

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Target 2.5: By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed

Indicator 2.5.1: Number of plant and animal genetic resources for food and agriculture secured in either medium or long-term conservation facilities

Institutional information

Organization(s):

Food and Agriculture Organization of the United Nations (UN FAO)

Concepts and definitions

Definition:

The conservation of plant and animal genetic resources for food and agriculture (GRFA) in medium or long term conservation facilities (*ex situ* in genebanks) represents the most trusted means of conserving genetic resources worldwide. Plant and animal GRFA conserved in these facilities can be easily used in breeding programmes as well, even directly on-farm.

The measure of trends in *ex situ* conserved materials provides an overall assessment of the extent to which we are managing to maintain and/or increase the total genetic diversity available for future use and thus protected from any permanent loss of genetic diversity which may occur in the natural habitat, i.e. *in situ*, or on-farm.

The two components of the indicator, plant and animal GRFA, are separately counted.

Plant genetic resources

The plant component is calculated as the number of accessions of plant genetic resources secured in conservation facilities under medium or long term conditions, where an 'accession' is defined as a distinct sample of seeds, planting materials or plants which is maintained in a genebank. Genebank Standards for Plant Genetic Resources for Food and Agriculture (accessible at <http://www.fao.org/documents/card/en/c/7b79ee93-0f3c-5f58-9adc-5d4ef063f9c7/>), set the benchmark for current scientific and technical best practices for conserving plant genetic resources, and support key international policy instruments for the conservation and use of plant genetic resources. These voluntary standards have been endorsed by the FAO Commission on Genetic Resources for Food and Agriculture at its Fourteenth Regular Session (<http://www.fao.org/docrep/meeting/028/mg538e.pdf>).

Animal genetic resources

The animal component is calculated as the number of local breeds stored within a genebank collection with an amount of genetic material stored which is required to reconstitute the breed (based on the Guidelines on Cryconservation of Animal Genetic Resources, FAO, 2012, accessible at

<http://www.fao.org/docrep/016/i3017e/i3017e00.htm>). The guidelines have been endorsed by the Commission on Genetic Resources for Food and Agriculture at its Thirteenth Regular Session (<http://www.fao.org/docrep/meeting/024/mc192e.pdf>).

Rationale:

Genetic resources for food and agriculture provide the building blocks of food security and, directly or indirectly, support the livelihoods of every person on earth. As the conservation and accessibility to these resources is of vital importance, medium or long term conservation facilities (genebanks) to preserve and make accessible these resources and its associated information for breeding and research have been established at country, regional and global levels. Inventories of genebank holdings provide a dynamic measure of the existing plant and animal diversity and its level of preservation. Data relevant to this indicator facilitate the monitoring of diversity secured and accessible through genebanks and support the development and updating of strategies for the conservation and sustainable use of genetic resources.

The indicator is related to a monitoring framework endorsed by the FAO Commission on Genetic Resources for Food and Agriculture in which the status and trends of plant and animal genetic resources are described through globally agreed indicators and regular country-driven assessments.

The number of materials conserved under medium or long term storage conditions provides an indirect measurement of the total genetic diversity which we are managing to secure for future use. Overall, positive variations are therefore approximated to an increase in the agro-biodiversity secured, while negative variations to a loss of it.

Caution needs to be paid in interpreting the indicator. In the case of plant genetic resources, an uncontrolled addition of accessions which in fact are duplicates of samples already conserved and accounted for, or, *viceversa*, the deletion from the reported collections of redundant duplicates may lead to wrong interpretations. Another example that needs to be monitored both while reporting and interpreting the results include the grouping or splitting of accessions, as in both cases the variation in the accounted number does not reflect a variation in the genetic diversity conserved and secured. Therefore, it is crucial that reporting countries and stakeholders together with the accession level information requested explain also the reason for the decrease or increase in the number of accessions when this does not reflect a real loss or gain in the genetic diversity conserved and secured.

Concepts:*Plant genetic resources*

Plant genetic resources for food and agriculture (PGRFA): Any genetic material of plant origin of actual or potential value for food and agriculture.

Accession: An accession is defined as a sample of seeds, planting materials or plants representing either a wild population, a landrace, a breeding line or an improved cultivar, which is conserved in a genebank. Each accession should be distinct and, in terms of genetic integrity, as close as possible to the sample provided originally.

