

How to create solitary bee nest sites on your farm

Protecting Farmland Pollinators Action Sheet 1

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In 2019, the National Biodiversity Data Centre received funding through the Department of Agricultural, Food and the Marine for a five-year European Innovation Partnership (EIP) project called 'Protecting Farmland Pollinators'. By working closely with a group of 40 farmers, chosen to reflect differing farm types and intensity levels, it identified actions that will allow biodiversity to coexist within a productive farming system. It aims to help farmers to provide small habitats that will offer food, safety, and shelter on their farms for pollinators (wild bees, hoverflies), and other biodiversity. The National Biodiversity Data Centre have taken the evidence-based actions and developed a whole-farm pollinator scoring system. This results-based method helps farmers to understand how pollinator friendly their farm is and identifies what simple low-cost actions they can take to work towards improving their score in a way that does not negatively impact on the farm as a business.

These action sheets outline how best to carry out each of the evidence-based actions to help pollinators and other biodiversity. They have been developed in collaboration with the farmers and are based on information from extensive biodiversity surveys which took place on each of the 40 farms within the project in 2020. This action sheet identifies how best to create solitary bee nesting habitat on a farm. As part of the

EIP project, farmers created over 300 nest sites for mining solitary bees and 130 sites for cavity nesting solitary bees.

Of the 101 bee species in Ireland, 79 are solitary bees. Solitary bees look very different from bumblebees. They are much smaller and occur in a range of different shapes and colours. Some species are small and black like ants with wings, while others have black and yellow striped bodies like wasps. Solitary bees do not form colonies with a queen and workers, like bumblebees or honey bees. Each female makes her own small nest. Within each cell, she lays a fertilised egg and leaves a food reserve composed of regurgitated nectar and pollen. The larvae feed on the provisioned food before pupating and spending the winter hibernating to emerge as adults the next year. Solitary bees are harmless and not aggressive and are excellent pollinators. They nest in two main ways; mining bees burrow into the ground (ground-nesting bees), while above-ground cavity nesting bees use existing holes in hollow stems, wood, or stone walls.

No matter the species, all bees need flowers close to their nest. Remember solitary bees will only travel a few hundred meters to find food.

You will only see solitary bees for a short time each year, maybe 6-8 weeks (some bees can be seen flying in April and others can be seen in August. The rest of the time bees are developing or hibernating in their nest, so it is important not to disturb nest sites all year. Avoid using pesticides in these areas to ensure next year's bees are safe.

How to provide suitable habitat for ground-nesting solitary bees on farmland

Our 64 species of mining solitary bees nest by making tiny burrows in bare earth clay, peat, sand and soil. They will nest in flat well-drained areas but will generally prefer south/west facing sheltered banks.

YOU WILL NEED:

- 1 A well-drained sunny south or west facing bank (or an aspect in between). Alternatively, you can use well drained flat ground.
- 2 A spade.
- 3 Some muscle.

Making a bare soil nest site is as easy as one, two, three.

- 1 Ensure flowers are close by.
- 2 Clear the vegetation on your bank with a spade. Vegetation will need to be kept clear and the site may need to be cleared more than once a year.
- 3 Avoid clearing back the vegetation when the nest is active. Never spray the site with pesticides or allow drift to access the site.



Figure 1 Active mining bee nest at the base of a hedgerow.

These sites can be created along hedgerows, driveways, and other field boundaries. Bees don't like the damp so be sure the sites are dry banks. The evidence from the EIP suggests that hedgerows are the location most likely to be used. Scraping back the top layer of vegetation will not disturb the bees when they are not active.

