NSW GOVERNMENT Primary Industries

NEWSLETTER

# Organic news

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## In this issue



## Farmscaping: Making use of nature's pest management services

*In order to remain commercially viable, organic farmers need to consider the development of a farming system which, as near as possible, mimics nature. This means designing a system which provides not only ideal growing conditions for crops and pastures, but also an environment which attracts and sustains a diverse ecology which includes, for example, an assortment of birds, predatory insects and soil microorganisms.*

*The following article looks at Farmscaping - a design concept aimed at increasing the presence of beneficial organisms in the farming system. The article is reproduced in-full with the kind permission of the U.S. based eXtension eOrganic Community of Practice. eOrganic author of the article is Geoff Zehnder, Clemson University.*

### What is Farmscaping?

Farmscaping is a whole-farm, ecological approach to increase and manage biodiversity with the goal of increasing the presence of beneficial organisms. Many pest populations can be managed by enhancing the efficacy and local abundance of the existing community of natural enemies through modification of the environment, a concept that has been termed "conservation biological control."

Farmscaping methods include the use of insectary plants, hedgerows, cover crops, and water reservoirs to attract and support populations of beneficial organisms such as insects, spiders, amphibians, reptiles, bats, and birds that parasitize or prey upon insect pests.

Insectary plants like mustards interplanted with market crops provide pollen and nectar to attract and maintain beneficial insects in the crop landscape.

Ideal farmscape plantings provide food and shelter for beneficial organisms, suppress weeds, and grow in close proximity to the cash crop without competing for space (light, water and nutrients). In some cases, the term "farmscaping" is broadened beyond just augmentation of insectary plants to include trap crops—i.e. host plants that are more attractive to the pest than the cash crop that are planted near the cash crop to "trap" pests, thus reducing pressure and damage to the cash crop. More on trap crops later…

### How does Farmscaping work?

Farmscaping aims to prevent damaging levels of pests from developing in the crop ecosystem. Early research demonstrated that biological control of insect pests can be achieved if significant numbers of natural enemies are present at critical times during pest development.

*Figure 1. Evaluating a sorghum trap crop being used to control stink bugs in adjacent fields of peanuts and cotton. Photo: Stephen Ausmus, USDA Agricultural Research Service Photo Library*

In farmscaping, beneficial organisms are considered – and managed - as “mini-livestock”. Livestock producers will tell you that their animals are healthier and reproduce more readily when provided an adequate and nutritious diet. Likewise, natural enemies require adequate supplies of nectar, pollen and plant-feeding insects and other arthropods as food to sustain and increase their populations. Flowering plants provide many of the food resources natural enemies need. However, creating a farmscape of flowering plants picked at random may favor pest populations over beneficial organisms. This crude approach has been referred to as “Chocolate Box Ecology”.

*Figure 2. Simply adding attractive flowering plants to the farmscape without knowledge of the biology and behavior of key pest and natural enemy species will not result in effective biological control. This practice has been called "Chocolate Box Ecology”. Photo: eOrganic archive*

Planting a diversity of flowering plants to enhance biological control has been referred to as "chocolate box ecology" because of the colorful floral display. However, using this approach without knowledge of key pests and the interaction among plants, pests and natural enemies may lead to failure. Recent research has shown that the quality, not quantity, of the farmscape plantings is most important. Researchers now commonly screen plant species and use a range of selection criteria to determine appropriate botanical composition. An excellent reference on the topic is *Ecological Engineering for Pest Management: Advances in Habitat Manipulation for Arthropods* (2004). Gurr, Wratten & Altieri [eds], CABI Publishing).

