



How To: Mobile Insectaries

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Summary:

A “how to” guide on implementing mobile insectaries on your farm. This guide covers: planning, species selection and configuration, insectary construction, and monitoring and maintenance of insectary plantings. Also included are tips to help engage and educate your teams, record keeping, and some common pitfalls to avoid.

Introduction

The purpose of integrating mobile insectaries, or moveable pods, with perennial native plants on your farm is to boost plant diversity throughout your blocks and property, thereby enhancing the range of natural enemies available for pest control.

These insectaries are designed to provide concentrated shelter, nectar, alternative hosts and pollen (SNAP) for natural enemies during the peak pest season for your vegetable crops, from spring through autumn, while also offering benefits during the winter months.

The selection of specific plants and the strategic placement and timing of the insectaries will depend on your farm’s unique conditions, requiring some experimentation to determine the most effective approach.

Nevertheless, the advantages soon become apparent as the increased presence of natural enemies and pollinators shows the effectiveness of these initiatives.

Planning your implementation

Begin by evaluating your vegetable cropping rotation to identify which crops would benefit most from enhanced pest control or pollination. Determine whether your focus is on attracting natural enemies for pest control or pollinators for crops that require pollination. This decision will guide your selection of perennial native plants for the insectaries, which are crucial for effectiveness, as well as the timing for deploying the mobile insectaries.

Select plants for the insectaries that will flower in alignment with your crops’ specific pest control needs to ensure effectiveness throughout your crops’ peak pest seasons, typically from early spring to late autumn.



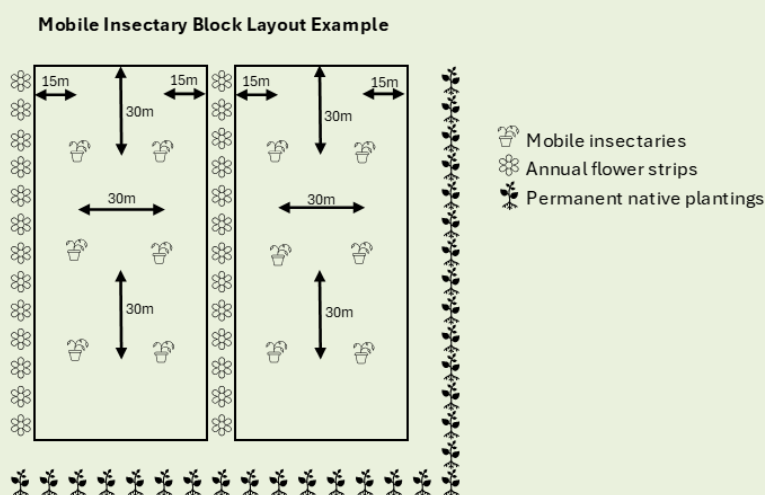
Mobile insectaries in pumpkin crop
(7 February 2024)



Consider how you incorporate your insectaries with other floral resources such as permanent native plants or annual flower strips to establish floral corridors. These corridors should facilitate the movement of beneficial insects across your property to your block and then out into your crops using your insectaries, enhancing the overall effectiveness of your integrated pest management strategy. For more detailed guidelines on additional floral resources, refer to the '[A Lighter Touch – How to guides.](#)'

When planning the layout and spacing of the mobile insectaries, it's important to consider your target beneficial insects. Some smaller natural enemies only travel up to 15 metres from a floral resource into the crop. However, if targeting pollinators, you may opt for wider spacings, as these can often fly much further. Arrange the insectaries in a pattern across the block, ideally placing them about 15 metres out from the edges but 30 metres apart down the rows to allow the smaller insects to move inwards. A 30-metre gap in the centre allows insects from opposite sides to meet and provide full crop protection.

The figure below illustrates the placement of mobile insectaries on two of the demonstration blocks. It also highlights the locations of other SNAP within the blocks, providing a view of the ecosystem management strategy employed. Ensure that your plantings are applied in a practical manner and arrange them to avoid interference with routine operations like spraying. Consider placing them outside the reach of your spray boom or along designated spray rows to minimise the need for frequent adjustments of spray nozzles. Many boom sprayers provide for the nozzles, or sections of nozzles, in the spray row to be turned off, reducing the impact of spray application on beneficials living in the floral strips in spray rows.



