

More Than Staggers

Perennial ryegrass toxicosis in autumn 2002: 1. The epidemic and its effects

by Kevin Reed, Katrina Rainsford, Dion Borg, and Leo Cummins, Natural Resources and Environment, Pastoral and Veterinary Institute, Hamilton, Victoria

Summary

In Victoria, stock suffering with perennial ryegrass staggers are frequently observed on Western District properties in summer and autumn. By April 2002, it was clear that this condition, caused by the ryegrass endophyte, which commonly causes few losses and minor interruption to stock management, was considerably more widespread and serious than usual. Substantial mortality and prolonged management problems were evident. A different term was employed (perennial ryegrass toxicosis) to convey the more serious nature of the condition and to distinguish it from the quite different and unrelated annual ryegrass toxicity, a condition linked to the annual species of ryegrass, and one that is common in Western Australia and South Australia, but not in Victoria. Farmers were invited to fill in questionnaires concerning their recent experience. Two hundred sixty-two producers from three states responded. Stock losses were especially severe across the Basalt Plains of western Victoria, in central Gippsland, and in the northern midlands of Tasmania. The survey showed that 29,109 sheep and 448 cattle died on 224 properties. Deer and horses were also lost. Up to 30% mortality

occurred in some mobs, with the majority of losses being weaners. Cattle losses were minimal (0.2% on average) but up to 2% in some weaner mobs. Most producers reported difficulty in carrying out sheep and cattle management and increased risks working with cattle. Delays to husbandry practices and marketing plans and concerns about continuing ill-thrift and impaired reproduction were widely reported. The survey details have been summarised below. Solutions and management options will be discussed in the next newsletter.

Background

The production and clinical and subclinical effects of toxins produced by the endophyte in perennial ryegrass have been described in the 2000 GSV conference proceedings and the January 2002 newsletter. The toxins, both in new and old pasture, are associated with ill-thrift, staggers, and heat stress in livestock. The staggers condition is seen nearly every autumn. Sheep and cattle deaths do occur as a result of immobilisation and heat stress. However, the frequency of such occurrences is usually low. Occasionally, serious epidemics occur. In an earlier, widespread epidemic in Victoria and Tasmania during the 1985/86

season, 60% to 70% of properties in southern Victoria suffered problems. In this earlier epidemic, the proportion of weaner sheep affected averaged 30% and ranged from 5% to 100% with a mortality rate of up to 30% and commonly 5% to 10%. In Gippsland, up to

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President's Report: November 2002



The season, or lack of a season, remains a huge concern for many members, with northern Victoria in the grip of drought and other areas starting to be dry. In July, I boasted that, at home in Gippsland, we were having a wonderful season. It has now dried off, and we do not look like having a spring. However, I dare not complain, as, having driven to Hay for the recent AWI meeting, I have seen for myself some very drought-affected areas. The ABC Country Hour announced today that weather predictions are for good rain in early autumn. Let us hope rain arrives earlier than that.

Some members will receive a voting slip for the society name change in their copy of this newsletter.

If you have already voted but forgot to sign your voting slip, your voting slip has been returned for you to sign. Please sign your slip, and return it to the GSV office as soon as possible.

Members who have not voted on the name change as yet will receive a blank voting slip. Could we urge all those members who have not voted yet to please vote, sign your slip, and return it?

The society needs 75% of members to vote to constitutionally allow the name change. The executive and committee are encouraging the name change for several reasons. We have very active branches in Tasmania and in South Australia, and we have many members living in New South Wales. The name 'Grassland Society of Victoria' no longer covers the scope of our organisation, so it is time to do something about it. The name 'Grassland Society of Southern Australia' is the proposed new name. Please vote if you have not already done so. The name change will be resolved at the GSV annual general meeting to be held in March 2003 in conjunction with the Mac Troup Lecture.

The annual conference, which next year is to be a joint conference

between the Grassland Societies of Victoria and New South Wales, is in its planning stages, and the draft program, which I have had a peek at, is looking very enlightening. The emphasis is on satellite technology and promises to be very exciting. Remember to mark 12 and 13 June 2003 in your diaries if you have not already done so.

Work is progressing on the GSV web site with the aim of providing restricted access for members to some information, such as a newsletter archive on the web with up to 18 months of back issues and conference proceedings.

Members have suggested in the past that branch information and activities be included on the web site. This is a great idea but requires branch secretaries to forward the information to head office so that it can be posted on the web. I encourage all branches to do this. We are all interested to know what everyone else is doing. Information from the branches not only helps to provide good ideas for other branches, it is another way of spreading information and results; and this, of course, is the chief purpose of our society.

As this newsletter is the last before Christmas, could I wish all members a very Happy Christmas and a prosperous New Year and thank all members for their participation in the society and all those actively involved working for the good of all.

**Rosemary Irving
 President**

Grassland Societies of Victoria and New South Wales Joint Conference 2003

**11 to 13 June 2003
 Albury, New South Wales**

Letters to the Editor

Dear Editor,

In Tom Morgan's article about the 3 September Western District branch field day (GSV newsletter, September 2002, pages 12-13), most of the main points I made after lunch at Robert Lyons and later at Danny and Anita Watt's property were overlooked. In addition, several things were incorrectly attributed to me. Rather than give a blow by blow correction, here are the main points I made.

- Deaths due to ryegrass staggers commonly are isolated and rare; but in 2002, they were widespread, and some very high losses occurred.
- Deaths due to phalaris poisoning were also higher than normal. As well, following the commonly used guidelines failed to prevent the losses.
- Worms in sheep were a horrific problem.
- Sheep death rates over winter were well above 'normal'.

What went wrong?

The reason for the deaths from ryegrass staggers and phalaris poisoning are not known. The situation seemed to be a 'once in a lifetime' experience, and so it makes no sense to be making significant changes to management.

In contrast, the problem with worms in sheep, and sheep deaths, does have a pattern and does challenge us to rethink some parts of our management.

The problem started last spring. The spring of 2001 was huge for pasture growth, and there was no way stock would have paddocks grazed down to the target of 1,500 kg DM/ha by the autumn break, almost no matter how late the break was.

In April and May, sheep were losing weight at a far higher rate than most people realised. By the time of the autumn break (late May), many sheep were close to fat score 2, the lower end of the range suggested in Prograze.

When the break came, there was still a lot of dry feed on many paddocks. This meant that the green pick was mixed with a lot of dead matter, which means the pasture

quality overall was moderate to poor. In addition, because of the amount of dry feed on the paddocks, very little clover germinated, a further negative for feed quality.

Thin sheep grazing very short, moderate- to poor-quality pasture is a good recipe for worm problems and possible deaths. David Rendell's sheep worm risk matrix, as outlined on page 13 of the September 2002 issue of the newsletter puts all this together very well.

What are the lessons?

- Think well ahead. In spring, if it looks like the amount of pasture at the next autumn break will be above target, consider cutting extra hay or silage, bringing stock in on agistment, or trading some stock. In other words, complete a 'pasture budget' and act on the outcomes. The end result of this will be high-quality (minimal dead matter mixed with the green and good clover content) pasture after the autumn break.
- Once the available dry pasture gets below about 2,500 kg DM/ha, monitor the weight change of sheep very closely. Relying on 'the eye' to do this is probably unsatisfactory.
- Adjust the autumn supplementary feed program so the fat score of all sheep, and especially the high risk groups in the Rendell matrix, is at least 3 at the time of the autumn break.

Are the set of circumstances experienced in autumn and winter 2002 so rare that we should consider them, like ryegrass staggers, a 'once in a lifetime' experience so we should not have to deal with them again for a very long time, or are they a wake-up call? Some people adjusted their management and did not have a problem, so I'm inclined to think of it as a wake-up call. Time to revisit the principles in Prograze by rereading the manual, or redoing the course? The course is being continually upgraded, so maybe the latter will be the best thing to do.

Danny and Anita Watt, from Balmoral, are very capable and successful managers of a grazing business (predominantly a self-replacing wool flock) and terrific supporters

Need a gift idea?

Perhaps you can't think of the perfect gift for the person who has everything. Well, do they have membership to the Grassland Society of Victoria?

Your 12-month membership gift includes:

- Gift card with your message mailed to the recipient before 25 December 2002.
- Copy of the 2002 conference proceedings.
- Complimentary newsletter every two months.
- Invitations to GSV events, such as the annual conference, Mac Troup lecture, and branch activities.

You can phone, fax, or e-mail the person's details to the GSV office; and with payment of \$77 by credit card or cheque, your gift problem is solved. (See page 2 for the GSV addresses and telephone numbers.)



of the Grassland Society of Victoria. The point of visiting them as part of the field day was that, while the 2002 season had its challenges, they had no dramas. Sheep deaths were well within the normal range, and the amount of drenching done was within the 'normal range.' Some mobs we saw were last drenched in November 2001 and still had a faecal egg count of less than 100 eggs/gram.

What did they do that was so special?

- Danny is very focused about making good use of the spring pasture growth every year. With his normal stocking program (annual stocking rate around 16 DSE/ha), it is impossible to achieve the benchmarks for pasture use he believes are important. It is common to see cattle brought in on agistment, and occasionally a paddock is cut for hay to sell. This means that, in virtually every year, once the autumn break comes, the pasture is very high quality – no

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Looking for a summer employee?

Below are employment wanted advertisements from university students seeking farm-related employment for the summer or longer. Please consider them if you need some summer help.

MARGARET BRIDGEWATER, (03) 5389

1371. Course studied 2002: Advanced Diploma of Agriculture; current year of study: 2nd last year of the diploma.

Available: Full-time, and I will work weekends from January to May 2003. (It doesn't have to be for the 4 months; even a few weeks' work would be excellent.)

