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BIOBIO indicator factsheet

Habitat Richness (HabRich)

Refers to Chapter 5 'Habitat indicators' of the Guidebook 'Biodiversity Indicators for European Farming Systems'

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Habitat Richness (HabRich)

Description

Number of habitat types, including linear habitats, occurring on a farm. Habitats considered are intensively farmed habitats as well as extensively farmed and semi-natural habitats. The **unit** of measurement is number of habitats per hectare of farm area. **Sub-indicators** can be generated from this such as Number of intensive agricultural habitats or extensive agriculture and semi-natural habitats per hectare of farm area.

Habitat Richness is a **state indicator** and over time it can be used as a **change indicator**. Some farms have large fields of a single crop, with few field boundaries or other semi-natural habitats. This is typical of arable farming. These farms will have low Habitat Richness. Other farms, typically horticultural farms, have very small fields and grow a variety of crops, thus having a greater Habitat Richness. Often there is an association between farm size, field size and habitat richness, but this is not necessarily the case. Habitat Richness is standardized to a per area basis to correct for differences in farm sizes.

Surveyor skills

The indicator is based on habitat mapping, which requires basic GIS, ecological and botanical skills.

Data collection method

The habitat mapping method is described in Deliverable 2.2[1].

Calculation method

Habitat Richness is measured by summing up the number of different areal and linear habitat types recorded on the farm. To standardize these values to a per hectare basis, this total number of habitats should be divided by total farm area (m^2) and multiplied by 10,000. For small farms <1ha this standardization would lead to artificially high values due to mathematical reasons. HabRich should therefore not be calculated for farms <1ha.

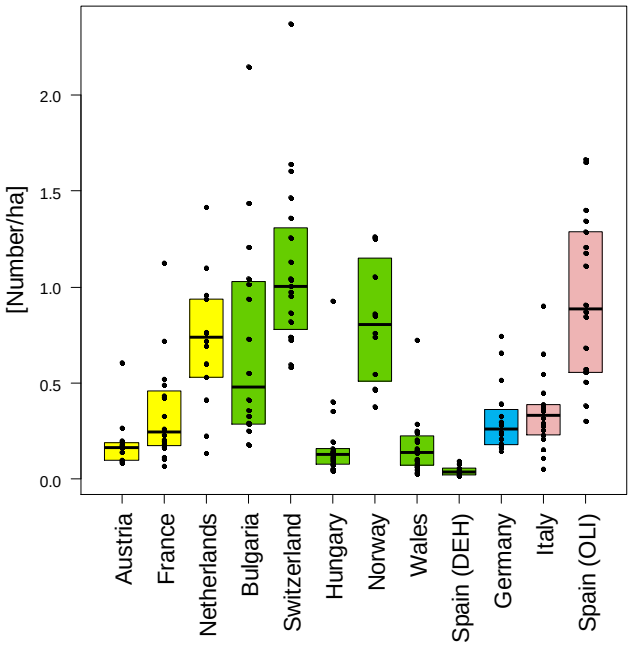
$$\text{HabRich} = \frac{\text{N}}{\text{UAA}}(10{,}000)$$

In which *HabRich* is Habitat Richness, *N* the number of habitat types on the farm and *UAA* the area of the farm (m^2).

Results from BioBio case studies

The graph shows the HabRich mean values and their distribution across the 12 BioBio case study regions. Two olive farms in Spain were excluded from this calculation because they were smaller than 1 hectare. In most case studies, there is a reasonable spread of the values across the farm sample, which means that the indicator differentiates between individual farms. The Spanish Dehesa farms have the lowest values mostly because of the large size of those farms and of the large average 'Patch Size', compared to the farm and 'Patch Size' of the other case study regions. This result illustrates the limitations of comparisons across such different regions and farming systems. High values were reached in some

Large scale arable farm (top, Groningen, The Netherlands) and small scale mixed farm (bottom, N-Portugal). Photos: Bob Bunce. Alterra



Distribution of indicator 'Habitat Richness'
Each point displays the indicator value of a farm. Farms are grouped in the respective case studies. Yellow: field crops & horticulture in Austria, France and the Netherlands, green: specialist grazing livestock in Bulgaria, Switzerland, Hungary, Norway, Wales and Dehesa in Spain, blue: mixed crops & livestock in Germany, pink: permanent crops in Italy and olives in Spain. The colored box contains the values of 50 % of the farms of a case study. The line marks the median.

[1] Dennis P. et al. 2012. Biodiversity in organic and low-input farming systems ALTERRA. Report 2308.

Sown flower strip in Switzerland, dissecting an agricultural habitat (crops) into two. Swiss farmers have to manage 7% or more of their land as "Ecological Compensation Areas" under Cross Compliance. Photo: Gabriela Brändle Agroscope

grassland case study regions and in the horticultural case study in The Netherlands, where there are comparatively small plots of different crops / vegetables.

