AFIA grades for cereal hay and silage.

Table 1: AFIA grades for cereal hay and silage.

DMD %	ME	Crude Protein %			
	MJ/kg	>10	8-10	4-7	<4
>66	>9.5	A1	A2	A3	A4
60-66	8.7-9.5	B1	B2	B3	B4
53-59	7.4-8.6	C1	C2	C3	C4
<53	<7.4	D1	D2	D3	D4

For more information go to the AFIA website on www.afia.org.au.

RICE HAY & SILAGE:

Questions have been raised about the quality of rice hay and silage of crops cut throughout this rice season. Eight samples of rice, sorghum and millet crops were analysed for feed quality in 2003 and the results are in Table 2.

[1]**Table 2: Feed analysis results for 2003** (Source: Feedtest Service, Victoria 2003)

TYPE	Moisture %	*CP %	**DDM %	#ME (MJ/kg DM)
Rice				
1. Silage	51	6.6	57.2	8.1
2. Silage	79.1	6.5	47.3	6.6
3. Hay	9.9	8.5	58.7	8.4
Sorghum				
4. Silage	85.7	13.5	61.5	8.8
5. Silage	26.9	15.5	66.3	9.6
6. Silage	56.9	6.5	50.2	7.0
Millet				
7. Silage	62.3	11.1	61.6	7.9
8. Silage	68	15.1	57.6	7.6
Oats				
9. Hay	10.4	9.3	64.1	9.2

* CP = Crude Protein (N x 6.25) ** DDM = Digestible Dry Matter # ME = Metabolizable Energy

The results show some large variations in quality between samples but also indicate that some of the hay and silage samples were insufficient for use as even maintenance feed for livestock, *(see further in this article for livestock maintenance requirements).*

The variations in quality between samples is related to the stage of crop growth at the time of cutting as well as the amount of weeds present in the sample. Table 3 shows a comparison on feed analysis of rice crops cut at various growth stages in 1994.

Table 3: Feed analysis of rice hay (Source: Feedtest Service, Victoria 1994)

Stage Cut	DM %	CP %	DDM %	ME (MJ/kg DM)
* Late vegetative	79.3	9.4	54	8.2
** Mid Bloom	71.0	6.25	50	7.5

** = average of 8 samples; ** = average of 5 samples*

As with all crops or pastures, the later a rice crop is cut the lower will be the quality of the silage or hay produced. Conversely, the later a rice crop is cut the higher the dry matter weight, with the highest dry matter at head filling.

What about the silicon content?

The silicon content of rice is still an unknown factor at different cutting times. It is also an unknown in how it will affect palatability. The amount of silica is greater in stems than leaves. If cut in the late vegetative stage it may be acceptable. Cutting too far into flowering may effect palatability as well as reducing quality and therefore may be too abrasive for sheep.

RICE STRAW:

Approximately 1 million tonnes of rice straw is produced in NSW each year (every tonne of grain produces a tonne of straw). Rice straw is of low quality, although quality can vary considerably, and low protein and often provides insufficient energy for livestock maintenance.

Stock Requirements

Dry adult stock require feed with approximately 55% digestibility, 7 MJ/kg energy and protein levels of 6-7% for maintenance.

To improve the energy and protein levels of rice stubble/silage an addition of grain would be required, the quantity of grain being determined by the energy requirement of the stock being fed. Likewise to enhance the level of crude protein the addition of a good quality legume hay or legume grain would be necessary.

[1] **Feed Analysis Definitions**

Crude Protein (CP) is the protein content of feed expressed on a dry matter basis and equals the percentage of nitrogen multiplied by 6.25.

Metabolizable Energy (ME) is used to express the energy content of livestock feed. It is a measure of the energy available to an animal, after accounting for energy losses in faeces, urine and methane.

Digestible Dry Matter (DDM) is the amount of feed digested by the animal. The higher the DDM, the more nutrients the animal has been able to extract from the feed. If the DDM value is too low, the animal will not be able to meet its nutritional needs.

There are some very good publications on the NSW Agriculture website www.agric.nsw.gov.au dealing with cattle and sheep nutrition that will assist in developing suitable rations for various classes of stock.

Analysis of Rice Straw

The only role for untreated rice straw in animal feeding is as a source of roughage (Table 4).

Table 4: A typical composition of rice straw

	Average Value	Range	**2003 Feed Analysis Results	
Protein	4.1%	2.2-9.0	2.0	2.5
Digestibility	42%	30-55	49.3	46.4
Energy (MJ/kg DM)	5.1	3.1-7.5	6.9	6.4
Moisture	< 10%	-	11.3	11.1
Minerals*	15%	-	-	-

* Low Sulphur, Phosphorus & often Sodium
** Feedtest Service, Hamilton Victoria (2003)

Based on the average values and the 2003 results, dry rice straw therefore needs to be boosted significantly in energy and protein for animal maintenance.