In planning the farmscape it is important to identify specific plants, planting situations, and management practices that best support populations of beneficial organisms. This requires some information-gathering and management skill on the part of the grower, but this investment can result in the following benefits:

- **Reduced need for pesticides and savings in pest management costs**. The pest suppressive influence of an effective farmscape will perpetuate as long as the farmscape provides suitable habitat for natural enemies.
- **Increased habitat and wildlife diversity on the farm**. A carefully planned farmscape increases overall ecological diversity and improves habitat for plant and animal species.
- **Farmscaping is adaptable to any farm plan**. Insectary plantings can be placed adjacent to crop fields, but they can also be placed next to paths or roadways, on steep banks, along drainage ditches, or in buffer zones.
- **Erosion control/soil building**. Farmscapes placed in contours between fields, steep ditches, or places that are easily eroded gives stability to the soil. Farmscaping can also be used as a filter strip to prevent water runoff and soil erosion. Plants used in farmscapes contribute to healthy soil by adding nutrients and organic matter.
- **Added value.** Farmscape plants like cut flowers and medicinal plants can be sold at market to generate added income for the farm. (Note: Farmscape plants grown in designated buffer zones cannot be sold as "organic," but they may have market value. Records should be maintained of all sales of crops harvested from buffer zones.)

## Farmscape planning

Keep in mind that farmscaping is not a “silver bullet” that alone will solve all pest problems. Rather, it is an ecological approach or tool that can be combined with other pest management strategies as part of an integrated organic pest management program.

- **1st Phase:** Cultural practices compatible with natural processes, such as crop rotation, soil management, non-transgenic host plant resistance, farm/field location

- **2nd Phase:** Vegetation management to enhance natural enemy impact and exert direct effects on pest populations
- **3rd Phase:** Inundative and inoculative releases of biological control agents
- **4th Phase:** Approved insecticides of biological and mineral origin, and use of mating disruption

In this phased approach to on-farm pest management planning, farmscaping (2nd phase) is integrated with other pest management strategies. Priority is given to preventative pest management strategies like farmscaping, followed by more direct measures if preventative strategies are not sufficient (Zehnder et al. 2007).

There are many different approaches and strategies in farmscaping. Many farmers start with a simple farmscaping plan, such as including strips of a cover crop within a cash crop, based on the farmer's observation that the flowering cover crop attracts beneficial insects. The farmer may later add other elements such as perennial hedge rows, perimeters or strip plantings of beneficial habitat seed mixes, and herbs and/or cut flowers known to support natural enemies of the farm's major pests.

One common approach in farmscape planning is to first think about the intended crop, then the key pest(s) that are known to attack the crop, then determine the commonly occurring natural enemies of the pest(s), and identify appropriate food plants and harborage requisites.

## Designing a Farmscape for enhanced biological control

This section will familiarize you with key factors to consider in planning a farmscape for effective biological control, including:

- Ecology and timing of pests and beneficials
- Selection of appropriate strategies
- Establishment and characteristics of insectary plants

The most successful farmscape systems have been developed and fine-tuned by farmers to fit their individual circumstances.

Before planning the farmscape, collect as much information as possible. For each market crop to be grown, make a list of the most damaging pests that require management; then for each pest, try to answer the following questions:

- What are its food and habitat needs?
- Where does the pest come from, how is it attracted to the crop?
- What factors influence pest abundance, and when/how does it cause economic damage?
- What are the most important endemic (local, naturally occurring) predators and parasites of the pest?
- Where do predators/parasites come from, how are they attracted to the crop and what factors cause them to persist in the crop?
- Are critical resources (pollen, nectar, alternative hosts/prey) available at the right time?
- Which annuals and perennials can compensate for critical gaps in resource availability, particularly when prey is scarce?

*Figure 3. Assassin bugs are generalist predators; although they feed on both pest and beneficial insects they are generally considered to be beneficial. The Orange Assassin Bug, Gminatus wallengreni or Gminatus australis. Photo by Peter Chew. http://www.brisbaneinsects.com/*

## Selection of appropriate strategies

Once information is available on key pests and their natural enemies, the following strategies can be considered:

- **Reduction of pest habitat.** Reduce or alter the pest overwintering site, or reduce/alter the locations from which the pest invades
- **Augmentation of beneficial habitat.** When establishing insectary plants, consider both perennial and annual options; i.e. permanent plantings such as hedgerows along with flowering annuals. Depending on key pests and beneficials present, it will probably be advantageous to establish year-round beneficial organism habitat and food sources. The "beneficial habitat season" may be extended by adding plants that bloom sequentially throughout the growing season or the whole year.