When planning the layout and spacing of the mobile insectaries, it's important to consider your target beneficial insects.

If you choose to have only annual flowers in your mobile insectaries, note that they require less soil depth, allowing for lighter and more cost-effective insectary designs. However, the primary focus should remain on the native plantings, which offer more sustainable benefits year-round.

Although the insectaries on the demonstration farm are designed with a wicking reservoir to sustain the native plants through occasional rain and irrigation events during summer, assess your own irrigation setup. If your insectaries will be regularly irrigated over summer and receive natural rainfall in winter, you might not need a wicking reservoir. However, consider whether you'll need to top up the water during the peak of summer, and how the insectaries will be situated relative to water sources once moved and being stored for the next crop.

Ensure that the implementation of your insectaries does not disrupt routine farm operations. Consider placing the mobile insectaries into the crop after any herbicide applications are finished. When applying sprays, opt for softer chemistries to minimise the impact on beneficial insects, or avoid spraying the insectaries altogether if possible. This careful placement and timing helps maintain the integrity of both your crop management and the insectaries' effectiveness. Consider constructing and planting your mobile insectaries during winter or early spring to take advantage of consistent moisture, which aids in the establishment of the plants.

Selection of plant species

When selecting plant species for your mobile insectaries, diversity is key. However, your choices can be guided by several factors to ensure that the selected species meet the specific needs of your farm and do not introduce new management challenges:

- Choose species that attract natural enemies needed for the pest control of your target crops.
- Opt for species that do not harbour pests associated with your target crops.
- Select species with varying flowering times to provide continuous support throughout your targeted growing season.
- Consider the full grown height of the species to ensure they do not impede farm machinery, such as spray booms.
- Choose species that are well-suited to your regional climate and environmental conditions.
- Use a range of plant types, even within the same species, as they can offer varied characteristics such as flowering times, leaf sizes, and growth forms.
- Include a variety of flower colours and sizes to attract a broad range of pollinators.
- If following eco-sourcing principles, your selection of plant species may be limited but more environmentally aligned.
- Consider the availability of species within your region to ensure easy sourcing. You may need to visit several nurseries to get the plants you want.
- Avoid species known to be weedy or problematic in your area.
- Further research species that can benefit the natural enemies specific to your crops.

The best resource for matching native plants with your crop pests and natural enemies is the search function on the [Plant-SyNZ](#) website. Also useful is the [NZ Plant Conservation Network](#) website.

A basic guide for species selection suited to a temperate climate region like Pukekohe is available in the "Moveable Pods" section of the [A Lighter Touch plant species list](#) from the Biodiversity Planting on Vegetable Farms project.

For a broader range of species, particularly those not commonly available in commercial nurseries, consider consulting specialised native nurseries or exploring the variety of New Zealand native plant books. These resources can provide valuable insights into species that thrive across different regions of New Zealand and their tolerance to various environmental stresses such as cold, drought, and frost, which may affect their survival under your specific conditions

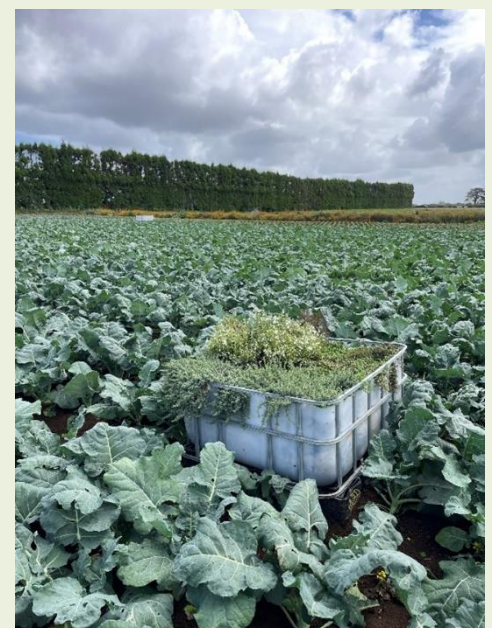
Useful websites linked in this resource:

<https://a-lighter-touch.co.nz/our-projects/biodiverse-planting/>
<https://plant-synz.landcareresearch.co.nz/SearchForm.aspx>
<https://www.nzpcn.org.nz/>



Above: Spider webs woven in the *Muehlenbeckia axillaris* during winter (25 June 2024).

