

ENCOURAGING NATURAL PREDATORS (OUTDOORS)

PROBLEM

Controlling crop pests that reduce yield and quality in the face of pest resistance, increasing restrictions on use, and a declining list of approved chemicals that may also be non-selective and therefore harmful to beneficial insects and to the environment.

SOLUTION

Naturally occurring predators and parasitoids can reduce the abundance of pest invertebrates in crops and contribute to pest management in agroecosystems. Managing field margins and other parts of the farm to increase additional prey, improve floral resources and provide overwintering habitat, can help encourage them.

Conservation Biological Control (CBC) aims to promote diverse, robust natural enemy populations to encourage a reliable and consistent contribution to integrated pest management (IPM).

OUTCOME

Enhanced biological pest control and reduced insecticide inputs.

Control of pest populations, reducing the likelihood of economic thresholds being exceeded.

Improved ecosystem services and increased biodiversity through more diverse habitats and providing nectar and pollen sources for naturally occurring predators and parasitoids.

Reduced insecticide use, reduced development of insecticide resistance, and compliance with the Sustainable Use Directive.

PRACTICAL RECOMMENDATIONS

IMPLEMENTATION

- To encourage robust control of crop pests at all times and locations, it is essential that a wide range of natural enemies (biological control agents / biocontrols / beneficials) are present, capable of controlling each of the pest's life stages. Promoting natural enemy populations relies on three main factors that can be managed to optimise their pest suppression function:
 - Providing suitable floral resources
 - Additional alternative prey/hosts (other than the target pest)
 - Over-wintering habitat
- The best way to provide all three elements is to utilise and properly manage field margins and boundaries. Beetle banks can also be used to increase the area in and around crops suitable for natural enemies

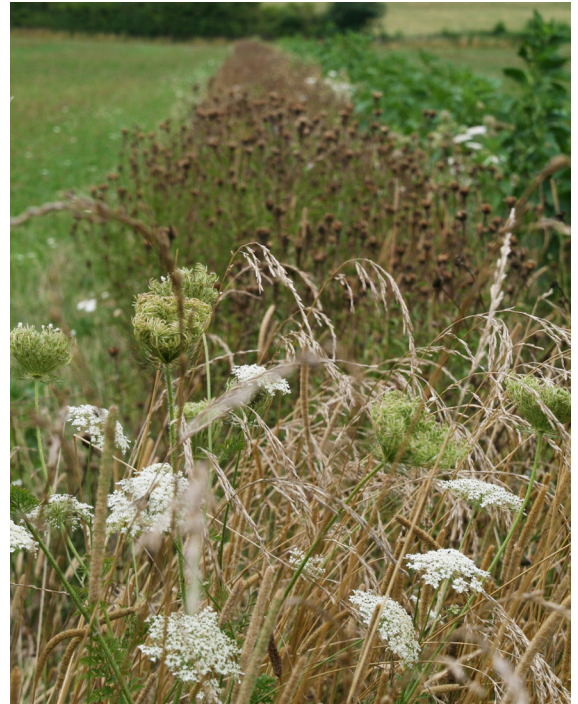


Photo: Phil Sumption (ORC)

APPLICABILITY

Applicable production types



Application time

All year round with peaks during certain times of the year especially during key points of pest pressure and for establishing/managing habitats i.e. drilling pollinator mixes, making beetle banks

Required time

Time required in building/managing habitats and resources - ongoing

Equipment/resource required

Practice should be possible with existing farm equipment

Best in

All situations, with crops suffering from aphid damage particularly relevant



- Providing semi-natural habitats such as forests, hedgerows, field margins, fallows and meadows, will encourage numerous species of beneficial arthropods through providing a more stable environment than annually cropped monocultures
- Establishing buffer zones (field margin strips, hedgerows, beetle banks, conservation strips, wind breaks) will use the natural functions of non-crop habitats to benefit the crops
- Quantity and quality of non-crop habitat patches adjacent to fields can influence the effectiveness of pest suppression
- Utilising and enhancing natural enemies can be considered using the 'SAFE' approach (Shelter, Alternative prey, Flower-rich habitat and Environment)
See <https://www.agricology.co.uk/resources/beneficialsfarmland>
- Given the importance of floral resources to the majority of natural enemies, providing suitable nectar and pollen sources represents the greatest opportunity for enhancing naturally occurring predators and parasitoids in agroecosystems
- If seed mixtures are required for non-crop habitats, specialist seed merchants should be able to provide advice on the most appropriate mixture for the site. Ideally wildflower seed should be of native UK origin. Seed should be broadcast onto a fine seed bed created by cultivation
- Non-crop habitats contain populations of intermediate hosts and alternative prey that are useful to pest parasitoids and predators. In some cases, the presence of alternative prey may even increase the size of beneficial insect populations
- Natural enemies can be imported to locations where they don't naturally occur, or farmers can make a supplementary release, boosting the naturally occurring population

EASE OF ADOPTION ON NON-ORGANIC FARMS

- The practice is of medium difficulty as it requires landscape management across the farm to enhance conservation biological control, and therefore is of greater complexity than simply focusing on crop production
- Knowledge of how to grow wild flower mixes and other habitats, and how to best manage non-cropped areas for the benefit of natural predators must be acquired

