EVALUATION OF AZOLLA PLANT AS AN ALTERNATIVE STOCKFEED SOURCE

DATE: 13TH DECEMBER 2007
PREPARED FOR: GOULBURN BROKEN CATCHMENT AUTHORITY

Report compiled by:

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EVALUATION OF AZOLLA PLANT AS AN ALTERNATIVE STOCKFEED.

EXECUTIVE SUMMARY

- Azolla Plant rated against alternative stockfeed options. In terms of nutritive value, Azolla contained 9MJME, 18% Crude Protein, 46% NDF, allowing the plant to fall into the "forage category" of feedstuffs and therefore comparable to silage and hay samples. The products dry matter content is a negative attribute.

- Azolla Plant tested clear for Organophosphates and Organochlorides

- Azolla Plant tested clear of Mycotoxin activity as a fresh sample and 1 week old.

- Shelf life of Azolla is largely dependent upon ambient temperature at storage, the level of free water present during storage, the presence of Azolla compost and finally, the presence of fresh water shrimp. If the plant is free of shrimp and compost, it requires a 2 day shelf life during summer months and extends to a possible 7 day shelf life thereafter.

- Azolla Feed contains Aquatic fresh water shrimp that reside in the floating plant structure. "Australia currently has an inclusive ban on the feeding to all ruminants of all meals, including meat and bone meal derived from all vertebrates, including fish and birds". **Under the current Australian Ruminant Feed Ban, while Azolla Feed contains traces of Aquatic life, Azolla Feed cannot be fed to Ruminants of any class.**

- On the basis of this finding, it is suggested that composting and fertilizer avenue streams be investigated. Does the product serve as an ideal media for the Mushroom Industry?????

BACK GROUND

Azolla (*Azolla filiculoides*), locally known as duck weed, is a small aquatic plant/fern which grows in abundance throughout the lower reaches of the Broken Creek system.

The harvest and subsequent removal of Azolla from the catchment is the current method employed to clear the waterways of the flourishing plant population. With tonnages harvested in excess of 20 cubic meters per hour, a considerable amount of the plant is removed from the system on an annual basis. This has promted the urgent investigation to assess the nutritive value of Azolla and possible clearance of the product as a stockfeed alternative, thus removing the issues and cost associated with treatment of such a waste stream.

TEST PERFORMED

In order to assess the viability of Azolla for use as an alternative feed source, several "standard" tests were performed. Two specific 'types' of Azolla were tested, classified purely upon colour of plant material, both commonly harvested from the Broken creek. Azolla 'Pink' and Azolla 'Green' (figure 1 & 2 respectively).

Figure 1: Azolla Pink

Figure 2: Azolla Green

The standard tests performed were:

- Standard nutritive analysis including values for Dry Matter(DM), Energy (Metabolisable Energy, MJME), Crude Protein (%), Fibre (Neutral Detergent Fibre NDF) , Sugars and a host of minerals

- Chemical testing of the samples was undertaken to determine the levels of Organophosphates and Organochlorides present.

- Mycotoxins in feeds (moulds, toxins, spores, fungi) have a negative impact on a variety of animal health issues. A mixed sample of the two Azolla types was therefore screened for Mycotoxin levels.

In situations were Azolla plant density is high, mature Azolla plants will begin to decompose, resulting in a third sample, known as “Azolla compost” (figure 3). This sample was also sent away for Mycotoxin screening.

Figure 3: Azolla Compost

The original Azolla ‘Green’ and ‘Pink’ samples were then monitored for seven days to assay the expected shelf life of the product. A final Mycotoxin sample was sent for testing to investigate if extending shelf life had a promoting effect on Mycotoxin activity.

LABORATORY RESULTS

Nutritional Analysis

Nutritive analysis was contracted through George Weston Foods services, where standard testing for all common feedstuffs and by- product or alternative stock feeds are tested. On a dry matter basis the particular’s that affect the sale ability of such an alternative feed are listed in table one. (Full reports shown in appendix 1). An Explanation of abbreviations is also shown in appendix 2.

Product	DM%	CP%	MJME	NDF%	Fat%	Starch%	Sugar%	Ca	P	K
A.Green	5.3	19	9.2	46.2	4.8	2.7	0.3	1.4	0.03	1.68
A. Pink	6.15	17.8	8.8	46.4	5.0	5.5	0.3	1.6	0.18	1.81

Table one: Nutritive results for Azolla samples

The results above show the two Azolla samples testing similar in terms of all major nutritive specifications and therefore will be referred to from this point onwards as simply just ‘Azolla Feed’.

Without going into the specific nutritive requirements of cattle, the energy, protein and fibre levels of Azolla do rate against other common stockfeeds. Table two compares Azolla Feed to common feedstuffs.

Product name	Dry Matter DM%	Metabolisable Energy MJME	Crude Protein CP%	Neutral Detergent Fibre NDF%
Azolla Feed	5.7	9.0	18.4	46
Quality Pasture	15	11.0	22	39
Summer Pasture	20	10.5	17	44
Lucerne Hay	88	10.0	23	44
Wheat Grain	90	12.7	12	12
Canola Meal	90	12.0	38	20

Table two: Comparison of Azolla Feed to common stockfeeds

From the above, perhaps the largest problem that marketing of Azolla Feed has to deal with, is the products low dry matter content. Cartage of 6% dry matter product is expensive. (94% water! Stockfeeds are purchased based on the dry matter content)

Chemical Residue Testing

Azolla samples were tested for an array of Organo Phosphates and Chlorides (posted in appendix 3). As at the time of sampling, all tests were clear and well within the permissible levels for domestic stockfeed requirements. These Chemical residue results can be compared to the Maximum Residue Limits in food and animal feedstuffs MRL table in Appendix 4.

It should be noted, that Organo chemical testing, provides a “true” test for the water quality within the Broken Catchment itself and therefore plant sample analysis is directly dependent upon good water quality.

Mycotoxin screening

Fresh Azolla Feed samples, 1 week old Azolla Feed and surprisingly Azolla compost samples were clear of mycotoxin activity, primarily, Aflatoxins.

All samples tested lower levels than 0.1ppb, when positive results test from 5 to 20ppb. At these levels, the samples tested were clear and free of contamination from Aflatoxins (Also sited in appendix 3)

Physical Appearance and Shelf Life

Azolla, being an aquatic plant, appeared to be palatable with negligible odour. The plant itself comprises of leaf and root matter and therefore physically, a soft plant that could be fed to ruminant stock.

Composting Azolla, as the name suggests, was far less palatable, with a notable odur and certainly less attractive to the eye (particularly if expected to purchase the feed). The shelf life of the product was therefore determined by the inclusion level of the composted product.

Collection and storage of the plant in bulk will also alter its expected shelf life. If Azolla is harvested and held in tip bins and allowed to sit in water, this will stimulate immediate breakdown. Clean Azolla feed samples appear to have an approximate shelf life of seven days, by which time it is highly recommended that the product be fed.

It should be noted that the observation of shelf life was conducted between the 1st October 2007 and 10th October 2007, well before the on set of summer and subsequent heat (Ambient temperature approx. 20 degrees) and fly infestation. It is recommended that there will be a reduction in the expected shelf life over summer months. Fly populations may find the higher protein content of moist Azolla Feed an ideal environment for larvae.

Cold, fresh Azolla Feed is the preferable stage to be fed; therefore it is recommended that the product be consumed within two to four days post delivery to farm.

Foreign materials

The harvesting of Azolla has some negative implications for the shelf life and salability of Azolla Feed.

Figure 4: Mechanical harvesting of Azolla Feed

The fact that Azolla plant floats on the waters surface makes it an easier task to harvest however, floating foreign materials such as timber, sticks, Bark and other floating objects (rubbish) are common and were present within the 15kg sample provided for this study. (Figure 5)

Aquatic stream life is perhaps the largest major implication found throughout the whole investigation. Fresh water shrimp appear to thrive or reside within the root system of the plant and are therefore harvested and become part of the Azolla sample itself (figure6).

Figure 5: Foreign materials harvested

Figure 6: Fresh water shrimp

Fresh water shrimp pose a two fold problem:

Firstly, in terms of product Shelf life, decomposing shrimp will increase plant decomposition, reduce palatability to stock and provide media for Mycotoxin growth, not mention a meat feed source for the fly populations during summer heat. This would further restrict the feeding of Azolla feed to daily use during summer months to ensure it is fed prior to rotting.

Secondly, and more importantly, Animal Health Australia outlines the law on Restricted Animal Material (RAM) and the current Australian Ruminant Feed Ban which is an "inclusive ban on the feeding to all ruminants of all meals, including meat and bone meal derived from all vertebrates, including fish and birds". This legislation extends to ruminants of all classes. (Appendix 5)

Therefore, while fresh water shrimp are present in the sample, Azolla Feed cannot under current law be allowed to be fed to Ruminant stock.

STORAGE AND HANDLING OF AZOLLA FEED

If the laws were amended in the coming period, and you could commence feeding Azolla, the suggestion for Azolla feed is to store the product in overhead "hopper" storage that allows excess water to drain from the product from time of harvest, until pick up and subsequent cartage. The suggestion has many positives improving logistics.