Below: Mobile insectaries in broccoli crop (5 March 2024).



By considering these factors, you can strategically select plant species that enhance the ecological balance and pest management efficacy of your farm while ensuring compatibility with your existing agricultural practices

Configuring insectary plantings

When selecting and combining plants for the insectaries, careful consideration is needed to balance species compatibility and growth patterns. Some species are vigorous growers and can dominate others, potentially leading to an imbalance where one species overtakes all others within an insectary. To avoid this, it's crucial to plan the plant mix to ensure harmonious growth and the effective use of space within each insectary.

In the insectaries, design a strategic layered planting by incorporating a mix of taller species and ground covers to utilise vertical space efficiently, maximising the area available for floral expression and habitat creation.

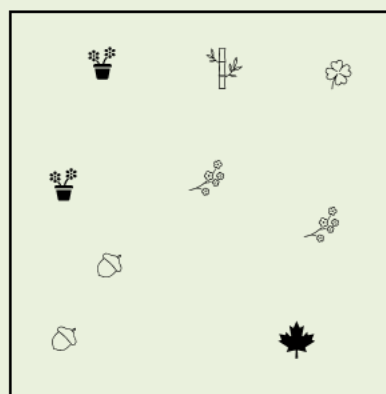
To manage vigorous growing species, such as *Muehlenbeckia axillaris*, it's effective to either plant them alone or limit the insectary to two vigorous types, positioned on opposite ends to prevent over-competition. Include a taller species (depending on machinery height limitations) that can reach up to approximately 0.5-1 metre above the intermediate bulk container (IBC) plastic water tank height, serving as a beneficial canopy. Around this central plant, arrange 6-8 ground cover plants to ensure the underlayer remains shaded and moist, ideal for growth and attracting a variety of natural enemies.





Ensure to incorporate trailing ground cover species around the edges of the IBC to extend over the sides, increasing the flowering area of the insectary dramatically.







Planting in the insectaries offers the flexibility to include some less robust species that thrive in controlled conditions but might struggle in open ground. This method allows for greater diversity, particularly when combined with permanent plantings, enhancing all elements of SNAP and effectiveness of your mobile insectaries.

To provide practical insights and help you optimise your insectary plantings, below are examples of planting plans that have been successfully implemented on the demonstration farm. These plans highlight effective species combinations and layout strategies that encourage harmonious growth and beneficial insect attraction.

Mobile Insectary Layout Examples



-  *Carpodetus serratus prostrata*
-  *Pimelea prostrata* Blue Peter
-  *Pomaderris edgerleyi*
-  *Leptinella rotundata*

-  *Parahebe catarractae* Snowcap
-  *Pimelea prostrata* (Robinson's Nursery)
-  *Pimelea prostrata* (Joy Nurseries)
-  *Leptinella* cv. Seal Island
-  *Leptospermum scoparium* Nanum Kea
-  *Leptospermum scoparium* Nanum Kiwi

Included below is a detailed table that lists the successful species used in the insectaries on the demonstration farm, notes on their vegetative vigour, and other qualities. This table serves as a resource for selecting species that will thrive in the insectary environments without dominating the space.

Table 1: Plants Successful in Demonstration Farm Mobile Insectaries

This table lists shrubs and ground covers used in the mobile insectaries on the demonstration farm, with heights ranging from 3 cm to 1 m. Vigorous species are noted and recommended to be planted singly in an insectary. These plant species offer a broad range of support for natural enemies over a wide timeframe and are generally not associated with most vegetable pests.

Species	Common Name	Size Category	Notes
<i>Veronica pimeleoides</i> Quicksilver	Hebe Quicksilver	Shrub	
<i>Leptinella dioica</i>	Shore cotula	Groundcover	Trailing
<i>Leptinella</i> cv Seal Island	Seal island button daisy	Groundcover	Trailing
<i>Leptinella rotundata</i>	Northland button daisy	Groundcover	Trailing
<i>Leptospermum scoparium</i> Nanum Kea	Dwarf Kea tee tree	Shrub	
<i>Leptospermum scoparium</i> Nanum Kiwi	Dwarf Kiwi tee tree	Shrub	
<i>Muehlenbeckia axillaris</i>	Creeping muehlenbeckia	Groundcover	Vigorous grower
<i>Parahebe catarractae</i> Snowcap	Parahebe Snowcap	Shrub	
<i>Pimelea prostrata</i> Anatoki	Pimelea Anatoki	Groundcover	Trailing
<i>Pimelea prostrata</i> (Joy Nurseries)	Pinātoro	Groundcover	Trailing
<i>Pimelea prostrata</i> (Robinson's Nursery)	Pinātoro	Groundcover	Trailing
<i>Pimelea prostrata</i> Silver Ghost	Pimelea Silver Ghost	Groundcover	Trailing
<i>Pimelea prostrata</i> Blue Peter	Pimelea Blue Peter	Groundcover	Trailing
<i>Pomaderris edgerleyi</i>		Groundcover	Trailing

