Protecting Farmland Pollinators

National Biodiversity Data Centre
Documenting Ireland's Wildlife

Protecting Farmland Pollinators Final Report

December 2023

eip-agri
AGRICULTURE & INNOVATION

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture Food and the Marine

The European Agricultural Fund for Rural Development: Europe investing in rural areas

All-Ireland Pollinator Plan

Contents

Key achievements

The project demonstrated that the participating farmers have a huge interest in learning about biodiversity and want to know how to maintain, protect and enhance biodiversity on their farms.

Key achievements of the project are:

- ✓ Forty farms were surveyed for pollinators, with a total of 37 different bee species and 57 different hoverfly species recorded.
- ✓ Using this data, we developed a simple evidence-based whole farm pollinator scorecard. It allows farmers to input their current management practices and understand how pollinator friendly their farm is.
- ✓ For four consecutive years, forty farmers used the whole-farm pollinator scorecard to assess their farms, subsequently receiving four results-based payments based on their pollinator-friendly practices.
- ✓ Overall, the Pollinator Points increased across the 40 farms and within each farm type (arable, beef, dairy, and mixed).
    - The median score increased by 87% from the first to the final year of the project.
    - Thirty-two farmers have increased their pollinator score.
    - Nine farmers more than tripled their pollinator points.
- ✓ By the end of the project, the forty farms contained over 90 kilometres of hedgerows managed for pollinators, 30 ha of native hay meadow and over 11,640 pollinator-friendly trees.
- ✓ Value for money: we have developed an innovative approach to engaging farmers on biodiversity. Forty percent of the total project budget was allocated to farmer payments, averaging €2,721 per farm per year. This offers excellent value for money given the potential of the approach to significantly improve pollinator and biodiversity levels across intensively managed farmland.
- ✓ We have demonstrated a transparent and evidence-based mechanism for assessing how pollinator-friendly a farm is using a simple system that has a low administrative burden and is suitable for national rollout.

Background

The main aim of the 'Protecting Farmland Pollinators' project was to identify small actions that farmers can take that would allow biodiversity to coexist within a productive farming system. We wanted to work in tandem with farmers to better understand how to provide small wildlife habitats for pollinators, in terms of food, safety, and shelter, on their farms.

Pollinators are important for growing insect-pollinated crops, fruits, and vegetables; for the health of our environment; for their cultural significance and for the economy. Farmers recognise this importance, but farmland has experienced wide-scale loss of wild pollinators over the last 50 years. In Ireland, one third of our 102 bee species are threatened with extinction.

By working closely with a pilot group of 40 farmers, management practices that benefit pollinators on Irish farmland were identified, and a whole farm pollinator scoring system was developed. The score is based on providing food, safety, and shelter for pollinators on the farm. This score helps farmers to understand how pollinator friendly their farm is, and identify what simple, low-cost actions they can take to work to improve their farm for pollinators in a way that does not negatively impact productivity.

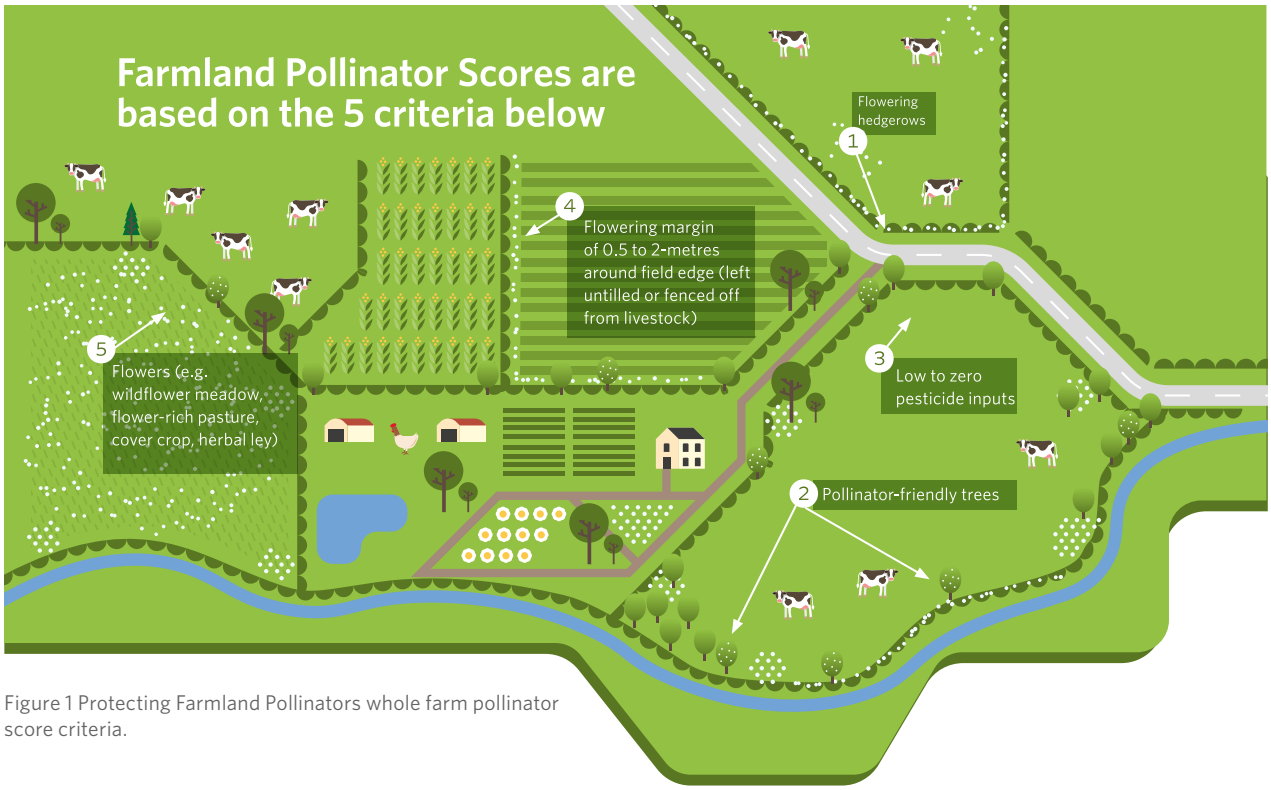

Figure 1 Protecting Farmland Pollinators whole farm pollinator score criteria.

The Protecting Farmland Pollinators EIP project began in July 2019 and finished at the end of 2023. Across this period, we worked with a group of 40 farmers, across farm types (arable, beef, dairy, and mixed) and intensities (high, medium, and low) in Co. Kildare, Co. Laois and Co. Wicklow.

The project identified evidence-based actions and used a results-based payment model. Within the project, farmers received an annual payment based on their overall farm pollinator score, which was calculated based on the quantity and quality of pollinator friendly habitat on the farm - the higher the pollinator score of the farm, the more the farmer was paid annually.

In taking action to protect pollinators, we start a chain reaction that has positive benefits for the general health of our environment, and the wellbeing of future generations. This project enabled all farmers to understand how pollinator-friendly (or not) their farm was, and what simple, low-cost actions they could take to work towards improving their whole farm for pollinators and other biodiversity in a measurable way that does not impact on productivity.

Project objectives

This project had four key objectives:

1 To test the effectiveness of a range of pollinator measures across different farm types in Ireland and to identify those that have most impact and that are most cost-effective.

2 To test the impact of these pollinator measures on broader biodiversity.

3 Based on the pollinator measures, to develop a simple farm-scale pollinator scoring system that uses a habitat matrix approach to quantify how pollinator-friendly the entire farm is.

4 To develop a simple results-based payment method that encourages and assists farmers in attempts to improve their whole farm pollinator score.

Project Team

The Protecting Farmland Pollinators Project was co-ordinated by the National Biodiversity Data Centre. There were ten farms of each type: arable, beef, dairy, and mixed. In each farm type, there were those managed intensively with limited space for nature and others already employing practices beneficial to biodiversity. Some farms had higher inputs than others, and three of the farms were certified organic.

The following people worked on this project:

Table 1 Project Team of the Protecting Farmland Pollinators Project. All mentioned were staff of the National Biodiversity Data Centre unless otherwise stated.

