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## Broadacre weed control: *Non-herbicidal strategies, Part 2.*

*In the February issue of Organic News, Steve outlined the importance of correct identification of weed species and gaining a thorough understanding of their lifecycle in order to plan an effective management program. Once weeds and their susceptible stages are identified weed management options during the pasture and pre-cropping (fallow) phases can be considered.*

### The role of pasture leys in weed management

Pasture leys in cropping systems are essential for rejuvenating soil structure, improving fertility and for weed management. Introduced perennial pastures, notably lucerne, can be used for lowering water tables in the paddock and in doing so, bring leached nutrients back to the surface layers of soil.

#### Pasture weed management

This is a difficult topic because some plants which are desirable or can be tolerated in a pasture are often problems in the crop, depending on their density. A species like annual ryegrass is a prime example. If it has moderate density in a pasture (2000 plants per square metre) it will have a large soil seed bank. It will take two years of seed set prevention to go from 2000 down to less than 50 ryegrass per square metre (*It is known that ryegrass will reduce wheat yields at densities less than 50 plants per square metre*). Therefore, it should be obvious that ryegrass management must begin in the pasture phase. Note that non-grain crops can be used in combination with or instead of pastures for managing weeds.

Table 1 shows the impact of two successive silage cuts on the density of ryegrass.

*Table 1 Ryegrass density over a 4 year period at Young (Sutherland and Verbeek 1999)*

Year	Situation	Ryegrass present per square metre
1997	Failed triticale crop cut for silage. Zero ryegrass seed set.	2000
1998	Legume forage grazed and then cut for silage. Zero ryegrass seed set.	260
1999	Field pea	10*

\* Ten ryegrass per square metre will produce a lot of seed in a poorly competitive crop.



NSW Agriculture

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## PASTURE ESTABLISHMENT AND WEED MANAGEMENT

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*“Plant it thick and plough it quick” (Patriquin 1988).* This interesting quotation came from a Canadian farmer who was referring to lucerne and its weed management role. The *“plant it thick”* part relates to the fact that if you want a competitive pasture, the best start is to sow plenty of seed. Everyone knows that you can get reasonable pastures with low sowing rates (2-4 kg/ha) but they invariably take time to become competitive. High seeding rates for all pasture species puts the pressure on the weeds straight away. Clover seeding rates should be up around 10 kg/ha while 5-6 kg/ha lucerne would ensure quick density.

Naturally, to get the best bang for your pasture seed buck, a lot of effort needs to go into the seeder set up to ensure quick, even emergence. Satisfactory inoculation is vital for legume pasture vigour.

### **How many years of pasture?**

A commonly observed error in ley systems is that the pastures are left in for too many seasons. All ley pastures go through a period of being legume dominant. This happens because the crop phase has reduced soil nitrogen levels and the legumes are much better at competing for light, nutrients and water. Then, as the nitrogen levels build again, non-legumes begin building up. If the paddocks are left in pasture too long, non-legumes invariably dominate them. Many of these plants are crop weeds. Hence the second part of the quote *“plough it quick”*. This farmer had cottoned onto the fact that a good way to manage weeds in a ley pasture is to fallow the paddock before the weeds dominate. Some advantages of a short ley are:

- Non-legumes (weeds) have a shorter time to build up.
- Most of the nitrogen the ley is capable of accumulating is fixed in around 3 years.
- Where lucerne is involved, maximum water table reduction is achieved in two to three years.



*Above: ‘Plant it thick, plough it quick’. Sowing lucerne at a higher (5-6 kg/ha) ensures a high stand density and better weed competitiveness.*

## Managing weeds in pasture

In this section, for simplicity, I will refer to plants that are *crop weeds* as weeds in pasture as well.

Consider the following data from Annabel Bowcher's PHD experiment. Annabel aimed at studying the effect of set stock grazing and various forage removal times on pasture composition.

**Table 2. Impact of 2 years of grazing or forage removal on the proportion of annual ryegrass, vulpia, sub clover and Paterson's curse plants. (Bowcher)**

Treatment	Change in frequency percentage			
	ryegrass	vulpia	clover	Paterson's curse
<b>Grazed.</b> Set stocked at 7 to 10 dry sheep equivalents per hectare.	26–18 down	20 – 26 up	23 –18 down	4 – 0.3 down
<b>Cut early October</b> Ryegrass was it the ear emerged, pre-flowering stage. Vulpia was post flowering to soft seed stage.	25 – 28up	17 – 2 down	31 – 36 up	4 – 7up
<b>Cut late October.</b> Rye grass had finished flowering and most plants had soft seed. Vulpia plants had soft seed.	26 – 52 up	13–10 down	37 –12 down	3– 4up
<b>Cut late November.</b> All ryegrass seed was mature and some had begun to shed. Vulpia seed was shedding.	26 – 9 down	13 – 41 up	32 – 20 down	3 – 1.5 down

It's very obvious that a single management option brings about complex changes and that if more than one species needs to be reduced, a combination of treatments is required. Purely as an example, consider a pasture ley that is of four years. Weed management options can be split up according to the age of the pasture.