- **Trap Crops:** Trap crops are more attractive to the pest than is the market crop. This is due to the timing of the appearance of the trap crop and/or because it is physiologically more attractive to the pest insect.

## Establishment of insectary plants …. things to consider

- What seed and plant sources are available?
- What is the cost in time and dollars involved with land preparation, planting and maintenance of annual and perennial plantings?
- What are the equipment and supply needs?

*Figure 4. Tanimura & Antle, Inc. vegetable growers in California plant flower strips between rows of celery to provide food and habitat for beneficial insects, which reduce aphid outbreaks. Photo: Eric Brennan; courtesy of UC SAREP*

## Characteristics of insectary plants that make them attractive to beneficials

Flowers or extra-floral nectaries provide nectar. Nectar is a source of liquid sugar (energy) and vitamins for beneficials, and is critical for optimum performance. Research has shown that for a typical parasitic wasp, egg laying capacity can be 10 times greater for females given a high quality nectar diet compared with females given a poor quality diet.

**Extra-floral nectaries** are nectar glands that are not associated with flowers. Parasitic and predatory insects use extra-floral nectaries as food sources and mating sites. The supplemental nectar provided by extra-floral nectaries is important, especially during the early season or periods of drought when few plants are in bloom. Peonies, sweet potato, bachelor button and lima bean are examples of plants with extra-floral nectaries located on various parts of the plant.

*Figure 5. M. croceipes parasitoid feeding from an extrafloral nectary on a cotton leaf. Photo courtesy Dr. W. Joe Lewis, USDA-ARS*

**Flowers that provide pollen.** Pollen is a source of protein and protein is critical for egg laying. Many plants in the Umbelliferae family are good sources of pollen. Another good pollen producer is the corn plant.

**Alternative hosts for beneficial insect prey.** In some situations it is useful to establish plantings that will support prey populations that can provide food for natural enemies to sustain their initial establishment into the area. For example, goldenrod and fennel can be planted to harbor aphids that serve as hosts for early-season predator species.

**The flower structure providing pollen/nectar must be accessible.** Some of the best nectar source plants are those in the wild carrot family (also known as Umbelliferae or Apiaceae), such as dill, fennel, tansy, Queen Anne's lace, caraway, coriander, and parsnip. These plants have small, open flowers that are accessible to the tiny mouthparts of small, parasitic wasps. Fennel (both the common and bronze varieties) is not only attractive to small parasitic wasps but its flowers also attract syrphid flies, lacewings, mantids, lampyrids (lightning bugs) and ladybugs. Thus, this one plant can attract a "guild" or several different types of beneficial species.

An easy way to add Umbeliferae to the farmscape is to buy carrots or parsnips at the market with the tops on and plant them in the farmscape. If planting as a market crop, let some plants go to seed and overwinter to provide an abundance of flowers next season.

*Figure 6. Wild parsnip (left) and Figure 7. Queen Anne's Lace; note the many small flowers accessible to the mouthparts of small parasitoid species. Photo courtesy Dan Tallman, Northern State Univ.*

## A recap: steps in Farmscape planning

1. Keep good records of where, when, and what pests occur on the farm.
2. Gather information about key pest and natural enemy life cycles and habitat requirements.
3. Make a list of available strategies to go into your farmscaping "toolbox" that can be implemented to create a friendlier habitat for the beneficials, and a more unfriendly habitat for pests.
4. Select a combination of strategies from the toolbox that best fit your farm plan (i.e., location of your fields, crops grown and rotation plans, available equipment and labor).
5. Choose appropriate annual and perennial insectary plants.
6. Observe and keep records of the results; experiment with different strategies and fine tune the system. Start simple and small, then develop and expand the farmscape based on observations and results.