Experience: I grew up on a cropping, sheep, and cattle farm in the Wimmera; and I work on it during the year. Some of the jobs I do are mustering, drenching/backlining, vaccinating stock, and feeding. I have my professional Australia Wide Woolclassing stencil, and I have experience being a rousse. I also help with cropping and harvesting. I can drive tractors and ride motorbikes and horses. I have worked at the Victorian Institute of Dryland Agriculture in Horsham over two harvests. While at university, I have been doing relief milking on weekends and in any other spare time, so I have dairying experience too.

LAUREN O'CONNOR, 0407 055 408 or

(03) 5796 2512. Course studied 2002: Agricultural Science; current year of study: 3rd year. **Available:** Part-time or full-time

from late December 2002 to March 2003.

Experience: Interested in gaining further experience on a grazing property, particularly wool-growing or beef, but willing to work any job. Experienced in sheep/beef farming (regular work on family/local properties); have held casual positions on a southwestern Victorian dairy farm, and on a beef/sugar-cane property in northern Queensland. Currently completing Wool Classing certificate, with view to taking on casual shed work. Drivers licence and experienced in driving tractors. Very keen, hard worker, looking for industry experience. Have also worked part-time in customer service sector for 5 years.

LISA MARTIN, (03) 9347 4713 and (03)

5721 6470. Course studied 2002: Agricultural Science; current year of study: 3rd year. **Available:** Part-time from December 2002 to January 2003. **Experience:** I am from a cattle property and am interested in finding some work experience on a grazing property. I have good customer service skills as I am currently employed in a part-time position for a restaurant/hotel. I'm very keen to get some experience over the summer or in uni holidays during the year.

GLENN WATT, 0417 272 871. Course studied 2002: Ba Ag (Dookie); current year of study: 1st year. **Available:** Part-time or full-time from as soon as possible. **Experience:** I have worked on our sheep and cropping farm near Balmoral all my life. I'm experienced in all aspects of sheep farming and would like to learn more, particularly about the stud industry. I have completed a year of the degree course at Dookie College and am looking to work and study part-time.

Letters

Continued from page 3

old dead feed mixed with the new green pasture and a high clover content. This was certainly the case in the paddocks we looked at on the field day.

- The Watt's stock management in 2002 was such that sheep did not lose too much weight in April and May. They fed more supplementary feed than normal in this period. The 2001/02 supplementary feed costs were 40% higher than the average over the last 5 years.

Considering these two points, and the Rendell Worm Risk Matrix, it is not surprising that worms had not been a problem in 2002 and that the Watts were comfortable going away for their normal holiday break in the middle of winter.

Peter Schroder

Peter Schroder Rural Consulting
Hamilton, Victoria

Dear Editor,

Don't get too excited about promotional material expounding the benefits of barley grass (*Critesion* spp.) ('Treasure your barley grass!', letter to the editor, July 2002 newsletter). Unfortunately, these health products are not a new use for the troublesome weed, but rather 'wholesome green foods' made from the leaves of young barley plants (*Hordeum vulgare*) and young wheat plants (*Triticum aestivum*), the cereal crops used for grain production.

Upper leaves are harvested when the plants reach their nutritional peak – just before seedhead development, or around 6 to 8 inches tall. They are then dried and crushed into a green powder you can mix with water or sprinkle on food and are also available in tablet form. Personally, I'd rather eat my conventional vegies!

Kathy Junor
Mernda, Victoria

Update on the GSV/GSNSW joint conference

Planning for the GSV/GSNSW joint conference is developing well, reports Hugh Watson, joint conference convenor; and the conference committee is anticipating a range of local, interstate, and even international speakers.

One of the objectives of the conference committee is to link research and practical applications. With conference committee members spread over a wide geographical area, it is a challenge to get people together, with the added complication of the widespread drought. However, we believe that we will have an informative and exciting conference to educate and motivate all those interested in grassland farming.

Sessions planned will involve cutting-edge satellite technology and its relationship to on-farm reality, the latest facts on fodder and feeding, and recent research presentations. The committee is well aware of the benefits of networking at grassland conferences, so the conference will provide plenty of opportunities to do so, including the poster demonstration and a trade fair.

The ever-popular conference bus tours are still 'under construction' by the Albury-Wodonga GSV branch, which is working on a varied and interesting range of sites to whet the appetite of all those people interested in grassland farming. These include tours of 'alternative' interests, such as the region's wineries.

Stay tuned for further conference updates in the newsletter.

Enclosure

Enclosed is a copy of Landlinks, a catalogue that brings together current research, books, and articles focusing on sustainable agriculture, the environment, and natural resource management. It is compiled and published by CSIRO and includes publications from CSIRO and other organisations.

What happens when hay heats?

by Frank Mickan, Pasture and Fodder Conservation Specialist, NRE, Ellinbank

If your hay heats, you are losing dry matter and quality. Hay will heat when it is made from pasture that was not cured enough (i.e., too sappy or rain has fallen onto the windrows). Hay will also heat up from rain falling on bales before being transported to a shed or covered with a tarp. Only a small volume of wet hay in the shed or stack can lead to heating and then mould and possibly fire (spontaneous combustion).

Physical symptoms

Over 80% of hayshed fires have been from large square bales. Large round bales, due to their large volume to surface area ratio, are more prone to heating than small squares and should be baled 4 to 6 degrees drier. These are suited for storing outside until used or until they have become drier and should be less of a problem. However, large square bales are the most prone to heating due to their high density and their large volume to relatively low surface area ratio. These should be at least 6 to 8 degrees drier than small squares at baling. Hay should be baled at the suggested moisture content in Table 1; but in practice, hay is often baled at higher moisture contents.

Dry hay does not heat because it lacks moisture to support microbial growth. High humidity, which occurs as the hay heats, is a precursor to spontaneous combustion. The heating is caused by plant and microbial respiration and chemical reaction. The maximum amount of heating in hay

will occur in the moisture range of 20% to 40%.

The thermal conductivity (transfer of heat) of dry hay is less than that of wet hay as the evaporation of water dissipates the heat being generated in the moist hay. As the hay moisture decreases, the heat transfer out of the stack becomes less effective. Hay temperature may not rise sharply until most of the moisture has evaporated. Fire needs oxygen to start, as do the microbes to live, so fires often begin outside the centre of stacks, although very high temperatures can allow spontaneous combustion.

Moist hay will go through several stages before it may become a bonfire (Figure 1). Firstly, it will heat as a result of activity by plant respiration and bacteria. Then the stack may cool down over several days or weeks. However, if the hay is extremely wet and air circulation is restricted, heating may continue to 43°C to 66°C, which then favours the growth of heat-resistant fungi. This often results in even higher temperatures; and once the temperature rises above about 70°C to 77°C, chemical reactions take over, killing off the living fungi, microbes, etc.

The stack is now in a very dangerous state, and temperatures can quickly rise to the point of catching fire at about 200°C if oxygen is

freely available. If the hay is tightly stacked and oxygen supply is limited, the temperature may rise to about 280°C before igniting. This heating may reach flash point over approximately 1 to 8 weeks, although more commonly it will occur over 2 to 5 weeks.

If there is the slightest risk of a fire starting due to wet hay, *never* keep machinery in the hayshed and do not allow children to play in heating stacks.

Losses in heating hay

The hotter a hay stack gets, the greater are the dry matter and quality losses. Hay should be stored at moisture levels below about 20%, but round bales should be about 2% to 4% drier and large squares even drier (see Table 1). As bale density increases at a given moisture content, bale heating increases and quality decreases.

Hay stored above the recommended moisture contents will deteriorate during storage due both to direct microbial and plant respiration and degradation and to associated heating damage. Apart from dry matter losses, the quality of the hay is substantially reduced as temperature rises.

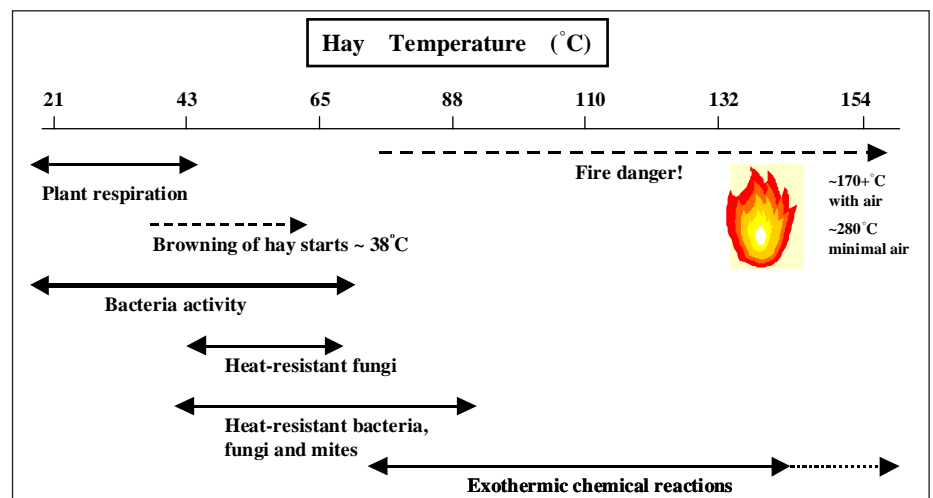
Table 2 gives an indication of the likely losses in quality at various temperatures in pasture hay stacks under Australian conditions.

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Table 1. Recommended moisture contents (%) for safe storage of hay.