The table below contains a flowering plan, outlining the blooming periods for each species used in the insectaries for the Pukekohe Demonstration Farm. This information is essential for ensuring that the insectaries offer continuous floral resources throughout the growing season, aligning with the peak pest activity periods. These flowering times are based on the first year of plant establishment; in subsequent years the duration of flowering may extend.

INSECTARY PLANTED SPECIES	AUG 23	SEPT 23	OCT 23	NOV 23	DEC 24	JAN 24	FEB 24	MAR 24	APR 24	MAY 24	JUNE 24	JULY 24
<i>Veronica pimeleoides</i> , Quicksilver												
<i>Leptinella dioica</i>			YES	YES	YES				YES			
<i>Leptinella</i> cv Seal Island			YES	YES	YES				YES			
<i>Leptinella rotundata</i>			YES	YES	YES				YES			
<i>Leptospermum scoparium</i> , Nanum Kea	YES	YES	YES	YES								
<i>Leptospermum scoparium</i> , Nanum Kiwi	YES	YES	YES	YES	YES							
<i>Muehlenbeckia axillaris</i>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
<i>Parahebe catarractae</i> , Snowcap	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
<i>Pimelea prostrata</i> Anatoki	YES	YES	YES	YES	YES				YES			
<i>Pimelea prostrata</i> (Joy Nurseries)			YES	YES	YES							
<i>Pimelea prostrata</i> (Robinson's Nursery)	YES	YES	YES	YES	YES				YES			
<i>Pimelea prostrata</i> Silver Ghost	YES	YES	YES	YES							YES	YES
<i>Pimelea prostrata</i> Blue Peter									YES	YES	YES	YES
<i>Pomaderris edgerleyi</i>												

Monitoring of insectary plantings

After planting, it's crucial to regularly monitor the growth interactions, flowering times, and overall survival of the species within your insectary, especially considering the specific environmental conditions of your region. Here are key aspects to observe and actions to take:

- Monitor when each species flowers and how the plants interact with each other. This observation will help you understand which combinations work best and adjust future plantings accordingly.
- The ground covers in the insectaries should eventually form a dense layer that suppresses weeds effectively. In Pukekohe, with an initial planting in August, full coverage of the insectary surface was typically achieved by early January – about five months after planting. The ground covers expanded to reach the ground after ten months.
- By late autumn, from an early spring planting, the plants should be well-established. This is when you can start to observe the movement of beneficial species from the insectaries out into the surrounding crops. Effective establishment not only promotes a healthier plant environment but also enhances the ecological benefits by supporting a diverse range of natural enemies of pests.

These observations will guide your ongoing maintenance and adaptation of your mobile insectary strategy, ensuring that each insectary achieves its maximum potential in enhancing biodiversity and supporting your farming ecosystem.

Creating mobile insectaries

To construct your mobile insectaries, you can repurpose water-resistant containers such as 1000L IBCs, converting them into self-wicking watering containers for the permanent native species. Here's a step-by-step guide:

1. Preparation:

- Ensure that the containers have not previously held any herbicides or plant-toxic products.
- Confirm that each IBC has fitted tops and bungs to ensure they are watertight.
- Cut the containers in half to create two equal-sized pods.
- Place the tops of the IBC onto pallets to facilitate easy lifting by a forklift. Secure them using zip ties, screws, or other suitable fastening methods to ensure stability during movement.



This image showcases mobile insectaries where the trailing ground covers have reached their full length after 10 months (18 June 2024).

Effective establishment promotes a healthier plant environment and enhances the ecological benefits by supporting a diverse range of natural enemies of pests.