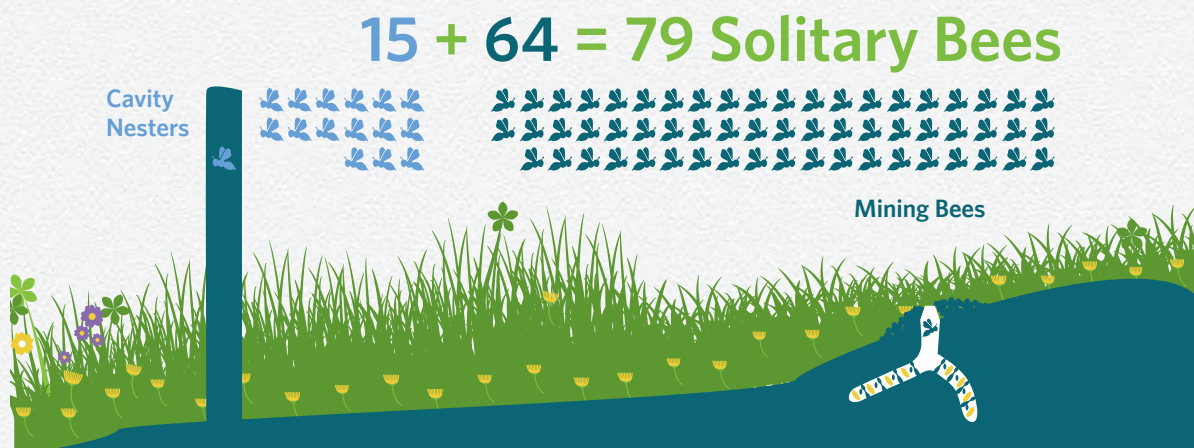


Figure 2 Number of solitary bees in Ireland.



Figure 3 Active mining bee nests on farmland.

TIPS FROM THE FARMERS

- 1 Sheltered banks work better than flat ground.
- 2 If you are creating a pond or carrying out construction, reuse the removed soil to create additional raised banks around the farm.
- 3 The larger the area scraped back the better. It will save time going back every few months to clear back the overgrown grass.

Evidence base from the Protecting Farmland Pollinators project

Eighty-one bare soil sites from 40 farms were monitored to assess if the site was occupied by solitary mining bees. The area, aspect, general context (location and whether the nest was manmade), number of nests, and shade for each site was recorded. Each site was monitored for ten minutes.

Within the first 4 months, the exposed areas of bare soil were already successfully colonised by mining bees, and one-third of nest sites were occupied (27 out of 81 sites).

What species of bee were found?

Newly created nest sites on farms were immediately used by a range of different ground-nesting solitary bees. Across nineteen farms, a total of nine different bees were observed. Three *Andrena* bees (Buff Mining Bee, Chocolate Mining Bee, and Gwynne's Mining Bee), six sweat bees (Gooden's Nomad bee, Marsham's Nomad Bee, Bronze Furrow Bee, Orange-legged Furrow Bee and a species of *Lassioglossum* and *Sphecodes*). Nest sites were occupied on all farm types (6 beef, 4 dairy, 4 mixed and 5 tillage). The most common bee to nest was Orange-legged Furrow Bee (found on 9 farms) and Marsham's Nomad Bee came in a close second (8 farms). All results reported here include data on active occupied nest sites only.

How large should the nest site be?

The area of the bare soil where occupied nests were found ranged from 150 cm² to 12 m². 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.

What aspect did the bees prefer?

Across the nineteen farms, ground-nesting solitary bees were found occupying banks of different aspects. South facing banks had the highest nest occupancy (Figure 4) and the highest number of bee species (Figure 5). Figure 4 shows that bees were found nesting on NE banks (2 sites), S (6 sites), SE (4 sites), SSW (2 sites), SW (5 sites), W (3 sites), WSW (1 site) WNW (1 site), NNW (2 sites) and NW (1 site). While the Northeast aspect had just two occupied nest sites (Figure 4), five different species were found nesting within these two sites (Figure 5).