**Table 3 Weed management options during the pasture phase (examples)**

Pasture year	Weed management options
1	Competition from the dense seedling pasture and grazing management aimed at maximising the competitive ability of the pasture.
2	Competition plus strategic grazing. Use different livestock species depending on their selective grazing habits. Topping may be appropriate if grasses are thick already. Silage or hay cut may be worthwhile in lieu of topping.
3	Strategic grazing and topping of weeds. Once again, silage or hay would be an option as an alternative to topping.
4	Grazing to utilise pasture. Fallow paddock before any seed is formed.

Intensive grazing during the vegetative stages of grass growth will suppress the grass (eg barley grass or ryegrass) and allow other species like clover to benefit. Unattractive grasses like vulpia are less likely to be suppressed by grazing.

The program would also work with plants like Paterson's curse, except that it would rely more on grazing management than need be the case with grasses. The best cutting time for curse is late flowering through to early green seed formation. Cutting curse prematurely will simply result in re-growth and more flowers.

### Tickling during the pasture phase

Some weeds are adept at lying dormant during pasture phases. One way to stimulate them is by using an autumn tickle. This light working would be done before the break rains so that minimal damage is done to the clover and other desirable plants. Once germinated, the weeds can be managed by a combination of grazing and topping.

## FALLOWING

In all forms of cropping, the fallowing operation between the pasture and crop (or between non-grain crop and grain crop) phase presents a unique opportunity to reduce seed production of problematic species. The primary cultivation needs to be timed so that the earliest maturing species are prevented from seeding. In addition, the plough needs to be correctly adjusted so that all plants are buried, minimising the need for an early secondary cultivation. An effective ploughing operation will bury many seeds deeply enough so they will not germinate next year. The trick with secondary workings is to avoid bringing the weed seeds back to the surface. Seed burial may not be essential if a green manure crop is planned.

## NON-GRAIN CROP OPTIONS

Crops which are planted for green manure, forage or fodder conservation purposes are powerful weed control options. (see Table1). The reason being that the desired outcome is achieved before weeds make viable seed. The paddocks are ploughed so that at season's end, no weed seed (or at least only small amounts) has been added to the soil seedbank. In addition, during the paddock preparation for each crop, more dormant seeds can be stimulated.

Where weeds like wild radish are a problem, more than one year of high levels of weed control is needed to run the seedbank down and a succession of non-grain crops would be a useful option.

In a weed control context, there is little difference between any of these three options. However, there are other considerations:

- **Green manure** builds soil structure and nutritional level but can be difficult to justify economically. Green manure crop could be grazed for a time, which would improve the economics, but reduce the quantity of material for ploughing in.
- **Silage (or hay)** easier to justify, especially if the material is used in the short term and livestock prices are satisfactory. The problem is that a large amount of nutrient is removed from the paddock.
- **Forage crop** is easy to justify when livestock product prices are good. Best of all, the grazing livestock removes relatively small amounts of nutrient.

## BIOLOGICAL WEED CONTROL

Biological control of weeds can play an important part in an integrated weed management system although biological control agents may take a long time to build to a level where significant impact on the pest weed occurs. In the case of Paterson's curse, for example, there are five main insects that have been reared and distributed Australia-wide and models have predicted that control is likely to be achieved in 15+ years. More information on these and other biological control agents can be found at

[http://www.ento.csiro.au/research/weedmgmt/info\\_sheets.html](http://www.ento.csiro.au/research/weedmgmt/info_sheets.html) also  
<http://www.agric.nsw.gov.au/reader/1878>

## Don't be Tempted!

The essential part of all such non-grain crop options is that the crop and weed plants should not be allowed to shed seed onto the paddock. Where a non-grain crop looks like making a lot of grain, there will be the temptation to harvest grain. This will result in weed seedbank replenishment and will be a step backwards in terms of weed control.