Back in 1994, NSW experienced drought conditions similar to 2002/2003, and crops were cut for hay or silage and rice straw was utilised after harvest.

Samples from a number of these crops were analysed for feed quality through NSW Agriculture's Feed Testing Service and the Feedtest Service in Hamilton, Victoria. Typical values are shown in Table 5.

Table 5: Feed quality results of rice straw & silage

	* Rice Straw Dry	** Rice Silage *(Amaroo)* not treated with ammonia gas	** Rice Silage *(Amaroo)* treated with ammonia gas
Protein	3%	3.1%	9.7%
Digestibility	43%	46.4%	55.2%
Energy	5.5 MJ/kg	5.9 MJ/kg	7.4 MJ/kg
Moisture	<10%	62.2%	50.6%

Source: * NSW Agriculture's Feed Test Service (1994)
** Feedtest Service, Hamilton Victoria (1994)

How does rice straw compare?

Table 6 compares the feed value of rice straw with other low protein/dry roughage feed sources.

Table 6: Typical quality of alternate low protein/dry roughage feed sources

	Average feed quality results			
	*Wheat Straw	*Oat Straw	*Barley Straw	** Rice Straw
Protein	2.1%	4.1%	2.0%	**3.0%**
Digestibility	40.6%	47.1%	45.7%	**43%**
Energy (MJ/kg DM)	5.5	6.5	6.3	**5.5**

* Feedtest Service, Hamilton Victoria (2002)
** NSW Agriculture's Feed Test Service (1994)

Treating Rice Straw

The goal with conserving rice straw is to maintain moisture levels above 50%, as moisture is required to help the process of breaking down the cell walls. It is therefore best to bale and wrap rice straw within 24 hours of the grain being harvested, as this makes it more palatable to stock than dry hay.

Quality of rice straw can be improved by various methods. The initial quality of rice straw varies, and this initial quality will determine how good the feed value is even after treatment.

How?

The most practical method of treating rice straw is to use urea or anhydrous ammonia. In this process the straw is harvested green and either wrapped in plastic or ensiled in a pit. Nitrogen is then added in the form of urea or anhydrous gas.

With wrapped round bales urea can be added by dissolving in water (approximately 40 litres) and injecting into the bale with a probe, or alternatively anhydrous ammonia can be injected into the bale using a spear or probe. In the case of silage pits or bunkers urea can be added by broadcasting in layers during the rolling process.

CAUTION: *Urea can be toxic to stock if feed at a high rate, for example sheep should receive a maximum of 3g of urea per 10kg live weight.*

How much N is required?
If using urea, 4% of urea is required per dry matter weight of bale

eg: 500 kg bale (wet weight) @ 50% moisture
= 250 kg dry matter
250 kg dry matter x 4%
= 10 kg of urea needed

If using anhydrous ammonia, 3% of anhydrous ammonia is required per dry matter weight of bale

eg: 250 kg dry matter x 3% anhydrous ammonia
= 7.5 kg of anhydrous ammonia

By treating rice straw with nitrogen, protein can be increased on average by 5-6% and digestibility by 2-10%. If better quality rice straw is used the higher end of the ranges apply.

For example if green leafy stubble on fertile country is used, treating the straw can lift feed values close to maintenance levels for dry stock. On the other hand if lower quality rice straw is used, protein and energy levels will be increased but not to levels required for maintenance.

In any case, when using rice straw, further supplements will be required for livestock production.

RESIDUE RISKS:

In drought conditions you need to consider the potential for residues in any feed given to stock as a range of factors can lead to a higher risk of chemical residues in livestock. If these dry conditions continue rice straw could be the main or only source of roughage in the diet and could be a potential residue risk.

Australian maximum residue limits (MRL's) have been established in cattle for most of the pesticides used in rice crops and under normal conditions cattle grazing on rice stubble are unlikely to exceed these MRL's.

In purchasing feed there is a Commodity Vendor Declaration (CVD) which allows the buyer to identify chemical residue risks that may arise from a variety of sources. National Vendor Declarations (NVD's) for sheep and cattle also have specific questions about the chemical treatments of any crop, pasture, stubble grain or fodder consumed by livestock within 60 days prior to sale.

SUMMARY:

Rice straw is a low quality roughage of limited feed value, which often needs to have its protein and digestibility increased in to be a useful feed.

Baling high moisture rice straw directly behind the header, wrapping and then treating it with anhydrous ammonia or urea, may be able to sustain cattle in a dry period. Where production is required good quality hay or silage and a high energy grain is required in addition.

Conserving rice straw as a stockfeed needs careful economic consideration. The costs of treated rice straw needs to be compared with the cost and quality of other available feeds. In a dry year it may be a viable option, but in a good season the economics may not be there.

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