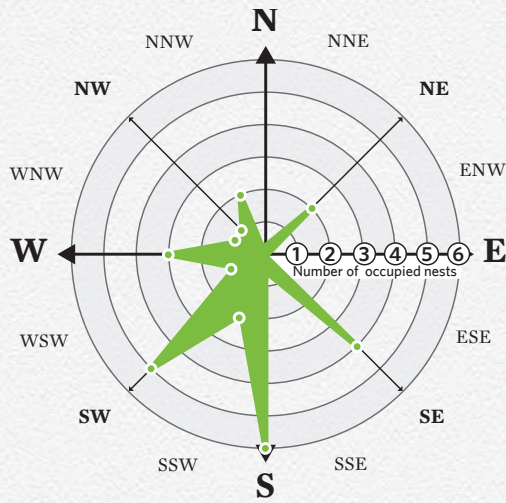


Figure 4 Aspect of occupied mining bee nests.

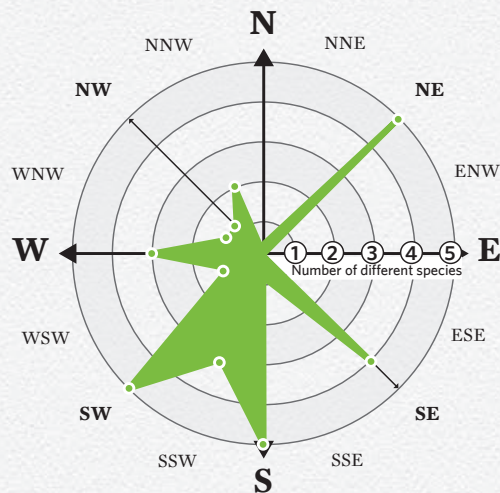


Figure 5 The number of different species of ground-nesting bees found at each aspect.

Can new nest sites also be naturally made by livestock?

Yes, they can. Out of the twenty-five occupied nests, fourteen were made by livestock and ten were made by the farmer. All occupied nests were located within a hedgerow.

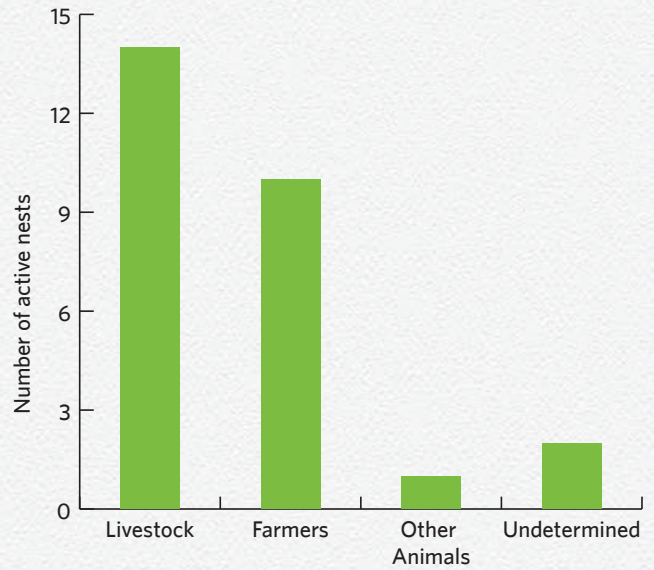


Figure 6 How the bare soil site was created.



Figure 7 Active mining bee nest.

How to make a nest box for above-ground cavity nesting bees



Figure 8 The range of bee boxes that were placed on the farms. The holes have been covered by leaves or soil in the occupied nests.

Our fifteen species of cavity-nesting solitary bees make their nests in existing cavities in stone walls, masonry, wooden structures, or commercially available bee nest boxes.

- 1 Ensure flowers are close by.
- 2 Keep it simple (see images above for inspiration).
- 3 Drill with the grain/ drill into the end grain.
- 4 Use a sharp drill bit to ensure no splinters.
- 5 Drill between 10-30 holes depending on the size of your piece of wood.
 - > Use the following size drill bits only: 4, 5, 6, 7, 8, 9 and 10 mm (bradpoint or forstner).
 - > Ensure the depth into the wood is 10 cm (the length should be at least ten times the diameter of the hole).
 - > Do not drill all the way through the wood.
- 6 Mount at least 1 metre above ground (1-2.5 metres preferable) facing the sun (East, South or West facing).