- Firstly, you no longer require expensive trailers or trucks to be left on site. One truck could be used to clear all Azolla harvest sites for a majority of the year, except for periods of peak growth. This will ensure that there is a 'full load' of product daily, making it a more attractive proposition as a stockfeed.

- Secondly, simply draining the product will enhance Azolla Feed quality, making it as dry as possible and limiting the time sitting in water, detrimental to product shelf life.

- Finally, cartage of a drier product attracts less attention from Vicroads officers chasing trucks that leak effluent on road ways.

Figure 7: Large scale hopper storage facility

These photos depict an extensive overhead hopper structure used by the citrus squeeze industry. Obviously, you would not need 60 tonne hoppers like this, but it shows you the type of structure discussed. You will see a smaller version used by SPC in Shepparton.

On farm storage of Azolla Feed, will vary from direct feeding to paddock for dry stock, through to delivery to specialized on farm mixing areas such as the one shown in figure 8. Here, concrete floored bunkers are used to hold wet stockfeeds (citrus pulp and brewers grains) with minimal loss, further enhancing product shelf life and environmentally friendly (From a public perspective). There are a number of dairy farms scattered along the broken catchment with mixing facilities similar to this.


Figure 8: Desirable on farm storage concrete bunkers

Once delivered to farm, dairy farms with bunker storage systems then also have machinery like the mixing wagon depicted in figure 9, whereby a multiple number of ingredients, including Azolla Feed could be mixed and fed to stock on feed pads.

Figure 9: On farm mixer wagon to blend Azolla Feed with other ration ingredients

Feeding cows a mixed ration of a multiple ingredient list (figure 10), potentially containing Azolla Feed. If Azolla Feed can be mixed and complemented with concentrates and other forages, it could be fed with minimal detection by stock. In this circumstance, up to 3kg dry matter could be fed or up to 15% of intake for the average Goulburn Valley cow. (Producing 6000 Litres on 19kgDMI)

Figure 10: Cows eating a total mixed ration

COSTING OF AZOLLA FEED IN THE MARKET PLACE.

The biggest implication that Azolla Feed has as an attractive stockfeed option, is the issue of Dry Matter. All stockfeed products are negotiated in terms of the feeds cost on a dry matter basis. For example, wheat is purchased as an energy source and it is approx 90% dry and still contains 10% water or moisture. If the product was purchased for $350/tonne delivered, this would equate to $350/0.9=$388/TDM. Wheat contains 12.7MJME per kg DM, so the unit cost per MJME of energy is therefore: $388/10/12.7=3 cents per unit energy. Table 3 compares Azolla Feed to other products on an energy basis.

FEED	$/WetTonne	D M %	$/Dry Tonne	MJME	COST/MJME
WHEAT	$390	90	$433	12.7	3.4
MOLASSES	$240	80	$300	13	2.3
LUCERNE	$400	87	$459	10	4.6
CITRUS PULP	$47	18	$261	12.5	2.1
AZOLLA FEED	$12	6	$200	9	2.2

Table 3: Costing of Azolla Feed on an energy basis.

In the current climate, Azolla Feed in the local energy market would trade at a maximum of $12 per wet tonne. This estimate is based on good, clean samples with low free water content.

It should be noted that these feed prices are current “Inflated drought” prices for other commodities and therefore in normal season’s the price that could be paid for Azolla Feed would be much less, possibly requiring freight subsidy to accept the product.

Appendix 1

WESTON TECHNOLOGIES

1 Braidwood Street
Enfield NSW 2136

Sampled	Recvd	Printed	ST CO
	03/10/2007	5/10/07	
7813-002 AZOLA PINK			

Sample Description	Ref No
7813-002 AZOLA PINK	11648360

Analysis Results

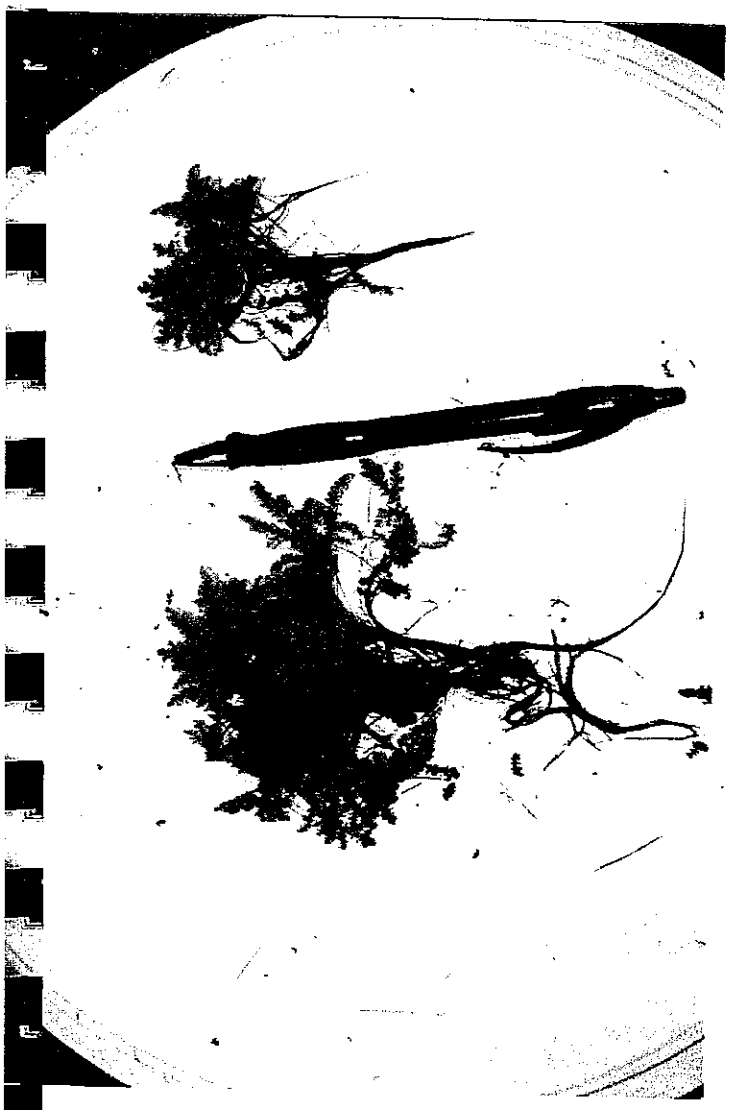
Components	As Fed	DM
% Dry Matter	6.15	
% Neutral Detergent Fiber	2.85	46.4
% Crude Protein	1.09	17.8
Soluble Protein % CP	22.00	22
ADICP % CP	27.20	27.2
% Crude Fat	0.31	5.0
% Ash	1.12	18.15
Lignin % NDF	22.50	22.5
NDICP % CP	49.80	49.8
% Calcium	0.10	1.59
% Phosphorus	0.01	0.18
% Magnesium	0.02	0.39
% Potassium	0.11	1.81
% Sulfur	0.01	0.12
% Chloride Ion	0.03	0.52
DCAD (meq/ kg DM)		
% Acid Detergent Fiber	2.39	38.9
% ADICP	0.30	4.8
% NDICP	0.55	8.9
% Lignin	0.64	10.4
% NFC	1.32	21.5
% NSC		
% TDN	2.95	48
NEL, (MJ/kg)	0.28	4.56
NEM, (MJ/kg)	0.23	3.68
NEG, (MJ/kg)	0.09	1.42
Relative Feed Value	118.00	118
ME, (MJ/kg)	0.54	8.8
% Moisture	93.85	
% Available Protein	0.80	13
% Adjusted Crude Protein	0.86	14
Degradable Protein % CP	26.00	26
% Starch	0.34	5.5
% Water Soluble Carbs.	0.02	0.3
% Lysine	0.05	0.74
% Methionine	0.01	0.24
NDFD 24hr % of NDF	1.75	1.75
% IVTD 24hr		

Appendix 1

WESTON TECHNOLOGIES

1 Braidwood Street
Enfield NSW 2136

Sampled	Recvd	Printed	ST CO
	03/10/2007	5/10/07	
7813-001 AZOLA GREEN			



Sample Description	Ref No
7813-001 AZOLA GREEN	11648350

Analysis Results

Components	As Fed	DM
% Dry Matter	5.30	
% Neutral Detergent Fiber	2.45	46.2
% Crude Protein	1.01	19
Soluble Protein % CP	12.00	12
ADICP % CP	25.50	25.5
% Crude Fat	0.25	4.8
% Ash	0.96	18.15
Lignin % NDF	24.20	24.2
NDICP % CP	51.30	51.3
% Calcium	0.07	1.4
% Phosphorus	0.00	0.03
% Magnesium	0.02	0.45
% Potassium	0.09	1.68
% Sulfur	0.01	0.15
% Chloride Ion	0.04	0.75
DCAD (meq/ kg DM)		
% Acid Detergent Fiber	1.92	36.3
% ADICP	0.26	4.9
% NDICP	0.52	9.8
% Lignin	0.59	11.2
% NFC	1.14	21.6
% NSC		
% TDN	2.49	47
NEL, (MJ/kg)	0.24	4.52
NEM, (MJ/kg)	0.19	3.60
NEG, (MJ/kg)	0.07	1.34
Relative Feed Value	122.00	122
ME, (MJ/kg)	0.49	9.2
% Moisture	94.70	
% Available Protein	0.75	14.2
% Adjusted Crude Protein	0.81	15.2
Degradable Protein % CP	22.00	22
% Starch	0.14	2.7
% Water Soluble Carbs.	0.02	0.3
% Lysine	0.04	0.79
% Methionine	0.01	0.25
NDFD 24hr % of NDF	1.75	1.75
% IVTD 24hr		