## Seed Increase Area

Some non-grain crop area will need to be prepared for the production of sowing seed. This would involve extra prior weed management, as for a grain crop. This will help maximise non-grain crop seed production and minimise weed seed contamination.

## FALLOW MANAGEMENT

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Fallow weeds tie up nutrients which would otherwise be available for the following crop. They also use soil moisture. Therefore, fallows need to be kept free of weeds as much as possible, bearing in mind that a minimum number of workings is desirable for soil structure. Obviously, grazing is an option to be used in conjunction with cultivation, remembering that some summer weeds are unattractive and or toxic to stock.

### Summer grazing crop?

An option in some areas is to grow an over summer forage crop such as cow pea or lab lab bean rather than having a fallow. The advantage is that the crop competes with weeds and being a legume, provides high quality tucker and adds to soil nitrogen. The disadvantage is that soil moisture is used up, available nutrients like phosphorus will be tied up and some weeds will make seed. The residue of the crop after grazing would be ploughed in time to get the paddock ready for cereal sowing. Harvesting the crop would remove nutrients that would otherwise be used by the winter crop.

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*Steve Sutherland, NSW Agriculture and CRC for Australian Weed Management*

## References

Bowcher, A. 2000, Impact of cutting time on the density of *Vulpia* spp and *Lolium* spp. personal communication.

Patriquin, D.G. 1988 "Weed Control in Organic Farming Systems" in Weed Management in Agroecosystems: Ecological Approaches: Editors Altieri, M.A. Liebman, M.Z and Boca Raton, F. L. CRC Press pp 303-317.

Sutherland, S.J.M. and Verbeek, B.1999. Unpublished data. A progress report on a weed management demonstration at Young, NSW

**Next month: The April issue of Organic News will be the final in the series by Steve and will look at options for weed control during the cropping phase.**



## Organic Vegetables Thriving at Bathurst



Above: Adrian Lynch inspecting flowering organic sweet corn at BARAS.

### Publications

#### NSW Agriculture publications

##### Turning the worm.

Electronic newsletter edited by Stephen Love containing information on the management of internal parasites of farmed animals including sheep, cattle, goats and alpacas.

For the latest issue and back issues go to:  
<http://www.agric.nsw.gov.au/reader/6359>

#### Other publications of interest

**Fresh Produce Manual:** Handling & Storage Practices for Fresh Produce. (3<sup>rd</sup> Ed.).

Australian United Fresh Fruit and Vegetable Association Ltd. This manual is for use by all players of the postharvest fruit and vegetable industry. The manual describes in simple terms the physiology of fresh produce and its implications for their handling and storage. It brings up-to-date information on quality management and food safety, which are two of the major challenges currently faced by the industry. It describes all key technical aspects such as temperature management, humidity, postharvest treatments, controlled and modified atmospheres, operation of facilities and equipment, packaging, supply/demand chain logistics and transport.

Australian United Fresh Fruit & Vegetable Association Ltd (AUF) is making available discounts for Bulk purchases (10 or more) of the Fresh Produce Manual.

For More Information contact:

Australian United Fresh Fruit & Vegetable Assn Ltd  
PO Box 82, Sydney Markets NSW 2129  
Ph: 02 9763 1767, Fax: 02 9746 3008, Mobile: 0407 589 445  
Email: [auf@iprimus.com.au](mailto:auf@iprimus.com.au)

Horticultural Researcher Gus Campbell and Technical Assistant Adrian Lynch have successfully converted a small part of Bathurst Agricultural Research and Advisory Station (BARAS) over to organic production. Despite the challenges of the drought last year, they have produce healthy crops of sweet corn, tomatoes, beans, pumpkins, cucumbers, zucchini, broccoli, lettuce, onions, chilli and capsicum. The small-scale trial takes up about one third of a hectare, but has supplied a valuable learning experience for staff at BARAS. Hopefully, with industry funding, this area will be expanded in the coming years to provide important information to the organic sector.

Developing the block was not without challenges. It has a heavy weed seed burden and it has taken some time and money to sort out the irrigation infrastructure. Considerable effort has been spent manually removing weeds, next season this problem will be tackled by adjusting row spacings for mechanical weed control and using irrigation techniques such as T-tape to reduced water availability to weeds. The seasonal timing of planting out seedlings will also be looked at to increase the vegetable crop capacity to compete with weeds.

Added to the list for next season will be rhubarb, silverbeet, and asparagus, these crops offer the advantage of having more than one harvest per season. It is hoped they will provide more income per unit of labour.