Active collection: An active collection is defined as a set of distinct accessions that is used for regeneration, multiplication, distribution, characterization and evaluation. Active collections are maintained in short to medium-term storage and usually duplicated in a base collection.

Base collection: A base collection is defined as a set of unique accessions to be preserved for a medium to long-term period.

Medium or long term conservation facilities: Biological diversity is often conserved *ex situ*, outside its natural habitat, in facilities called genebanks. In the case of plant genetic resources, genebanks conserve base collections under medium or long term storage conditions, in the form of seeds in cold rooms, plants in the field and tissues *in vitro* and/or cryopreserved.

For the purpose of this indicator, in order to avoid duplicate counting at the national level, primarily base collections should be reported. An active collection could be exceptionally reported, only when, in the absence of a base collection, it also serves the function of the base collection.

Animal genetic resources

Breed: A breed is either a sub-specific group of domestic livestock with definable and identifiable external characteristics that enable it to be separated by visual appraisal from other similarly defined groups within the same species, or a group for which geographical and/or cultural separation from phenotypically similar groups has led to acceptance of its separate identity.

Medium or long term conservation facilities: Biological diversity is often conserved *ex situ*, outside its natural habitat, in facilities called genebanks. In the case of domestic animal diversity, *ex situ* conservation includes both the maintenance of live animals (*in vivo*) and cryoconservation.

Cryoconservation is the collection and deep-freezing of semen, ova, embryos or tissues for potential future use in breeding or regenerating animals.

Comments and limitations:

Plant genetic resources

Broadly, two issues are of concern in using the “number of accessions” as an indicator of diversity in *ex situ* collections:

Undetected duplicates of accessions may contribute to an increase of the indicator, as each accession is a managed unit, kept and recorded as distinct. The detection of such duplicates will therefore result in a reduction in the number of accession previously reported. This can occur at different levels, for example within genebank collections and also at international level.

A loss of viability of the material(s) conserved that is not promptly detected may as well not be reflected in the number of accessions, contributing to an overestimate of the actual number of accessions.

Additional information could be provided by other indicators measuring *ex situ* conservation, which are part of the monitoring of the Global Plan of Action for PGRFA.

Animal genetic resources

To collect data on a regular base the Domestic Animal Diversity Information System DAD-IS needs to be amended.

Methodology

Computation Method:

Plant genetic resources

The plant component of the indicator is calculated as the total number of unique accessions of plant genetic resources secured in medium to long term conservation facilities. This should include all the accessions in base collections, and unique accessions stored in medium term conservation facilities, as active collections, only when these accessions should be considered to become part of the national base collections.

Animal genetic resources

For the animal component the indicator is calculated as the number of local breeds stored within a genebank collection with an amount of genetic material stored which is required to reconstitute the breed (based on the Guidelines on Cryconservation of animal genetic resources, FAO, 2012, <http://www.fao.org/docrep/016/i3017e/i3017e00.htm>).

Disaggregation:

For both, plant and animal, components geographic disaggregation (national, regional, global) is possible. Grouping by income, sex, age etc. is not applicable.

Treatment of missing values:

- **At country level**
For both components, plants and animals, missing values are treated as such and not replaced by estimates.
- **At regional and global levels**
For both components, plants and animals, missing values are treated as such and not replaced by estimates.

Regional aggregates:

For both components, plants and animals, aggregates are the sum of country values.

Sources of discrepancies:

There are no internationally estimated data. Data on this indicator are all country produced.

Methods and guidance available to countries for the compilation of the data at the national level:

For the plant component of the indicator genebank holdings are just counted based on the germplasm lists reported by countries and regional/international centres according to descriptors agreed by the Commission on Genetic Resources for Food and Agriculture (question 6.2 in the reporting format <http://www.fao.org/3/a-mm294e.pdf>).

For the animal component the National Coordinators for the Management of Animal Genetic Resources provide the type of material (e.g. semen samples, embryos, somatic cells) cryo-conserved within the framework of a cryconservation programme, as well as the number of the respective male and female donors to the Domestic Animal Diversity Information System DAD-IS.