Type of bale	Moisture content of hay (%)	
	Ideal	Maximum*
Small square bales	18 to 20	23 to 25
Large round bales	14 to 18	20 to 22
Large square bales	12 to 14	15 to 18

*Hay stored at maximum moisture content will result in some reduction in quality and dry matter due to slight heating caused by plant respiration and possibly mould growth.



Source: Sheaffer and Martin (1979).

Figure 1. The causative agents in haystack fires.

Hay

Continued from page 5

Eventually, as hay heats to the higher levels, browning, or carmelisation (Maillard reactions), will occur. This results in sugars in a certain state (reducing sugars) and proteins binding together, which renders them largely indigestible to stock. This fodder will have a characteristic dark-brown colour. Despite the heated hay smelling 'nice and sweet', looking good, and being very palatable to stock, it has very low feed value.

Use whatever is available to you to ensure your hay is cured to the recommended levels as often as possible. Using mower-conditioners, tedders, and preservatives can aid you to do this. However, nature will intervene, resulting in wet and damaged hay, so make allowances when storing, selling, buying, or feeding hay that has heated.

Determining stack temperature
Keep an eye out for signs of your haystack heating. Steam condensation on the roof, mould growth, acrid fumes, and hot and humid air at the top of the stack are all good indicators. When building stacks with suspect 'wet' hay, always stack the bales loosely to

allow air movement through the bales. Also, spread the stack over a wide area (i.e., over several bays), thereby reducing heat build-up.

Most heating will occur over the first 1 to 2 weeks, but heating has been known to reach 'flash point' up to approximately 8 weeks after baling.

If you suspect a stack will heat or if you have seen any of the indicators above, monitor the stack temperature regularly. Do this using a pipe or crowbar inserted as deep as possible into the stack.

If you use a pipe, a thermometer can be lowered down the pipe to give you an accurate and quick reading of the internal stack temperatures.

If you use a crowbar, leave it for 2 hours and then use your hand to give you a rough guide of the internal stack temperature. The temperature is up to about 50°C if you can hold the bar without discomfort. It is up to 60°C if the bar can be held for a short time only, and it is up to 70°C if the bar can be held only briefly. If you can't hold the bar at all, the temperature is above 70°C, and fire is a real possibility. Treat the stack with caution!

What can be done if hay heats to danger levels?

Pull the stack apart as quickly as possible. Avoid walking on the

Table 2. Nutrient losses caused by hay heating.

Maximum stack temperature	Loss of energy (%)	Loss of digestible protein (%)
Up to 45°C	5 to 10	Nil
45°C to 55°C	5 to 15	10 to 30
55°C to 70°C	15 to 30	30 to 80
70°C to 75°C	40 to 70	100

stack if possible because the extremely high temperatures may have charred the centre of the stack, and this won't be visible from the outside. Your extra weight on top of the stack might be enough to cause the top of the stack, and you, to collapse into the extremely hot centre. Please believe me when I say that it will be a lot more serious than just having your hair singed! Be aware that, as the bales are pulled out, especially in a tightly built stack, oxygen can now get to the hot spot more readily and may actually start a fire. Have the local fire brigade on hand, if possible, and if not at least a fire cart and other people for safety reasons.

For further information, contact Frank Mickan on (03) 5624 2222 or frank.mickan@nre.vic.gov.au.

Reference

Shafer, C. C., and Martin, N. B. 1979. Hay preservation. Extension folder 489-1979. Agricultural Extension Service, University of Minnesota, USA.

Sulphur content of supplements may affect copper metabolism, and protein-based supplements can be fed infrequently

Ross Gould of Calgary, Canada, posted the following extracts from the *Journal of Animal Science* to the *GRAZE-L e-mail mailing list*. They seemed relevant during this drought period, as many people will be feeding supplements to their stock.

Sulphur

Ross said, 'Just got the online issue of the November 2002 issue of the *Journal of Animal Science*. The article (Effect of corn- vs molasses-based supplements on trace mineral status in beef heifers, *J. Anim. Sci.* **80**: 2787-2791) compared a corn/cottonseed with a molasses/cottonseed supplement. The results suggested that the sulphur contained in the molasses might interfere with copper metabolism.

'The implications are shown below.

'Implications: These results suggest that components within molasses decrease the accumulation of liver Cu in heifers. This effect is likely the result of high concentrations of S naturally found in molasses, as the inclusion of added S to corn-based supplements resulted in slower rate of Cu accumulation, which was similar to that realised with the molasses-based supplement. In production environments where risk of Cu deficiency may be present, attention to the S content of supplemental feeds is warranted.

'The full article can be found at: [\[a02B2787.pdf\]\(#\) for those with access to the online journal.'](http://www.asas.org/jas/papers\2002\</p>
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Protein-based supplements

Ross then mentioned two other related papers from the current issue of the *Journal of Animal Science* on protein supplements for steers on low-quality forage. He said, 'I expect there would be similar results for wintering cows. If so, it would mean a lot less labour, especially if they were grazing, or on swath grazing management, or even on hay or straw diets.

'Implications of the first article (Influence of rumen protein degradability and supplementation frequency on steers consuming low-quality forage: I. Site of diges-

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Supplements

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tion and microbial efficiency, *J. Anim. Sci.* **80**: 2967–2977): Infrequent supplementation of rumen degradable and/or undegradable intake protein is a valid alternative to daily supplementation of ruminants consuming low-quality forage. It appears that ruminants consuming low-quality forage are able to effectively use supplemental nitrogen, even when supplemented once every 6 days, independent of ruminal crude protein degradability. Therefore, infrequent supplementation of protein provides beef producers with a management alternative to decrease supplementation costs and improve economic returns.

'Implications of the second article (Influence of rumen protein degradability and supplementation frequency on steers consuming low-quality forage: II. Ruminal fermentation characteristics, *J. Anim. Sci.* **80**: 2978–2988): Infrequent supplementation of protein with ruminal degradability ranging from 40% to 80% to ruminants consuming low-quality (less than 6% crude protein) forage is a viable alternative to daily supplementation. Ruminants appear to be able to maintain a productive ruminal environment (adequate fiber digestion, fluid dynamics, and particulate passage) when supplemented infrequently with degradable intake protein or undegradable intake protein, even though degradable and undegradable intake protein elicit different effects on ruminal fermentation end products. This supports other research that has demonstrated ruminants consuming low-quality forage and supplemented infrequently (as infrequently as once every 6 days) are able to maintain performance, nitrogen efficiency, dry matter intake, nutrient utilisation, and microbial efficiency comparable to daily supplemented individuals.

'Links to the full articles (if you have access): www.asas.org/jas/papers/2002/a02B2967.pdf and www.asas.org/jas/papers/2002/a02B2978.pdf.'

Travel Grants 2002

And the winners are...

by Vicky Rush, Chair of the GSV Travel Grant Committee

This year Geoff Saul, Hugh Dove, and Frank Mickan were the successful applicants for the 2002 Grassland Society of Victoria Travel Grants, receiving cheques for \$1,000, \$1,200 and \$800 respectively.

Geoff currently works at the Pastoral and Veterinary Institute in Hamilton. He will be attending the European Grassland Federation Conference in Bulgaria in May 2003. Geoff has also submitted an abstract for the conference titled 'Economic and environmental balance in sheep grazing systems'.

Hugh Dove currently works at the CSIRO Division of Plant Industry in Canberra. He will be attending and presenting a paper on his work on the interactions between grazing animals and their pasture at two conferences: the 6th International Symposium on the Nutrition of Herbivores in Mexico in October 2003 and the 9th World Congress on Animal Production in Brazil in October 2003. While in Mexico, Hugh will also be representing Australia on the International Advisory Committee for the Herbivore Nutrition Symposia.

Frank Mickan works at the Department of Natural Resources in Ellinbank. He will be attending, and presenting a poster titled 'Silage making training in Indonesia' at the 13th International Silage Conference in Scotland in September 2003. Following the conference, Frank, together with Dr Alan Kaiser, will be touring research institutions in the United Kingdom, Ireland, and The Netherlands to discuss current silage research in these countries that may be relevant to Australia.

The travel grants provide Grassland Society members the opportunity to apply for funding to assist in attending conferences or undertaking study tours in other areas of Australia or overseas. The purpose of the travel must be to further the applicant's knowledge on a subject of interest relating to grassland farming that would benefit the society and its members.

The closing date for applications is 30 September each year. Grant recipients must present a written report to the society within 3 months of completing their travel and also must make themselves available to the society for 12 months for speaking and extension activities.

These three members of our society will be full of information following their trips; and if any member or branch would like Geoff, Hugh, or Frank to attend a branch activity or meeting, please contact Linda Bennison to arrange this.



Geoffery Saul



Hugh Dove



Frank Mickan

Perennial ryegrass toxicosis

Continued from page 1

20% of heifers and calves were affected.

Alkaloids produced by the endophyte, specifically the tremorgen lolitrem B, act as neurotoxins. Lolitrem B affects the smooth muscle of the gastrointestinal tract, as well as the voluntary muscles. The vasoconstrictor alkaloid ergovaline is also produced and affects circulation. Ergovaline is associated with increased body temperature (sheep with elevated temperatures – greater than 41°C – were recorded), lameness, impaired reproduction, and reduced production of prolactin. Sheep develop a fine head tremor that progresses to nodding and trembling. They display poor coordination and jerky, exaggerated limb movements with a stiff-legged gait. The condition is induced by stimulation, such as mustering; and affected stock can go down on

Table 1. Number of farms reporting large losses of livestock.