Nutrient supply for the crops was provided by compost produced on farm, blue metal dust and lime. "Insect control is not an issue" according to Gus Campbell. Heliothus was controlled with a biological control agent.

Most of produce is being sold through local conventional markets for a conventional price as BARAS does not yet have official organic certification. This has highlighted to us the problems a small-scale organic producer may encounter finding markets that provide adequate prices for their produce. In the future, gross margins and cost benefit analysis of the organic production block will be useful to the industry.

For more information contact Gus Campbell on 02 6330 1200.

*Karen O'Malley, NSW Agriculture Bathurst Centre for Organic Farming*

## Onion Thrips Exposed

Onion thrips, a pest of onions, garlic and other related plants worldwide, is considered the most important pest insect by the Australian onion industry. A recent survey of growers showed that 60% of growers reported crop loss due to direct damage by onion thrips in recent years. Thrips feed on onion leaves by piercing and rasping the leaf surface to release liquids from plant cells. As the leaf grows, the damaged area enlarges, leaving patches of damaged tissue, and reducing the plant's ability to photosynthesize and maintain a water balance.

Thrips can also damage harvested bulbs. In Tasmania, significant losses have occurred in storage and during shipping transit of export onions to Europe. In 2002, thrips damage to a red onion shipment resulted in half of the shipment being lowered in quality and value.

Integrated pest management options for thrips overseas include avoiding planting during the hot, dry season, maintain good soil moisture, destroying unharvested plants, mixed cropping of carrots and onions and regular monitoring using sticky yellow traps and visual inspection of the lower parts of the leaves. Reduction of alternate host plants and weeds around the crop is also helpful. While information from overseas is useful, not all findings or recommendations are readily applicable to the Australian onion industry.

An industry-funded study has revealed new information on the seasonal movement and potential threat that onion thrips pose to onion crops in Southern Australia. While part of the study assessed the impact of pesticides in conventional crops, the population dynamics in an organically grown onion crop proved an interesting comparison.

One organic and one conventional onion crop in NSW along with two conventional crops in South Australia were studied during the 2003/04 season. Thrips numbers were monitored from mid August through to harvest in December of the crops in NSW. Numbers started to build up in September when the plants were 15-17 weeks old. The conventional site received regular pesticide applications from mid- September onwards, while no treatments were applied to the organic crop. By late October thrips numbers reached a peak of 15 adults per plant at the organic site, and 10 adults per plant at the conventional site. Thereafter, thrips numbers started to decline, until the plant tops collapsed in late September, by which time all thrips had disappeared from both crops.

In South Australia, thrips numbers reached a peak of 30 thrips per plant in early December. At the two sites, although the crops were of different maturity, thrips numbers peaked around the same time suggesting that weather patterns and day-length had more influence on numbers than crop stage. Discussions with growers also revealed local knowledge of thrips movements. For instance, several growers reported rapid increases in thrips numbers in onion crops once nearby cereal crops "hayed-off" leading up to harvest.



*Above: Harvesting organic onions on the thrips trial site at Coleambally in southern NSW.*

According to project leader Dr. Jian Hua Mo from NSW Agriculture's National Vegetable Industry Centre at Yanco, more than 85% of the thrips found in the NSW onion crops were onion thrips. A small number of plague thrips and unknown thrips species were also found occasionally. In contrast, over 50% of the thrips found in weeds surrounding the crops were plague thrips. In South Australia, only 40% of the total thrips collected on sticky traps were onion thrips, while in the crop approximately 95% of thrips were onion thrips.

A number of economic action thresholds have been developed overseas ranging from five to 10 thrips per plant. Some people base their threshold on number of thrips per leaf, while others used per plant or an infested plant threshold of 50% infested plants. Developing a threshold appropriate to Australian conditions is part of the study. Figures 1 and 2 give an indication of the numbers found in Australian onion crops.

The above charts show the seasonal populations in both an organic and conventionally grown onion. In the organic crop (Figure 1), thrips numbers slowly built up during the season, then declined as the crop matured. In contrast, the conventional crop showed fluctuations in population, corresponding to pesticide applications. However, there appears to be a large increase in thrips numbers towards the end of the conventional crop. It's interesting to note that although the conventional onion crop had three insecticide applications, thrips numbers in the organic crop at harvest were less than the conventionally grown crop.

While the results of this year's monitoring suggests that onions can be grown organically without direct treatment for thrips, higher pest pressures may force growers to consider alternative management strategies. Tasmanian researchers have achieved excellent laboratory results using a natural pyrethrum insecticide for control of onion thrips. This season they are looking at field treatments with the hope of developing effective spray program for onion thrips control when populations are high.

