Biodiversity and ecosystem services: think functional!

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During the last years, several studies and reviews have considered the relationship between biodiversity and ecosystem functioning or the provision of ecosystem services. Many studies found that plant functional traits and plant functional diversity (FD) are key drivers in this relationship in terrestrial ecosystems. Therefore, it is important to incorporate this way of thinking in ecosystem service research.

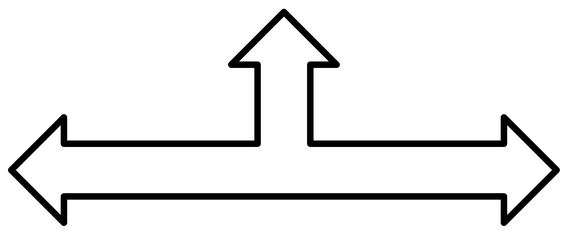
Measuring plant FD

Different methods have been developed to **measure or calculate** plant functional diversity. A frequently used example is functional group richness: the amount of functional groups present, after dividing plants into groups based on one functional trait (e.g. 'life form).

More **complicated measures** make use of multiple traits, and calculate the functional distance or dissimilarity between species, or the branch length on a functional dendrogram. Some measures also consider the **intraspecific variability** for a trait, or directly measure traits in a vegetation, regardless of the species. Although these different measures can be useful in ecological research, **in practice** mostly simple measures like functional group richness are used.

Functional diversity?

Defined as the "value and range of those traits that influence ecosystem functioning " by Tilman (2001), functional diversity is becoming an alternative for classical species richness in ecological studies. Functional diversity of a vegetation can be seen as the diversity or richness of functional traits.



Creating plant FD gradient

Studies aiming to relate plant functional diversity to another response variable, usually ecosystem properties, processes or services, often make use of a **functional diversity gradient**.

Depending on the research questions, researchers choose for observational monitoring of **existing natural communities**, experimentally **manipulating natural communities** by removing species to obtain a certain functional diversity value, or assembling **synthetic communities** in the field or in microcosms in controlled lab conditions.

After establishment, researchers can choose to maintain the functional diversity level by species removal or planting if necessary, or to subject the vegetation to natural succession.

ULg thinks functional:

The AgricultureIsLife wildflower strips experiment @ Gembloux Agro-Bio Tech

A gradient in plant functional diversity to test the effect on ecosystem services

1

Plant species and trait selection

We listed indigenous perennial herbaceous plant species frequently used in wildflower strips in Wallonia and available in the market. From the TRY plant database and the flora, we selected a set of floral traits important for pollinators and flower visiting pest control insects.

2

Functional diversity calculation

Functional diversity of all possible mixtures of 7 of these plant species was calculated with the Rao quadratic entropy index for multiple traits. This results in 77520 possible mixtures with different functional diversity.

3

Selection of mixtures

4 contrasting mixtures were selected with very low, low, high and very high functional diversity.

	VERY LOW	LOW	HIGH	VERY HIGH
Flower species	B	C	D	E
Achillea millefolium	x	x	x	x
Anthriscus sylvestris	x		x	x
Crepis biennis		x		
Galium verum	x	x		
Geranium pyrenaicum			x	
Heracleum sphondylium	x			
Hypericum perforatum				
Hypochaeris radicata		x		
Knautia arvensis	x	x		
Leontodon hispidus		x	x	
Leucanthemum vulgare	x		x	
Lotus corniculatus				x
Lythrum salicaria		x		x
Malva moschata				x
Medicago lupulina				x
Origanum vulgare			x	
Prunella vulgaris			x	x
Ranunculus acris				
Silene latifolia				
Trifolium pratense	x			
FD	**0,08**	**0,11**	**0,15**	**0,19**

5

Monitoring of ecosystem services:

During the following years, 4 ecosystem services will be monitored in the wildflower strips and crops:

- Pollination
- Pest control
- Biodiversity support
- Valuable compound provisioning

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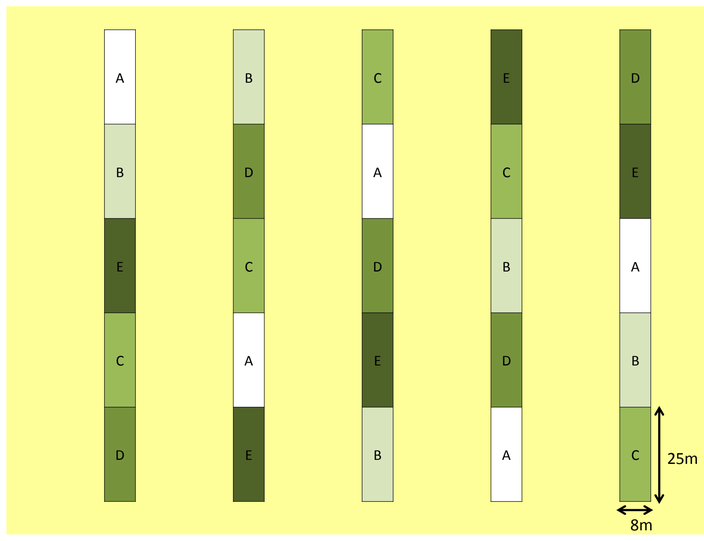
4

Functional diversity gradient

In 2013, wildflower strips were created with a functional diversity gradient by sowing the four mixtures in a field. After sowing, the strips are subjected to natural succession and a regular mowing regime.



Functional diversity

A	Control
B	Very low
C	Low
D	High
E	Very high
	Crop

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