Staff member	Role	Time in role
Dr. Saorla Kavanagh	Project Manager	July 2019 – September 2023
Dr. Úna FitzPatrick	Project Co-Ordinator and Chair of the Operational Group	July 2019 – December 2023
Paulina Furmaniak and Cathy Walsh (Compass Informatics)	Financial Manager	July 2019 – May 2023
Richard Tilson	Financial Manager	June 2023 – December 2023
Niamh Phelan	1. Project Manager 2. Ecological Team Survey Member	1. October 2023 – December 2023 2. March 2020 – August 2020
Dr. Michelle Larkin	Research Officer	June - September 2021
Owen Beckett	Research Officer	October and November 2021
Dr. Neus Rodriguez-Gasol	Ecological Team Survey Member	March 2020 – August 2020
Shannen O'Brien	Ecological Team Survey Member	March 2020 – August 2020

The Operational Group consisted of:

- The National Biodiversity Data Centre
- Five Champion Farmers (Andrew Bergin, John McHugh, Kim McCall, Mireille McCall and Trevor Harris)
- Bord Bia
- Tírlan Ireland
- Macra na Feirme
- Teagasc
- Trinity College Dublin

The group was locally led by the five Champion Farmers, who represented arable, dairy, beef & mixed farm types. It was put together to ensure scientific expertise in pollinator requirements, project design and data analyses (National Biodiversity Data Centre, Trinity College Dublin); farmer engagement and knowledge transfer (Teagasc, Macra na Feirme, Champion Farmers); and to advise on future practical recommendations with respect to agri-environment (Teagasc) and biodiversity/sustainability schemes from a commercial perspective (Bord Bia, Tírlan and HEINEKEN Ireland). The Operational Group was further supported by the 15-member steering group of the All-Ireland Pollinator Plan, which includes representatives from both The Department of Agriculture, Food and the Marine and the Department of Agriculture, Environment and Rural Affairs.

Participant farmers

Figure 2 Participant farmers at a farm walk on Trevor Harris' Farm, Co. Kildare.

An important part of this project was to work in tandem with farmers, so that together we can better understand how to protect pollinators on modern Irish farms. All forty farms remained in the project from the beginning to the end. We would like to thank all the participant farmers and their families: Mireille McCall, Kim McCall, Andrew Bergin, John McHugh, Trevor Harris, Colm Flynn, Anthony Mooney, Mary-Rose Mooney, Conor Mooney, Tom Tierney, Helen Harris, Philip Harris, Jenny Young, Peter Young, William Mulhall, Tom Phelan, Rachael Creighton, James Creighton, Barnaby O'Sullivan, Sharron Kelly, Martha Kelly, James Kelly, Fergal Byrne, Thomas Dunne, Mary Dunne, John O'Loughlin, Seamus O'Loughlin, Shane O'Loughlin, Kenneth Roberts, Thomas O'Connor, Laurie Young, Nigel Young, Brian Ovington, Colm Losty, Seamus McGrath, Karl Matuska, Mervyn McCann, Kathryn Payne, Alison Payne, Mervyn Payne, Valerie Payne, Brendon Gorman, Martin Hayden, Robert Greene, Kevin McNamee, Pat Durkin, James Whelehan, Caroline Whelahan, Aiden Byrne, Arthur Craige, Liam Dunne, Larry Hannon, Jonny Greene, Alfie Beatie, and Paul Grace.

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Protecting Farmland Pollinators was European Innovation Partnership (EIP) funded by the Department of Agriculture, Food, and the Marine (DAFM) under the Rural Development Programme 2014-2020.

Testing the effectiveness of a range of pollinator measures across different farm types in Ireland

In developing the scorecard across the life of the project, a series of hedgerow management types and different farm features were tested. The results of how important each of these were for pollinators on the farms is discussed in the results section.

Hedgerows

Hedgerows are an integral part of the agricultural system in Ireland. They are traditionally planted as a boundary to divide land ownership, divide fields within farms and provide shelter to livestock. They are an essential component of our landscape and provide food and shelter to many animal species, including pollinators. Hedgerows were divided into three main categories for the purpose of developing the scorecard:

1. Flowering hedgerow cut once every 3-5 years with a 1.5-2m margin or understory fenced from grazing part of the year or untilled.
2. Flowering hedgerow cut once every 2-5 years with at least 0.5m margin fenced from grazing part of the year or untilled.
3. Flowering hedgerow cut once every two years with no margin.

Hedgerows that were cut annually were not included in the testing or the scorecard as most hedgerow species only flower on two-year old wood. If hedgerows are cut annually, they will provide limited flowers for pollinators to feed on.

Farm features

Farm features were:

1. **Clover pastures** are pastures that have Clover incorporated into them. They are a common feature on Irish farmland as Clover has the ability to fix nitrogen, so pastures need less chemical application.
2. **Mixed species sward or Herbal ley**. Mixed species swards are designed to maintain productivity but also to address the agri-enviromental challenges that livestock farmers face. It is typically a mixture of Perennial Ryegrass, Timothy, Red and White Clover, Chicory and Ribwort Plantain. Herbal leys also contain a mix of non-native flowering plants in addition to grasses. Typically, are a complex mixture of grasses, legumes and herbs, and may have a more diverse number of species in comparison to a mixed species sward.
3. **Non-farmed areas** are areas on the farm that are not in agricultural production and are excluded from the basic farm payment e.g., around gates, field margins, laneway and roads that are unmanaged and allow grasses and wildflowers to develop naturally.
4. **Native hay meadow** is a mixture of grasses and wildflowers. Meadows are typically allowed grow until July and are cut to produce hay to feed livestock over the winter.
5. **Pollinator-friendly catch, companion, or cover crop** are crops that are grown between production crops on arable farms to provide ground cover e.g., Brasscias, Legumes or Phacelia. Companion planting is growing plants alongside each other that are mutually beneficial to allow crops to grow more efficiently.
6. **Sown meadows** are a sown mix of seeds that are not native Irish plant species.
7. **Wild bird cover** is a mixture of grain and flower seeds (usually non-native) with the aim of producing seed for birds.
8. **Barely** is a feature of arable farms only and could be a crop of spring or winter barely. This was a control feature, used to test the effectiveness of all other features against.
9. **Perennial Rye Grass pasture** was a sward that was made up of pure Perennial Ryegrass. This was a control feature, used to test the effectiveness of all other features against.

Hedgerows and the other farm features above (excluding the two controls) were included in the initial draft scoring system, along with an additional three actions which are known to support pollinators, but which were more difficult to test in the survey phase of this project:

- Other pollinator-friendly field boundary
- Number of pollinator-friendly native trees
- Actions around pesticide use

Extensive pollinator surveys were carried out across the forty farms in 2020. The survey was designed to assess pollinator abundance and diversity across each of the farm features and hedgerows in Ireland (see results section). This was to ensure that we developed a final scoring system that was fully evidence-based (page 24).

How did the scorecard and the results-based payment system work?

A results-based payment structure was used to score the 40 farms. Payment scales were linked to the whole farm pollinator score which depends on the farmer's management practices. Farmers received an annual payment based on their overall farm-scale pollinator score which was calculated based on the amount and quality of habitat maintained and/or created.

Within the overall score, each action was weighted relative to the others and then further refined by the quality of the resource using a range (page 10). For example, a high-quality hay meadow (i.e., higher plant diversity) will score more than a low-quality meadow (i.e., lower plant diversity).

In year one, each farmer was paid €1,000, and a baseline pollinator score was calculated for each farm by the Project Manager. The results-based payment did not apply until year two of the project. From years two to five, the farmer completed their own scorecard. The farmer simply filled in the approximate amount section on the scorecard for each of the actions they had taken in that farming year. Every year at least 10% of the farms were randomly selected to be audited by the Project Manager. If there was a drastic change in pollinator points on a specific farm it was also automatically selected for auditing.

How farms were scored

There were three steps to creating a whole farm pollinator score.

1 Create solitary bee nesting habitat

↓

2 Identify Pollinator-friendly actions on your farm (food, safety, shelter)

↓

3 Score your farm

Before you score

Before the farmer could score their farm, they had to create solitary bee nesting habitat for mining and cavity nesting bees. It was decided not to include this within the score itself but to have it as an initial mandatary requirement for two reasons:

1. It could be created at little or no cost.
2. It was a known limiting factor. Farms that are flower rich will not have wild pollinators unless they also have safe areas where pollinators can nest.

Based on expert judgement, the farmer must satisfy the following requirements for wild bee nesting habitat per 35 hectares, with this scaled up on the total farm area.

Must have nesting habitat:	Per 35Ha (average farm size)
Bare soil for mining solitary bees (Fig. 3a)	8 separate locations at least*
Bee boxes or equivalent for cavity-nesting solitary bees (Fig. 3b)	3

*There was a minimum of eight locations per farm. It's ideal to distribute these bare soil sites throughout the entire farm, with each site occupying at least 30^{2}cm.

The vegetation around nest sites can grow back quickly and needed to be maintained at least twice a year without the use of chemicals.

Figure 3 Examples of (a) bare soil for mining solitary bees and (b) bee boxes or equivalent for cavity-nesting solitary bees.

Draft scorecard: years 1-5

An initial draft scorecard was used to score the farms from year 1-5. This was developed at the project proposal stage, based on evidence-based studies of what actions were likely to be beneficial. The initial scorecard retained its structure and key actions, but evolved over the life of the project as more evidence gradually became available. This occurred in collaboration with the farmers following their feedback, and as data collected within the project was analysed. It has also evolved in line with other evidence-based studies on pollinator conservation. Following completion of the analysis of all survey data in the final months of the project, the scorecard was finalised (page 24).