Quality assurance

FAO. 2012. Cryoconservation of animal genetic resources. FAO Animal Production and Health Guidelines No. 12. Rome. (available at <http://www.fao.org/docrep/016/i3017e/i3017e00.pdf>)

FAO 2014. Genebank Standards for Plant Genetic Resources for Food and Agriculture. Rome. (<http://www.fao.org/3/a-i3704e.pdf>)

Officially appointed National Focal Points for plant and animal genetic resources, as well as regional and international centres are invited to report on this indicator on an annual basis directly to FAO DAD-IS (<http://dad.fao.org/>) for the animal component, and, for plant genetic resources either directly to FAO (<http://www.fao.org/wIEWS>) or through regional/international systems which apply the same standards for information exchange e.g. EURISCO (<http://eurisco.ipk-gatersleben.de>) or Genesys (<https://www.genesys-pgr.org>).

Data Sources

Description:

Plant genetic resources

Country data are stored in the World Information and Early Warning System for plant genetic resources for food and agriculture (WIEWS), the FAO information system established to facilitate information exchange as well as periodic assessments of the state of the world's plant genetic resources for food and agriculture.

Officially appointed National Focal Points (NFP) (see <http://www.fao.org/agriculture/crops/thematic-sitemap/theme/seeds-pgr/gpa/national-focal-points/en/>) report directly to FAO through the WIEWS Reporting System, according to the Reporting Format for monitoring the implementation of the Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture (CGRFA-15/15/Inf.9, accessible at <http://www.fao.org/3/a-mm294e.pdf>), which is based on the 63 indicators agreed by the Commission on Genetic Resources for Food and Agriculture (CGRFA-15/15/Report, Appendix C). Indicator 20, 'Number of accessions conserved *ex situ* under medium or long-term conditions', is one of those 63 indicators and also the equivalent of the plant component of SDG indicator 2.5.1. It is compiled with data from question 6.2 of the Reporting Format for monitoring the implementation of the Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture. Data on this indicator is sourced from NFP either directly or through published information systems which comply with the standard of the FAO/Bioversity Multi-crop Passport Descriptor List (MCPD) v. 2 (see References), e.g. EURISCO (<http://eurisco.ipk-gatersleben.de/>) and Genesys (<https://www.genesys-pgr.org>). Besides NFP, regional and international agricultural research centres holding PGRFA *ex situ* collections also provide information on those collections.

The frequency of data reporting is decided by the Commission on Genetic Resources for Food and Agriculture in the framework of the monitoring of the Global Plan of Action for Plant Genetic Resources for Food and Agriculture and the preparation of the periodic assessment of the State of the World's plant genetic resources for food and agriculture. It could be complemented by annual reporting on this specific indicator.

For the indicator, countries are requested to provide the name of the genebank (or holding institute code), the accession number and the scientific name of the accession¹ (name of taxon, including genus, species and lower taxonomic ranking). Optionally, information on several other descriptors is provided (see Reporting Format for the list of descriptors). This allows to analyse changes in different types of diversity concerned, including changes in the type and origin of the material secured (e.g. biological status; country of origin; locations of safety duplications; etc.) and better describe the composition of the secured materials. The indicator applies the FAO/Bioversity Multi-Crop Passport Descriptor (MCPD) v. 2, an international standard for PGRFA information exchange.

Animal genetic resources

National Coordinators for Management of Animal Genetic Resources, nominated by their respective government, provide data to the Domestic Animal Diversity Information System (DAD-IS) (<http://dad.fao.org/>). DAD-IS could be amended to collect the required information. Currently a project for DAD-IS development is ongoing. The updated version of DAD-IS will allow countries the storage of data on animal genetic resources being secured in either medium or long term conservation facilities as needed for the indicator.

Collection process:

The indicator is related to a monitoring framework endorsed by the FAO Commission on Genetic Resources for Food and Agriculture in which the status and trends of plant and animal genetic resources are described through globally agreed indicators and regular country-driven assessments. Officially appointed National Focal Points / National Coordinators report directly to FAO, using a format agreed by the Commission on Genetic Resources for Food and Agriculture.

Sessions of the intergovernmental technical working groups on plant and on animal genetic resources for food and agriculture allow for formal consultation processes.

Data Availability

Description:

Plant genetic resources

The most recent data collected for the implementation of the Second Global Plan of Action for PGRFA will serve as baseline (number of accessions as of June 2014).