## Monitoring the Farmscape

Once the farmscape is in place, regular monitoring of plants will indicate whether a healthy population of beneficial insects has been established. Sampling of crop plants should be done at least weekly. Insect sampling guidelines are available online. Use your web browser to search for "insect sampling guidelines" by specific crop.

As a general indication of the effectiveness of farmscape plantings, 25-30% of crop plants that are sampled should show signs of beneficial insect activity (visible predators and parasitoids, cocoons, mummies, partially eaten egg masses, etc.) and/or they should be pest free.

## Other considerations

**Consider the area to be Farmscaped.** The optimum area of the farm devoted to farmscaping depends upon the dispersion capabilities of the beneficials you want to attract (see Table 1 below). For example, syrphid fly adults can travel over long distances, so food plants established in just one location could support syrphids that could travel over the entire farm. To attract small parasitic wasps or ladybugs with a much more limited range, it is necessary to establish food plants in several areas of close proximity to the crop. In general, multiple "clumps" of food plants spread out over an area will generally be more effective than establishing just one large "clump".

**Table 1. Dispersion capabilities of some common beneficial insects.**

| **Low Dispersion: Stay in or near field** | **Medium Dispersion: ~ 1/4 mile** | **High Dispersion: > 1/4 mile** |
|---|---|---|
| Ground beetles | Med. size parasitic wasps | Syrphid and hover flies |
| Lady beetles | Predatory wasps | Dragonfiles, tachinid flies |
| Small parasitic wasps | Predatory bugs (hemipterans) | Large parasitic wasps |

**Added value.** Remember also that farmscaping plants can add value beyond biological control. For example, fennel and colored yarrow varieties can be sold as cut flowers. Flowering medicinal plants like Echinacea, fever few, and boneset also have multiple uses.

**Weather.** Weather variations from year to year may strongly influence whether a particular management practice is effective. Therefore, a flexible approach is needed to be able to adjust beneficial habitat according to weather conditions. Observation and experience are the most valuable tools in this regard.

## Enhancing crop diversity to manage pests from the "bottom up"

We've previously discussed the establishment of insectary plants that effect pests in a "Top Down" manner. This term is used because we are providing food and habitat for the top animals in the food chain, the predators and parasites. But we can also manage pests from the "Bottom Up" by manipulating the environment for host plants upon which the pests feed. Intercropping, companion planting and trap cropping are three examples:

### *Intercropping*

Intercropping is the practice of growing two or more crops (usually different families) in the same area. Strip cropping is a derivation of intercropping and is the practice of growing two or more crops in alternating strips across a field. Both practices serve to increase biodiversity and make the habitat less suitable for pest development. Pests find it easier to locate host plants when grown in a monoculture versus a mixed planting. This is based on the "Resource Concentration Hypothesis" which says that plant-feeding insects are more likely to find and stay in more dense and less diverse patches of their host plants. Interplantings of non-host crops may also act as a food source or habitat for beneficial organisms. More research is needed to understand the complex interactions among pests, natural enemies, and mixed crop habitats.

### *Companion planting*

This is a broad topic that refers to the addition of specific plants to enhance the growth and quality of nearby crops. In a pest management context companion plants are usually added to deter or repel pests. The African marigold, for example, releases thiopene—a nematode repellent—making it a good companion for a number of garden crops.

A recent study on the effects of non-host companion plants on host finding by the cabbage root fly and onion fly demonstrated that companion plant odor had little or no effect, but that plant size, leaf area and color were the most important factors in disrupting host location.

*Figure 8. Example of companion planting (from left to right; lettuce, cabbage and sunflower).*

### *Trap cropping*

A trap crop is a crop that is planted to lure insect pests away from the cash crop. The trap crop can be a different plant species, a different variety, or just a different growth stage of the same species, as long as it is more attractive to the pests when they are present. Successful use of trap crops is challenging. The trap crop must be more attractive to the pest than the cash crop, and steps must be taken to ensure that the pests in the trap crop don't later migrate to the cash crop.