Appendix 1

GEORGE WESTON
TECHNOLOGIES
A Unit of George Weston Foods Limited
A.B.N. 45 008 429 632
1 Braidwood Street Enfield
N.S.W. 2136 Australia
P.O. Box 1 Enfield NSW 2136
Phone : 61-2-9764 8222

Analytical Report

Customer: Maxi Cow Consulting
Address: 14 O'Hagan Place
Bacchus Marsh VIC 3340
Australia
Attention: Daniel Huggins
Fax: 03 5367 2187
Phone:

Report Number : 19561
Issue Date: 16/10/2007
Order No :
Date Received : 03/10/2007

Project Number:	**E07/007813**	
Sample Number	E07/007813-001	E07/007813-002
Client Reference	1	2
Description	Azola Green	Azola Pink
Sulphur (DM) (LTM188)	3730 mg/kg	4460 mg/kg
Zinc (DM) (LTM188)	10.6 mg/kg	17.8 mg/kg

Authorised By :

Douglas Sutherland

Douglas Sutherland
Chemist – Chemistry Laboratory

Sample(s) tested as received. Result(s) reported only apply to sample(s) as listed. Laboratory is not responsible for sampling.

Appendix 1

GEORGE WESTON
TECHNOLOGIES
A Unit of George Weston Foods Limited
A.B.N. 45 008 429 632
1 Braidwood Street Enfield
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Phone : 61-2-9764 8222

Analytical Report

Customer: Maxi Cow Consulting
Address: 14 O'Hagan Place
Bacchus Marsh VIC 3340
Australia
Attention: Daniel Huggins
Fax: 03 5367 2187
Phone:

Report Number : 19561
Issue Date: 16/10/2007
Order No :
Date Received : 03/10/2007

Project Number:	**E07/007813**	
Sample Number	E07/007813-001	E07/007813-002
Client Reference	1	2
Description	Azola Green	Azola Pink
NIRD1	see attached	see attached
Cadmium (DM) (LTM188)	< 0.5 (LOQ) mg/kg	< 0.5 (LOQ) mg/kg
Calcium (DM) (LTM188)	6050 mg/kg	4340 mg/kg
Copper (DM) (LTM188)	11.4 mg/kg	9.66 mg/kg
Iron (DM) (LTM188)	7870 mg/kg	8200 mg/kg
Magnesium (DM) (LTM188)	3360 mg/kg	3330 mg/kg
Manganese (DM) (LTM188)	769 mg/kg	634 mg/kg
Molybdenum (DM) (LTM188)	3.37 mg/kg	1.54 mg/kg
Phosphorus (DM) (LTM188)	1290 mg/kg	1700 mg/kg
Potassium (DM) (LTM188)	31100 mg/kg	33100 mg/kg
Sodium (DM) (LTM188)	10300 mg/kg	10500 mg/kg

Authorised By :

Douglas Sutherland

Douglas Sutherland
Chemist - Chemistry Laboratory

Sample(s) tested as received. Result(s) reported only apply to sample(s) as listed. Laboratory is not responsible for sampling.

Appendix 2

INDICATORS OF FEED QUALITY

The balance of the indicators listed below will determine the quality of feed for dairying. If analysis shows values outside the normal ranges it might be advisable to supplement. Note that indicators apply to the whole diet consumed.

CRUDE PROTEIN (CP) (% DM)

A minimum of 15 % is required to maintain milk production in lactating cows. Growth can be achieved with 10-14 % CP, with better results at the high end of the range.
Maintenance requirement is about 7 % CP, so values lower than 7 % will cause a CP deficiency. Note that maize silage normally has a low CP %, barely enough to provide maintenance requirement, so it should be regarded predominantly as an energy supplement.

SOLUBLE SUGARS AND STARCH (% DM)

SSS supplies the rumen microbes with energy for their synthetic activities. The normal range for pasture is 10-15 %. If SSS is less than 10 % rumen microbial fermentation is likely to be reduced with negative effects on digestion. Maize silage should be in the range 30-40 % SSS. The normal range for Pasture silage is 2-7 % SSS.

FIBRE (Acid detergent [ADF] and neutral detergent [NDF] fibres) (% DM)

ADF and NDF are both measures of difficult-to-digest plant cell wall carbohydrates. Generally the lower the fibre the better, but not below 20 % ADF or 30 % NDF, because some fibre is needed to stimulate rumen activity. Normal ranges are:

	ADF	NDF
Good quality	20-35	30-45
Average quality	35-50	45-70
Poor quality	>50	>70

FAT (CRUDE FAT [Lipid])(% DM)

The normal range in pasture based diets is 2.5-4.5 %. Too much fat (>7 %) can interfere with fibre digestion and cause diarrhoea.

ELEMENTS (% DM)

The following concentrations of major elements should meet animal requirements. Lower values are likely to limit animal performance.

Na	0.12	Ca	0.44
K*	0.58	P	0.32
Mg	0.19	S	0.18

*K concentrations >5 % are undesirable and would reduce Mg availability, leading to a need to supplement with Mg.

IN VITRO ORGANIC MATTER DIGESTIBILITY (OMD) (% DM)

OMD estimates the total nutrients apparently digested by the animal. It is measured in the laboratory (in vitro) and calibrated against animal measurements (in vivo). Normal ranges are:

Poor quality	<55
Average quality	55-70
Good quality	>70

NB Instrument calibration is based on actual feeding trials of a sample feed source. Maize silage cannot be used as a sole feed source; as such we are unable to provide a result for In vitro organic matter Digestibility.

METABOLISABLE ENERGY (ME) (MJ/kg DM)

ME is a measure of the energy that is available to the animal for maintenance, growth and milk and wool production. ME is calculated using a well-established equation. Normal ranges are:

Poor quality	<8
Average quality	8-10
Good quality	10-12
Excellent quality	>12

SILAGES (Additional quality indicators)

Silage is a fermentation product and the chemical composition will reflect this. Some RFC is converted to organic acids (especially lactic) that preserve the silage and some protein is degraded to ammonia. The following indicators are used, in addition to those given above to assess silage quality.

pH. Well fermented pasture and maize silages made in a pit or stack should have a pH <4.5 and legume based silages should be <5. Wrapped silages are usually of a higher DM % and their pH should be <5. Values higher than these indicate a poor primary fermentation or subsequent spoilage.

Ammonia (NH_3-N) (% total N). NH_3-N concentration reflects the degree to which dietary protein has been degraded during silage fermentation. NH_3-N should be less than 5 % for maize silages and < 10 % for pasture silages. Values higher than these indicate excessive wastage and probably loss of quality.

Lactic acid (% DM). A high lactic acid content is desirable: >6-8 % for wet silages (>65 % moisture) and > 3-4 % for wilted silages (<55 % moisture). Lower values indicate poor quality.

Volatile fatty acids (% DM). Acetic acid should be <2 %, propionic acid <1 % and butyric acid <0.1 %. If concentrations are higher than these values poor fermentation or spoilage is indicated.

Information kindly supplied by FeedTECH, AgResearch Nutrition & Behaviour

Appendix 3 3.