Draft scorecard

The weightings for the actions changed over the course of the project as more data became available. Weightings at the end of year 4 are include here, as year 5 admin has only recently been finalised.

No.	Action	Units of Measurement	Weighting
1	Flowering hedgerow max. cut once every 3-5 years with a 1.5-2m margin or understory fenced from grazing part of the year or untilled	meters	12
2	Flowering hedgerow cut once every 2-5 years with at least 0.5m margin fenced from grazing part of the year or untilled	meters	6
3	Flowering hedgerow cut once every two years (no margin)	meters	4
4	Other pollinator-friendly field boundary	meters	2
5	Pollinator-friendly flowering trees at least 10 years established (up to max. 500)	meters	40
6	Pollinator-friendly flowering trees planted in the last 10 years must be established for 1 year or more (up to max. 500) *	number of trees	8
7	Native hay meadow (maximum cut or grazed once/twice a year)	ha	7000
8	Herbal ley allowed to flower / sown wildflower area	ha	800
9	Clover pasture / mixed species sward allowed to flower	ha	800
10	Bird cover / Poly-crop	ha	400
11	Non-farmed areas (e.g. around farmyard, lanes, road margins) unmanaged to allow grass and wildflowers to grow naturally	m^2	0.10
12	Flowering pollinator-friendly catch, companion or cover crop allowed to flower	ha	200
13	Eliminated herbicides, fungicides and insecticides from whole farm	Yes or No	100
14	Eliminated herbicides, fungicides and insecticides from whole farm excluding livestock	Yes or No	80
15	Eliminated insecticides and fungicides from whole farm	Yes or No	60
16	Eliminated insecticides from tillage crops	Yes or No	50
17	Eliminated herbicides from whole farm	Yes or No	25
18	Herbicides – spot spray only noxious and invasive plants (Chickweed, Ragwort, Giant Hogweed, and other invasive species)	Yes or No	10
19	Herbicides - only used on crops and not used to "tidy-up" the farm	Yes or No	5

*Action 6 was added in 2021 at the request of farmers.

How was habitat quality assessed?

A range from 1-5 was used to assess habitat quality, with 5 being the best or most beneficial for pollinators. The range for actions 1-4 and 7-12 were based on the number of flowering plant species, the formulas are shown below. The tree actions (5 and 6) and safety actions (13-19) have a standard range of one (it does not change).

Actions 1-4

$$N = \frac{(\text{number of species of ground flora} + \text{number of woody species})}{2}$$

If N = <2 (2 species) the range = 1
If N = 2-4 (3-9 species) the range = 2
If N = 5-6 (10-12 species) the range = 3
If N = 7 (14 species) the range = 4
If N = >8 (16 species) the range = 5

To get a score of 5 for a hedge you need at least 16 species of flowering plants in flower in that hedge.

Woody species = 8
Ground Flora = 8
N = 8

$$N = \frac{8+8}{2}$$

Actions 7-12

For all other actions (7-12), the range is based on the number of flowering plant species (number of plants in flower).

1 = <2 species in flower
2 = 3-4 species in flower
3 = 5-7 species in flower
4 = 8-12 species in flower
5 = >12 species in flower

To get a score of 5 for a hay meadow you need at least 12 plant species in flower within the meadow.

Example Farm

This example shows how the pollinator score changed for a 12 hectare beef farm (Farm 42) from year one to year four based on the initial scorecard. The pollinator scorecard and associated farm map for the farming years one and year four are shown below (Figure 4 and Figure 5).

The farmer increased their pollinators points by over 460% from 24502.50 in year one to 137862.00 points in year four. This was achieved by changing how they managed their hedgerows, increasing the number of pollinator friendly trees and establishing a small native hay meadow.

Figure 4 Whole farm pollinator score for Farm 42 for year one. Maps are drawn in Google Earth.

Table 2 The actions taken by Farm 42 that were included in the initial scorecard in year one.

No.	Action	Units of	Approx. amount	Proposed Weighting	Score	Range 1-5	Final Score
4	Other pollinator friendly field boundary	meters	1072	2	2144	4	8576.00
6	Pollinator-friendly flowering trees (up to max 500)	number of trees	40	8	320	5	1600.00
9	Clover pasture / mixed species sward allowed to flower	ha	3.94	800	3152	3	9456.00
10	Bird cover / Poly-crop	ha	2.88	400	1152	4	4608.00
17	Eliminated herbicides from whole farm	Yes or No	10.5	25	262.5	1	262.50
			Total Score		**7030.5**		**24502.50**

Table 3 The actions taken by Farm 42 that were included in the initial scorecard in year four.

No.	Action	Units of measurement	Approx. amount	Proposed Weighting	Score	Range 1-5	Final Score
1	Flowering hedgerow max. cut once every 3-5 years with a 1.5-2m margin or understory fenced from grazing part of the year or untilled	meters	938.5	12	11262	5	56310.00
2	Flowering hedgerow cut once every 2-5 years with at least 0.5m margin fenced from grazing part of the year or untilled	meters	1224	6	7344	5	36720.00
5	Pollinator-friendly flowering trees at least 10 years established (up to max. 500)	number of trees	440	40	17600	1	17600.00
6	Pollinator-friendly flowering trees planted in the last 10 years must be established for 1 year or more (up to max. 500)	number of trees	50	8	400	1	400.00
7	Native hay meadow (maximum cut or grazed once/twice a year)	ha	0.0262	7000	183.4	5	917.00
9	Clover pasture / mixed species sward allowed to flower	ha	6.4	800	5120	5	25600.00
11	Non-farmed areas (e.g. around farmyard, lanes, road margins) unmanaged to allow grass and wildflowers to grow naturally	m2	100	0.10	10	4	40.00
17	Eliminated herbicides from whole farm	Yes or No	11	25	275	1	275.00
			TOTAL SCORE		**42194.4**		**137862.00**

On farm biodiversity surveys in 2020

Large amounts of data on the biodiversity present on each of the 40 farms were collected by a team of ecological surveyors between May-September 2020. These data were collected to meet the objectives of the project and to ensure the pollinator scorecard was evidence-based.

Forty farms were surveyed twice between May and July and a further 20 were surveyed in August. The 40 farms make up a total area of 2,774.70 ha. Surveys were conducted to assess each of the features on the scorecard and to get a sense of pollinator, invertebrate, and floral diversity for each of the farms.

- Plant and pollinator transects were carried out on 80 hedgerows and 54 farm features.
- Over 16,200 metres of hedgerow were assessed for plants, pollinators, and structure.
- 474 pan traps were set to gather data on farm pollinator abundance and diversity.
- 50 Malaise traps were set to record the invertebrate diversity on each of the farms.
- Solitary bee nest sites were checked for occupancy on each of the 40 farms.

Results

Pollinators found on the farms

A data set consisting of 8,669 records of pollinators was collected from the transect walks, pan traps and malaise traps. A total of 8,003 of these specimens were identified to genus level and 7,191 specimens were identified to species level. Thirty-seven species of bee and 57 species of hoverfly were recorded.

The top five most frequently recorded bumblebee, solitary bee, and hoverfly species are shown in Tables 4-6. The number of farms that each species was recorded on is also reported.

Table 4 The most frequently recorded species of bumblebee. The Latin name, common name, number of records and number of farms on which the species was recorded is reported.

Pollinator Species	Common name	Number of individuals recorded	Number of farms
Bombus lucorum agg.	Bombus lucorum complex	622	39
Bombus pascuorum	Common carder bee	419	38
Bombus lapidarius	Red-tailed bumblebee	270	28
Bombus pratorum	Early bumblebee	81	27
Bombus hortorum	Garden bumblebee	65	18

Table 5 The most frequently recorded species of solitary bee. The Latin name, common name, number of records and number of farms on which the species was recorded is reported.

Pollinator Species	Common name	Number of individuals recorded	Number of farms
Halictus rubicundus	Orange-legged furrow bee	69	16
Nomada marshamella	Marsham's nomad bee	35	15
Andrena scotica	Chocolate mining bee	34	13
Andrena haemorrhoa	Early mining bee	19	9
Andrena bicolor	Gwynne's mining bee	17	12

Table 6 The most frequently recorded species of hoverfly. The Latin name, common name, number of records and number of farms on which the species was recorded is reported.

Pollinator Species	Common name	Number of individuals recorded	Number of farms
Episyrphus balteatus	Marmalade hoverfly	1692	39
Platycheirus albimanus	Grey spotted boxer	406	39
Melanostoma mellinum	Short meanostoma	392	35
Helophilus pendulus	European hoverfly	314	33
Platycheirus peltatus	Meadow boxer	248	19

The Large Carder Bee (*Bombus muscorum*) was recorded on four of the farms, three farms in Co. Kildare and one farm in Co. Laois. This species is listed as Vulnerable on the European Bee Red List and is under severe decline in Ireland.

Figure 6 An example of some of the pollinators found on the farms.