BENEFITS OF IMPLEMENTATION

- Environmental gains include a reduction in insecticide usage and associated environmental issues including loss of biodiversity through negative impacts on non-target species. Habitats created and managed for natural enemies also provide resources for other wildlife including small mammals and farmland birds.
- Reduction in pollution from insecticide use and reduction of build-up of insecticide resistance
- Economic gains include a reduction in input costs through IPM and improved control of pests help to reduce economic losses
- Social sustainability gains include improved public perception of farming from reduced insecticide application, improved biodiversity, enhanced agroecosystem landscapes and a reduction in harmful effects on non-target beneficial species such as bees

DRAWBACKS OF IMPLEMENTATION

- The barriers to implementation should be low and come mainly in the form of knowledge required to establish and/or manage habitats across the farm for the benefit of natural enemies
- There are virtually no additional equipment or infrastructure requirements
- Small areas of cropping may need to be sacrificed to make way for non-cropped habitats
- Extra work will be required to manage a diverse range of habitats effectively to promote beneficials



BARRIERS AND RISKS

- There is a certain lack of precision in using the practice and how to effectively measure the benefits
- Relying solely on natural enemies may not be a sensible approach on non-organic farms, with the practice best suited to be part of a wider IPM approach to spread risk
- Market requires clean products with no foreign bodies
- Retailers and consumers may need education to understand and help support this practice

FINANCIAL ANALYSIS

The financial implication of encouraging natural predators is minimal (with a margin increase at farm level of less than 10%) as the table below shows

Initial investment	Ongoing costs	Yields	Financial output	Expected effect on margin
↑	↓	~	~	~

Rating approach used to describe the effect and direction of change (increase or decrease): Unknown = ? None = ~ Low = ∨ Moderate = ∨∨ High = ∨∨∨

The financial analysis was based on the following assumptions:

- Insecticide use can be reduced by 30% with no effects on yield
- Removal of 3% of land from production would result in no net loss of yield at the field level for wheat and OSR crops and bean yields might increase because of higher abundance of crop pollinators

RELEVANT LEGISLATION AND CURRENT INCENTIVES

- Pillar II payments for a diverse range of Environmental Stewardship options for habitat creation/management across the farm.
- Compliance with the Sustainable Use Directive.

FURTHER INFORMATION

Videos

- Example of beetle bank creation:
https://www.youtube.com/watch?time_continue=6&v=AuHTsWHUCOY

Further reading and weblinks

- AHDB (2014) Encyclopaedia of pests and natural enemies in field crops. Available at: <https://www.agricology.co.uk/resources/encyclopaedia-pests-and-natural-enemies-field-crops>
- GWCT. Beetle banks. Available at: <https://www.agricology.co.uk/resources/beetle-banks>
- HGCA (2008) Beneficials on Farmland. Available at: <https://www.agricology.co.uk/resources/beneficials-farmland>
- Ramsden M (2017). Conservation Biological Control – making the most of natural enemies in farming landscapes. ADAS. Available at: <https://tinyurl.com/ADAS-naturalenemies>
- Médiène SM et al. (2011). Agroecosystem management and biotic interactions: A review. *Agronomy for Sustainable Development* 31:491-514.
- Ramsden M et al. (2013). The enhancement of conservation biological control through targeted landscape management. *Conference Paper: Aspects of Applied Biology: Environment Management on Farmland*, vol 118: 119-126
- Ramsden M et al. (2015) Optimizing field margins for biocontrol services: the relative role of aphid abundance, annual floral resources, and overwinter habitat in enhancing aphid natural enemies. *Agriculture, Ecosystems and Environment*, vol 199: 94-104.
- Veres A et al. (2011). Does landscape composition affect pest abundance and their control by natural enemies? A review. *Agriculture, Ecosystems & Environment*.



CASE STUDY FARMER APPLYING THE PRACTICE: ALLERTON PROJECT, LODDINGTON ESTATES

Location: Leicestershire

Size: 330 hectares

Enterprises: Arable, sheep

Farm manager Phil Jarvis said:

“Given the right conditions, predatory insects and spiders can over-winter in field boundaries and in spring move into the crop, reducing pest numbers significantly. By providing places for them to spend the winter you can encourage winter boundary densities of more than 1,000 per square metre.

“We now have fewer hedgerows than in the past, and less of the dense grass cover provided at their base by species such as Cocksfoot, Timothy and Red Fescue, which can shelter and support beneficial insects and spiders. Modern field boundaries are often poor quality and do not create the ideal habitats for such insects to over-winter. However, some have improved with ‘cross compliance field margins’, where no spray or fertiliser can be applied within 2 metres of the centre of the hedge. This has led to thicker habitat. There can also be problems with very large fields because it can take the predators several weeks to reach the centre of larger fields, as many of them cannot fly.

“A simple way to encourage these predatory insects and spiders without interfering with your farm management is to create mid-field refuges, like hedge banks but without the woody shrubs, where predators can over-winter and where they can spread across the crop in spring. The banks are easy to establish and are positioned so that normal cultivation can continue. They are currently financially supported within agri-environment schemes, making them a more attractive habitat for growers. The numbers of insects and spiders which inhabit such ridges can be even higher than in traditional/existing field boundaries.”

<https://www.gwct.org.uk/farming/advice/sustainable-farming/beetle-banks/>

<https://www.agricology.co.uk/field/farmer-profiles/phil-jarvis>



Photo :Agricology



Photo Peter Thomson (GWCT)



Photo Phil Sumption (ORC)

ABOUT THIS PRACTICE ABSTRACT

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www.agricology.co.uk

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