Trap crops are not effective against pests that are weak fliers and/or are wind-dispersed (e.g., aphids, spider mites). Trap crops were originally designed to be used in conventional systems where insecticides could be used to kill the pests in the trap crop. In organic systems approved insecticides can be used, but pests can also be eliminated by crop destruction. The timing is critical – destruction too early or too late can negate the trap crop effects or even result in mass pest migration to the cash crop.

*Figure 9 Predatory bug parasitises Heliothis larvae in a trap crop of pigeon peas Photo: R. Neeson NSW DPI*

## References


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*This is an eOrganic article and was reviewed for compliance with the USDA National Organic Program regulations by members of the eOrganic community. Always check with your organic certification agency before adopting new practices or using new materials.*

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***Editor's notes:***

*1. When selecting plants to act as nectaries / insectaries it is important to ensure they do not become a significant weed problem*

*2. The Association of Beneficial Arthropod Producers Inc (ABC Inc) website lists key pests of crops and all the commercially available beneficial insects in Australia and New Zealand. The site also has an introduction to Integrated Pest Management (IPM) - including suggestions on how to start using beneficial insects in your crops: http://www.goodbugs.org.au/index.html*

# News, publications, commentaries & events

## News & commentaries

### *NSW DPI Organic Farming Course*

NSW DPI's "Introduction to Organic Agriculture" is a workshop that will be run on demand throughout NSW. The workshop is usually a full day and classroom based, however 2-day workshops are also available, particularly where farm visits are requested and courses are tailored to suit the needs of a specific group.

"Introduction to Organic Agriculture" is targeted at those participants who are aspiring to convert to organic production, or experienced organic producers who want to improve their skills or diversify into new areas. It is also suitable for people involved in the provision of technical services, organic fertilisers, crop protection agents and other organic inputs, also people in non-rural areas looking at sustainable land management practices.

"Introduction to Organic Agriculture" will give a broad perspective of the organic industry and the issues you need to understand before you become involved in organic production.

The workshop will cover

- Principles of organic farming;
- Converting to organics;
- Organic certification
- Markets for organic products
- Assessing soil health;
- Organic soil improvement;
- Organic weed management;
- Organic crop production – grains, vegetables and orchard crops;
- Organic pest and disease management;
- Organic farm design and physical planning;
- Grazing systems for organic production;
- Organic livestock health and welfare;
- Organic product chain management and marketing; plus more

Groups of 12 or more are required for the course to proceed, and courses can be tailored to suit the needs of the group.

The full cost of the 1-day "Introduction to Organic Agriculture" is $295 and $452 for the 2-day course. Costs will include the course materials and resources. Lunch as well as morning and afternoon tea will also be provided. Students are required to make their own accommodation and travel arrangements. The course is FarmReady accredited and therefore attracts a subsidy for eligible participants (See: http://www.farmready.gov.au/)

*For further information contact Robyn Neeson on 02 6951 2735; mobile: 0427401462*

*Email: robyn.neeson@industry.nsw.gov.au*

### *Naturalure® approved for use in fruit fly outbreak*

AQIS has issued special instructions regarding the use of the Queensland Fruit Fly control product Naturalure Fruit Fly Bait Concentrate (Naturalure®) until 30 June 2012.

Under the criteria set by the National Standard for Organic and Biodynamic Produce Naturalure® would normally not be acceptable for use in certified organic farming due to the presence of a synthetic substance in the product. However, due to proclaimed outbreaks of Queensland Fruit Fly in parts of Victoria and southern New South Wales, AQIS in conjunction with the Organic Industry Standards and Certification Council agreed that Naturalure® could be used by organic growers without effecting their organic status provided that:

- The relevant State authority has given written instruction to treat for fruit fly;
- The certified grower has sought and received written approval for the use of Naturalure from their AQIS approved certifying organisation. The certified operator must have a documented system in place to manage the use of this product for the pest outbreak;
- Application of Naturalure® must be in accordance with the manufacturer's instructions; and

- AQIS will verify at annual audit of the AQIS approved certifying organisations the implementation of this Notice.

Organic operators should also note that some importing countries may not recognise this pest control substance, therefore if it is used where the certified produce enters the export chain, operators and exporters should verify that the importing country will accept their product.

