DIVERSify Factsheet no. 9

RESILIENCE AND ECOSYSTEM SERVICES

Measuring biodiversity in plant teams

ABSTRACT

Knowing which plants, insects and soil organisms are present on your farm can help you to understand: the presence of potential pests and what countermeasures could be needed; which beneficial organisms (e.g., for biological pest control) are present; and how your farm is contributing more widely to maintaining a healthy environment and fostering biodiversity. **Biodiversity encompasses all natural life** that can be found on your farm and beyond.

Below, we outline guidelines to establish straightforward **methods to assess plant, insect, and soil organism communities** in the field. The methods described involve counting non-crop plant species, pests, flower-visiting insects, and organisms living in the soil. Following the simple methods described, you can calculate an estimate to inform you on how 'biodiverse' a given field is at a certain point in time. This can be used to track differences over time and in space across all farming systems, including conventional, organic, monoculture and intercropping.

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CONTEXT

Understanding the biodiversity levels (including the number and type of different species) found in your fields will be **helpful when planning crop management options**. For example, which weeds are potentially noxious or harmful, and which are weak competitors that do not require intervention? Which insects are present that can cause damage to crops (e.g. cereal leaf beetle, virus-transmitting aphids) and which insects are beneficial (e.g. bees and wasps)?

Increasing levels of biodiversity have been shown to lead to a range of benefits such as increased **pollination service** or **improved soil health**. Did you know that there are hundreds of millimetre-sized parasitic wasp species, most of which are beneficial? Or that there are many different species of little soil insects (called springtails)? Taking all the different types of biodiversity into account, even high-input monocultures can contain many more species than you think. There might be more there than you realise...

ASSESS BIODIVERSITY LEVELS ON YOUR FARM

Follow the simple method outlined below to get an indication of biodiversity levels in a certain field.

Firstly, select one or several **1x1 metre areas** in your crop when the main crop is flowering. You can mark out your plot with canes for ease of assessment. Traditionally, a square quadrat is used. Then you will need: pen and paper to take notes or use a mobile phone. When counting species, **you don´t need to know their identity – just give them consistent names** (e.g., “bee with white tail”). Mobile phone apps can also help with species identification if you´re unsure or would like to know more.

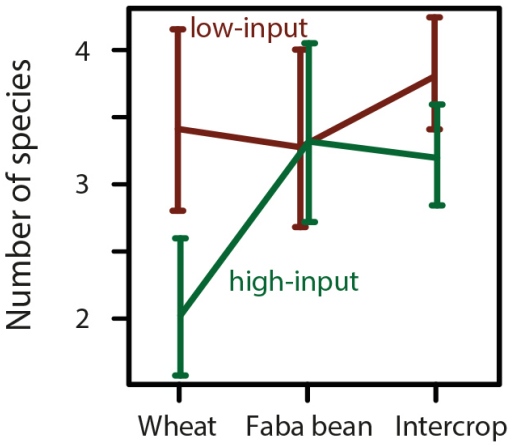

Fig. 1 Number of flower-visiting insects in high vs. low input (reduced levels of fertiliser and herbicide application) in monocultures and mixtures of wheat and faba bean. Modified from Scherber *et al.* (2019)

Fig. 2 Example of 1x1 metre study area for assessment of biodiversity components, for example flower visitors. Credit: Jana Brandmeier

Once you're set up record the **field location/name, the crop(s) growth stage and date/time**. Then **record any or all of the following** in your study area:

1. Count the number and type of all the different types of **plant**, including weeds.
2. Count the number and identity of all **flower-visiting insects for 10 minutes** (e.g., 12 white-tailed bees, 10 big flies...).
3. Count any **pests** visible on all the crops (e.g., aphids).
4. You can also use a **sweep net in the square to catch insects/arthropods** and write down what you find. This can be helpful for pick things up that are not visible at first.
5. Dig up a **two spadefuls of soil** in your study area, place it in a white tray or bucket, then count the **soil arthropods** within (e.g., worms).
6. To go further, you can put **four yellow plastic bowls or cups** filled with water, some salt and detergent, in your square. These are known as water-, pan- or pitfall traps. Different types of **insects/arthropods will fall in them** if you leave them out for 2 – 3 days. After this time, go back to the traps and note down what you have caught.

Please make sure that you have any required permits from your local nature conservation authorities if trapping biodiversity.

CAN YOU BOAST ABOUT YOUR BIODIVERSITY?

Fig. 3 Ladybird (*Coccinella septempunctata*) on *Chenopodium album*, likely searching for its preferred prey, aphids. Ladybirds are one example of a beneficial insect being a natural enemy of the pest

Fig. 4 A friendly beetle from the family *Cantharidae* on faba bean flowers (*Vicia faba*). Beetles can pollinate flowers as well as bees, butterflies and flies

To find out the biodiversity level indicator: sum up the **number of species in each sample** (e.g., from methods 1, 3 and 5). Then, for each 1 x 1m study area, divide the number of species of each group (e.g., non-crop plant, flower-visiting insect, pests, other insects and arthropods) by the **maximum seen across all squares**. If you have sampled a number of study areas, then you can calculate the average for these numbers. **The higher this number, the higher the biodiversity is on your field!**

CONCLUSION

Knowing about biodiversity on your farm enables communication with customers, colleagues, and friends about how you are working with biodiversity. Farming systems can be incredibly diverse – yet we all need to find ways to conserve and improve farmland biodiversity and ensure that the ecosystems services that it provides remain for generations to come. The simple methods described here can be used to give you an estimate of how much biodiversity there is in a certain area of your farm. With this information, you can compare across different crops or cropping systems on your farm and share with your neighbours or local wildlife conservation groups.

FURTHER INFO

> You can find more information on methods to assess biodiversity at: biobio-indicator.org

> Relevant scientific publications include:

1. Brandmeier J. *et al.* (2021) Intercropping in high input agriculture supports arthropod diversity without risking significant yield losses. doi.org/10.1016/j.baae.2021.02.011
2. Scherber C *et al.* (2019) Insect diversity and ecological processes in agricultural and forest landscapes (in German). doi.org/10.17433/6.2019.50153699.245-254
3. Pappagallo S. *et al.* (2018) 'Effects of agrobiodiversity on pest control in Vicia faba L.' Baćanović-Šišić J, Dennenmoser D and Finckh MR: EUCARPIA Symposium on Breeding for Diversification, University of Kassel, Witzenhausen, Germany, 19–21 February.
4. Meyer M. *et al.* (2019) Crop identity and memory effects on aboveground arthropods in a long-term crop rotation experiment. doi.org/10.1002/ece3.5302
5. Scherber C. *et al.* (2019) Novel approaches to sampling pollinators in whole landscapes: a lesson for landscape-wide biodiversity monitoring. doi.org/10.1007/s10980-018-0757-2

> Watch 'From the Ground Up' - episode 1 of the DIVERSify web series Growing Beyond Monoculture which explores the wider benefits of plant teams and highlights the value of plant teams for biodiversity.

> Read on: DIVERSify Factsheet no. 2 - DIVERSify Factsheet no. 10 - DIVERSify Factsheet no. 13

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