Agrifood TECHNOLOGY

Your link with quality

ANALYSIS REPORT

Maxi Cow Consulting
14 O'Hagan Place
BACCHUS MARSH VIC 3340

ATTENTION Daniel Huggins
FAX NUMBER 03 5367 2186

PURCHASE ORDER
PROJECT NUMBER J0710-0040

DATE RECEIVED 03 October 2007
OUR SAMPLE NUMBER S2007-07876
YOUR REFERENCE Azolla Green
SAMPLE TYPE Plant

TEST	Result
Aflatoxin - HPLC (TP/055)	
Aflatoxin B1 (ppb)	<1.0
Aflatoxin B2 (ppb)	<1.0
Aflatoxin G1 (ppb)	<1.0
Aflatoxin G2 (ppb)	<1.0
Total Aflatoxin (ppb)	<1.0
Organochlorine Extended Screen (TP/057)	
Aldrin (mg/kg)	<0.0050
Alpha BHC (mg/kg)	<0.0050
alpha Endosulphan (mg/kg)	<0.010
Beta BHC (mg/kg)	<0.0050
beta Endosulphan (mg/kg)	<0.010
Captan (mg/kg)	<0.10
Cis Chlordane (mg/kg)	<0.0050
Delta BHC (mg/kg)	<0.005
Dicofol (mg/kg)	<0.02
Dieldrin (mg/kg)	<0.0050
Endosulphan Sulphate (mg/kg)	<0.010
Endrin (mg/kg)	<0.005
HCB (mg/kg)	<0.0050
Heptachlor (mg/kg)	<0.0050
Heptachlor Epoxide (mg/kg)	<0.0050
Lindane (mg/kg)	<0.0050
op DDE (mg/kg)	<0.010
op DDT (mg/kg)	<0.010
Oxychlordane (mg/kg)	<0.0050
pp DDD (mg/kg)	<0.010
pp DDE (mg/kg)	<0.010
pp DDT (mg/kg)	<0.010
Procymidone (mg/kg)	<0.10
Total BHC (mg/kg)	<0.0050
Total Chlordane (mg/kg)	<0.0050
Total DDT (mg/kg)	<0.010
Total Endosulphan (mg/kg)	<0.010
Trans Chlordane (mg/kg)	<0.0050
Organophosphate Extended (TP/092)	
Acephate (mg/kg)	<0.10
Azinphos methyl (mg/kg)	<0.05
Bromophos ethyl (mg/kg)	<0.10
Carbfenthion (mg/kg)	<0.10
Chlorfenvinphos (mg/kg)	<0.050

Report Number: 13509
Issued: 10 Oct 2007

Agrifood Technology Pty Ltd ABN 52 085 032 104
260 Princes Highway, PO Box 728, Werribee Victoria 3030
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Ap. 3

Agrifood TECHNOLOGY

Your link with quality

ANALYSIS REPORT

Maxi Cow Consulting
14 O'Hagan Place
BACCHUS MARSH VIC 3340

Azolla Green.

ATTENTION Daniel Huggins
FAX NUMBER 03 5367 2186

PURCHASE ORDER
PROJECT NUMBER J0710-0040

Chlorpyrifos (mg/kg)	<0.10
Chlorpyrifos methyl (mg/kg)	<0.10
Demeton-s-methyl (mg/kg)	<0.10
Diazinon (mg/kg)	<0.050
Dichlorfenthion (mg/kg)	<0.10
Dichlorvos (mg/kg)	<0.10
Dimethoate (mg/kg)	<0.050
Disulfuton (mg/kg)	<0.020
Edifenphos (mg/kg)	<0.10
EPN (mg/kg)	<0.10
Ethion (mg/kg)	<0.10
Ethoprophos (mg/kg)	<0.0050
Etrimfos (mg/kg)	<0.10
Fenamiphos (mg/kg)	<0.10
Fenitrothion (mg/kg)	<0.10
Fenthion (mg/kg)	<0.10
Isofenphos (mg/kg)	<0.10
Malathion (mg/kg)	<0.10
Methacrifos (mg/kg)	<0.10
Methamidiphos (mg/kg)	<0.10
Methidathion (mg/kg)	<0.010
Mevinphos (mg/kg)	<0.10
Monocrotophos (mg/kg)	<0.10
Omethoate (mg/kg)	<0.050
Parathion (mg/kg)	<0.10
Parathion methyl (mg/kg)	<0.10
Phenchlorphos (mg/kg)	<0.10
Phenthoate (mg/kg)	<0.10
Phorate (mg/kg)	<0.020
Phosalone (mg/kg)	<0.10
Phosmet (mg/kg)	<0.05
Phosphamidon (mg/kg)	<0.10
Pirimiphos ethyl (mg/kg)	<0.10
Pirimiphos methyl (mg/kg)	<0.10
Profenophos (mg/kg)	<0.10
Prothiophos (mg/kg)	<0.10
Pyrazophos (mg/kg)	<0.1
Terbufos (mg/kg)	<0.0050
Thiometon (mg/kg)	<0.010
Tolclofos methyl (mg/kg)	<0.020
Triazophos (mg/kg)	<0.1
Trichlorfon (Dep) (mg/kg)	<0.010
Vamidothion (mg/kg)	<0.10

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ANALYSIS REPORT

Maxi Cow Consulting
14 O'Hagan Place
BACCHUS MARSH VIC 3340

Azolla Green.

ATTENTION Daniel Huggins
FAX NUMBER 03 5367 2186

PURCHASE ORDER
PROJECT NUMBER J0710-0040

Note **All samples are analysed on an as received basis.**
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TP refers to the technical procedure used to conduct the analysis.

Final Report

Report Number: 13509

Doreen Fernandez

Doreen Fernandez
Manager Laboratory Operations

10 October 2007

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ANALYSIS REPORT

Maxi Cow Consulting
14 O'Hagan Place
BACCHUS MARSH VIC 3340

ATTENTION Daniel Huggins
FAX NUMBER 03 5367 2186

PURCHASE ORDER
PROJECT NUMBER J0710-0040

DATE RECEIVED 03 October 2007
OUR SAMPLE NUMBER S2007-07877
YOUR REFERENCE Azolla Pink
SAMPLE TYPE Plant

TEST	Result
Aflatoxin - HPLC (TP/055)	
Aflatoxin B1 (ppb)	<1.0
Aflatoxin B2 (ppb)	<1.0
Aflatoxin G1 (ppb)	<1.0
Aflatoxin G2 (ppb)	<1.0
Total Aflatoxin (ppb)	<1.0
Organochlorine Extended Screen (TP/057)	
Aldrin (mg/kg)	<0.0050
Alpha BHC (mg/kg)	<0.0050
alpha Endosulphan (mg/kg)	<0.010
Beta BHC (mg/kg)	<0.0050
beta Endosulphan (mg/kg)	<0.010
Captan (mg/kg)	<0.10
Cis Chlordane (mg/kg)	<0.0050
Delta BHC (mg/kg)	<0.005
Dicofol (mg/kg)	<0.02
Dieldrin (mg/kg)	<0.0050
Endosulphan Sulphate (mg/kg)	<0.010
Endrin (mg/kg)	<0.005
HCB (mg/kg)	<0.0050
Heptachlor (mg/kg)	<0.0050
Heptachlor Epoxide (mg/kg)	<0.0050
Lindane (mg/kg)	<0.0050
op DDE (mg/kg)	<0.010
op DDT (mg/kg)	<0.010
Oxychlordane (mg/kg)	<0.0050
pp DDD (mg/kg)	<0.010
pp DDE (mg/kg)	<0.010
pp DDT (mg/kg)	<0.010
Procymidone (mg/kg)	<0.10
Total BHC (mg/kg)	<0.0050
Total Chlordane (mg/kg)	<0.0050
Total DDT (mg/kg)	<0.010
Total Endosulphan (mg/kg)	<0.010
Trans Chlordane (mg/kg)	<0.0050
Organophosphate Extended (TP/092)	
Acephate (mg/kg)	<0.10
Azinphos methyl (mg/kg)	<0.05
Bromophos ethyl (mg/kg)	<0.10
Carbfenthion (mg/kg)	<0.10
Chlorfenvinphos (mg/kg)	<0.050
Chlorpyrifos (mg/kg)	<0.10

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BACCHUS MARSH VIC 3340

Azolla pink.

ATTENTION Daniel Huggins
FAX NUMBER 03 5367 2186
PURCHASE ORDER
PROJECT NUMBER J0710-0040

Chlorpyrifos methyl (mg/kg)	<0.10
Demeton-s-methyl (mg/kg)	<0.10
Diazinon (mg/kg)	<0.050
Dichlorfenthion (mg/kg)	<0.10
Dichlorvos (mg/kg)	<0.10
Dimethoate (mg/kg)	<0.050
Disulfuton (mg/kg)	<0.020
Edifenphos (mg/kg)	<0.10
EPN (mg/kg)	<0.10
Ethion (mg/kg)	<0.10
Ethoprophos (mg/kg)	<0.0050
Etrimfos (mg/kg)	<0.10
Fenamiphos (mg/kg)	<0.10
Fenitrothion (mg/kg)	<0.10
Fenthion (mg/kg)	<0.10
Isofenphos (mg/kg)	<0.10
Malathion (mg/kg)	<0.10
Methacrifos (mg/kg)	<0.10
Methamidiphos (mg/kg)	<0.10
Methidathion (mg/kg)	<0.010
Mevinphos (mg/kg)	<0.10
Monocrotophos (mg/kg)	<0.10
Omethoate (mg/kg)	<0.050
Parathion (mg/kg)	<0.10
Parathion methyl (mg/kg)	<0.10
Phenchlorphos (mg/kg)	<0.10
Phenthoate (mg/kg)	<0.10
Phorate (mg/kg)	<0.020
Phosalone (mg/kg)	<0.10
Phosmet (mg/kg)	<0.05
Phosphamidon (mg/kg)	<0.10
Pirimiphos ethyl (mg/kg)	<0.10
Pirimiphos methyl (mg/kg)	<0.10
Profenophos (mg/kg)	<0.10
Prothiophos (mg/kg)	<0.10
Pyrazophos (mg/kg)	<0.1
Terbufos (mg/kg)	<0.0050
Thiometon (mg/kg)	<0.010
Tolclofos methyl (mg/kg)	<0.020
Triazophos (mg/kg)	<0.1
Trichlorfon (Dep) (mg/kg)	<0.010
Vamidothion (mg/kg)	<0.10

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ANALYSIS REPORT

Maxi Cow Consulting
14 O'Hagan Place
BACCHUS MARSH VIC 3340

Azolla pink.