Plants found on the farms

One hundred and five different flowering plant species were recorded across the 80 hedgerows within the 40 farms. The number of different flowering plants found within the hedgerows and hedgerow margins ranged from 11 to 32 per farm, with 19 being the average number of plant species per farm.

Figure 7 Some of the flowers found on the participant farms

Data on the flowering plant species for each of the different farm features were also collected.

Data collected was used to address the following five main questions:

i. Where nesting habitat was created, was it occupied and what drives this?

ii. How does pollinator diversity and abundance vary by farm type?

iii. Which of the pollinator actions on the scorecard are most effective in Ireland?

iv. Using the scorecard, did farmers increase their whole farm pollinator score over the course of the project?

v. Do farms that score higher have a greater abundance and/or species richness of pollinators (bees and hoverflies)?

Where nesting habitat was created, was it occupied and what drives this?

Eighty-one bare soil sites from 40 farms were monitored for 10 minutes to assess if the site was occupied by solitary mining bees. The sites were convenience sampled i.e., sites sampled were easy to access and not far from the farm survey locations. The following were recorded for each site: area, aspect, general context (location and whether the nest was manmade), number of nests, and shade. Twenty-nine nest boxes were also surveyed from 18 farms.

The results from the solitary bee survey in 2020 (81 bare soil sites surveyed from 40 farms and 29 nest boxes surveyed from 18 farms), showed that some sites were occupied within the first 4 months of creation.

Bare soil sites

Exposed areas of bare soil created by the farmers were colonised by mining bees on 19 farms, and one-third of nest sites surveyed were occupied (27 out of 81 sites). Across 19 farms, a total of nine different solitary bees were observed: *Andrena bicolor* (Gwynne's Mining Bee), *Andrena nigroaenea* (Buff Mining Bee), *Andrena scotica* (Chocolate Mining Bee), *Nomada goodeniana* (Gooden's Nomad bee), *Nomada marshamella* (Marsham's Nomad Bee), *Halictus tumulorum* (Bronze Furrow Bee), *Halictus rubicundus* (Orange-legged Furrow Bee), *Lassioglossum* species and *Sphecodes* species.

Nest sites were occupied on all farm types (5 beef, 6 dairy, 3 mixed and 5 arable). The most common bee to nest was *Halictus rubicundus* (found on 9 farms) and *Nomada goodeniana* came in a close second (8 farms). All results reported here include data on active occupied nest sites only. Dairy farms had the highest species diversity of ground nesting mining bees. There was no significant difference in the diversity of mining bees across each of the farm types (beef = 7 species, dairy = 8 species, mixed = 5 species, and arable = 5 species).

The area of the bare soil where occupied nests were found ranged from 150 cm^2 to 12 m^2. The highest number of species were found within areas less than one meter squared (7 species). Occupied nests were in both open locations (no shade; 13 sites) or sheltered (some shade; 14 sites). The number of nests per site ranged from 1 to 150. Across the nineteen farms, ground-nesting solitary bees were found occupying banks of different aspects: south facing banks had the highest nest occupancy and the highest number of bee species. Bees were found nesting on banks with various aspects.

Table 7 The number of occupied bare soil nesting sites and their aspect, ordered by most frequently nested in.

Nesting aspect	Number of sites
South	6
Southwest	5
Southeast	4
West	3
Northeast banks	2
South-Southwest	2
North-Northwest	2
West-Northwest	1
West-Southwest	1
Northwest	1

Although the Northeast aspect had two occupied nest sites, five different species were found nesting within these two sites. Out of the twenty-five occupied nests, fourteen were made by livestock and ten were made by the farmer.

Bee boxes

All active nest boxes were placed at least 1.5 meters above ground. Eleven of the 29 bee boxes from eight farms were occupied. Cavity bees were found nesting on several different aspects, south-southwest facing bee boxes were the most frequently occupied bee boxes (Table 8). All active nests had floral resources close by. They were placed in areas where the farmer had taken action to protect pollinators, either within a field boundary (hedge or stone wall) or close to a farm garden.

Table 8 The number of occupied bee boxes and their aspect, ordered by most frequently nested in.

Nesting aspect	Number of sites
South-Southwest	3
West	2
East	1
East-Southeast	1
South	1
Southeast	1
West-Southwest	1
North-Northwest	1

An unidentified *Megachile* species was the only cavity-nesting solitary bee observed flying into a nest box. Other bees had not emerged from their nests at the time of surveying. *Megachile centuricularis* (Patchwork Leafcutter Bee), *Megachile versicolor* (Brown-footed Leafcutter Bee) and *Hylaeus confusus* (White-jawed Yellow-face Bee) were observed flying close to nest boxes.

How does pollinator diversity and abundance vary by farm type?

Honey Bees (*Apis*) were not included in this analysis as this is dictated by the number of bee keepers in the area. Non-*Apis* pollinators refers to bumblebees, solitary bees and hoverflies.

Among the farm types, arable farms had the highest non-*Apis* pollinators abundance followed by dairy, mixed and beef farms respectively (Figure 8).

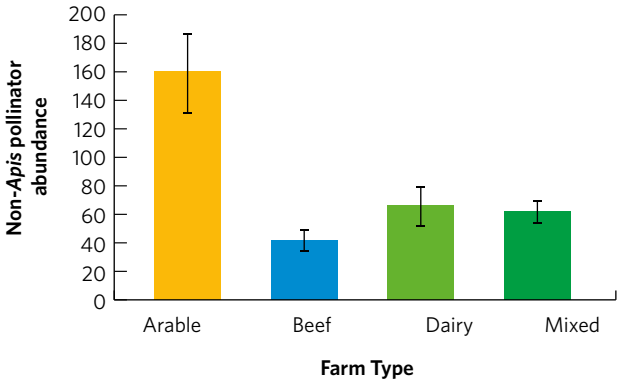

Figure 8 Mean abundance of non-*Apis* pollinators.

Comparatively dairy farms had the highest species richness, followed by mixed, beef and arable respectively (Figure 9).

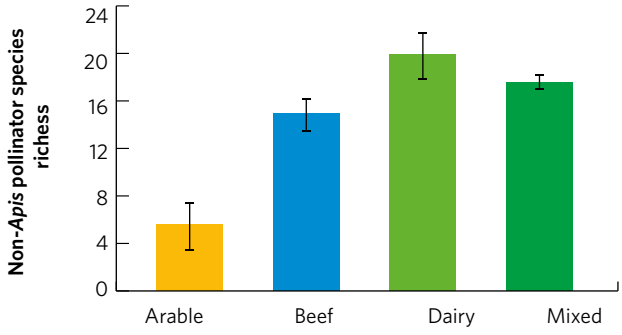

Figure 9 Mean diversity of non-*Apis* pollinators.

Which of the pollinator actions on the scorecard are most effective in Ireland?

Data on the pollinators recorded on the farm hedgerows and farm features were analysed to understand which features are most important to different pollinator groups (bumblebees, solitary bees and hoverflies). Generally, the features with a higher number of flowers had a higher abundance and species richness of pollinators. All were tested against the control features (Barley and Perennial Rye Grass pasture).

Table 9 The number of farms that completed the 19 different actions in the draft score and an accumulative total amount across all farms in year four. * The number of trees is an underestimation as the cut off for number of trees is 500.

Action	No. of farms (Y4)	Approx. amount (Y4)
Flowering hedgerow max. cut once every 3-5 years with a 1.5-2m margin or understory fenced from grazing part of the year or untilled	18	30281.5m
Flowering hedgerow cut once every 2-5 years with at least 0.5m margin fenced from grazing part of the year or untilled	23	38831.7m
Flowering hedgerow cut once every two years (no margin)	23	21356.1m
Other pollinator-friendly field boundary	24	31145.7m
Pollinator-friendly flowering trees at least 10 years established (up to max. 500)	35	9495 trees
Pollinator-friendly flowering trees planted in the last 10 years must be established for 1 year or more (up to max. 500)	16	2124 trees
Native wildlife/ hay meadow (maximum cut or grazed once/twice a year)	13	30.27235 ha
Herbal ley allowed to flower / sown wildflower area	13	32.69889 ha
Clover pasture / mixed species sward allowed to flower	28	722.6 ha
Bird cover / Poly-crop	9	7.25 ha
Non-farmed areas (e.g. around farmyard, lanes, road margins) unmanaged to allow grass and wildflowers to grow naturally	32	376497.95 m^2
Flowering pollinator-friendly catch, companion or cover crop allowed to flower	6	171.47 ha
Eliminated herbicides, fungicides and insecticides from whole farm	5	223.9 ha
Eliminated herbicides, fungicides and insecticides from whole farm excluding livestock	6	555.9 ha
Eliminated insecticides and fungicides from whole farm	3	92.86 ha
Eliminated insecticides from tillage crops	5	486 ha
Eliminated herbicides from whole farm	3	139.1 ha
Herbicides – spot spray only noxious and invasive plants (Ragwort, Giant Hogweed, and other invasive species)	10	773.2 ha
Herbicides - only used on crops and not used to "tidy-up" the farm	10	634.4 ha

Three most popular actions

Over the project, we kept track of the actions taken by farmers to understand which actions are more accessible.