For more information contact Mark Hickey on 02 6951 2523.

*Mark Hickey, NSW Agriculture National Vegetable Industry Centre, Yanco*

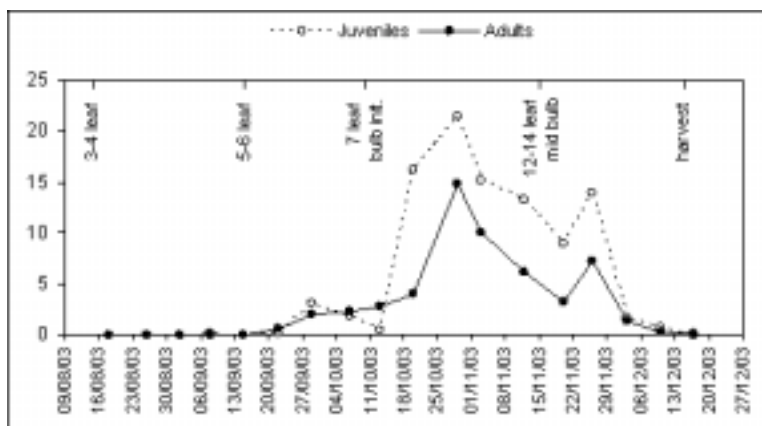


Figure 1 - Seasonal population (thrips/plant) of thrips in an organic onion crop.

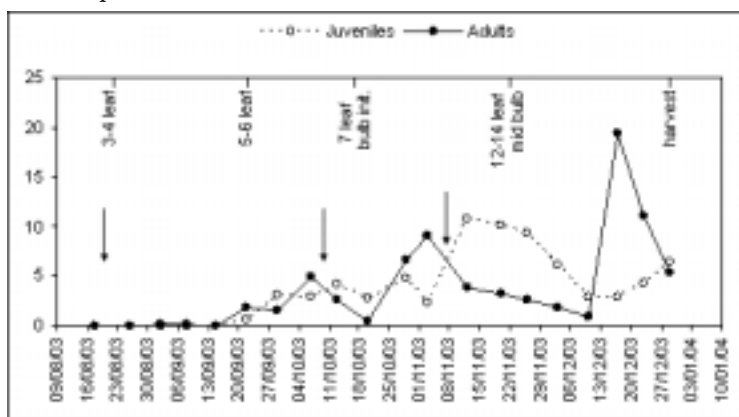


Figure 2 - Seasonal population (thrips/plant) of thrips in a conventional onion crop. Arrows indicate when pesticide spray applied



## Events calendar

### **Organic Conference**

March 12–13, 2004  
East Gippsland Organic  
Agriculture Association  
PO Box 1263 Bairnsdale VIC 3875  
03 5157 1586

### **Annual Macfarlane USA FARM STUDY TOUR 2004.**

Don will once again be conducting his popular annual tour to the USA on June 17 – July 12, 2004.

This year's itinerary includes visits to some of the most progressive and inspirational farming enterprises in the states of Nebraska, New York and Washington DC.

This tour will introduce the group to scientists and farmers chosen because their skills have enabled them to achieve astonishing outcomes in farm viability, marketing and environmental care.

Also their transformational leadership abilities engender optimal information transfer, from the most basic to an advanced technical level.

The cost of the tour will be around \$AUS 5,500 p.p. which includes the cost for air ticket from Brisbane, Sydney or Melbourne, airport taxes, coach, motel accommodation, some with breakfast, for a group of 40.

For more details contact: Don Macfarlane  
"Kilbirnie" MS 126, Harrisville QLD 4307  
Ph: 07 5467 1411 Fax: 07 5467 1127  
Email: biofarmtours@bigpond.com

### **European Seminar on Organic Farming Statistics**

Berlin, 26 and 27 April 2004

Second Announcement and call for papers:  
new deadline for abstracts

The first EISfOM seminar on the 'Development of European Information Systems for Organic Markets — improving the availability, quality and comparability of statistical data' will take place in Berlin on 26 and 27 April 2004.

Full details and the outline program are available at

<http://www.eisfom.org/seminar/index.html>

## Calcium Silica interactions

Martin I'Ons who is a Geologist and stonefruit grower has funded some of his own work to try to solve apparent calcium deficiency problems on his own orchard. The work is in relation to the widespread promotion of foliar calcium sprays that are being recommended to growers by a number of commercial companies to counteract the soft tip problems that are encountered on some varieties in some seasons.