ATTENTION	Daniel Huggins
FAX NUMBER	03 5367 2186
PURCHASE ORDER	
PROJECT NUMBER	J0710-0040

Note All samples are analysed on an as received basis.
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Final Report

Report Number: 13509

Doreen Fernandez

Doreen Fernandez
Manager Laboratory Operations

10 October 2007

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ANALYSIS REPORT

Maxi Cow Consulting
14 O'Hagan Place
BACCHUS MARSH VIC 3340

ATTENTION Daniel Huggins
FAX NUMBER 03 5367 2186

PURCHASE ORDER
PROJECT NUMBER J0710-0040

DATE RECEIVED 03 October 2007
OUR SAMPLE NUMBER S2007-07878
YOUR REFERENCE Azolla Compost
SAMPLE TYPE Plant

TEST	Result
Aflatoxin - HPLC (TP/055)	
Aflatoxin B1 (ppb)	<1.0
Aflatoxin B2 (ppb)	<1.0
Aflatoxin G1 (ppb)	<1.0
Aflatoxin G2 (ppb)	<1.0
Total Aflatoxin (ppb)	<1.0

Note **All samples are analysed on an as received basis.**
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Final Report

Report Number: 13509

Doreen Fernandez
Manager Laboratory Operations

10 October 2007

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ANALYSIS REPORT

Maxi Cow Consulting
14 O'Hagan Place
BACCHUS MARSH VIC 3340

ATTENTION Daniel Huggins
FAX NUMBER 03 5367 2186
PURCHASE ORDER
PROJECT NUMBER J0710-0084

DATE RECEIVED 11 October 2007
OUR SAMPLE NUMBER S2007-08044
YOUR REFERENCE 1 wk old Azolla
SAMPLE TYPE Plant

TEST	Result
Aflatoxin - HPLC (TP/055)	
Aflatoxin B1 (ppb)	<1.0
Aflatoxin B2 (ppb)	<1.0
Aflatoxin G1 (ppb)	<1.0
Aflatoxin G2 (ppb)	<1.0
Total Aflatoxin (ppb)	<1.0

Note **All samples are analysed on an as received basis.**
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Final Report

Report Number: 13551

Doreen Fernandes
Doreen Fernandez
Manager Laboratory Operations
19 October 2007

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Ap 4. Appendix 4.

Australian Government
Australian Pesticides and
Veterinary Medicines Authority

MRL Standard

Maximum residue limits in food and animal feedstuffs

December 2007

Table 4

Maximum residue limits for pesticides in animal feed commodities

Residues of substances may occur in animal feed commodities for which the following maximum residue limits (MRLs) or extraneous residue limits (ERLs) apply. Residues of a substance may arise from approved uses of that or another substance, or from extraneous contamination. Entries in Table 4 are normally expressed on a dry weight basis.

Feed commodities that are also primary human food commodities have not been included in this table and the MRLs for these commodities will also apply as MRLs when they are used as animal feed commodities. Examples of such commodities are the cereal grains, pulses, oil seeds and any other food commodity that is used as a substantial animal feed commodity. The entries in this table should be read in conjunction with the relevant entries in Table 1 when considering the MRLs (or ERLs) applied to animal feed commodities.

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Table 4

Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
AL 0541	Soya bean fodder	*0.01
Aldrin and Dieldrin		
	Primary feed commodities	E0.01
Aminopyralid		
AF 0081	Forage of cereal grains (green)	3
	Mixed pastures (leguminous/grasses)	200
AS 0081	Straw and fodder of cereal grains (dry)	0.2
Atrazine		
	Primary feed commodities	T40
	Rape seed forage	10
	Rape seed straw or fodder	0.5
Azimsulfuron		
	Rice fodder (fresh weight)	*0.05
AS 0649	Rice straw and fodder, dry	*0.05
Azoxystrobin		
	Almond hulls	5
	Barley forage	10
AS 0640	Barley straw and fodder, dry	3
AL 0061	Bean fodder	T10
AL 1030	Bean forage (green)	T10
AB 0269	Grape pomace, dry	15
AL 0072	Pea hay or Pea fodder (dry)	T10
AL 0697	Peanut fodder	25
	Peanut hulls	1
AL 0528	Pea vines (green)	T10
	Tomato pomace (dry)	10
	Wheat forage	10
AS 0654	Wheat straw and fodder, dry	3
Benomyl *see* **Carbendazim**		
Bensulfuron-methyl		
AS 0649	Rice straw and fodder, dry	*0.05
Bentazone		
	Rice forage (fresh weight)	*0.03
AS 0649	Rice straw and fodder, dry	*0.03
Benzofenap		
	Rice forage (green)	*0.02
	Rice straw and fodder (dry)	*0.02
BHC (other than γ isomer, Lindane)		
	Primary feed commodities	E0.02
Bifenazate		
	Almond Hulls	T5
AB 0226	Apple pomace, dry	3
Bifenthrin		
AL 1020	Alfalfa fodder [Lucerne]	0.1
AL 1021	Alfalfa forage (green)	0.1
	Canola fodder (dry)	*0.01
	Canola forage (green)	1
AL 1031	Clover hay or fodder	*0.05
	Clover forage (green)	*0.05
	Faba bean fodder (dry)	**0.02**
	Faba bean forage (green)	1
	Field pea fodder (dry)	0.01

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Table 4

Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
	Field pea forage (green)	1
	Forage (green) of cereal grains	0.2
	Lupin fodder (dry)	0.02
AL 0545	Lupin forage	1
	Navy beans fodder	1
	Navy beans forage (green)	5
AL 0072	Pea hay or Pea fodder (dry)	T*0.01
AL 0528	Pea vines (green)	T1
	Pear pomace, dry	5
AS 0081	Straw and fodder (dry) of cereal grains	*0.01
AM 0659	Sugarcane fodder	*0.02
AS 0654	Wheat straw and fodder, dry	*0.01
Bitertanol		
AL 1030	Bean forage (green)	50
AL 0061	Bean fodder	50
Boscalid		
AB 0269	Grape pomace, dry	25
Buprofezin		
AB 0001	Citrus pulp, dry	5
AB 0269	Grape pomace, dry	5
Butafenacil		
	Forage of cereal grains (dry)[except rice]	*0.01
AS 0081	Straw and fodder (dry) of cereal grains[except rice]	*0.02
Butroxydim		
AL 0157	Legume animal feeds	*0.01
Captan		
	Almond hulls	T60
AB 0226	Apple pomace, dry	10
AB 0269	Grape pomace, dry	10
Carbaryl		
AF 0080	Forage of cereal grains	T100
AS 0081	Straw and fodder (dry) of cereal grains	T100
Carbendazim		
AL 0157	Legume animal feeds	25
Carbosulfan *see* **Carbofuran**		
Carbofuran		
	Primary feed commodities	2
Carfentrazone-ethyl		
	Cereal grain forage and fodder	*0.05
	Pastures	*0.05
Chlordane		
	Primary feed commodities	E0.01
Chlorfenapyr		
AB 0226	Apple pomace, dry	3
Chlormequat		
	Barley forage (green)	T25
AS 0640	Barley straw and fodder (dry)	T15
	Wheat forage (green)	25

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Table 4

Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
AS 0654	Wheat straw and fodder, dry	15
Chlorothalonil		
	Pulses, forage and fodder	T100
Chlorpyrifos		
AM 0691	Cotton fodder, dry	30
	Cotton meal and hulls	0.05
AL 1270	Peanut forage (green)	T10
	Peanut hay	T2
Chlorsulfuron		
	Primary feed commodities	10
Clodinafop acid		
AS 0654	Wheat straw and fodder, dry	*0.1
Clodinafop-propargyl		
AS 0654	Wheat straw and fodder, dry	*0.1
Clofentezine		
	Almond hulls	T5
Clomazone		
	Rice forage (green)	*0.01
AS 0649	Rice Straw and fodder (dry)	*0.01
Clopyralid		
	Canola fodder	10
	Canola forage	25
	Forage of cereal grains	25
	Pasture	100
AS 0081	Straw and fodder (dry) of cereal grains	10
Cloquintocet-mexyl		
	Cereal forage (fresh weight)	*0.1
AS 0081	Straw and fodder (dry) of cereal grains [except rice]	*0.1
Clothianidin		
	Cotton seed by-products	T*0.01
Cyanazine		
AS 0654	Wheat straw and fodder, dry	*0.01
Cyfluthrin		
	Canola forage (green)	1
	Canola fodder (dry)	2
	Chick-pea forage (green)	5
	Faba bean forage (green)	5
	Field pea forage (green)	5
AF 0081	Forage of cereal grains	5
	Grass pastures (green)	2
	Legume pastures (except vetch) (green)	3
AL 0545	Lupin, forage (green)	2
	Navy bean forage (green) and fodder	1
AF 0651	Sorghum forage (green)	0.5
AS 0081	Straw and fodder (dry) of cereal grains	5
Cyhalofop-butyl		
	Rice forage (green)	*0.1
AS 0649	Rice straw and fodder (dry)	0.2