The base of the IBC includes a built-in pallet for easy movement by forklift. The top half, however, requires the addition of a pallet to facilitate similar mobility.

2. Base layer:

- Fill the bottom third of each pod with small-sized gravel (7-9mm works well). Ensure minimal fine dust or dirt is present to avoid clogging the water reservoir.
- Compact the gravel slightly by standing on it.
- Mark the gravel level on the outside of the container to guide where to drill drainage holes later.

3. Waterproofing:

- Place a layer of water-permeable cloth over the gravel. Suitable materials include geotextile, weed mat, or wool mat.
- Ensure the cloth extends well beyond the inside edges of the pod.
- When adding soil, ensure the edges of the cloth are tightly secured against the outside of the plastic. Press the soil firmly against the cloth to prevent any from slipping into the gravel layer below.

Soil additions

- Select a free-draining growing medium with a neutral pH, such as lawn mix, which is well-suited for most native species that prefer medium to dry soil conditions.
- Fill the pod right to the top with the medium. Keep in mind that the soil will settle over the next few weeks and may require topping up to maintain the desired level.
- Ensure the soil level remains close to the top edge of the pod. This placement supports the growth and spread of low-growing ground covers, allowing them to creep up and over the sides for optimal coverage.

4. Drainage:

- Drill three evenly spaced 1.5cm drainage holes at the top of the gravel level on each side of the pod. This placement ensures that water does not accumulate in the soil, which could lead to anaerobic conditions harmful to the plants. Drainage holes can be drilled after the containers have been completely filled with media.

5. Planting:

- Plant your selected native species in the insectary, placing two fertiliser tabs under each plant for nourishment.
- Number each insectary and create a detailed planting plan. This helps keep track of the plant species as they grow and intermingle.

6. Installation:

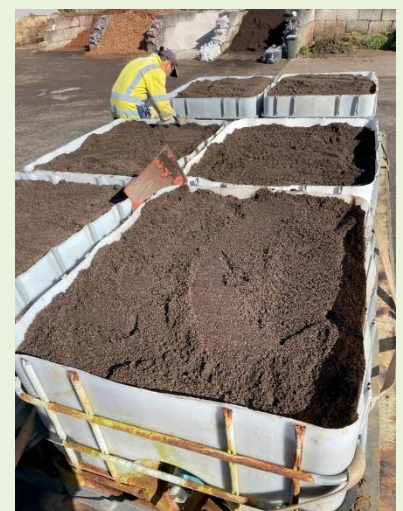
- Move the insectaries to their designated locations within your crop at the appropriate time to maximise their effectiveness.



Standing on the gravel to compact and smooth it helps reduce settling in the pod over time, minimizing the need for additional top-ups of growing medium later.



This photo illustrates the wool mat layer over the gravel, highlighting insufficient side overlap, which complicates the process of adding the growing medium.



Fill the pods nearly to the top with growing medium to account for settling. This approach prevents the formation of a significant gap at the top, eliminating the need for additional filling later.

Maintenance

Weeding: Frequent hand weeding is essential during the initial stages of ground cover establishment to prevent weeds from outcompeting the young plants. Once the ground covers are fully established, they will naturally suppress most weeds, significantly reducing the frequency of hand weeding to just occasional maintenance checks. Pay special attention to clover, as it can be particularly challenging to control once established amongst the ground covers.

Fertilising: Avoid using fertilisers after planting the natives. Some native species can be sensitive to fertilisers, and application can be detrimental to their health.

Plant management: Regular maintenance might be required to manage the height of some plants, especially if they grow taller than expected. Trim the trailing ground covers hanging over the edges of the insectaries as necessary.

Irrigation: Additional watering may be required during the peak of summer, especially if the insectaries are not located within regularly irrigated areas of your farm. Although the insectaries are designed to minimise the need for frequent watering, they may still need occasional irrigation during extreme heat.

Relocation: After the crop season ends, consider moving your insectaries to another crop area to continue benefiting from their ecological contributions, or overwinter them in a part of the farm to help create a natural enemy corridor.

General upkeep: Keep an eye on the overall health and vigour of the plants in the insectaries. Adjust care routines based on observations to ensure the longevity and effectiveness of your mobile insectaries.

By implementing these maintenance practices, you can ensure that your mobile insectaries continue to function effectively, supporting your farm's ecosystem by enhancing biodiversity and natural pest control.