State/Region	No. of farms with sheep losses greater than					
	100	300	400	500	650	1,000
Southwest Victoria	54*	23	17	12	8	3
Gippsland, Victoria	3	2	2	2	2	0
Tasmania	4	4**	3	2	1	1

*Plus one farm that lost more than 100 deer. **Plus one farm that lost more than 300 cattle.

their side with their legs extended. Left alone they can recover. The condition is a reversible alkaloid toxicosis. Stock grazing affected pasture can exhibit symptoms after 1 to 2 weeks; and when removed from the toxic pasture, stock return to normal movement in 1 to 3 weeks.

Location

The vast majority of affected farmers first noticed staggers symptoms in February or March 2002. Farmers in the shorter growing-season districts observed the symptoms first. Problems were reported from all the main Victo-

rian districts where perennial ryegrass is a common pasture species, except the northern irrigated region. Respondents from northern Victoria mainly reported no problems. Questionnaires returned by producers confirmed that 29,109 sheep and 448 cattle had died on 224 affected properties. The full extent of the epidemic is not known and would depend on how representative this particular group of farmers was.

Communication with veterinary scientists indicated that problems had been encountered by sheep and cattle producers in Tasmania; on Kangaroo Island, South Australia; and by sheep and cattle producers in the Albany district of Western Australia. The problems were greater than these veterinarian scientists had previously experienced. In southwest Victoria, many farms suffered large losses of sheep (Tables 1 and 2).

Sheep impact

From the data reported by farmers, approximately 20% of affected sheep died. Both Merino and crossbred sheep were affected. Losses were spread across ewes, wethers, rams, weaners, and hoggets. Old and young stock were affected, but the weaner and yearling sheep and cattle were particularly vulnerable. Many weaner sheep died; their loss impacts on future breeding and marketing goals. The degree of immobility, readily aggravated by mustering and vehicle noise, led to associated costs, including reduced lambing, tender wool, increased worm burden due to delayed drenching, an extended lambing period, and delays to pasture top-dressing and shearing. The toxic pasture reduced the con-

Table 2. Number of properties reporting effects of ryegrass toxicosis and their stock losses by locality.

Locality	No. of affected properties reported	Sheep losses	Cattle losses
Southeast South Australia	6	179	3
Tasmania	11	3,232	336
Victoria			
Horsham-Shepparton	2	19	0
Wodonga-Seymour	2	10	1
Kilmore-Yea-Mansfield	7	45	2
West Gippsland	12	171	3
Central Gippsland	9	2,123	14
Geelong	4	108	0
Colac	13	491	6
Terang-Princetown	6	0	3
Mortlake-Caramut	18	7,753	12
Macarthur-Woolsthorpe	19	1,664	3
Dunkeld-Glenhompson	13	1,977	1
Hamilton-Penshurst	20	2,922	8
Branxholme-Condah	5	2,266	0
Heywood-Portland	8	81	12
Casterton-Merino	15	1,043	13
Balmoral-Cavendish	10	1,067	0
Coleraine	9	2,312	31
Ararat-Beaufort-Willaura	10	196	0
Ballarat	25	1,450	0

dition of stock, particularly pregnant ewes and weaners. Several farmers who scanned prime lamb dams reported that the proportion of barren ewes was 10% to 20% higher than normal. Five badly affected sheep producers have subsequently advised that their lambing percentages were low, in the order of 30% to 50%, for some flocks where ewes were mated during the period of toxicity. Four others have reported satisfactory lambing. Some respondents, frustrated by the difficulties they had experienced with sheep, indicated that they were reducing the size of their sheep enterprise.

This year, more sheep were affected than usual and for a longer period. Many were found down in the paddock and remained recumbent for longer. Handling individual sheep aggravated the tetanic extension of limbs, and sheep were extremely difficult to nurse. A feature of losses this year was the number of reports of sheep drowning in troughs, not just in dams and drains. Predation of recumbent stock by fox and crow was a significant problem for several farmers. Many fenced off dams, as stock were in danger of drowning as they sought to suppress heat stress. With all species suffering ryegrass staggers, death is usually by misadventure (drowning in dams and gullies) or wasting due to recumbency, starvation, and dehydration, with many stock requiring euthanasia. This year, it was not uncommon for sheep to become recumbent and die in open paddocks overnight.

A cruel irony was that, during the epidemic, livestock prices were at the highest level they had been for 30 years. The short-term financial losses for many farmers were high due to deaths, prolonged ill-thrift, and inability to move stock to market. The losses reported were autumn losses considered to be directly due to toxicosis. In addition many farmers subsequently experienced unusually high losses in winter, which were frequently associated with high worm burdens. These losses were not canvassed in our autumn-focused questionnaire but were often asso-

ciated with a seriously disrupted end-of-summer drenching program. This disruption, due to staggers, was particularly unfortunate, coinciding as it did with the unseasonal weather, which favoured a high carry-over of worm eggs and larvae.

The occurrence of ill-thrift and poor growth rate when stock graze endophyte-infected perennial ryegrass is listed in diseases caused by toxins in plants by Radostits, Gay, Blood, and Hinchcliff (*Veterinary Medicine*, 9th edition). They state that pasture mycotoxins are suspected of causing this seasonal ill-thrift and reduced weight gain despite an abundance of feed. New Zealand, Australian, and European research has confirmed this cause of ill-thrift and shown also that the toxins affect digestion and can cause scouring. Secondary deficiencies in nutrients and trace elements could be anticipated. As described in the above text, US research (albeit on cattle suffering toxicosis associated with ergovaline) showed that heat stress may not recede until about 6 weeks after removal from affected pasture. The effects of a given concentration of ergovaline become more pronounced as temperature increases. Ill-thrift or stress caused by these toxins may mean that sheep will be more vulnerable to infectious diseases, such as salmonella; and those that have been exposed to ergovaline may need a long recovery spell before entering the tropics. It is possible that these issues may have contributed to the instigation of the unprecedented moratorium on live sheep exports from Portland this year. Live exports were directly affected as farmers experienced marketing delays and increased rejections prior to shipment. Some producers also reported an increase in flystrike and exacerbated foot rot in some flocks.

Cattle impact

The proportion of affected cattle that died was 0.2%. Young bulls were commonly affected, and lameness in cattle was mentioned by several respondents. Communication from veterinary scientists indicated problems on some dairy farms in Gippsland, Victoria; Tas-

mania; and Western Australia; however, few survey questionnaires were received from dairy farmers. Because of their size, affected cattle (and horses) can pose a risk of injury to their handlers. Cattle grazing toxic pasture commonly tremble, become excitable and erratic to handle, and can go down on their brisket and splay their legs out backwards. This year, disruption to herding, milking, and management procedures like pregnancy testing, weighing and marketing were recorded along with reports of deaths from drowning in troughs and liquid feeders. Cattle live exports were affected, as several farmers experienced marketing delays and increased rejections prior to shipment.

Type of pasture

The mean age of badly affected pasture was 15 years. The majority of badly affected pasture was what we usually regard as good: well fertilised and ryegrass dominant. Regrowth following mowing was often implicated, and problems were common in paddocks where there was a large mass of pasture present. Closely grazed pasture was also implicated. A number of respondents practicing cell grazing suffered serious losses.

Ryegrass cultivars

Respondents listed 19 cultivars in describing their worst-affected pasture. Victorian, an old ecotype representing considerable genetic diversity, was the most commonly mentioned variety. First released in 1936, until the last decade it was the most common choice of farmers. Its use has declined with the advent of improved proprietary cultivars, the earliest of which was Ellett. For paddocks where only one cultivar of perennial ryegrass had been sown, Victorian was nominated on 182 occasions. It was followed by Ellett (21), Victoca (6), Yatsyn 1 (4) and Impact (3). Banks and Nui were mentioned twice and Aries, Avalon, Camel, Fitzroy, Jackaroo, and Samson once. In addition to these, Bronson, Lincoln, Matilda, Roper, Tasdale, and Vedette were also present in affected paddocks where two or more cultivars were used.

Branch Report

Central West branch takes a walk at "Quamby"

by Mick Moran, Ararat

On 24 October, the Central West Branch of the Grassland Society of Victoria in conjunction with Mike Stephens and Associates arranged for an inspection of trial sites on Charles and Liz de Fegely's property, "Quamby" in Ararat, Victoria.

Gavin Milne from Pacific Seeds has set up a trial to evaluate the performance of the new winter-active variety of tall fescue called Flecha compared to the highly winter-active Holdfast phalaris. The field day also looked at a pasture: crop system trial on "Quamby", run by Pedro Evans, Pastoral and Veterinarian Institute, Hamilton, Victoria.

Speakers for the field day included the researchers, host Charles de Fegely, and Mike Gout of Wrightson Seeds. The pasture field day proved to be very successful, with approximately 100 people in attendance.

In 1989, 25% of "Quamby" was sown to Trikkala subterranean clover and summer-active Ellett ryegrass. The Ellett was soon eaten out, so trials have been run to find a productive and persistent replacement. Gavin established a variety trial, sowing ten treatments. These included sowing rate comparisons, species mixtures, phalaris, fescue, and perennial ryegrass. The focus is on Holdfast phalaris and Flecha tall fescue.

2002 has been a tough year, with a very late autumn break and only half the average annual rainfall

(300 mm to date; annual average rainfall 600 mm).

Flecha tall fescue is a winter-active, summer-dormant plant with a very narrow leaf. It has prostrate and dense growth and is relatively insignificant-looking compared to the larger-leaved phalaris. It has rapid spring growth, requiring aggressive management. It outperformed the Holdfast by up to 34%, even though the opposite appeared to be the case from observation. The Flecha tall fescue seed is costly, and it was suggested that a sowing rate of 5 kg/ha is nearly as good as 15 kg/ha if the seedbed is weed free.