- 7 Try putting a sloping roof on top of your bee hotel to ensure it stays dry during rainy weather.
- 8 Do not hang your bee hotel near bird feeders so the nesting bees will not be easy targets for hungry birds.

If your nest is not occupied within two years, move it to a different location. If you have an active nest, after four years put a second nest next to the active one. This way the bees will have somewhere to go when the original nest is no longer suitable. If using plywood you will need to consider waterproofing the nest box. Nests will need to be cleaned out once in while to stop the build up of debris, diseases, and/or parasites. Remember, even if bees don't use the nests, many other invertebrates will (for example spiders and potter wasps), so they will still help farmland biodiversity.



Figure 9 Occupied bee box created by a farmer in Kildare.

Did you know: The dog rose, *Rosa canina*, is used by leaf cutter bees to create nests. Other rose leaves can be used too. If you look closely, you can see the leaves have been cut on the rose in the image above.

TIPS FROM THE FARMERS

- 1 Keep your drill bit sharp.
- 2 While drilling your holes, take a break with one size bit (e.g., 4 mm) and start with another size (e.g., 6mm). This will allow the 4mm to cool down.
- 3 After a few minutes of drilling turn the block upside down and hammer out the saw dust. You can also use a Hoover to remove any excess pieces of wood.

Evidence base from the Protecting Farmland Pollinators project

Twenty-nine nest boxes from 18 farms were monitored to assess if the nest box was occupied by solitary cavity bees. The aspect, general context (location), number of nests and the size of each nest box was recorded. Each nest box was monitored for ten minutes.

What species of bee were found?

Eleven bee boxes from eight farms were occupied. *Megachile* sp was the only species observed flying into a nest box. Other bees had not emerged from their nests at the time of surveying. *Megachile centuricularis*, *M. versicolor* and *Hylaeus confusus* were observed flying close to nest boxes.

What aspect did the bees most commonly use for nesting?

Cavity bees were found nesting on several different aspects: E (1 site), ESE (1 site), S (1 site) SE (1 site), SSW (3 sites), W (2 sites), WSW (1 site) and NNW (1 site).

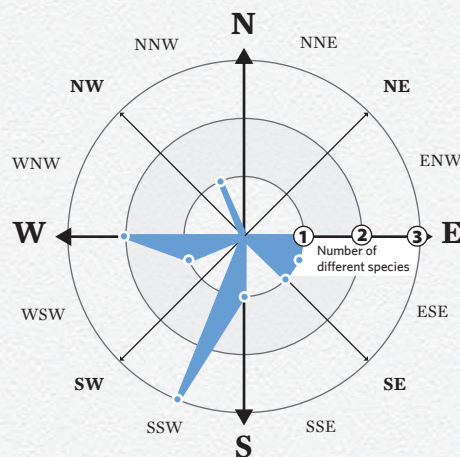


Figure 10 Aspect of the eleven occupied cavity bee nests.

Where did the farmers place the nest boxes?

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. All active nest boxes were placed at least 1.5 meters above ground.

