ART Schriftenreihe 17 | September 2012

BioBio indicator factsheet

Number and Amount of Different Breeds (Breeds)

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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Number and Amount of Different Breeds (Breeds)

Description

The genetic diversity of domesticated breeds of livestock is a commonly overlooked component of biodiversity and it is essential to include such indicators in any assessment of livestock farming. Genetic indicators of agrobiodiversity are especially important in relation to the conservation of genetic resources; now a priority area for the Commission on Genetic Resources for Food and Agriculture of the Food and Agriculture Organization (United Nations). A global decline in breed diversity, corresponding to genetic heterozygosity could result in less breeding resilience to environmental change in modern, commercial, domesticated livestock breeds; animals we depend upon for milk, meat, wool and leather production. The Interlaken Declaration on Animal Genetic Resources (2007) is a Global Plan of Action to prevent the loss of animal genetic diversity and this includes an objective to improve national monitoring of breeds of major livestock species.

Cattle and sheep were the main livestock species in the Bio-Bio case study regions. The main indicator calculated was an estimate of the average number of breeds per farm summarized by production system and country; the **unit** of measurement being the number of breeds per farm. A farm questionnaire provided the source data. The occurrence of nationally recognised local or rare breeds was also assessed. Particularly, ruminant livestock can be well adapted to local environmental conditions and can derive their nutritional requirements from semi-natural vegetation. These breeds are thus well suited to manage such habitats in an environmentally sensitive way, preserving both soil and biodiversity.

Surveyor skills

Formal livestock husbandry or animal science qualifications are not required for either the development of the farm questionnaire or the conduction of the animal genetic sections of the questionnaire during the interview with the farmer. . However, an appreciation of regional livestock breeding and production systems and knowledge of cattle and sheep breeds will more effectively engage the farmer. It will also reduce the possibility of errors related to the recall and recording of breeding stock names as well as combinations of cross breeds.

Data collection method

The data can be collected by using a questionnaire completed during interviews. The names of all livestock species and breeds in dairy and meat categories are recorded for each farm. Following interviews and completion of the livestock genetic resource spreadsheet, access to the FAO DADIS breed database is necessary to obtain a national list of sheep and cattle breeds. National organisations must also be identified and contacted to obtain a list of nationally recognised local and rare breeds (qualifying criteria often vary between countries).

Original Braunvieh, Weisses Alpenschaf, Welsh black cattle in the Cambrian mountains of Wales and Old Norwegian Short Tail sheep (from top to bottom). Photos: Gabriela Brändle, Agroscope, Peter Dennis, Aberystwyth University & Hanna Timmermann, NFLI

Wallis Blacknosed Sheep in Switzerland. Photo: Raymond Zurschmitten, Agroscope

Calculation method

The basic comparator is the number of breeds representing each livestock animal species per farm. This value must include breeds imported onto the farm for cross-breeding, whether live bulls and rams or purchased semen in artificial insemination. The mean breeds per species are calculated separately for cattle or sheep from the individual farm values. These farm values can be for different categories of livestock production systems to allow analysis of differences, for instance of organic versus conventional systems. This analysis can be expanded by assessing the proportion of the FAO DADIS national breed list represented across farms of one or more categories and also repeated for local and rare breed lists, where these are available.

Synergies with other indicators

There is no relationship with other indicators which have been investigated within this project.

Estimated effort and costs (labour effort required, analysis)

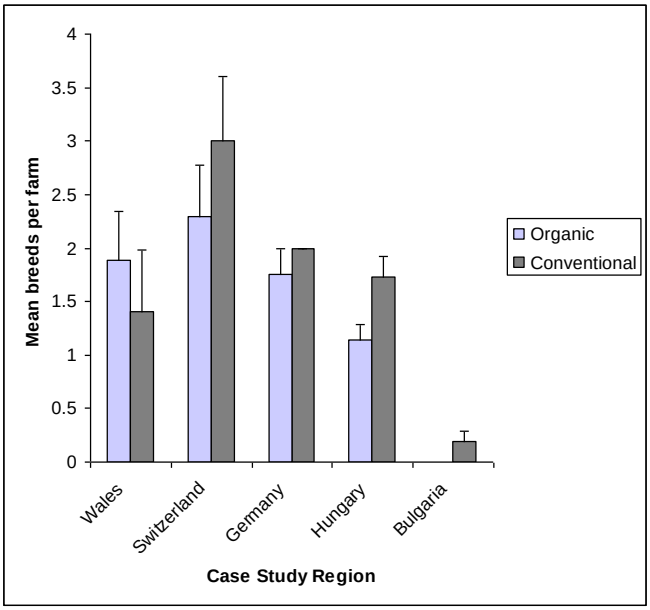
Based on a general time and cost assessment within the project, the time effort in conducting the genetic diversity questionnaire was 50 min on average, depending on agricultural complexity and size of farms.

Number and Amount of Different Breeds as an indicator

Emphasis on breed diversity is necessary because universal molecular markers are not yet available to directly assess genetic diversity and there is a significant developmental cost to overcome.

Interpretation

General specialisation of farms to livestock from mixed farming and recent, further specialisation into dairy or meat production has driven significant declines in the use of multiple livestock species and breeds at farm level. This process accounts for the recent recorded trends of declines in livestock genetic resources. The consequence of this decline and further loss of breeds may be a future limitation on the extent of resilience to environmental change that can be bred into the modern, commercial breeds of domestic livestock that we depend upon for milk, meat, wool and leather production.



Average breeds (± SEM) per farm of cattle recorded in Case Study regions of BioBio project, 2010. Comparison of mean cattle breeds between organic and conventional farms by t-test, Hungary: t = -2.418; P <0.05; remaining CS regions t < 1.00; not significant.

Strengths and weaknesses

Data are easy to collect using questionnaires, given the co-operation of farmers and accurate recall of information from each farmer. The assessment of livestock breeds on farms is a simple assessment of genetic diversity. The indicator “Breeds” is based on the assumption that different breeds are genetically diverse. Genetic distance between two animal breeds might actually be very small due to close relatedness which cannot be measured by breed diversity, despite the extent of differences in phenotype expressed as colour and length of coat or fleece, conformation of body shape, horn shape and size.

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