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BIOBIO indicator factsheet

Origin of Crops (CropOrig)

Refers to Chapter 7 ‘Indicators for genetic diversity of crops and husbandry animals’ of the Guidebook ‘Biodiversity Indicators for European Farming Systems’

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Origin of Crops (CropOrig)

Description

Origin of Crops (or cultivated accessions) is an indicator based on landraces cultivated on farm. A landrace is a local variety of a domesticated plant species highly adapted to local conditions due to natural selection and evolutionary processes. Compared to cultivars landraces are heterogeneous, but less yielding. However, the high number of landraces worldwide provides a major basis for plant breeding. The **unit** is the percentage of landraces grown on farm, measured across all crop species and varieties.

Origin of Crops is a **state indicator** and over time it can be used as a **change indicator**. If available, additional use can be made of any national list containing landraces. However, the indicator value is dependent on selected case studies and on the presence of landraces at all. There is no applicability of this indicator for case studies without any type of crop species, for example grassland case studies. Furthermore, the evaluation of landraces in some tree-based farming types might be difficult and depends on the further information available. Here, farmers basically manage natural populations (e.g. cork oaks), which are not defined as landraces, or crops with long life cycles. In most cases, long life cycles make it difficult to trace back origin unless further information provided by breeding books (e.g. *Malus domestica*, Switzerland) is available. These books enable the identification of the evolutionary processes required when defining a crop as a landrace.

Surveyor skills

The survey of the the number of landraces requires no detailed agronomical or ecological skills.

Data collection method

The data collection method is a questionnaire completed during interviews. The required information is assessed by assigning all crop species and their corresponding varieties to three categories: ‘Cultivar’, ‘landrace’ or ‘others’. The category ‘others’ refers to accessions with unknown cultivar names or natural populations (e.g. cork oaks).

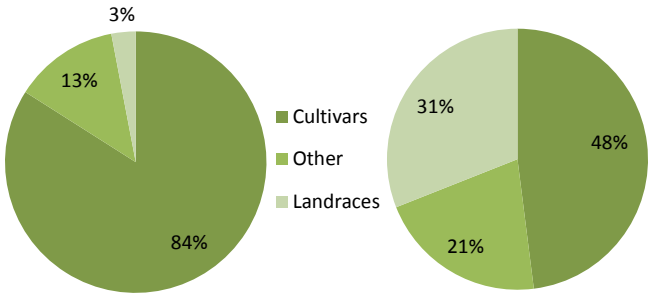
Calculation method

The calculation of the indicator ‘Origin of Crops’ investigates the percentage of landraces on a farm.

$$\textbf{Origin of crops} = \frac{\text{Number of landraces}}{\text{Number of (Cultivars} + \text{Landraces} + \text{Others)}} * 100$$

The following graphic is an example of the percentage of landraces for the 195 farms in all European case studies. Here, an overall amount of 5 landraces were found. In contrast, in 16 farms of the Uganda case study, 37 landraces were found.

Potato and maize landraces. Photos: Gabriela Brändle, Agroscope and Pro Specie Rara



Percentage of cultivars (varieties), landraces and other origins of crops on the 195 farms in the European case study regions (left) and on the 16 farms of the Uganda case study (right).

Synergies with other indicators

There is no relationship with other questionnaire-derived or BioBio indicators. Origin of crops is a very basic indicator representing the farmers' perceptions and preferences towards landraces as a family/farm heritage or general biodiversity increase on farm, rather than an assessment tool for intra-specific genetic diversity.

Estimated effort and costs (labour effort required, analysis)

Based on a general time and cost assessment within the project, the time effort in conducting the genetic diversity questionnaire was 50 min on average, depending on agricultural complexity and size of farms.

Origin of Crops as an indicator

A change in indicator value (change in state) may indicate pressure on genetic resources, which are crucial for maintaining genetic diversity of crop species and overall genetic diversity as a basic fundament of biodiversity in agro-environments.

A decrease in landraces on farm can be a response to intensification of land use with regard to higher yields and uniformity achieved through application of high performance cultivars. Cultivars of all major crop species already provide most of the world's crop production and food supply. Additionally, the increasing use of genetically modified crops or hybrids, enhancing yields and profitability, replace landraces as valuable genetic resources. A decrease of indicator value for landraces can also be a signal for genetic erosion. Safeguarding the conservation of traditional genetic resources may require actions such as collecting backup material for *ex situ* collections (genebanks) or the installation of on-farm management programs.

On the other hand, increasing values may also be a result of farmers' perceptions shifting towards more diverse farming systems, either taking into account the importance of genetic diversity within crop species and its benefits with regard to adaptation and resistance, or cultural and traditional aspects of local farming.

Interpretation

Landraces play an important role for crop breeding as well as for the *in situ* conservation of genetic resources. Especially in plant breeding, a major interest is the use of traits occurring in landraces, e.g. pest resistance, climatic adaptation, quality traits and yield improvement. With regard to worldwide food security in the face of changing climatic conditions, cultivation of landraces is one important factor for maintaining valuable genetic resources. However, besides economical or agricultural aspects, landraces are a highly valuable and traditional heritage of local farming.

The indicator can therefore be interpreted as state assessment of genetic resources within agricultural systems.

An increase in landraces on farm may be due to farmers' preference for the enhancement of variability concerning agro-biodiversity, i.e. species and genetic diversity, on farm, but also due to taking over responsibility for supporting the conservation of genetic resources. A decrease in landraces on farm might cause an unpredictable and tremendous loss of gene pools.

Strengths and weaknesses

The cost and time effort for the data survey and evaluation is low. This indicator does not directly measure genetic diversity within one crop species. It gives an estimation of on-farm genetic resources. The direct assessment of genetic diversity within one species requires molecular or phenotypic assessment. An in-depth survey of landraces could cover phenotypic traits based on the UPOV (International Union for the Protection of New Varieties of Plants) guidelines.

Compared to developing countries, the evaluation of genetic diversity addressing landraces occurring on European farms revealed very little information due to a general low use of landraces. In developing countries, landraces play a major role in agriculture and genetic diversity assessments based on 'CropOrig' will be more informative than in European farming.

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