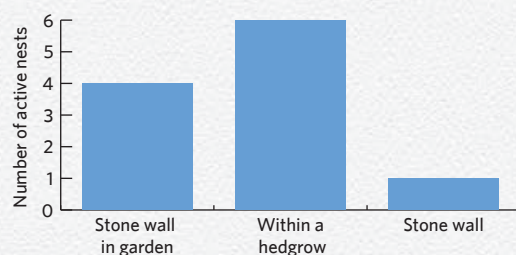
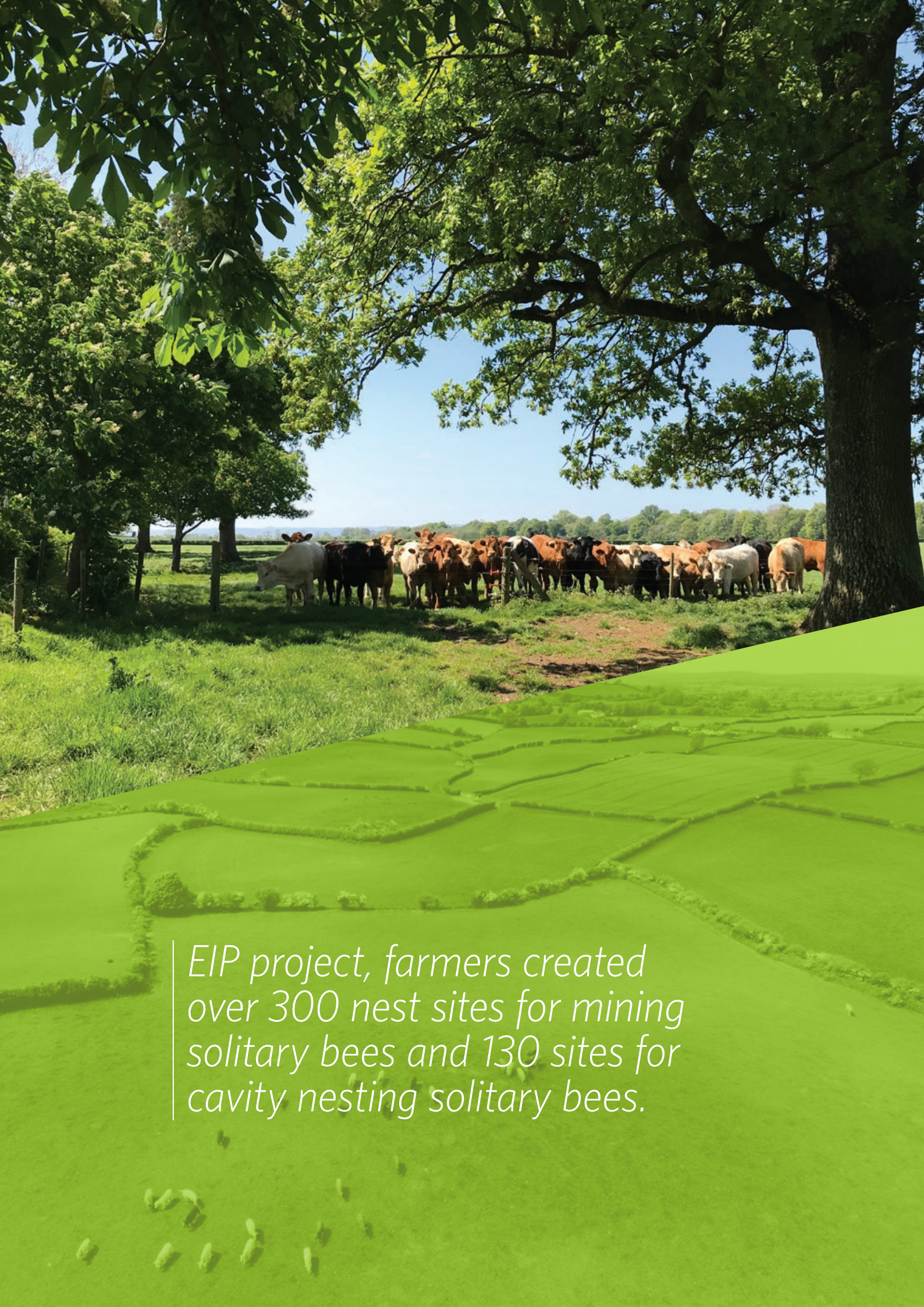


Figure 11 General context of the eleven occupied cavity bee nest boxes.



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This Action Sheet has been compiled by Dr Saorla Kavanagh and Dr Úna Fitzpatrick, National Biodiversity Data Centre.

Design: Vitamin Creative Ltd.

Citation: How to create solitary bee nest sites on your farm Protecting Farmland Pollinators Action Sheet 1, National Biodiversity Data Centre, Waterford.

We would like to thank Dr Simon Hodge for his input, the ecological survey team (Neus, Niamh and Shannon) and the participant farmers.

Protecting Farmland Pollinators is an EIP (European Innovation Partnership) project being administered by the National Biodiversity Data Centre. The Project is 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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