The Victorian ryegrass plots had an alarming absence of clover. This was thought to be due to the presence of high endophyte levels reducing the clover content.

Gavin Milne, representing Pacific Seeds, set up this trial and discussed the preliminary results. Mike Gout, Wrightson Seeds, spoke of other similar varieties being introduced. He suggested sowing Victorian ryegrass would 'cost you money' in terms of lost production and poor persistence. Charles de Fegely said that Flecha tall fescue could be used as a specialist pasture for breeding, using a late lambing due to the difficulty of keeping it well grazed in spring. Charles thought Holdfast phalaris is a better option for bigger paddocks.

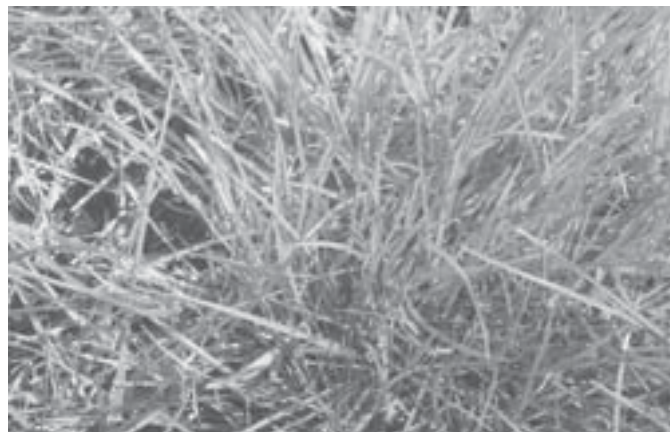
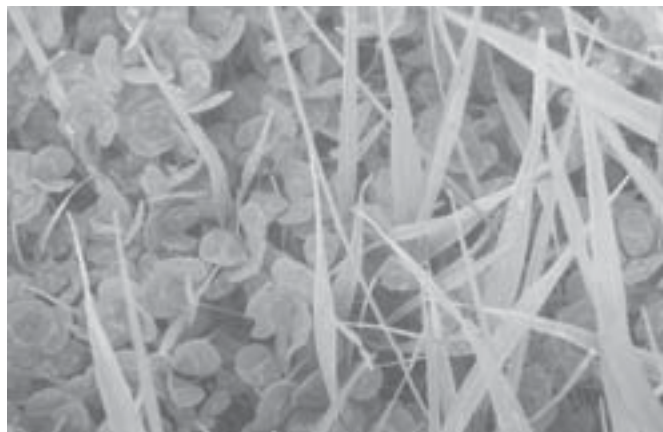
The other trial site under discussion for the day was the

pasture:crop system run by Pedro Evans, Pastoral and Veterinary Institute in Hamilton.

The aim of this trial is to identify a pasture phase in a cropping rotation that can support a productive, profitable livestock enterprise and have agronomic benefits for the cropping enterprise. To this end, the trial has a short rotation of annual ryegrass (Winter Star) and hard-seeded clovers (Zulu arrowleaf clover and Bolta balansa clover) to build nitrogen for canola cropping and allow minimal knockdown herbicide use when changing phases. The pasture was grass dominant, and Charles thought this was due to sowing the clovers too deep.

There was much discussion over the spring management to maximise seed set from the aerial seeding clovers with vastly differing flowering dates. It was resolved to graze to suit the Zulu arrowleaf at the expense of the Bolta balansa and probably resow the cheaper balansa in Year 2. Overall, the paddocks looked very fresh, even though the growth appeared restricted for this time of year. Around Ararat, the 2002 season has been surviving on timely showers all through the year. Therefore, the spring is close to being, but has not yet, finished completely.

The 100 visitors appeared impressed, and a comment frequently



Photos: Rob and Debbie Shea

Trial plots of Holdfast phalaris and Trikkala sub clover (left) and Victorian ryegrass (right). Note the lack of clover in the Victorian ryegrass, although the two plots are adjacent in the trial.

heard was 'what would these trials look like in an average year?'

At the completion of the day, our host, Charles de Fegely, outlined their strategy to cope with the dry season. Charles has downgraded it from a drought to a dry year but stressed that, if he had missed one shower during the season, things would have been very bad.

The aim at "Quamby" this year is to get the Merino lambs up to the target weight of 25 kg as quickly as possible so as to drastically reduce the supplementary feed costs, especially lupins, because they will be difficult to access. (After the lambs reach 25 kg, their protein requirement is greatly reduced, as is the need for expensive supplements to keep them growing.)



A cage in a trial plot

He mentioned their worm management plan and highlighted the unusually high faecal egg counts that have appeared this year. The de Fegelys include an ongoing, biannual drench-efficiency test as part of their monitoring program.

The lambs have already been 'imprint' fed with their mothers

and will be drafted into weight ranges at weaning.

Charles and Liz intend to investigate ways of utilising the crop straw residue as stock feed, perhaps to roll up and sell. Charles paid tribute to Gavin Milne for the effort he has contributed to the trials, especially regarding tall fescue.

The final assessment of the "Quamby" trials, including financial outcomes, will be completed early next year. The Central West Branch, Mike Stephens Associates, and Charles and Liz de Fegely look forward to holding another field day during March 2003 to release and discuss these results.

For further information, contact Robert Shea, Central West branch president, on (03) 5352 1357.



Some of the 100 attendees at the "Quamby" farm walk

Perennial ryegrass toxicosis

Continued from page 9

Cause of problem in 2002

The toxins in perennial ryegrass are produced in the hotter months and when plants suffer moisture stress. Toxin concentrations were not higher than in other years. We consider that the severity of toxicosis in 2002 was associated with changes in the quantity of perennial ryegrass that grew during summer. That is, the amount of grass and toxin ingested, rather than an unusually high concentration of toxins in the grass, aggravated the condition. Strong summer growth was associated with spring rainfall that was higher than average in most badly affected districts. In some districts of northern Tasmania, southwest Western Australia, southwest Vic-

toria, and the La Trobe Valley in central Gippsland, the amount of rain that fell in late January to early February further contributed to the unseasonal growth seen in these districts. The rainfall conditions would also have aided the survival of worm eggs and larvae on pasture. The prolonged autumn drought aggravated the toxicosis problem. Autumn rains bring fresh growth of low-toxin grass, diluting the toxicity of the feedbase. This year the autumn rains did not occur until the third week in May.

Acknowledgments

We are indebted to all the farmers and their partners who, in the midst of what was often a most distressful period, volunteered to write down their observations about the epidemic and make the above information available to government and industry. The GSV and the McKinnon Group, University of Melbourne School of

Veterinary Science, helped distribute questionnaires. Within NRE, several staff from PVI and district services, especially animal health staff, helped circulate information and questionnaires.

Further information

Outcomes from relevant research have been extended via NRE Agnotes (www.nre.vic.gov.au/notes), the Animal Welfare Centre (www.animal-welfare.org.au/comm), and in the proceedings of the Grassland Society of Victoria (e.g., 2000, 2002). New Zealand studies can be accessed via the New Zealand Grassland Association (www.grassland.org.nz). A list of relevant Australian research reports is available on request. Contact Kevin Reed on (03) 5573 0911 or kevin.reed@nre.vic.gov.au. A second article on this topic, addressing solutions and management, will appear in the January 2003 edition of this newsletter.

Branch Report

Albury-Wodonga branch looks at 'Beefing Up Pastures in the Upper Murray'

This report was cobbled together by Liz Jacobsen, using the branch activity report, bus tour notes, and participants' feedback provided by Jeff Hirth, GSV Albury-Wodonga branch secretary.

Over 75 people attended the Albury-Wodonga branch bus tour to the Tintaldra area of the Upper Murray River on 12 September 2002. The tour, held in conjunction with the Albury-Wodonga Beef Improvement Association, visited three large properties, "Tintaldra Station", "Ardenside Station", and "Tooma Station". The GSV branch also held their AGM during the lunch break in Tintaldra village.

The tour was subtitled 'Managing high-rainfall pastures for beef production', as it's purpose was to look at fertiliser and pasture management issues, including perennial pasture species, within the context of large-scale beef management and beef production systems in a high-rainfall (greater than 800 mm), high-altitude part of south-eastern Australia.

"Tintaldra Station"

At "Tintaldra Station", the topic was 'High-rainfall pastoral enterprises and high-analysis fertilisers for pastures'. Alex McKinnon, station owner, provided a general discussion about the success of pasture establishment and high-rainfall cropping on "Tintaldra Station", which is used for the production of beef cattle, lambs,

and pasture seed. David Harbison, Hi-Fert research agronomist, then discussed the Hi-Fert fertiliser trial established in the 'bull paddock' on the property in autumn 1999. The aim of the trial was to measure pasture growth responses to phosphorus (P) and sulphur (S) on light acidic soils under high rainfall conditions (growing season rainfall of 650 mm).

David explained that the paddock had been sown to subterranean clover, ryegrass, phalaris, and cocksfoot in 1986, with minimal fertiliser inputs between 1986 and 1990, when it was last fertilised. The soil test results of a soil sample taken in April 1999, prior to the beginning of the trial, are given in Table 1. A total of 12 fertiliser treatments were applied soon after and reapplied again in February of each subsequent year. Because of the low pH, the trial site was limed in February 2000 with 3 t/ha. The soil phosphorus and sulphur results after three seasons (December 2001) are given in Figures 1 and 2.