The most popular actions in the final year were:

1. The number of pollinator friendly trees (established for at least for 10 years, action 5) was the most frequently used action on the participating farms for the final year of the project (40 farms). The number of trees on an individual farm ranged from 12 to 500 plus.
2. The second most popular action was managing hedgerows, 37 farmers implemented actions 1-3.
3. The third most popular action was non-farmed areas (32 farms).

Action	Importance for pollinators
Flowering hedgerow with a maximum cut once every 3-5 years with a 1.5-2m margin or understory fenced from grazing or untilled.	This was vital for pollinators, and the most important hedgerow action. Within the scoring system, weightings were adjusted to reflect this.
Flowering hedgerow cut once every 2-5 years with at least 0.5m margin fenced from grazing or untilled.	This was the second most important hedgerow action for pollinators. Within the scoring system, weightings were adjusted to reflect this.
Flowering hedgerow cut once every two years (no margin).	This was also beneficial to pollinators, but less so than the previous two hedgerow actions. Within the scoring system, weightings were adjusted to reflect this.
Clover pastures	Clover pastures were found to be important to bumblebees and not used by solitary bees or hoverflies.
Mixed species sward or Herbal ley	This action was not found to support a high abundance or diversity of pollinators.
Non-farmed areas	This was important for pollinators but proved difficult to reflect in the scoring system.
Hay meadow	The data showed hay meadows to be an incredibly important habitat for pollinators.
Pollinator-friendly catch, companion, or cover crop	Flowering plants in this feature on arable or mixed farms have a very short flowering time and only provide support late in the season.
Sown meadows	Non-native seed mixes can support flower-visiting insects, but this action is not endorsed by the All-Ireland Pollinator Plan due to potentially negative impacts on wider biodiversity (page 30).
Wild bird cover	Non-native wild bird cover mixes and can support flower-visiting insects, but they typically flower outside the main flight period of wild pollinators. This action is not endorsed as a pollinator action by the All-Ireland Pollinator Plan.

IV. Using the scorecard, did farmers increase their whole farm pollinator score over the course of the project?

Between the first year and the fourth year of the Project, 32 farms saw their pollinator scores increase. Nine of the 40 farms increased their scores by at least a factor of three. In the final year of the project, the pollinator scores for all the farms ranged from 2,831 points to 79,790 points, with the median score of 47,998 points. When comparing the first year to the fourth year of the project, the median score for the farms improved (Figure 10).

Graphs presented represent years one to four of the results based payment, as scores for year 5 have only recently been finalised (October 2023).

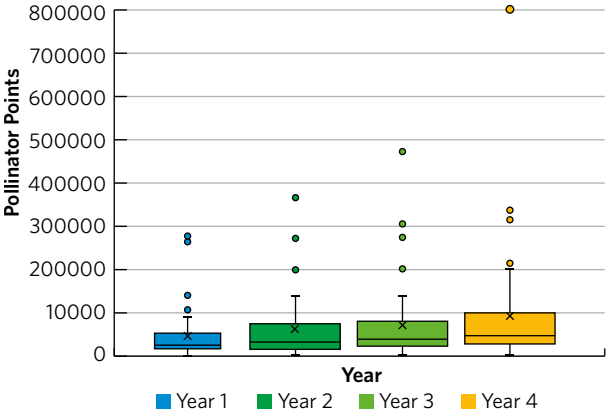

Figure 10 Distribution of the whole farm pollinator score (pollinator points) across the four farming years. Each box represents the median farm score for each farm type. The maximum (top dot outside the box), minimum (bottom line outside of the box), median (line inside the box) and mean (x inside the box) pollinator score for each farming year are represented.

The median score increased from 25,696 in first year to 47,998 in fourth year, an 87% increase with arable and dairy farms showing the largest increase (Figure 11).

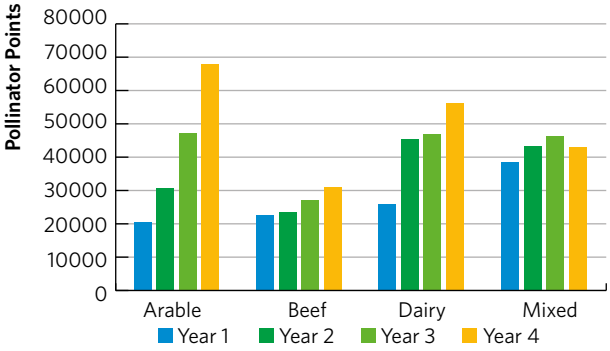

Figure 11 Median whole farm pollinator score for each farm type (arable n=10, beef n=10, dairy n=10 and mixed n=10) for the four farming years. Each bar represents the median farm score.

Arable farms were initially the lowest scoring farms overall, with some farmers offering little to no protection for pollinators. After receiving guidance on simple pollinator measures, these farms significantly improved their practices, showing the greatest increase in pollinator points over three years, followed by dairy farms. Eight out of ten arable farmers increased their scores in the four years, and seven of these farmers increased the amount of flowering hedgerow and hedgerow margins on their farms. Arable farmers did not need to move fences to increase hedgerow margins and did not have the same concerns regarding hedgerows encroaching on electric fences as livestock farmers. Among farm types, beef farmers exhibited the smallest increase in pollinator points over the three-year period.

Farms that are incredibly biodiversity friendly occurred across all types:

The highest score overall came from a mixed farm (79,7990 pollinator points), the second highest came from an arable farm (33,7051.20 pollinator points) and the third highest from a beef farm (31,4825.60 pollinator points).

V. Do farms that score higher have a greater abundance and/or species richness of pollinators?

Species richness of pollinators

The relationship between wild bee species richness and pollinator points is positive. Based on the final scoring system, those farms that had scored more points, did support more bumblebees and solitary bees. This means that the system does reward farmers for helping to protect bumblebees and solitary bees, which are our most important wild insect pollinators.

The relationship between non-*Apis* pollinator species richness and pollinator points per 35 hectares is also positive (Figure 12). Based on the scoring system, those farms that scored more points, did support more non-*Apis* pollinators (bumblebees, solitary bees and hoverflies). This means that the system does reward farmers for helping to protect our native pollinators. It is referred to as non-*Apis* because honey bees (*Apis mellifera),* while important pollinators, were excluded from the analyses. This is because their presence is primarily dictated by the number of bee keepers in the area.

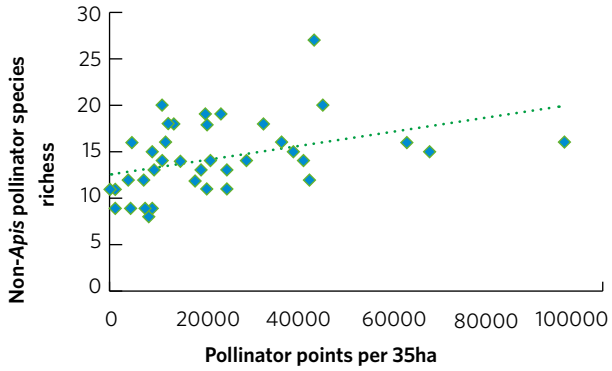

Figure 12 The relationship between non-*Apis* pollinator species richness and pollinator points per 35ha. N=39.

Large numbers of detailed analyses were carried out (not presented here). When drilling down into the data it did appear that bumblebees and solitary bees had the strongest relationship to pollinator points. Table 10 shows the relationship between different pollinator types and the pollinator points. This suggests that bumblebees and solitary bees might have a stronger connection to the number of pollinator points, than when we consider all the non-*Apis* pollinators at once. Hoverflies have complex life cycles with species-specific requirements at the larval stage. The scoring system did not deliberately focus on this, which may explain the finding.

Table 10 The rho, p and R values to represent the relationship between various subsets of pollinators and pollinator points. N=39.

	Bumblebee	Solitary bee	Bumblebees and solitary bees	Bumblebees, solitary bees and hoverflies
rho	.456	.591	.127	.127
p	.003	.029	0.443	0.443

Abundance of pollinators

The relationship between the abundance of bumblebees and solitary bees and pollinator points is also positive (Figure 13). Based on the scoring system, those farms that scored more points, did support a high abundance of bumblebees and solitary bees.

This means that the system does reward farmers for helping to protect bumblebees and solitary bees, which are our most important wild insect pollinators.

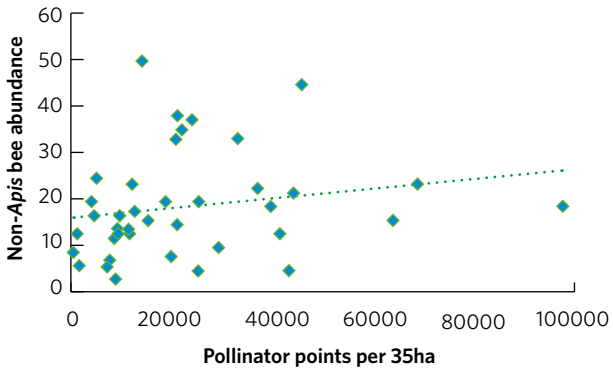

Figure 13 The relationship between non-*Apis* bee abundance and pollinator points per 35ha. N=39.