Estimated effort and costs (labour effort required, analysis)

The indicator measurement requires habitat mapping and subsequent GIS analysis. Medium effort.

Habitat Richness change as an indicator

A decrease in indicator value (change in state) may indicate pressures on biodiversity, e.g. habitat loss, changes in farming practice or increased field size. An increase in habitats per farm can also signal land use changes, such as a change from intensive farming to hobby farming or planting green corridors. Changes in state may also be a response to the application of agri-environmental policies, e.g. increased linear elements due to designation and planting of species rich grass strips.

Interpretation

Adding a new habitat type to a farm will offer options for additional species to be present on the farm. Higher values of HabRich therefore indicate the potential of species to be present on the farm. However, the indicator should only be interpreted in conjunction with other indicators, namely with 'Habitat Diversity' (HabDiv) and 'Patch size' (PatchS) as well as farm management indicators (particularly indicators of management intensity). This is because an increase in Habitat Richness may be due to either addition of new semi-natural habitat or diversification of agricultural practices. Similarly, decreases in 'Habitat Richness' may be due to increases in the size of certain habitat types and the loss of others, e.g. an increase in arable field size resulting in loss of hedgerows.

HabRich cannot differentiate between two farms, of which one consists of a range of different habitat types with reasonable areas of each, and the other mostly of intensively managed crops and e.g. a few crop margins, making up a small share of the farm. HabDiv and PatchS will yield the additional information which is needed to evaluate the potential of the farm to host wild species. HabRich can only be interpreted in the context of the farm landscape under study as this allows for its interpretation for specific sets of species, e.g. species dependent on agricultural land versus those dependent on semi-natural habitat. As individual species have different habitat requirements, changes that are positive for some species are negative for others. An increase in openness is positive for meadow birds, but will be negative for forest birds. An increase in field size through field boundary removal will reduce semi-natural habitat, which is negative for butterfly and bee species and subsequently pollination as an ecosystem service. In general, grassland species decline as woodland habitats increase and woodland species decline as grassland increases. Small scale farming landscapes with a number of different habitat types will therefore generally support a higher biodiversity than large scale monoculture. However, 'Habitat Richness' will be more important for some species than others and factors such as size, shape, history or the location of habitats in the landscape can also be important.

Strengths and weaknesses

Habitat mapping requires fieldwork, but the indicator is easily computed once the habitat map is available. Indicator values depend strongly on the definition of habitats and on the habitat mapping method (thematic and spatial resolution), so comparisons between farms/countries require standardization (as in BioBio). 'Habitat Richness' reflects the variety of habitats and is not affected by spatial configuration of the farm or relative abundance of each habitat type. However, very different farms can have the same 'Habitat Richness' and not all habitat types are of equal value for biodiversity. Other map-derived as well as management indicators will aid interpretation. By controlling for the number of habitat types per hectare comparisons can be made between farms of different sizes[2]. Sub-indicators can be used to show a mix of farmed habitats and semi-natural habitats.

[2] For very small farms <1ha this can lead to artificially high values due to mathematical reasons. HabR should therefore not be calculated for farms <1ha.

This factsheet is part of the Guidelines **Biodiversity Indicators for European Farming Systems**.
More detailed information on the set of indicators developed in the EU FP7 research project BIOBIO (Biodiversity indicators for organic and low input farming systems, KBBE-227161) is given in a printed report, published as ART Publication Series Nr. 17. The report can be downloaded from the BIOBIO website.
Printed versions can be ordered at www.agroscope.admin.ch or at Agroscope, Reckenholzstrasse 191, 8046 Zurich, Switzerland

BIOBIO Indicator Factsheets

Genetic diversity	
Breeds:	Number and amount of different breeds
CultDiv:	Number and amount of different varieties
CropOrig:	Origin of crops

Species diversity	
Plants:	Vascular plants
Bees:	Wild bees and bumblebees
Spiders:	Spiders
Earthworms:	Earthworms

Habitat diversity	
HabRich:	Habitat richness
HabDiv:	Habitat diversity
PatchS:	Average size of habitat patches
LinHab:	Length of linear habitats
CropR:	Crop richness
ShrubHab:	Percentage of farmland with shrubs
TreeHab:	Tree habitats
SemiNat:	Percentage of semi-natural habitats

Indirect management indicators / parameters	
EnerIn:	Total direct and indirect energy input
IntExt:	Intensification/Extensification - Expenditure on inputs
MinFert:	Area with use of mineral nitrogen fertiliser
NitroIn:	Total nitrogen input
FieldOp:	Field operations
PestUse:	Pesticide use
AvStock:	Average stocking rate
Graze:	Grazing intensity