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Table 4

Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
Cyhalothrin		
	Cereal forage (green)	1
	Cotton seed by-products	1
	Forage brassicas (green)	1
AL 0157	Legume animal feeds [green]	1
	Legume fodder/straw	2
	Rape/canola forage (dry)	2
Cypermethrin		
AM 0691	Canola (rape) forage (green) and fodder	15
AL 0524	Chick-pea fodder	10
	Chick-pea forage	10
AM 0691	Cotton fodder, dry	10
	Primary feed commodities	5
Cyproconazole		
	Barley forage	10
AS 0640	Barley straw and fodder, dry	3
AL 0697	Peanut fodder	20
	Peanut hulls	0.2
	Wheat forage	10
AS 0654	Wheat Straw and fodder, dry	3
DDT		
	Primary feed commodities	E0.05
Deltamethrin		
	Fodder and forage of cereal grains	5
	Fodder and forage of oilseeds	5
	Fodder and forage of pulses	5
	Fodder and forage of sweet corn	5
	Rice hulls	7
Dicamba		
AM 0659	Sugar cane fodder	0.1
AV 0659	Sugar cane forage	0.1
Dichlofluanid		
AI 0697	Peanut fodder	*0.1
Dichlorprop-P		
AB 0001	Citrus pulp, dry	2
Dieldrin *see* **Aldrin and Dieldrin**		
Difenoconazole		
AB 0226	Apple pomace, dry	1
	Barley forage (green)	*0.1
AS 0640	Barley straw and fodder, dry	*0.05
	Cereal grain fodder and forage	T*0.05
	Wheat forage (green)	*0.1
AS 0654	Wheat straw and fodder, dry	*0.05
Diflubenzuron		
	Pastures (mixed grasses/leguminous)	T50
Diflufenican		
AL 0157	Legume animal feeds	5
AS 0081	Straw and fodder (dry) of cereal grains	0.2
Dimethipin		
AM 0691	Cotton fodder, dry	20

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Table 4

Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
Dimethoate		
AL 0545	Lupin, forage	1
Diphenylamine	Apple pomace, wet	20
Diquat		
AL 0157	Legume animal feeds	100
Dithiocarbamates (mancozeb, metham, metiram, propineb, thiram, zineb and ziram)		
	Primary feed commodities	50
AL 1029	Vetch	T0.5
Diuron		
AL 0157	Legume animal feeds	2
	Primary feed commodities (except legume animal feeds)	50
Emamectin		
	Fodder and forage of sweet corn	0.05
Endosulfan		
AB 0226	Apple pomace, dry	1
	Cereal forage (green)	0.3
	Citrus pulp and pomace, dry	2
	Forage of pulse crops (green)	0.3
	Forage of oilseed crops	0.3
AS 0081	Straw and fodder (dry) of cereal grains	0.4
	Straw and fodder (dry) of oilseeds	*0.1
	Straw and fodder (dry) of pulse crops	0.3
Endrin		
	Primary feed commodities	E0.03
Epoxiconazole		
	Barley forage, green	5
AS 0640	Barley straw and fodder, dry	7
	Wheat forage, green	5
AS 0654	Wheat straw and fodder, dry	7
Ethametsulfuron methyl		
	Lupin fodder (dry)	*0.02
AL 0545	Lupin, forage [fresh weight]	*0.02
Ethephon		
	Primary feed commodities	10
Ethion		
AM 0691	Cotton fodder, dry	20
Ethoxysulfuron		
AM 0659	Sugar cane fodder [fresh weight]	T*0.01
Etoxazole		
AB 0226	Apple pomace, dry	2
AB 0269	Grape pomace, dry	T2
Fenamiphos		
	Primary feed commodities	1
Fenhexamid		
	Grape pomace (wet weight basis)	50
Fenitrothion I		
AL 1020	Alfalfa fodder [Lucerne]	T5
AL 1021	Alfalfa forage (green) [Lucerne]	T5

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Table 4

Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
	Canola forage (green)	T10
AL 0157	Legume animal feeds (except alfalfa fodder and forage)	T10
AS 0161	Straw, fodder (dry) and hay of cereal grains and other grass-like plants	T10
Fenoxaprop-ethyl		
	Cereal forage (fresh weight)	*0.01
AL 0524	Chick-pea fodder	0.5
	Chick-pea forage (green)	0.5
AS 0649	Rice straw and fodder, dry	T1
AS 0081	Straw and fodder (dry) of cereal grains except rice	0.5
Fenvalerate		
AL 1020	Alfalfa fodder	2
AL 1021	Alfalfa forage (green)	2
	Primary feed commodities (except alfalfa forage (green) and alfalfa fodder)]	10
Fipronil		
	Pastures (mixed grasses/leguminous)[fresh weight]	
0.02		
AL 0697	Peanut forage and fodder	0.01
	Rape (canola) forage (green)	*0.01
	Rape (canola) straw and fodder	*0.01
AS 0649	Rice straw and fodder, dry	0.005
AF 0651	Sorghum forage (green)[fresh weight]	0.02
AS 0651	Sorghum straw and fodder, dry	*0.01
AM 0659	Sugar cane fodder	0.01
	Sunflower forage (green) (fresh weight)	*0.01
Flamprop-*m*-methyl *see* **Flamprop-methyl**		
Flamprop-methyl		
AS 0654	Wheat straw and fodder, dry	0.1
	Triticale straw and fodder, dry	0.1
Florasula		
AF 0081	Forage of cereal grains [fresh weight]	*0.05
AS 0081	Straw and fodder of cereal grains (dry)	*0.05
Fludioxonil		
	Canola forage (fresh weight)	*0.01
	Canola straw and fodder	*0.02
AS 0645	Maize fodder	*0.02
AF 0645	Maize forage	*0.02
AL 0528	Pea vines (green)	T4
AF 0651	Sorghum forage (green)	T*0.02
AS 0651	Sorghum straw and fodder, dry	T*0.02
	Sunflower forage and fodder	T*0.02
	Sweet corn forage and fodder	*0.02
Flumetsulam		
	Barley forage [Fresh weight]	*0.1
AS 0640	Barley straw and fodder, dry	0.05
	Legume pasture	15
	Maize forage (green) and fodder	*0.05
AF 0647	Oat forage [Fresh weight]	*0.1
AS 0647	Oat straw and fodder, dry	0.05
	Peanut forage (green) and fodder	*0.05
	Pulse forage and fodder	*0.05

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Table 4

Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
AF 0650	Rye forage (green) [Fresh weight]	*0.1
AS 0650	Rye straw and fodder, dry	0.05
	Triticale forage [Fresh weight]	*0.1
	Triticale straw and fodder, dry	0.05
	Wheat forage [Fresh weight]	*0.1
AS 0654	Wheat straw and fodder, dry	0.05
Flumioxazin		
	Forage of cereal grains [fresh weight]	*0.05
	Forage of oil seeds [fresh weight]	*0.05
	Forage and fodder of pulses	*0.1
	Oil seed straw and fodder	*0.1
AS 0081	Straw and fodder (dry) of cereal grains	*0.05
Fluquinconazole		
	Barley forage	2
AS 0640	Barley straw and fodder, dry	0.5
	Canola forage	0.5
	Canola straw and fodder, dry	*0.01
	Pome fruit pomace, dry	3
	Wheat forage	2
AS 0654	Wheat, straw and fodder, dry	0.5
Fluroxypyr		
AF 0161	Forage of cereal grains and other grass-like plants	100
	Mixed Pastures (leguminous/grasses)	700
	Primary feed commodities [other than straw and fodder (dry) and hay of cereal grains and other grass-like plants, and sugar cane fodder and forage]	25
AS 0161	Straw and fodder (dry) and hay of cereal grains and other grass-like plants	100
AM 0659	Sugar cane fodder	100
AV 0659	Sugar cane forage	100
Flutriafol		
AF 0081	Forage of cereal grains	2
AL 0528	Pea vines (green) [fresh weight]	0.1
AS 0081	Straw and fodder (dry) of cereal grains	2
Furathiocarb *see* **Carbofuran**		
Glufosinate-ammonium		
	Canola forage	5
	Canola meal	0.2
	Canola straw and fodder (dry)	3
	Cotton meal and hulls	5
AS 0162	Hay or fodder (dry) of grasses	5
	Mixed pasture (legume/grasses)	15
Glyphosate		
AV 0691	Cotton forage	100
	Primary feed commodities [other than rape seed forage, rape seed straw and fodder (dry), cotton forage, soya bean hulls and soya bean aspirated grain fractions]	150
	Rape seed forage	50
	Rape seed straw and fodder (dry)	1
	Soya bean aspirated grain fractions	50
	Soya bean hulls	10
DM 0659	Sugar cane Molasses	T5