Again, very large numbers of analyses were carried out to try to understand these relationships, with only the most important highlighted in this final report.

Considering the effect of abundance and species richness on the various pollinator groups, the richness of species, indicating diversity, showed a stronger relationship and explained a higher percentage of the changes observed in pollinator points per area than the abundance.

Summary of findings

- Intensive farms in Ireland still contain a diversity of pollinators. Across the forty farms in this study, 37 bee species and 57 hoverfly species were recorded. This represents 37% of Ireland's wild bee fauna and around 38% of the hoverfly fauna.
- Solitary bee nesting habitat can be successfully created on farms, at very little cost. In some cases, these were occupied almost immediately.
- While it may not be representative in a larger sample size, in this project, arable farms had the highest abundance of wild pollinators, while dairy farms had the highest species diversity.
- Two of the most important actions for supporting pollinators on farmland were flowering hedgerows with margins and hay meadows.
- All farmers engaged with the process, with almost 80% increasing their pollinator points across the life of the project.
- The scoring system proposed does have an evidence-base. Those farms that scored more points, do support more wild pollinator abundance and diversity.

The final scorecard

An initial draft scorecard was used to score the farms from year 1-5. The scorecard retained its structure and key actions, but evolved over the life of the project as more evidence gradually became available. The changes occurred in collaboration with the farmers following their feedback, and as data collected within the project was analysed. It has also evolved in line with other evidence-based studies on pollinator conservation.

Following the statistical analysis of all survey data, the scorecard was then fully reviewed and finalised.

How was the final scorecard selected?

- Following significant statistical analyses of all pollinator data collected in 2020, a suite of measures were selected to ensure the final scorecard was evidence-based. During the analysis stage, numerous iterations of both actions and weightings were tested to ensure that the pollinator points generated by the scorecard were directly related to actual pollinator abundance and diversity on the farms. A consequence of this is that some actions which benefit only one pollinator component e.g., Clover pastures and bumblebees, were not included. **Importantly, it means that the final scorecard is evidence-based - those farms that generate more points, do have more pollinators.**
- Superimposed on this process, was a decision that the scoring system should be focused on long-term and sustainable biodiversity actions that will benefit both pollinators and wider biodiversity on the farms.

How will the final scorecard work?

Once sufficient nesting habitat is created, farmers fill in the approximate amount for each of the 11 actions on the final scorecard (Table 11). The score is then calculated based on the amount submitted. Actions are weighted (based on the survey data), so that those actions that are more beneficial to pollinators score more. The final scorecard is spilt into "Food and shelter" actions 1-7 and "Safety" actions 8-11. Food and Shelter actions are focused on providing more floral resources and Safety actions are focused on reducing or eliminating pesticides.

If the farmer does not have an amount to fill in i.e., if they are not managing a specific action, they can leave the amount blank or enter a null value. The preferred units of measurement for each action are stated.

Table 11 Whole Farm Pollinator Scorecard – left blank for farmers entry.

	No.	Action	Unit	Approx. Amount	Weighting	Score	Range 1-5	Final Score
Food and Shelter	1	Flowering hedgerow max. cut once every 3-5 years with a 1.5-2m margin or understory fenced from grazing part of the year or untilled	meters		6	0		0.00
	2	Flowering hedgerow cut once every 2-5 years with at least 0.5m margin fenced from grazing part of the year or untilled	meters		4	0		0.00
	3	Flowering hedgerow cut once every two years (no margin)	meters		3	0		0.00
	4	Other pollinator-friendly field boundary	meters		2	0		0.00
	5	Pollinator-friendly flowering trees at least 10 years established (up to max. 500)	number of trees		25	0	1	0.00
	6	Pollinator-friendly flowering trees planted in the last 10 years must be established for 1 year or more (up to max. 500)	number of trees		5	0	1	0.00
	7	Native hay meadow (maximum cut or grazed once/twice a year)	ha		3000	0		0.00
Safety	8	Eliminated herbicides, fungicides and insecticides from whole farm	ha		100	0	1	0.00
	9	Eliminated insecticides	ha		50	0	1	0.00
	10	Eliminated fungicides	ha		50	0	1	0.00
	11	Herbicides – spot spray only noxious and invasive plants (Ragwort, Giant Hogweed, and other invasive species)	ha		50	0	1	0.00
				Total Score		**0**		**0.00**

Hedgerows and field boundaries actions

Hedgerows tick all the boxes for pollinators, they can provide food and shelter. Each of the hedgerow actions and the boundary action are measured in metres.

Table 12 Pollinator friendly actions for hedgerows and field boundaries.

No.	Action	Units of Measurement	Weighting
1	Flowering hedgerow max. cut once every 3-5 years with a 1.5-2m margin or understory fenced from grazing part of the year or untilled	metres	6
2	Flowering hedgerow cut once every 2-5 years with at least 0.5m margin fenced from grazing part of the year or untilled	metres	4
3	Flowering hedgerow cut once every two years (no margin)	metres	3
4	Other pollinator-friendly field boundary	metres	2

Figure 14 Hedgerows cut on a minimum 3-year rotation with the margins clearly visible.

Action 1 Flowering hedgerow max. cut once every 3-5 years, with a 1.5-2m margin or understory, fenced from grazing part of the year or untilled

A flowering hedgerow cut once every 3-5 years at a maximum, with a margin or understory left untouched and protected from grazing or tillage, provides an essential habitat for pollinators, supports biodiversity, and contributes positively to the overall landscape. A margin/understory of 1.5 – 2 metres creates a more diverse habitat matrix on farms, increasing floral resources from hedgerow plants and grassland plants and providing nesting habitats for pollinators. The margin needs to be protected from livestock grazing (i.e., fenced) during the flowering season (between March and October at least) as it prevents grazing animals feeding on wildflowers ensuring resources for pollinators.

Figure 15 Hedgerow cut on a three-year rotation with 2-metre margin.

Action 2 Flowering hedgerow cut once every 2-5 years with at least 0.5m margin fenced from grazing part of the year or untilled

A flowering hedgerow cut once every 2-5 years with a margin of at least half metre will provide similar benefits as the hedgerow cut every 3-5 years with 1.5-2 metres but with less floral resources available and less nesting habitat available in the margin/understory. The increased cutting frequency reduces floral resources for pollinators. Hedgerow species typically flower on two-year-old wood, meaning that more frequent cutting leads to an increased number of years when these plants don't flower. With shorter intervals between cuts, the hedgerow plants have less time to develop the necessary two-year-old wood, resulting in fewer flowering periods and reduced availability of vital nectar and pollen sources for pollinators. The reduced margin when compared to Action 1 reduces the floral resources and nesting habitats for pollinators. Similar to action 1, the margin needs to be protected from livestock grazing during the flowering season.

Figure 16 Hedgerow cut on a two-year rotation with margin.

Action 3 Flowering hedgerow cut once every two years (no margin)

A flowering hedgerow that is cut every second year, will only flower fully every second year when there is at least two-year-old wood throughout the full hedgerow. A hedgerow with no margin will have no wildflowers growing at the base and the floral resources will be limited to the hedgerow. However, when hedgerows are left unfenced, livestock tend to scrape back the vegetation at the base of hedgerows creating solitary bee nesting habitat.

Action 4 Other pollinator-friendly boundary

This action includes several pollinator friendly farm boundary features including margins (e.g., buffer strips, road margins, drains) and treeline hedgerows. The margins must contain flowers but cannot be sprayed with herbicides.

Action 5 and 6 Pollinator-friendly flowering trees

Trees can provide pollen and nectar when other resources are scarce in spring and early summer when pollinators emerge from hibernation. Local provenance native* trees are best for our native wildlife, as they have evolved alongside each other. Only trees that are considered pollinator friendly (e.g., Bird Cherry*, Blackthorn*, Crab apple*, Elder*, Hawthorn*, Hazel*, Horse chestnut, Lime, Rowan*, Willow*, Wild Cherry*) could be included in this action. The following trees were not included: conifers / evergreen, Ash, Beech, and Oak. This action is measured by simply counting the number of trees on the farm. A maximum score of 500 trees is permitted for each of the tree actions. Pollinator friendly trees on farmland can be located within a hedge, garden or can be standalone trees in a field.

Table 13 Pollinator friendly tree actions

No.	Action	Units of Measurement	Weighting
5	Pollinator-friendly flowering trees at least 10 years established (up to max. 500)	number of trees	25
6	Pollinator-friendly flowering trees planted in the last 10 years must be established for 1 year or more (up to max. 500)	number of trees	5

Figure 17 Pollinator friendly trees on farmland McNamee Farm and Greene Farm Co, Kildare.