The key findings, according to David, were that:

- Annual pasture yields from high-analysis pasture fertilisers are equal to those of single superphosphate (SSP) (Figure 3).
- There were no differences in pasture growth between fertilisers with different forms of sul-

Table 1. Soil test results prior to the fertiliser trial, April 1999.

Attribute	Measurement	Exchangeable cations	
pH (CaCl)	4.3	Calcium	1.51 (47%)
Olsen P	16 mg/kg	Magnesium	0.68 (21%)
Colwell P	32 mg/kg	Potassium	0.62 (19%)
Potassium	249 mg/kg	Sodium	0.04 (1%)
Sulfur	7.1 mg/kg	Aluminium	0.39 (12%)
Organic carbon	2.1%	Total	3.24

phur (elemental sulphur vs sulphate-sulphur).

- Different product formulations had no effect on annual pasture yields when applied at 15 kg P/ha (Figure 4).
- Application rates of 15 kg P/ha and 19 kg S/ha only maintained soil P and S levels.
- None of the fertilisers affected the soil pH over the 3 years of the trial, except for the increase in pH across all plots following liming in 2000.
- Higher rates of P (30 kg P/ha) did not increase pasture growth, relative to 15 kg P/ha, but they did raise the soil Colwell P levels from 32 to 52 mg/kg.

"Ardenside Station"

Following lunch and the GSV branch AGM at Tintaldra village, the tour moved on to "Ardenside Station", a large property that consists of 5,914 ha of freehold and 31,862 ha of leasehold land. This station is operated by Ardenside Angus Pty Ltd, which runs about 4,500 Angus, 12,000 Merinos, and 780 first-cross ewes. Max Manfield, the manager at "Ardenside

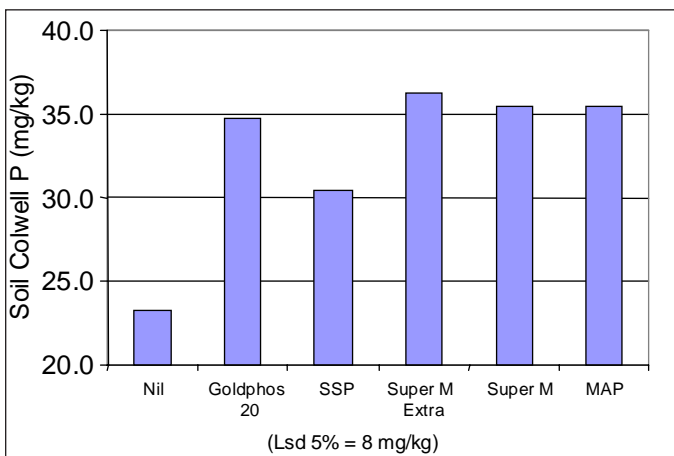


Figure 1. Soil phosphorus status, December 2001.

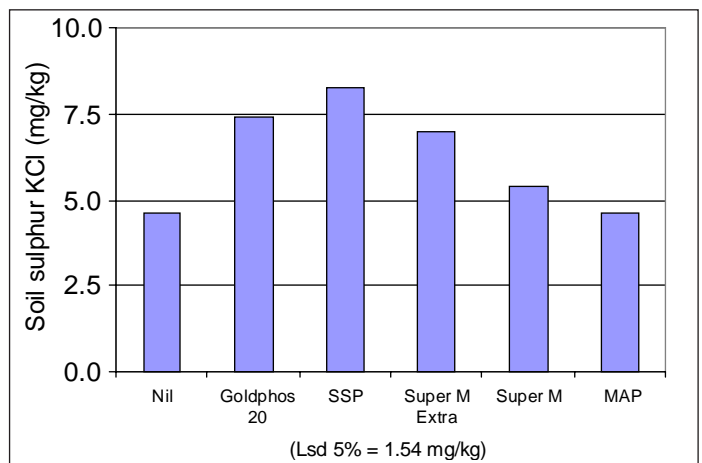


Figure 2. Soil sulphur status, December 2001.

Station”, discussed the breeding approach and management practices applied to the Angus stud and commercial herds at “Ardenside”, as well as the extensive pasture renovation that has been carried out since Max came in 1984. Max also gave some statistics on rainfall for the station, saying that the 21-year average (1981 to 2001) was 817 mm/year, with the driest month being February (39.4 mm on average) and the wettest being August (93.3 mm on average). The driest year of this period was 1982 (439 mm), and the wettest was 1992 (1,161 mm). Max said that the last 5 years have been 2% to 28% drier than average.

Max explained that the vision at “Ardenside” was to become ‘an elite farming enterprise, operating at world’s best practice and ranked in the top 10% of comparative operations for performance’. The short-term objectives are to increase productivity through:

- Improved infrastructure, including upgrading staff housing (5 permanent and 3 casual staff, increasing to 10 in total for mustering the lease in May to July).
- Increased paddock subdivision based on land-use capability and increased laneways.
- Efficient and low-maintenance cattle and sheep yards.

Between 1998 and 2001, the freehold plus leasehold land carried an average total DSE of 52,217, rising from 48,890 DSE in 1998 to a peak in 2000 of 55,838 DSE. Approximately 230 ha of the freehold land is cropped with Blackbutt oats and Jackie triticale



Photo: Jeff Hirth

In the paddocks at “Ardenside Station”

for grazing and grain production and Abacus triticale for grain.

Approximately 5,165 ha of the freehold land is available for grazing and cropping and is divided into 57 paddocks, ranging in size from 10 to 560 ha. Since 1984, most paddocks have been sown down with the following improved pasture species and cultivars:

- Phalaris (Holdfast, Australian, Sirosa, and Uneta): 36 paddocks.
- Cocksfoot (Porto, Condor, and Currie): 31 paddocks.
- Fescue (Au Triumph, Triumph, and Quantam): 10 paddocks.
- Ryegrass (Kangaroo Valley, Victorian, Lincoln, Ellett, Maverick, Concord, Sabrina, and Tetila): 40 paddocks.
- Subclover (Trikkala, Gosse, Leura, Karridale, Grasslands

Goulburn, Denmark, and Woogenellup): 42 paddocks.

- White clover (Haifa and Grasslands Tahora): 41 paddocks.
- Strawberry clover: 13 paddocks.
- Balansa clover (Paradana and Bolta): 6 paddocks.

The rates and annual totals of fertiliser used on “Ardenside” from 1992 to 2002 are shown in Table 2.

“Tooma Station”

The final stop was “Tooma Station”, one of the large, original stations in the Upper Murray. The Sutherland family has held the property for about 30 years. The land consists of 1,460 ha of undulating to hilly country, with an area of river flats fronting the Tooma River. The property is

Continued on page 14

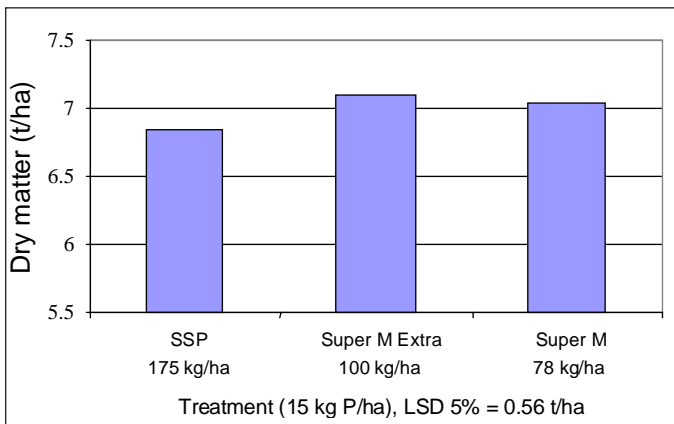


Figure 3. Effect of product formulation on dry matter production at 15 kg P/ha.

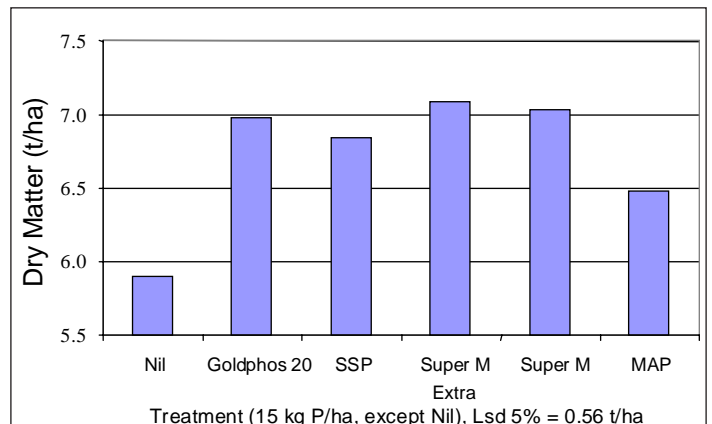


Figure 4. Dry matter production at the “Tintalra Station” fertiliser trial site (3-year average).

Beefing up pastures

Continued from page 13

predominantly used for seed production in conjunction with winter cropping, but it includes beef and wether production enterprises.

Here, Stuart Sutherland, owner, and Bruce Saxton, manager of seed production, addressed the theme 'Perennial grass alternatives'. They spoke about the 800-ha seed production business and led the group on an inspection of trial plots of perennial grasses and legumes, as well as whole paddocks of perennial grass-seed crops. The major pasture species from which they produce seed are cocksfoot, fescue, ryegrass, phalaris, and a range of clovers. Most of the seed is produced on the dryland portion of the station, but there is a small area of irrigation.