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Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
Halosulfuron-methyl		
AF 0654	Maize forage	2
AS 0654	Maize fodder	2
AF 0651	Sorghum forage {Fresh weight]	*0.05
AS 0651	Sorghum fodder	0.1
AV 0659	Sugar cane forage	*0.05
Haloxyfop		
AL 1021	Alfalfa forage (green) [Lucerne]	5
AL 0061	Bean fodder	0.5
AL 1030	Bean forage (green)	5
	Canola forage	10
	Canola fodder	0.5
	Chick-pea forage	10
AL 0524	Chick-pea fodder	0.5
	Linola fodder	0.5
	Linola forage	10
	Linseed fodder	0.5
	Linseed forage	10
AL 0545	Lupin forage	10
	Lupin fodder	0.5
	Pasture (green)	3
AL 1270	Peanut forage (green)	3
AL 0697	Peanut fodder	5
AL 0528	Pea vines (green)	5
	Pea fodder	0.5
AL 1029	Vetch	3
HCB		
	Primary feed commodities	E0.01
Heptachlor		
	Primary feed commodities	E0.02
Imazamox		
	Adzuki bean forage and fodder [fresh weight]	T*0.05
	Faba bean forage and fodder [fresh weight]	T*0.05
AL 0157	Legume animal feeds [except faba bean forage and fodder, peanut forage (green); pea vines (green); soya bean forage (green)]	1
AL 1270	Peanut forage (green) [Fresh weight]	*0.05
AL 0528	Pea vines (green) [Fresh weight]	*0.05
	Rape seed fodder	*0.05
	Rape seed forage [fresh weight]	*0.05
AL 1265	Soya bean forage (green) [Fresh weight]	*0.05
Imazapic *(formerly known as Imazameth)*		
	Canola fodder (dry)	*0.05
	Canola forage (green)	*0.05
	Cereal stubble (fresh weight)	0.5
	Forage of cereal grains [fresh weight]	*0.05
AL 0697	Peanut fodder	*0.1
AL 1270	Peanut forage (green)	*0.1
AS 0654	Wheat straw and fodder, dry	*0.05
Imazapyr		
	Canola fodder (dry)	*0.05
	Canola forage (green)	*0.05
	Forage of cereal grains [fresh weight]	0.2
AF 0645	Maize forage (green)[fresh weight]	*0.05
	Primary feed commodities [other than maize fodder (dry), maize forage (green)[fresh weight],	

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Table 4

Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
	canola fodder (dry), canola forage (green), forage of cereal grains [fresh weight] and wheat straw and fodder, (dry)]	15
AS 0654	Wheat straw and fodder, dry	*0.05
Imazethapyr		
AS 0645	Maize fodder (dry)	*0.05
AF 0645	Maize forage (green)[fresh weight]	*0.05
	Primary animal feed commodities	*0.1
Imidacloprid		
AB 0226	Apple pomace, dry	2
AL 0061	Bean fodder	T10
AL 1030	Bean forage (green)	T10
	Brassica forage crops (kale, rape, turnips and swede)	1
	Canola fodder	T0.5
	Cereal and sweet corn fodder and forage]	10
AB 0001	Citrus pulp, dry	10
	Cotton seed hulls	*0.02
	Cotton seed meal	0.02
	Lucerne fodder and forage	1
	Lupin fodder and forage	10
	Pastures	1
	Rape seed [canola] fodder and forage	1
AS 0081	Straw and fodder (dry) of cereal grains	0.7
AM 0659	Sugar cane fodder, dry	2
Indoxacarb		
AB 0226	Apple pomace, dry	20
	Cotton seed meal and hulls	*0.05
AB 0269	Grape pomace, dry	3
AL 0157	Legume animal feeds	10
	Linseed fodder	T10
	Linseed forage	T10
	Safflower seed fodder	T10
	Safflower seed forage	T10
	Soya bean hulls and aspirated grain fractions	2
	Soya bean meal	0.02
	Tomato pomace, dry	10
Iodosulfuron methyl		
	Wheat forage (fresh weight)	*0.05
AS 0654	Wheat, straw and fodder, dry	*0.05
Iprodione		
AL 1021	Alfalfa forage (green) [Lucerne]	20
	Canola forage	1
	Canola straw and fodder (dry)	1
AL 1270	Peanut forage (green)	20
AL 1265	Soya bean forage (green)	5
Isoxaflutole		
AL 0524	Chick-pea fodder	**0.03**
	Chick pea forage (fresh weight)	0.3
	Forage (green) of cereal grains	T2
AS 0081	Straw and fodder (dry) of cereal grains	T0.05
AM 0659	Sugar cane fodder	*0.01
Kresoxim-methyl		
AB 0226	Apple pomace, dry	0.5
Lindane		
	Primary feed commodities	E0.1

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Table 4

Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
Mefenpyr-diethyl		
	Cereal forage (fresh weight)	*0.1
AS 0081	Straw and fodder (dry) of cereal grains	*0.1
Mepiquat		
	Cotton seed meal and hulls	2
Mesosulfuron-methyl		
	Wheat forage [fresh weight]	*0.02
AS 0654	Wheat straw and fodder, dry	*0.02
Metalaxyl		
	Barley forage (green)	*0.1
AS 0640	Barley straw and fodder, dry	*0.05
	Wheat forage (green)	*0.1
AS 0654	Wheat straw and fodder, dry	*0.05
Methamidophos		
AL 0545	Lupin, forage (dry)	0.5
AL 0697	Peanut fodder	10
AL 1270	Peanut forage (green)	10
Methomyl *see also* **Thiodicarb**		
	Plantago ovata fodder	5
	Plantago ovata forage	5
Methoxychlor		
	Primary feed commodities	E1
Metolachlor		
	Cotton fodder	0.1
AS 0645	Maize fodder	0.1
AF 0645	Maize forage	*0.02
	Primary feed commodities	5
AF 0651	Sorghum forage (green)	0.2
AS 0651	Sorghum straw and fodder, dry	0.2
Metosulam		
AF 0161	Forage of cereal grains and other grass-like plants	*0.1
AL 0545	Lupin, forage	*0.1
AS 0161	Straw, fodder (dry) and hay of cereal grains and other grass-like plants	*0.1
Metribuzin		
	Primary feed commodities	0.2
Metsulfuron-methyl		
AL 0524	Chick-pea fodder [fresh weight]	*0.05
	Chick-pea forage [fresh weight]	*0.05
AF 0161	Forage of cereal grains and other grass-like plants [pasture]	1
	Linseed fodder and straw	T*0.02
	Linseed forage [fresh weight]	T0.1
AS 0161	Straw and fodder (dry) and hay of cereal grains and other grass-like plants	1
Omethoate		
AL 0157	Legume animal feeds [Fresh weight]	20
AL 0545	Lupin, forage	0.5
AS 0161	Straw, fodder (dry) and hay of cereal grains and other grass-like plants	20

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Table 4

Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
AM 0165	Miscellaneous fodder and forage crops [Fresh weight]	20
Oxydemeton-methyl		
AV 0691	Cotton forage	1
AL 0545	Lupin, forage	*0.01
Paraquat		
	Primary feed commodities	500
Parathion-methyl		
AL 1023	Clover	T5
AL 1031	Clover hay or fodder	T25
AM 0691	Cotton fodder, dry	T10
	Cruciferous forage crops	T5
AL 0157	Legume animal feeds	T25
Pendimethalin		
AL 1020	Alfalfa fodder [lucerne]	*0.1
	Forage and fodder of pulses	0.1
	Rape seed fodder and forage	*0.05
Permethrin		
AL 0528	Pea vines (green)	15
Phosphorous acid		
AL 1023	Clover	100
AM 0353	Pineapple fodder	100
Picloram		
AM 0659	Sugarcane fodder, dry	50
AV 0659	Sugarcane forage, dry	50
Picolinafen		
AL 1023	Clover	2
	Field pea forage (green)	0.5
	Forage of cereal grains (green)	0.5
AL 0545	Lupin forage	2
	Lupin straw (dry)	*0.02
AL 0072	Pea hay or pea fodder (dry)	0.05
AS 0081	Straw and fodder (dry) of cereal grains	*0.02
Pinoxaden		
	Barley forage (green)	3
AS 0640	Barley straw and fodder, dry	1
	Wheat forage (green)	3
AS 0654	Wheat straw and fodder, dry	1
Pirimicarb		
	Almond Hulls	2
AM0691	Cotton fodder (dry)	20
	Primary feed commodities	20
Procymidone		
	Canola forage	T5
	Canola fodder, dry	T5
	Lentil forage	5
	Lentil straw and fodder, dry	5
AL 0545	Lupin forage	0.1
Profenofos		
	Cotton meal and hulls	1