As of March 2016, data on about 3.6 million accessions were gathered from 71 countries and 12 international centres. The data collection is ongoing and expected to be finalized by December 2017. Efforts are made to improve the coverage of countries.

Animal genetic resources

The analysis of country reports to FAO provided by 128 countries for the preparation of 'The Second Report on the State of the World's Animal Genetic Resources for Food and Agriculture' provides a first baseline with regard to the number of national breed populations where sufficient material is stored.

¹ Accession number: The unique identifier for the accession within the genebank, and is assigned when a sample is entered into the genebank collection.

Time series:*Plant genetic resources*

Accession level information which includes the acquisition date in country reporting also allows to roughly estimate the status of the indicators of the plant component in previous years.

Animal genetic resources

Base line of data are country reports provided in 2014.

Calendar

Data collection:*Plant genetic resources*

Data collection can be on an annual basis. This frequency appears realistic for countries with datasets already published on internet (mainly developed countries). Next data collection round within the context of the FAO Commission on Genetic resources for Food and Agriculture is planned in January 2020. Efforts are being made to organize annual data collections on a global level.

Animal genetic resources

Data collection is continuous, no specific date planned.

Data release:*Plant genetic resources*

First semester 2017

Animal genetic resources

First quarter 2018

Data providers

The officially nominated National Focal Points / National Coordinators. For information by country see for plant genetic resources <http://www.fao.org/agriculture/crops/thematic-sitemap/theme/seeds-pgr/gpa/national-focal-points/en/> and for animal genetic resources <http://dad.fao.org/cgi-bin/EfabisWeb.cgi?sid=-1,contacts>.

Data compilers

Food and Agriculture Organization of the United Nations (UN FAO)

References

Plant genetic resources

National Focal Points for the monitoring of the Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture and the preparation of country reports for The Third Report on the State of the World's Plant Genetic Resources for Food and Agriculture:

<http://www.fao.org/agriculture/crops/thematic-sitemap/theme/seeds-pgr/gpa/national-focal-points/en/>

Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture:

<http://www.fao.org/docrep/015/i2624e/i2624e00.htm>

Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture

<http://www.fao.org/docrep/013/i1500e/i1500e00.htm>

Genebank Standards for Plant Genetic Resources for Food and Agriculture, FAO, 2014

<http://www.fao.org/documents/card/en/c/7b79ee93-0f3c-5f58-9adc-5d4ef063f9c7/>

Targets and Indicators for Plant Genetic Resources for Food and Agriculture, In: Report of the Fourteenth Regular Session of the Commission on Genetic Resources for Food and Agriculture,

CGRFA-14/13/Report, Appendix C, <http://www.fao.org/docrep/meeting/028/mg538e.pdf>

Reporting Format for Monitoring the Implementation of the Second Global Plan of Action for Plant

Genetic Resources for Food and Agriculture, CGRFA-15/15/Inf.9, <http://www.fao.org/3/a-mm294e.pdf>

FAO/Bioversity Multi-Crop Passport Descriptor (MCPD) v. 2

http://www.bioversityinternational.org/fileadmin/user_upload/online_library/publications/pdfs/FAO-Bioversity_multi_crop_passport_descriptors_V_2_Final_rev_1526.pdf

Animal genetic resources

Preparation of the First Report on the State of the World's Animal Genetic Resources

Guidelines for the Development of Country Reports. Annex 2. Working definitions for use in developing country reports and providing supporting data.

<http://www.fao.org/docrep/004/y1100m/y1100m03.htm>

Guidelines on Cryconservation of Animal Genetic Resources, FAO, 2012, accessible at

<http://www.fao.org/docrep/016/i3017e/i3017e00.htm>

National Coordinator for Management of Animal Genetic Resources:

<http://dad.fao.org/cgi-bin/EfabisWeb.cgi?sid=-1,contacts>

Status of Animal Genetic Resources – 2016, CGRFA/WG-AnGR-9/16/Inf.3,

<http://www.fao.org/3/a-mq950e.pdf>

Guidelines on In vivo Conservation of Animal Genetic Resources, FAO, 2013,

<http://www.fao.org/docrep/018/i3327e/i3327e.pdf>

The Second Report on the State of the World's Animal Genetic Resources for Food and Agriculture

<http://www.fao.org/3/a-i4787e.pdf>

Related indicators

The component on animal genetic resources has linkages with indicator 2.5.2