Feedback from participants ranged from complimentary ('good choice of theme and topics, good balance, did not fit too much in, good blending of people, very good interaction between participants, good networking opportunity) to critical ('thought it would be more scientific, need more concise summaries, needed more financial data to understand the economies of scale'), but overall Jeff felt the feedback showed that the tour had 'pretty much hit the mark', and he said most comments reflected the positive learning experience of most participants.

For further information, contact Jeff Hirth (02) 6030 4500 or jeff.hirth@nre.vic.gov.au.

Table 2. Fertiliser products, rates, and annual totals applied to "Ardenside" paddocks from 1992 to 2002.

Year	Product	Number of paddocks	Average rate (Range) (kg/ha)	Total (t/year)
1992	Single super (+ Mo)	15	141 (100-240)	224.7
	Pasture Starter	6	105 (75-175)	30.6
	DAP	1	120	4.8
1993	Single super (+ Mo)	14	129 (120-180)	130.3
	Pasture Starter	3	100 (85-125)	15.3
	DAP	2	90	9.5
1994	Lime	1	2,000	200
	Single super (+ Mo)	17	122 (120-150)	150.2
	Pasture Starter	4	119 (110-125)	44.7
1995	DAP	5	110	36.6
	Single super (+ Mo)	16	145 (120-180)	129.9
	DAP	7	106 (85-125)	56.6
1996	Single super (+ Mo)	14	133 (120-180)	159.4
	Pasture Starter	3	133 (130-140)	19.3
	Urea*	3	110 (100-130)	23.0
	DAP	6	115 (110-120)	34.3
1997	Pasture Gold	11	109 (100-125)	142.3
	Pasture Starter	3	130	39.3
	Urea*	2	110 (100-120)	19.2
	DAP	5	128 (120-130)	47.4
1998	Pasture Gold	25	113 (100-125)	187.1
	DAP	6	132 (130-140)	55.7
1999	Pasture Gold	24	115 (100-125)	205.1
	Pasture Starter	1	130	5.9
	DAP	6	125 (120-130)	43.1
2000	Pasture Gold	21	123 (100-125)	193.3
	Pasture Starter	3	130	27.3
	Urea*	2	100	15.7
	DAP	6	130	54.6
2001	Pasture Gold	26	125	229.2
	Pasture Starter	3	130	19.8
	Urea*	2	100	9.0
	DAP	4	130	29.2
	Lime	1	3,320	166
2002	Super M+	22	100	111.3
	Super M+ + Mo(0.04%)	4	100	33.6
	Pasture Starter	2	140	10.5
	Urea*	3	120	20.4
	DAP	5	130	32.5
	Lime	2	2,500	225

*Pasture Starter or DAP was also applied to these paddocks.



Photos: Jeff Hirth

The cultivar trials at "Tooma Station"

Weed Words: Barley grass

Weed Words is compiled by 2001 GSV travel grant winner Katherine Tozer, who is currently a PhD student at the Institute of Land & Food Resources, University of Melbourne, where she is researching the ecology and management of silver grass.

Barley grass originally came from the Mediterranean, south-west Europe, and parts of Asia; but it now grows in many countries throughout the world. Barley grass can provide good-quality feed in autumn after the break and during winter when it is in its vegetative stage. It has also been used for cover-cropping in Europe, in olive groves to prevent erosion in mountainous areas in Spain, and in vineyards in Turkey. In the vineyard, barley grass gradually builds up the humus in the soil and increases the population of beneficial soil fauna. An additional benefit is that barley grass tolerates drought well. In some cases, the grass is mown to reduce seed production.

There are four species of barley grass in Australia. The most common species, known as 'barley grass' (*Critesion murinum* subspecies *glaucum* and *leporinum*), is a weed of disturbed areas, pastures, and cereal crops (This species was formerly called *Hordeum murinum*, *H. glaucum*, and *H. leporinum*.) Sea barley grass (*C. marinum*) grows on salt-affected pastures, salty marshes, and coastal areas. The third species, *C. hystrix*, prefers silty soils and clay soils. The fourth, knotted barley grass (*C. secalinum*), is a perennial, unlike the other three, which are annuals, and has been found in isolated patches between Swan Hill and Shepparton.

Barley grass is a weed in both cropping systems and grazing systems; this article focuses on grazing systems. It is predominantly a weed of high-fertility soils, although sea barley grass is more prevalent on low-fertility soils. Barley grass can compete strongly after a subclover/legume phase in an annual pasture system, where there is a large build-

up of soil nitrogen. It is also very prevalent on stock camps. It is thought that barley grass is more able to tolerate high concentrations of salts than other, desirable pasture species.

The main problem associated with barley grass in grazing systems is the sharp, awned seeds of barley grass, which damage the mouths, eyes, hocks, fleeces, pelts, and carcasses of stock.

Fine-wool sheep tend to pick up the seeds more easily than sheep with coarse wool, although the actual skin damage is less with sheep with fine wool. Lambs are also much more susceptible than older sheep, as their skin is more easily penetrated. They spend more time lying on the ground, and much more of their body is closer to the ground, which increases the chance of them picking up barley grass seed.

In the vineyard, barley grass gradually builds up the humus in the soil and increases the population of beneficial soil fauna.

Once the seedhead comes up, sheep avoid grazing barley grass, which places additional pressure on the more desirable pasture species.

Barley grass can tolerate conditions of water stress better than other species and, being an annual, avoids the summer drought. Perennial grasses, on the other hand, will be selectively grazed over summer. This grazing pressure, in combination with water stress, can lead to their decline in pastures and reduces their ability to compete against annual-grass weeds, such as barley grass. This enables undesirable annual species to get a stronger foothold in the pasture.

A lot of research done was done between 1970 and the mid-1990s on the control of barley grass in Australia and New Zealand. In New Zealand, before it became established, some farmers put a lot



Barley grass seedhead.

of effort into trying to eradicate it. In 1971, in the proceedings of a weed control conference, one Kiwi farmer, R. Taylor, wrote:

Since 1966, areas suspected or known to contain appreciable numbers of viable seed have been fenced off, grazed a few times between January and September by sheep which were allowed in only to eat on their feet. This procedure has greatly helped to bring barley grass under control. Only about one new infestation of barley grass appears each year, never containing many plants. In earlier times, as many as a thousand barley grass plants appeared in a new infestation arising from seed carried in the wool of only sixty sheep. Barley grass is no longer collected in sacks, but in very small plastic bags. Half the lamb pelts at one time were punctured, but none is now.

Barley grass is now established throughout New Zealand, as well as Australia. With improved pasture and grazing management (including higher stocking rates to maintain the grazing pressure on barley grass), as well as herbicide use, many New Zealand farmers have been able to control barley grass. In addition, much of New Zealand has a higher rainfall than

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Barley grass

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Australia, which makes it easier for farmers to manage their perennial pastures.

Herbicide treatments, which are the most frequently used methods of controlling barley grass, include winter-cleaning and spray-topping. Winter-cleaning has variable results. Inadequate soil moisture in dry years can reduce herbicide uptake, and inadequate contact of the herbicide with the barley grass may also be a problem if pastures have been heavily grazed. Simazine can cause damage to other pasture species, such as clovers. Paraquat is safer on clover. There have been isolated cases of barley grass resistance to the herbicides paraquat and diquat.

Barley grass can provide good-quality feed in autumn after the break and during winter....An additional benefit is that barley grass tolerates drought well.

Likewise, spray-topping with glyphosate can have variable results. Although spray-topping will increase the water-soluble carbohydrate content of the plants, which means that stock will preferentially graze these plants, barley grass is able to put up new tillers and produce more seeds, even though seed production in the sprayed tillers is arrested.

One of the most effective chemical control methods at present appears to be the post-emergent herbicide Correct[®], which is taken up through the leaves. It is most effective when grasses are actively growing in the early tillering stage when the leaves are fully expanded and is rain-fast 1 hour after application. However, cocksfoot is very susceptible to damage by Correct; and some perennial ryegrasses and some phalaris species are also damaged by Correct, although this depends on the variety. In a legume-based pasture, clover may fill in the gaps left by the dead barley-grass plants, thereby providing excellent

spring feed for fattening lambs. Regardless of the herbicide used and how it is applied, it is important to resow competitive (perennial) pastures species, such as phalaris or ryegrass, to fill up the gaps; otherwise, barley grass will soon reinfest the pastures.

Grazing management can also help to control barley grass. Peter Dowling and other scientists from NSW Agriculture have found that grazing can be used to manipulate barley grass in annual pastures. This involves a period of deferred grazing followed by a period of heavy grazing. The grazing deferment causes barley grass to produce fewer tillers with their growing points higher off the ground. In the following period of heavy grazing, the stock remove the growing point, which results in the tiller dying and not producing seed. However, the grazing pressure must be maintained so that the barley grass does not produce new tillers and more seedheads. If the soil fertility is adequate, the gaps in the pasture that are left by the dead barley grass plants may be filled by other species in the pasture, such as clover, although resowing desirable pasture species may be necessary to prevent reinfestations. Heavy grazing can also reduce the height of the barley grass plant and seedheads. This in turn can reduce the damage that seed causes to sheep.

If barley grass seed production is reduced in one year, the amount of barley grass produced in the following year will also be greatly reduced. Barley grass has very little seed dormancy, so there is very little seed carryover from one year to the next.

Barley grass has also been controlled by grazing management in New Zealand. This was through heavily grazing the barley grass in spring to prevent it from producing seed, as well as lax grazing in summer to help maintain pasture cover. With little seed carryover, barley grass was controlled within a few years.

Charlie DeFegely, from "Quamby", Ararat, also mentions the importance of not overgrazing

in autumn and grazing more heavily in spring to reduce seedhead formation. Overgrazed pastures, with few perennials and a lot of bare ground, provide an environment for the build-up of barley grass populations.