Martin tested soils in a range of climatic zones where stone fruit is grown from Swan Hill, Orange, and Stanthorpe and locally to measure the silica levels in soils and the relationship to available calcium for plants. Red soils were generally low in silica due to high rainfall and leaching, where in places like Swan Hill silica was higher and so was available calcium. The higher calcium levels, Martin explains, are associated with firmer fruit, increased sugar levels, reduced insect problems and increased flower and fruit set. Further work is to be carried out this season. A data logger has been installed to measure the chill units on the block. This work is being partly funded by a voluntary contribution from the local association and Horticulture Australia Limited.

Privately funded research during the past four months indicates:

1. Silicon levels of around 1,000 ppm in leaf tissue are required before trees will take up and hold optimum calcium concentrations (around 3%).
2. Plant available silicon in soils appears to be about one tenth of the leaf analysis figure i.e. soil values have to be above 100ppm to achieve 1,000 ppm in leaf tissue.
3. Silicon application options: Ground application: Martin has looked at a number of options and tested the plant available silicon levels of different materials with the conclusion that a product 'Kwik Release Siliconite' from Queensland is the best material. One application at 1 ton per hectare thrown under the trees should provide sufficient silicon for 2,3 and maybe 4 years depending on the amount of rainfall and the initial analysis of the soil. It can be blended with lime or dolomite and applied in one operation. Soil values still need to be monitored to determine optimum application rates and intervals. This product is available through Batsons Eco Earth Products at \$450 per ton plus GST.
4. According to literature, higher silicon levels in plants have the following benefits: reduces moisture loss, improves photosynthetic capacity resulting in higher brix, strengthens cell walls (like calcium), reduces fungal infections and insect attack (plants are tougher), plants have more flowers and pollen in more viable resulting in greater fruit set.

For more information contact: Martin I'Ons 02 6687 1862.

Extracted from *Coastal Fruit Growers' Newsletter*.

No. 41 Winter 2001. ISSN 1036-4773.

<http://www.agric.nsw.gov.au/reader/10595>

## Organic meat tour planned for Southern NSW

Organic producers in the State's south are set to benefit from a two day bus tour being planned by NSW Agriculture's Tumut-based Beef Officer, Michael Campbell, and Organic Farming Liaison Officer, Robyn Neeson.

Set down for the middle of 2004, the tour will cover all aspects of organic meat production and supply chain management including principals of organic livestock production, transportation, slaughter, market specifications, and wholesaler and retailer requirements.

Michael explains that the tour is not just aimed at existing organic producers, but hopes to help those contemplating organic production as well. "The aim of the tour is to increase the knowledge of producers to the requirements for successful organic beef and lamb production. On the tour we will visit successful organic farms at Holbrook, Narrandera and Cootamundra," said Michael.

Supplying the organic meat market doesn't stop at the farm. Producing what the market wants is just as important for organic producers as it is for non-organic producers, so part of the tour will explain to producers just how they can meet market specifications. "A visit to Bush's abattoir at Yanco which is certified to process organic livestock, will include a presentation from a Meat Standards Australia (MSA) representative. We will then travel to an organic farm to get first hand experience in some of the techniques used to assess whether livestock are meeting these requirements. Tour participants will be shown how to undertake fat scoring, weighing and muscle scoring of beef and lamb and given the opportunity to practice these skills during the visit," said Michael.

The final leg of the tour will include a visit to well known Canberra organic meat retailer, Griffith Butchery and Delicatessen, followed by an organic dinner where tour participants will get to taste test some of the products from the Cootamundra organic farm. "This stage of the tour will really bring home to producers the importance of following their product all the way through the production and supply chain to the retail and consumer levels", said Michael.

For preliminary expressions of interest to take part in the organic livestock tour contact Michael Campbell on 02 6947 4188 or 0429 036 864.

*Robyn Neeson, NSW Agriculture Yanco*



### Do you have any Organic News?

Do you have any research results, field day reports or other information that may be of relevance to organic agriculture? If so, let us hear about it! Send your contributions to:

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NSW Agriculture  
PMB Yanco Agricultural Institute  
YANCO NSW 2703  
or Email: [robyn.neeson@agric.nsw.gov.au](mailto:robyn.neeson@agric.nsw.gov.au)

Note: Articles are to be received by the 2<sup>nd</sup> Tuesday of each month. Electronic copy preferred, Word format, Times New Roman, 10-point font, no column formatting is necessary.