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Table 4

Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
Prohexadione-calcium		
AB 0226	Apple pomace (dry)	0.1
Prometryn		
AL 0524	Chick-pea fodder	0.5
	Chick-pea forage (green)	0.5
AS 0162	Hay or fodder (dry) of grasses	50
Propachlor		
AS 0645	Maize fodder	1
AF 0645	Maize forage	5
AF 0651	Sorghum forage (green)	15
AS 0651	Sorghum straw and fodder, (dry)	5
Propaquizafop		
	Cotton fodder	*0.05
AL 0157	Legume animal feeds (except legume pastures, peanut forage(green) and fodder)	*0.1
	Legume pastures (green)	5
AL 0697	Peanut fodder	*0.05
AL 1270	Peanut forage	2
Propiconazole		
	Almond hulls	10
	Cane tops (fresh weight)	0.05
AS 0650	Forage and fodder (dry) of perennial ryegrass	10
	Forage of cereal grains (green)	10
AS 0081	Straw and fodder (dry) of cereal grains	5
Prothioconazole		
	Barley forage (fresh weight)	T*0.05
AS 0640	Barley straw and fodder, dry	T*0.05
	Wheat forage (fresh weight)	T*0.05
AS 0654	Wheat straw and fodder	T*0.05
Pymetrozine		
	Cotton seed meal and hulls	*0.02
Pyraclostrobin		
AB 0269	Grape pomace, dry	10
Pyrasulfotole		
AS 0081	Fodder and straw of cereal grains	T*0.02
AF 0081	Forage of cereal grains	T0.5
Pyraflufen		
AS 0081	Straw and fodder (dry) of cereal grains	1.0
Pyridate		
	Chick-pea forage (green)	*0.2
AL 1270	Peanut forage (green)	*0.2
Pyrimethanil		
AB 0269	Grape pomace, dry	40
	Pome fruit pomace, dry	0.3
Pyriproxyfen		
AB 0001	Citrus pulp, dry	2
	Cotton seed meal and hulls	*0.02
Pyrithiobac sodium		
AM 0691	Cotton fodder, dry	0.2
AV 0691	Cotton forage	0.2

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Table 4

Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
Quinoxyfen		
AB 0269	Grape pomace, dry	5
Quizalofop-ethyl		
	Canola forage and fodder	5
AL 1023	Clover	2
	Forage and fodder of soybeans, chickpeas, field peas, lupins, faba beans, mung beans, navy beans, lentils, vetch and green beans	10
	Medic pastures	10
AL 1270	Peanut forage (green)	0.5
Quizalofop-p-tefuryl		
	Canola forage and fodder	5
AL 1023	Clover	2
	Forage and fodder of soybeans, chickpeas, field peas, lupings, faba beans, mung beans navy beans and green beans	10
	Medic pastures	10
AL 1270	Peanut forage (green)	0.5
S-metolachlor (see Metolachlor)		
Sethoxydim		
	Barley Forage [fresh weight]	*0.1
AL 0157	Legume animal feeds [except peanut fodder and peanut forage (green)	15
AL 0697	Peanut fodder	10
AL 1270	Peanut forage (green)	10
	Rape seed fodder and forage	10
	Wheat forage (green)[fresh weight]	*0.1
AS 0654	Wheat straw and fodder, dry	*0.1
Simazine		
AL 0524	Chick-pea fodder	0.5
	Chick-pea forage (green)	0.5
	Faba bean fodder	0.1
	Faba bean forage (green)	3
	Rape seed forage	5
	Rape seed straw or fodder	1
Spinosad		
AB 0226	Apple pomace, dry	1
AB 0001	Citrus pulp, dry	1
	Cottonseed by-products	*0.01
AB 0269	Grape pomace, dry	1
AL 0157	Legume animal feeds	1
AF 0651	Sorghum forage (green)	0.5
AS 0651	Sorghum straw and fodder, dry	0.5
	Sweet corn, fodder and forage (dry)	1
Spiroxamine		
AB 0269	Grape pomace	10
Sulfosulfuron		
	Triticale straw and fodder, dry	0.1
AS 0654	Wheat straw and fodder, dry	0.1

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Table 4

Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
Tebuconazole		
	Primary feed commodities	50
Tebufenozide		
AB 0269	Grapes pomace, dry	10
	Pome fruit pomace, dry	10
Tepraloxydim		
	Canola forage and fodder	3
AL 0157	Legume animal feeds	3
Terbufos		
AL 0697	Peanut fodder	*0.05
AS 0081	Straw and fodder (dry) of cereal grains	*0.05
AF 0081	Forage of cereal grains	*0.05
Terbutryn		
AS 0161	Straw, fodder (dry) and hay of cereal grains and other grass-like plants	30
	Pastures (mixed grasses/leguminous)	75
	Field pea forage and fodder	30
Tetraconazole		
AB 0269	Grape pomace, dry	2
Thiacloprid		
AB 0226	Apple pomace, dry	3
Thiamethoxam		
AB 0001	Citrus pulp, dry	7
	Cotton seed hulls	0.5
AS 0645	Maize fodder	0.5
AF 0645	Maize forage	0.5
AF 0651	Sorghum forage (green)	0.5
AS 0651	Sorghum straw and fodder, dry	0.1
Thifensulfuron		
AS 0081	Straw and fodder (dry) of cereal grains	5
Thiodicarb *see also* **Methomyl**		
	Primary feed commodities [except maize; sorghum; sunflower]	30
AS 0645	Maize fodder	50
AF 0645	Maize forage	50
AF 0651	Sorghum forage	T50
AS 0651	Sorghum straw and fodder, dry	T50
	Sunflower forage	*0.05
Tralkoxydim		
	Primary feed commodities	*0.02
Triadimefon		
	Primary feed commodities	10
Triadimenol		
AF 0081	Forage of cereal grains	0.5
AS 0651	Sorghum straw and fodder, dry	10
Triasulfuron		
	Primary feed commodities	5
Tribenuron-methyl		
	Primary feed commodities (Fresh weight)	*0.05
Triclopyr		
AS 0651	Sorghum straw and fodder (dry)	*0.1

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Table 4

Compound	*Animal Feed Commodity*	*MRL (mg/kg)*
Trifloxystrobin		
AB 0269	Grape pomace (dry)	3
	Pome fruit pomace, dry	15
Trifloxysulfuron sodium		
AM 0659	Sugar cane fodder (fresh weight)	*0.02
AV 0659	Sugar cane forage (fresh weight)	*0.02
Triflumuron		
AF 0081	Forage of cereal grains	0.2
AS 0081	Straw and fodder (dry) of cereal grains	*0.05
Trinexapac-ethy		
AS 0162	Hay or fodder (dry) of grasses	3
AM 0659	Sugar cane fodder	1
AV 0659	Sugar cane forage	1
Triticonazole		
AF 0081	Forage of cereal grains	0.1
AS 0081	Straw and fodder (dry) of cereal grains	*0.05

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Appendix 5

Transmissible Spongiform Encephalopathy (TSE) Freedom assurance program.

AnimalHealth AUSTRALIA

AUSTRALIAN RUMINANT FEED BAN

Australia has an inclusive ban on the feeding to all ruminants of all meals, including meat and bone meal (MBM) derived from all vertebrates, including fish and birds. The current ban was established by statutory laws in each of Australia's jurisdictions and enforced by official inspections and audits, which also take into account quality assurance schemes that operate within Australia's ruminant livestock industries. This acts as a fail-safe control measure to rule out the possibility that feeding will amplify the BSE agent in the unlikely event that it is introduced to Australia.

A voluntary ban on the feeding of ruminant material to ruminants was adopted in Australia in 1996 to minimise the risk of recycling the BSE agent if it were introduced. This was a preliminary step towards laws to prohibit the feeding of ruminant material to ruminants. These laws were enacted in all of Australia's jurisdictions in 1997. In 1999, the prohibition was extended to the feeding of specified mammalian materials to ruminants. In March 2001, agricultural ministers agreed to introduce uniform legislation in all States and Territories to extend this prohibition to include a ban on the feeding of meals containing 'only porcine, equine, or macropod materials; blood and blood products; inspected meat products (that have been cooked and offered for human food and further heat processed into animal food); poultry (offal and feather) meals; and fish meals'. Following on from this decision all States and Territories have adopted in their respective legislation the term 'restricted animal material' (RAM) to describe animal meals that cannot be fed to ruminants, being any meal derived from animal origin including fish and birds.

Definition of RAM

Restricted Animal Material (RAM) is any material taken from a vertebrate animal other than tallow, gelatin, milk products or oils extracted from poultry and fish. It includes rendered products such as blood meal, meat meal, meat and bone meal, fish meal, poultry meal, feather meal, and compounded feeds made from these products.

Tallow is defined as:
"any product (not limiting to but including products known as tallow, yellow grease and acid oil), containing rendered fats and oils from any animal, or used cooking oil filtered or otherwise treated to remove visible particulate matter, and which complies with a specification of 2% maximum M+I (moisture plus insoluble impurities) as measured by American Oil Chemists' Society (AOCS) official methods[1]"

To ensure Australia has effective feed ban control measures, it was agreed at the March 2001 meeting of the Agricultural and Resource Management Council of Australia and New Zealand that audits be undertaken by all jurisdictions to verify compliance with feed ban legislation by all parties from manufacture to end-use. Prior to these jurisdictional audits, four national audits of the ruminant feed ban were conducted in Australia (see Audit Results section).