As with most grass weeds, an integrated approach, using a combination of methods to maintain the desirable, competitive pasture species and control barley grass, is important. This can include fertiliser application, grazing management, and herbicide use.

In perennial pastures, grazing management that encourages the perennial component will help the perennials to outcompete the barley grass for resources and reduce its ability to produce seed.

The main problem associated with barley grass in grazing systems is the sharp, awned seeds of barley grass, which damage the mouths, eyes, hocks, fleeces, pelts, and carcasses of stock.

In annual pastures, a cropping phase will enable barley grass control. The barley grass can be winter-cleaned or spray-topped before the cropping year. Sowing an annual or biennial ryegrass in an annual pasture is also of benefit as it provides a better alternative to barley grass and provides competition to help control it.

In the case of some grass weeds, their very presence is undesirable. The problem with barley grass is more caused by its dominating a pasture and inflicting great seed damage on stock rather than by its actual presence, as it provides relatively good-quality feed early in the season.

Using a combination of methods, such as those mentioned above, can help to manipulate the pasture composition and reduce damage to stock caused by barley grass seed, thus resulting in a more productive pasture.

And for those of you who are budding olive or vine growers, you may even consider using barley grass as a cover crop.

Pasture Points

Pasture Points is compiled by Lisa Miller, NRE Geelong. It aims to keep members up to date with the latest news in pasture-related research and timely information. Send your contributions to Lisa at (03) 5226 4607 or lisa.miller@nre.vic.gov.au.

Clover decline linked to high-endophyte ryegrass

At a recent GSV field day at Charles and Liz de Fegely's Ararat property, Gavin Milne from Pacific Seeds made the observation that poor clover content was caused by high endophyte levels of ryegrass. It is well known that high endophyte levels help improve the persistence of ryegrass but such levels have not been generally been linked to the loss of clover. Plots at the trial site clearly showed Victorian perennial ryegrass pastures devoid of clover in comparison with abundant clover in the winter-active fescue and phalaris treatments. As clover content drives animal production, this phenomenon is of concern, and it seems some dairy farmers are moving away from older-style, high-endophyte ryegrass cultivars in an effort to raise the clover content of their pastures.

Do intensive rotational grazing systems need less fertiliser?

A masters student at the University of Melbourne, Jen Clarke, recently finalised the results of her thesis, which compared the relative merits of rotational and set-stocking grazing systems. The farmers on whose property Jen set up trials were part of the SGS program, which partially funded Jen's work. One of the questions addressed in her study was the perception that, under intensive rotational or cell-grazing systems, less fertiliser would be needed compared to set stocking due to more nutrients being available for plant growth. After 2 years of study, no significant differences were found between the two grazing systems in soil biological activity, which drives nutrient recycling and availability. A difference may have shown up over a longer time frame; however, at this stage, the indication is that there is no differ-

ence in fertiliser requirements between the different grazing systems.

Confusion over the need to incorporate lime

The idea that you have to incorporate lime into soil to get an economic pasture response was discussed at recent SGS/GSV bus tours in central western Victoria. Cam Nicholson, SGS facilitator, reported that broadcast lime moved much faster than the commonly held view that lime moves slowly (0.5 to 1 cm per year) down the soil profile. On all the 20 top-dressed SGS trial paddocks, soil pH change was detected down to 5 cm after 16 months. John Montgomery, Pivot, says that past research gave similar findings that lime affected the top few centimetres of soil quite quickly but took longer to transform the next few centimetres. This led to the recommendation to work lime into soil where possible. However, where incorporation of lime into high-aluminium soils is not possible, then it is much better to apply lime to the surface than not to apply it at all.

Drought threatens soil assets

The biggest contributing factor to land degradation comes from catastrophic events like drought and floods. With every 1 mm of topsoil eroded, approximately 13 t/ha of topsoil, 130 kg/ha of organic carbon, 20 kg/ha of nitrogen, and 8 kg/ha of phosphorous are lost. Even residual pasture seed is under threat. With this in mind, it is important to conserve pasture cover on paddocks. At least 70% to 80% pasture cover is needed (or 500 kg DM/ha); and on light-textured soils, the amount needed is even greater. Hard decisions, such as not grazing failed crops and restricting stock to containment areas, need to be made. Stock having access to all the paddocks means trampling will break down the feed much faster, leaving the soils vulnerable.

Pastures as a carbon sink

Malcolm McCaskill, research scientist at PVI, Hamilton, reports that medium- and high-fertility pastures could be a carbon sink accumulating up to 2 tonnes of carbon per hectare each year, ac-

ording to results of a preliminary study. In 2000, soil samples were taken from three plots of the Long-term Phosphate Experiment at Hamilton as part of a project funded by the Australian Greenhouse Office (AGO) to calibrate and verify the Rothamsted Carbon Model to Australian conditions. Soil samples were analysed for total carbon and various carbon fractions and compared with similar samples collected in 1994.

A draft report prepared by project leader Dr Jan Skemsted of CSIRO Land and Water shows a 20% increase in carbon on plots with medium and high rates of P fertiliser (7 and 33 kg P/ha/year), indicating that these pastures are a sink for carbon. In contrast, the adjacent nil-P plot showed a 10% reduction in C, or a loss of 1 tonne of carbon per hectare each year. These results indicate that, even 16 years after sowing, the pasture is continuing to act as a sink for carbon. This is because the phosphorus application stimulates greater growth of both above and below ground plant material.

The Long-term Phosphate Experiment was started in 1978. Deep-soil coring was conducted in 1994 to determine whether the application of P was causing any environmental problems. In 2000, three of the 18 plots were sampled to validate the Rothamsted Carbon Model. Pasture measurements and site maintenance for the study were funded by the NRE Wool Strategy; and soil sampling, analysis, and interpretation were funded by the AGO. Further deep coring of all plots is planned for 2004 under the NRE Wool Strategy, which will provide a greater level of confidence in the magnitude of treatment differences.

At present, there is no mechanism by which primary producers can claim carbon credits for pasture improvement and fertiliser application. However, the study indicates that the Department of Natural Resources and Environment's encouragement of pasture improvement on appropriate land classes contributes to Victoria's greenhouse gas abatement.





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Branch Contacts and Coming Events

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Western District: Branch contact: Bruce Lewis, (03) 5574 6261.

Book and CD of interest to farmers and researchers

CSIRO Publishing sent the society two items to review in the newsletter.

The first is a book, which I have not yet read, *Managing and Conserving Grassy Woodlands* by S. McIntyre, J. G. McIvor, and K. M. Heard (editors). CSIRO Publishing says it describes a set of principles that will enable landholders to maintain or increase productivity in grassy woodland country without compromising ecologically sustainability and, at the same time, maintain a substantial proportion of the native flora and fauna. The book is intended for those at the interface of disciplinary research and on-ground application, whether they are working in research, regional planning, extension, Landcare, or land management. 262 pp, hardback, colour illustrations, ISBN 0643068317, \$59.95.

The second item is a compact disk titled *AusGrass: Grasses of*

Dates for the grassland farmer's diary

2nd International Agronomy Congress-2002. 26 to 30 November. New Delhi, India. Theme is 'Balancing food and environment security: a continuing challenge'. Contact: ++11-574 2283, rcg@iari.ernet.in, or www.agrosoc.com.

11th Australian Agronomy Conference. 2 to 6 February 2003. Geelong Waterfront Campus, Deakin University, Geelong, Victoria. Theme is 'Solutions for a better environment'. Contact: (03) 6224 3773, mail@cdesign.com.au, or www.cdesign.com.au/agro2003.

8th International Congress of Plant Pathology (ICPP 2003). 2 to 8 February 2003.

Christchurch Convention Centre, Christchurch, New Zealand. Contact: + 643 325 3685, icpp@lincoln.ac.nz, or <http://events.lincoln.ac.nz/icpp2003>.

ABARE Outlook 2003. 4 to 5 March 2003. National Convention Centre, Canberra. Contact: (02) 6272 2019 or www.abareconomics.com.

Weed Society of Victoria Biennial Conference. 20 to 21 August 2003. Bendigo, Victoria. Contact details in a later edition.

27th International Seed Testing Association Congress. 13 to 25 May 2004. Budapest, Hungary. Contact: www.seedtest.org/27congress/27istac.cfm.

Australia by D. Sharp and B. Simon.. CSIRO Publishing says it is the largest and most comprehensive identification guide to a plant group ever published. Using either interactive or dichotomous keys, *AusGrass* enables quick and accurate identification of any of the 1,323 species of grass, native or naturalised, growing wild in Australia. It can be used with living plants or dry specimens, even when they are not in fruit or flower.

A fact sheet is provided for each species, comprising a botanical description; notes on distribution and taxonomy; and images, such as diagnostic line drawings, scanned specimens, photographs, and stereo-micrographs.

I tried identifying a grass, using the interactive key; and even a non-scientist like me, who didn't know a palea from a rachis, was able to narrow the list based on my specimen description to 30 species. The program was easy to install and use, and I enjoyed the challenge of learning about the

names and functions of the various parts of grass plants. CD-ROM and manual, 1,323 species described, ISBN 0643068619, \$99.00.

For further information, contact CSIRO Publishing on 1800 645 051 or publishing.sales@csiro.au, or visit their website at www.publish.csiro.au.



GSV's e-mail address has changed

You can send e-mail to the Grassland Society of Victoria's office or to the newsletter editor at office@grasslands.org.au.

Please update your e-mail program's address book. The previous address no longer works.