Engage and educate your team

Begin by educating your farm staff about the benefits of the mobile insectaries from the outset. It's essential for all team members to understand the purpose, location, and importance of these insectaries to prevent accidental damage during routine farm operations. Regularly provide updates and conduct training sessions to familiarise staff with these new elements on the farm. These sessions should also cover the proper maintenance of the insectaries and clarify the roles each team member will play in their management. Be prepared for some initial challenges as the team learns to integrate these practices effectively.

Refinement and record-keeping

Maintain detailed records of your planting plans, including the species and varieties used, survival rates, and flowering periods. Utilise these data to refine your strategy annually, tailoring species mixes to better suit performance outcomes and adapt to environmental conditions. This process of continuous improvement is crucial for maximising the effectiveness of the mobile insectaries in enhancing your farm's ecosystem.



Drill three evenly spaced drainage holes on each of the four sides of the pod to ensure proper water drainage.



Planting in progress of the new mobile insectary.

Watch instructional videos on making self-wicking beds to explore alternative methods and materials that might be suitable for your setup.

A few videos to check out include:
[How to make an easy self-watering wicking bed from an IBC.](#)
[\(youtube.com\)](#)
[Wicking Beds. How to make IBC Self Watering Garden Beds MKI](#)
[\(youtube.com\)](#)
[My EASY Wicking Bed System \(IBC \) - Drought Proof Gardening - YouTube](#)

To track your progress efficiently, consider employing a spreadsheet for systematic monitoring. An example of such a tracking spreadsheet can be found [here](#). This tool will help ensure that you capture all relevant data systematically, allowing for easier analysis and decision-making year over year.



Common pitfalls to avoid:

Ill-planned species selection: Ensure you have a well thought-out plan for plant selection before beginning to source plants. This preparation prevents last-minute decisions that may not be optimal for your needs.

Contaminated IBCs: Avoid using IBCs that have previously contained herbicides or other plant-toxic products, as residues may harm the new plantings.

Poor drainage: Remember to mark the level of your gravel accurately while you can easily see its level. Proper marking will guide you when drilling drainage holes, ensuring they are placed correctly to prevent water from backing up.

Incorrect fertiliser management: Instruct your team not to apply fertiliser to the mobile insectaries as they would with other crops. Over-fertilisation can harm certain native species used in the insectaries.

Ill-considered insectary placement: Consider the placement of insectaries carefully to maximise exposure to beneficial species while minimising disruption to crop operations. Poor placement can reduce the effectiveness of the insectaries and lead to logistical challenges during farm operations.

Failure to educate your team: It's crucial to fully inform your team about the locations and significance of the plantings. Proper education helps prevent accidental damage and ensures the success of your biodiversity initiatives.

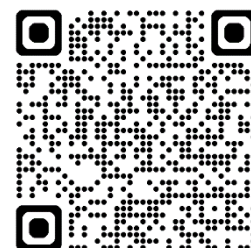


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For more information:

Please visit the [project page](#) on the A Lighter Touch website by scanning the QR code or visiting <https://a-lighter-touch.co.nz/our-projects/biodiverse-planting/>





Other 'how to' guides

The annual flower strips guide - [here](#)

A "how to" guide on implementing Annual Flower Strips to increase on-farm biodiversity. This guide covers: how to plan, select species, sowing considerations, and ongoing weed control and maintenance. Also included are tips to help engage and educate your teams, record keeping, and some common pitfalls to avoid.



The cover crop guide - [here](#)

A "how to" guide on implementing cover crops on your farm. This guide covers: planning, species selection, sowing rates, and maintenance. Also included are tips to help engage and educate your teams, record keeping, and some common pitfalls to avoid.



Other related resources

The plant species list - [here](#)

Planted to provide year round food sources, and shelter for the beneficial insects over winter. The species were also selected based on full growth size in order to avoid impeding machinery and minimise maintenance e.g., trimming.



Biodiverse planting on vegetables farms project - [here](#)

This project is designed to show manipulation of plant diversity on a farm can increase beneficial insect numbers and reduce the pests in a crop, meaning less use of insecticides is required.



Linked on this page are many other resources relating to this biodiversity project, including crop case studies sharing the crop protection approach taken in successfully harvesting vegetable crops using integrated pest management and biodiversity as key strategies.