Action 7 Native hay meadow (cut or grazed once a year)

Meadows are hugely valuable for biodiversity, featuring a variety of native wildflowers and grasses. Meadows in agricultural areas serve as vital habitats for pollinators, providing diverse floral resources and nesting sites.

For every hectare of hay meadow farmers were awarded 3000 points.

Table 14 Pollinator friendly actions for fields and flowers

No.	Action	Units of Measurement	Weighting
7	Native hay meadow (cut or grazed once/ twice a year)	ha	3000

Figure 18 Native hay meadow McCall's Farm and Kelly's Farm

Actions 8-11 Pesticide actions

By reducing or stopping the use of pesticides on the farm additional safety and floral resources will be provided for pollinators. Pesticides come in the form of fungicides, herbicides, and insecticides. All three groups have been shown to have negative effects on bees and other living organisms (lethal and sub-lethal).

There were three actions under pesticides where famers could have received points for helping pollinators.

Table 15 Pollinator friendly pesticide options

No.	Action	Units of Measurement	Weighting
8	Eliminated herbicides, fungicides, and insecticides from whole farm	ha	100
9	Eliminated insecticides	ha	50
10	Eliminated fungicides	ha	50
11	Herbicides – spot spray only noxious and invasive plants (Ragwort, Giant Hogweed, and other invasive species)	ha	50

Example Farm

Below shows the example farm (page 11) scored under the final scoring system

Table 16 The final scorecard for farm 42. The cap was increased in the final year from €5000 to €6000.

No.	Action	Unit	Amount	Weighting	Score	Range 1-5	Final Score	Payment
1	Flowering hedgerow max. cut once every 3-5 years with a 1.5-2m margin or understory fenced from grazing part of the year or untilled	meters	938.5	6	5631	5	28155.00	€1,407.75
2	Flowering hedgerow cut once every 2-5 years with at least 0.5m margin fenced from grazing part of the year or untilled	meters	1224	4.0	4896	5	24480.00	€1,224.00
5	Pollinator-friendly flowering trees at least 10 years established (up to max. 500)	number of trees	440	25	11000	1	11000.00	€550.00
6	Pollinator-friendly flowering trees planted in the last 10 years must be established for 1 year or more (up to max. 500)	number of trees	50	5	250	1	250.00	€12.50
7	Native hay meadow (maximum cut or grazed once/twice a year)	ha	0.0262	3000	78.6	5	393.00	€19.65
11	Herbicides – spot spray only noxious and invasive plants (Ragwort, Giant Hogweed, and other invasive species)	Yes or No	11	50	550	1	550.00	€27.50
			TOTAL		**22405.6**		**64828.00**	**€3,241.40**

Key actions

One of the aims of this project was to identify the farmland actions that are most important for pollinators and most cost effective for farmers. Two actions stand out as being of most importance for pollinators and wider biodiversity.

Hedgerows

Positively managing hedgerows for biodiversity by allowing them to flower and fruit had the biggest positive impact. It is also an action that is cost effective for farmers. Farmers who changed their hedgerow management, often by reducing their cutting, increased their pollinator points.

Hedgerows that are cut on a three-year rotation, when compared to hedgerows that are annually trimmed, will have twice the number of flowers for pollinators to feed on[1]. This is the simplest way to increase the number of flowers, and therefore the amount of food for pollinators on the farm. Hedgerows that have a diversity of species, will have a better score for habitat quality which both improved the pollinator score and the payment to farmers. Across all farm features, including hedgerows, avoiding monocultures e.g., a hedge that only has Hawthorn, and improving the diversity of species will have a positive impact on pollinators and wider biodiversity.

Hay Meadows

In the 1970's, hay meadows were one of the most common types of grassland, but they are now one of the most threatened habitats in Ireland. Recent data from the National Parks and Wildlife Service show losses of about 30% over a period of just ten years. This is a staggering figure. Maintaining existing hay meadows, or creating new ones, is an incredibly important action that farmers can take for pollinators and wider biodiversity. Those farmers who have and maintain these habitats should be recognised and rewarded.

Hay meadow management involves a cycle of growth, harvest, and grazing that supports wildflowers. Plantlife UK data shows these meadows can host up to 1,400 invertebrate species, including crucial pollinators, vital for both crops and wild plants.

One of the positive supplementary activities to take place within this EIP project occurred when seed was brush harvested from an existing hay meadow on the McCalls farm. This meadow has been maintained on the farm for decades. The project paid for the seed to be professionally collected and it was then made available to other project farmers in the locality who had suitable meadow or field margin sites. Brush harvesting collects seed from the donor meadow, so when sown in a new recipient location nearby, you are entirely replicating the species assemblage with native seed that is adapted to the local area. When seed is brush harvested, the meadow can still be cut for hay as normal.

The use of commercial wildflower seed mixes is very different to this. The industry is not regulated, so you may inadvertently introduce invasive species like Black Grass, which can be devastating to agriculture. Seed is often not native or not of local provenance. The new genetic material these introduce can have negative impacts on the native flora in your local area. Seed mixes also typically contain a mix of species that wouldn't be found growing together naturally, as they are often designed to appeal to humans.

1 CJ Barr., et al., A review of research on the effects of hedgerow management and adjacent land on biodiversity. 1996: Defra

Next steps

While the 'Protecting Farmland Pollinators' EIP project finished at the end of 2023, within the National Biodiversity Data Centre, we hope to build on the learnings of the project in coming years. Current plans are outlined below:

1 Review the evidence-based scoring system.
The evidence-based scoring system provides a very simple and transparent way for farmers to assess how pollinator-friendly their farm is from year-to-year. We want to review the final scorecard to ensure that it is fully fit for purpose and is communicated as clearly as possible. This will include:

- A review of how points are communicated. We have an evidence-based set of actions and associated weightings, but we would like to review how this translates into points. Within the EIP project, this was kept as simple as possible (measurements for each action taken were multiplied by the weighting, with totals summed). This leads to very large points e.g., 71,277, which are difficult to communicate out of context. Within the wider All-Ireland Pollinator Plan, we have recently been using an approach for other sectors (e.g., local communities) where areas are scored out of a 100, and a threshold set for when an area becomes pollinator friendly. A similar approach may be possible here, while retaining the evidence-based actions and weightings. This could make it easier to compare farms regardless of size, and for farmers to understand how pollinator-friendly their farm currently is. This should not prevent those farms that are exceptionally biodiversity friendly from being recognised.
- A review of how to better reward non-farmed areas. The project showed that non-farmed areas are very important for biodiversity, but this proved difficult to incorporate into the current scoring system. More thought needs to go into whether these areas can be better recognised and rewarded.
- Review of the scoring system in consultation with other relevant EIP projects. Given that each EIP project tested innovative approaches, it is important that we discuss our findings with other relevant projects to ensure that learnings are shared. In this instance, we need to determine if there are other evidence-based features that could be added to make the scorecard more applicable to wider biodiversity. The final measures chosen all benefit pollinators and biodiversity generally (none are pollinator specific), but there are additional actions, known to be important to biodiversity, that might be considered for future inclusion e.g., farmland ponds.

2 Develop new tools to communicate the scoring system.
Within this EIP we developed an online Survey123 tool that allowed farmers within the project to log their actions and accompanying photographs throughout the year. It was made available as a voluntary option for scheme administration in 2023. This meant that farmers could continually use the tool on their smartphone, rather than having to email a document outlining their actions, measurements, and photographs at the end of the year. The tool worked well, but we have gathered significant feedback across 2023, that we plan to use to create an improved version. This administrative tool means that the approach could be efficiently rolled out on very wide scales in future. We also want to develop a simple web-site application to widely communicate the scoring system. This would sit within the website and allow any interested farmer to test their own farm to get a sense of how pollinator-friendly it is. This would not store any data or personal information and would allow interested farmers to input different measurements under different actions, and make judgements on the best future actions to take for their farm e.g., how their score changes if they reduced hedgerow cutting etc.

3 Additional data analysis.

This project generated huge quantities of data from the on-farm biodiversity surveys in 2020. Given time constraints, analyses to identify an evidence-based scoring system for pollinators were prioritised. There are many more research questions that can be addressed using the wider data set, which also includes floral information. The dataset will continue to be interrogated by Saorla Kavanagh, within her new role in Teagasc. As part of this, it is expected that a series of scientific publications will be produced.

