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 (i.e. being reported to exist only in one country) stored within a genebank collection with an amount of genetic material stored which is required to reconstitute the breed in case of extinction (further information on “sufficient material stored to reconstitute a breed” can be found in 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 FAO Commission on Genetic Resources for Food and Agriculture at its Thirteenth Regular Session (http://www.fao.org/docrep/meeting/024/mc192e.pdf).

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.

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

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.

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 cryoconserved.

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.

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 are of vital importance, medium- or long- term conservation facilities (genebanks) to preserve and make these resources and their associated information accessible 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 are managed 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 the reporting and interpretation of the indicator. In the case of plant genetic resources, an uncontrolled addition of accessions that are in fact duplicates of samples already conserved and accounted for, or, *vice versa*, the deletion from the reported collections of redundant duplicates may lead to wrong interpretations. In order to avoid duplicate counting at the national level, primarily base collections should be reported. An active collection could be reported, only when, in the absence of a base collection, it also serves the function of the base collection. 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 regional/international centres together with the accession level information requested explain also the reason for the decrease or increase in the number of accessions, in particular when this does not reflect a real loss or gain in the genetic diversity conserved and secured.

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 similarly 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 implementation of the Global Plan of Action for PGRFA under the FAO Commission on Genetic Resources for Food and Agriculture.

Animal genetic resources

Information on cryoconserved material in the Domestic Animal Diversity Information System DAD-IS needs to be updated on a regular base.

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 are considered to become part of the national base collections. Base collections may include both seed, field, cryo-preserved or in vitro collections depending on the species conserved and the available facilities in the country.

Animal genetic resources

For the animal component the indicator is calculated as the number of local breeds with enough genetic material stored within genebank collections allowing to reconstitute the breed in case of extinction (based on the Guidelines on Cryconservation of animal genetic resources, FAO, 2012, http://www.fao.org/docrep/016/i3017e/i3017e00.htm).

Treatment of missing values:

- ***At country level:***

For plants missing values are treated as such and not replaced by estimates. For animals, for a given breed, if no data are provided for a respective year, it is assumed that the storage status remains the same as for the last year for which data have been reported. In this case the nature of data is considered to be estimated. However, if the most recent reporting refers to a year more than 10- years before, the storage status is considered “unknown”.

- ***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 produced by countries and regional or international centres.

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

For the plant component of the indicator, officially appointed National Focal Points and managers of regional or international genebanks are requested to provide the list of accessions conserved in medium or long term conservation facilities by filling a spreadsheet contained in document List of descriptors for reporting on the Plant Component of SDG indicator 2.5.1 (see References) accessible from the WIEWS home page (http://www.fao.org/wiews). Out of the 12 passport descriptors which can be used to characterize each accession, four are mandatory: (i) the name of the genebank (or *holding institute code*); (ii) the *accession number*[1]; (iii) the scientific name of the accession (*name of taxon*, including genus, species and lower taxonomic ranking); and (iv) the type of storage. Reporting on the remaining descriptors is highly recommended, as it allows the analysis of 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 describes the composition of the secured materials. The descriptors have been agreed by the FAO Commission on Genetic Resources for Food and Agriculture (see question 6.2 in the “Reporting format for monitoring the implementation of the Second global Plan of Action for Plant Genetic Resources for Food and Agriculture” http://www.fao.org/3/a-mm294e.pdf). Genebank holdings are counted based on the list of accessions reported.

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.

---

[1] ↑

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)

Data sources

Description:

Plant genetic resources

Data are sourced from officially appointed National Focal Points (NFP) (see http://www.fao.org/agriculture/crops/thematic-sitemap/theme/seeds-pgr/gpa/national-focal-points/en/) and regional and international agricultural research centres holding PGRFA *ex situ* collections. Data providers report either (i) directly to FAO by using the spreadsheet contained in document List of descriptors for reporting on the Plant Component of SDG indicator 2.5.1 (see References) accessible from the WIEWS home page (http://www.fao.org/wiews) or (ii) 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).

Data are stored in the World Information and Early Warning System for plant genetic resources for food and agriculture (WIEWS - http://www.fao.org/wiews), the FAO platform established to facilitate information exchange as well as periodic assessments of the state of the world's plant genetic resources for food and agriculture.

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 allows 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 FAO 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 data collected as part of the first monitoring cycle of the implementation of the Second Global Plan of Action for PGRFA serve as baseline (number of accessions as of June 2014).

As of February 2019, data on over 5 million accessions from 98 countries and 17 international/regional centres are being published. The data collection is carried out annually in January. Continued efforts are made to improve the coverage of countries and international/regional centres, as well as the quality of the information.

Animal genetic resources

The analysis of country reports to FAO provided by 128 countries in 2014 for the preparation of 'The Second Report on the State of the World's Animal Genetic Resources for Food and Agriculture' provided a first baseline with regard to the number of national breed populations where sufficient material is stored. As of March 2018 the information reported in DAD-IS was still scarce. According to DAD-IS, genetic material is cryoconserved for only a very low proportion (3 percent) of local breeds and for only around 1 percent of breeds is the quantity of stored material estimated to be sufficient for population reconstitution. The data from the Country Reports are not directly comparable with the data in DAD-IS, because the Country Reports refer also to transboundary breeds. However, the results based on DAD-IS data underline the urgent need for countries to report information relating to cryconserved material in DAD-IS.

Time series:

Plant genetic resources

Data are available in WIEWS for 2014, 2016, 2017 and 2018. Estimates of the status of the indicator before 2014 are made using the *acquisition date* of the accessions reported in 2014.

Animal genetic resources

Base line of data are country reports provided in 2014. DAD-IS data are available for 2017 and 2018.

Disaggregation:

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

Calendar

Data collection:

Plant genetic resources

Data collection is undertaken on an annual basis in the context of the FAO Commission on Genetic resources for Food and Agriculture.

Animal genetic resources

Data in DAD-IS can be updated throughout the whole year.

Data release:

Plant genetic resources

First quarter of the year.

Animal genetic resources

First quarter of the year.

Data providers

The officially nominated National Focal Points / National Coordinators, and managers of regional/international genebanks. 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://www.fao.org/dad-is/national-coordinators/en/ .

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/

List of descriptors for reporting on the Plant Component of SDG indicator 2.5.1, FAO 2017 http://www.fao.org/fileadmin/user_upload/wiews/docs/SDG_251_data_requirement_sheet_table_EN.docx

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 as of February 2020

The component on animal genetic resources has linkages with indicator 2.5.2.