For more information on the use and application of Naturalure® certified organic growers should contact their certifying organisation.

*AQIS Notice 2011-5 relating to the use of Naturalure® for the treatment of fruit fly can be found at www.daff.gov.au/aqis/export/organic-bio-dynamic/organic-notices-2011/2011-5*

### *Weed biological control agents available*

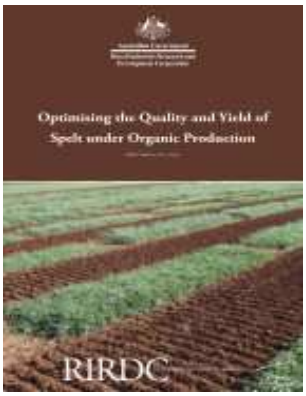
A range of biological control agents are now commercially available for weed control. A Wagga Wagga based business known as Weedbiocontrol is now supplying biological control agents for weeds including Patersons Curse, Bridal Creeper, St. John's Wort, Blackberry, Docks, Thistles, Horehound, Prickly Pear & aquatic weeds like Salvinia, Water Hyacinth, Alligator Weed & others.

For more information see the website:

http://www.weedbiocontrol.com.au/

## Publications

### *Organic spelt project results published*




Results from the EH Graham Centre project "Optimising the quality and yield of spelt under organic production are now published and available on-line.

This RIRDC report presents the results of trials aimed at providing the organic grain industry with potentially new and more reliable higher yielding genotypes of spelt. The report also provides information on improved agronomic practices for organic spelt production including optimal sowing dates, sowing rates, weed management, disease susceptibility and nutritional requirements. An analysis of the quality attributes of new spelt genotypes provides processors of spelt with milling and end-use information.

This report is targeted at organic and conventional grain stakeholders including producers, producer groups, processors, retailers, consumers, exporters, organic certification agencies, extension agronomists and research and development

The report is available to download or purchase on-line at:
https://rirdc.infoservices.com.au/items/11-066

*Note: the EH Graham Centre is a collaborative alliance between NSW DPI and Charles Sturt University*

## Events

### *Reaching the Organic Market - free one day workshops*

Two one day workshops (Wagga Wagga and Orange) will take an in-depth look at the organic market.

The workshops are to be presented by Tim Marshall. Tim is a consultant in Organics, and has also authored several books: "Weed", "Bug" and "The New Organic Gardener".

The free workshops will cover the following topics:

- What does organic mean? What does biodynamic mean? Is there a difference and what are the advantages?
- Understanding the market for Organic food and beverages
- Current trends and future projections for the global and domestic market
- Market entry strategies for the domestic and global markets
- Supply and value chains
- Organic processing techniques and requirements
- Using organic certification to enhance your environmental sustainability
- Certification and compliance: record keeping obligations and the Organic Management Plan
- Choosing a certifier and managing the certification process

The courses include a light lunch, morning tea, coffee and tea. All participants receive a workbook and CD containing useful current information on reaching the organic market.

*Date & Time:* 16th November, 9am – 4pm
*Where:* Orange Ex-Services Club, Morotai Room
231-243 Anson Street **ORANGE**, NSW 2800

*Date & Time:* 18th November, 9am – 4pm
*Where:* Business Enterprise Centre - Riverina
66-70 Coleman Street
**WAGGA WAGGA** , NSW 2650

For registration and more information contact:
*TM Organics Pty Ltd* ; Phone: 08 8339 1250
Email: pia@tmorganics.com
Web: www.tmorganics.com


***World renowned biological consultants Gary Zimmer and Graeme Sait tour Australia with BFA***

Two of the world's most renowned speakers on biological farming will be presenting in six regional locations in six different Australian states with the BFA Roadshow in October this year.

For more information, see the BFA Roadshow webpage:
http://www.bfa.com.au/Events/BFARoadshows.aspx

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http://www.dpi.nsw.gov.au/aboutus/resources/periodicals/newsletters/organic-news

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