4 Communicate the learnings from the project.

This is the most important future action, and we hope to address it in several ways:

- We will publish a short document on key learnings from the Protecting Farmland Pollinators project. We hope to liaise with other relevant EIP projects on this, and to generate a template that could be used by all. This will ensure that all learnings across projects, can be understood and considered by DAFM where relevant in the future. Collating the key findings from the completed EIP projects and using the evidence-based actions in the next CAP 2029-2033 can help to contribute to halting biodiversity loss, improving water quality and ensuring soil resilience and the continuation of sustainability in agriculture.
- The project website will be fully updated to communicate all project outputs.
- We will update the existing All-Ireland Pollinator Plan farmland resources to reflect the learnings from the project. Having these evidence-based findings from Ireland strengthens activities under objective 1 of the Plan: Making farmland pollinator friendly. The AIPP Farmland officer (funded by DAFM) will continue to support Irish farmers in making their farms more pollinator and biodiversity friendly.
- We will share the learnings with other EU Member States, as the scoring system approach used will have wide-scale application across other countries.

5 Explore funding options for further roll out of the scoring system and the result-based payment structure.

We are very grateful to the forty participant farmers who have made significant changes to their farms to better support pollinators and wider biodiversity. We understand the frustration felt by farmers when a project and results-based payment structure comes to an end after five years. The existing farmers have decided to retain their group communication through WhatsApp, and we will do all we can to continue advising and supporting the group within the National Biodiversity Data Centre. We have developed an approach, in tandem with the participant farmers, for making farmland more pollinator-friendly while not impacting on productivity. Within the Centre, we will explore funding options for further roll out of the approach developed. While our priority is the existing farmer network, we will also explore whether this approach could be rolled out on much wider scales in the future.

Agriculture accounts for 67.6% of the national land cover (COIRNE 2018). If Ireland wants to reverse the declines on pollinators, there needs to be a landscape approach focused on providing food, shelter and safety. Given the proportion of land that is designated to agriculture in Ireland, implementing measures on farmland is essential for creating a landscape where pollinators can survive and thrive without impacting the productivity of farmland. This project has demonstrated that this is possible.

Farmer profile

Kim and Mireille McCall manage an eighty-four-hectare farm that is a haven for biodiversity. They breed beautiful Aubrac cows and keep breeding ewes. They have 75ha of permanent pasture rich in floral diversity and 10ha in forestry. They manage all aspects of the farm and provide food, safety and shelter to a diverse range of different species. The hedgerows act as corridors throughout the farm for bats, bees, beetles, birds, and butterflies. They have several ponds and a great diversity of dragonflies and damselflies. Kim and Mireille have been engaging with the National Biodiversity Data Centre for several years and regularly submit data from their farm. They have been very generous in providing advice from the farmers perspective to all our ongoing schemes and work programs. Fifteen different species of bee and thirty-two different species of hoverfly were recorded on the McCalls farm during the 2020 farm surveys.

Buíochas

We would like to thank all those who have participated in and contributed to the project. With special thanks to all the participant farmers and their families for continuing with the project until the end. Namely: Mireille McCall, Kim McCall, Andrew Bergin, John McHugh, Trevor Harris, Colm Flynn, Anthony Mooney, Mary-Rose Mooney, Conor Mooney, Tom Tierney, Helen Harris, Philip Harris, Jenny Young, Peter Young, William Mulhall, Tom Phelan, Rachael Creighton, James Creighton, Barnaby O'Sullivan, Sharron Kelly, Martha Kelly, James Kelly, Fergal Byrne, Thomas Dunne, Mary Dunne, John O'Loughlin, Seamus O'Loughlin, Shane O'Loughlin, Kenneth Roberts, Thomas O'Connor, Laurie Young, Nigel Young, Brian Ovington, Colm Losty, Seamus McGrath, Karl Matuska, Mervyn McCann, Kathryn Payne, Alison Payne, Mervyn Payne, Valerie Payne, Brendon Gorman, Martin Hayden, Robert Greene, Kevin McNamee, Pat Durkin, James Whelehan Caroline Whelehan, Aiden Byrne, Arthur Craige, Liam Dunne, Larry Hannon, Jonny Greene, Alfie Beatie, and Paul Grace.

Appendix

Year	Communication category	Details
2023	Events	• Closing event • Five farm walks
2023	Written Commuinication	• Final report • Mini paper published "Managing High diversity landscape features for Pollinators" • Paper published Whole farms scorecard - experiences and recommendations in the Journal Pollination Ecology
2023	Content Creation	• Eight promotional videos all available on our YouTube Channel, @ biodatacentre • Three flyers • Promoted the project via a monthly newsletter, social media, and the webpage • Three blogs
2023	Training and Education	• Primary school visit • Promoted through the Teagasc signpost series, Origin Green Webinar and Hedgerow Ireland webinar • Promoted at Bloom in the Park • Attended the EU Focus Group Enhancing Biodiversity on High Diversity Landscape Features • Provided two training sessions on Survey123 application
Pre 2023	Events	• Seven farmer training events • Six farm walks
Pre 2023	Content Creation	• Action sheet for solitary bees • Promoted the project via a monthly newsletter, social media, and the webpage • Three promotional videos produced • Hoverfly identification sheet
Pre 2023	Training and Education	• Eight presentations delivered by the Project Manager and Project Co-Ordinator at a national and international level • Six blogs produced by the Project Manager and one by a participant farmer • Promoted in Teagasc podcast • Mentioned in three media blogs • Developed online training course in hoverfly identification
Pre 2021	Written Reports	• Annual report
Pre 2021	Training and Education	• Project presented at five different events: Tillage Industry Ireland, Clare Biodiversity Training, Ulster Beekeepers Association, Burren Winterage School and Teagasc Tillage Training workshop.
Pre 2021	Media	• Featured on Nationwide • Interviewed by Midlands Science • Feature in three different newspapers
Pre 2021	Content creation	• Project page setup • Children's Farming Newsletter • Two blog pieces

EIP Finanical summary 2019 - 2023

Annual spending	2019 Expenditure	2020 Expenditure	2021 Expenditure	2022 Expenditure	2023 Expenditure	Total cost over 5 years (2019-2023)
	€	€	€	€	€	€
Personnel costs						
Project Manager employment costs	25,705	52,223	68,182	58,108	52,207	256,425
Project Manager travel & subsistence	5,656	39,588	2,227	6,633	11,004	65,108
Financial management & overhead	5,071	21,644	20,621	18,716	4,458	70,510
Research & Training						-
Contingency/ consumables/ equipment	17,237	12,490	7,426	16,105	7,416	60,674
Professional Consultant Hire	-	59,870	-	-	2,315	62,185
IT Development	-	-	-	29,997	-	29,997
Practical						-
Dissemination activity (promotion, publications)	-	186	3,310	10,720	26,154	40,370
Total Gross	**53,669**	**186,001**	**101,766**	**140,279**	**103,554**	**585,269**
VAT*	12,344	41,672	23,244	32,263	4,564	114,087
Total Net	**66,013**	**227,673**	**125,010**	**172,542**	**108,118**	**699,356**
Results based payments to Farmers	-	40,000	147,824	93,645	153,881	435,350
Overall cost	**66,013**	**267,673**	**272,834**	**266,187**	**261,999**	**1,134,706**

*Note - The National Biodiversity Data Centre became a CLG on the 1st of April 2023 and was no longer registered for VAT from that date on.

Budget Summary	€
Budgeted Project funding over 5 years	1,194,679.00
Actual expenditure over 5 years	1,134,706.46
Budget underspend at end of Project	59,972.54

Protecting Farmland Pollinators

Text: This booklet has been compiled by Saorla Kavanagh, Niamh Phelan & Úna Fitzpatrick, National Biodiversity Data Centre. Special thanks to Colm Flynn for his input.

Design: Vitamin.ie

Citation: *Protecting Farmland Pollinators Final Report December 2023*, National Biodiversity Data Centre, Waterford.

Acknowledgements: We would like to thank the participant farmers, the survey team (Neus Rodriguez-Gasol, Niamh Phelan and Shannen O' Brien) and the Operational Group (Andrew Bergin, Sadhbh McCarrick, Barbra-Anne Richardson, Catherine Keena, Jane Stout, John McHugh, Kim Mc Call, Mireille McCall, Michael Hassett, Trevor Harris and John Keane) and Liam Lysaght.

Photo credits: Colm Flynn, Fergal Byrne, James Creighton, Jimmy Goodwin, John McHugh, John O'Loughlin, Kim McCall, Martha Kelly, Peter Cutler, Peter Young, Rachael Creighton, Saorla Kavanagh, Mireille McCall, William Mulhall, Liam Lysaght and participant farmers.

Protecting Farmland Pollinators was an EIP (European Innovation Partnership) project that was adinistered by the National Biodiversity Data Centre. The Project was funded by the EU Recovery Instrument Funding under the Rural Development Programme 2014-2022.

Is tionscadal EIP (Comhpháirtíocht Nuálaíochta Eorpach) é an Protecting Farmland Pollinators atá á riaradh ag National Biodiversity Data Centre. Tá an Tionscadal maoinithe ag Maoiniú Ionstraim Téarnaimh an AE faoin gClár um Fhorbairt Tuaithe 2014-2022.

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All-Ireland Pollinator Plan

The European Agricultural Fund for Rural Development: Europe investing in rural areas

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture Food and the Marine

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