LEARNING ABOUT 2 5.1 5.2 INDICATORS

SDG Indicators 2.5.1 and 2.5.2 – Plant and animal genetic resources

Lesson 4: Interpreting and communicating results on plant genetic resources

Text-only version

The interactive version of this lesson is available free of charge at: https://elearning.fao.org

Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

working for Zero Hunger

In this lesson

This lesson describes how to interpret information in FAO's World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture (WIEWS) with a specific focus on Indicator 2.5.1 for the Sustainable Development Goals (SDG).
It describes how to use these indicators in national policy-making, and how to communicate with various stakeholders about conserving plant genetic resources.

Learning objectives

At the end of this lesson, you will be able to:

- understand how to display data in WIEWS;
- apply some criteria to properly interpret Indicator 2.5.1;
- describe the Second GPA monitoring framework;
- understand how WIEWS indicators can inform decision-making;
- be aware of some policy related issues regarding the conservation of plant genetic resources.

Introduction

The **World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture**, or **WIEWS**, contains a wealth of data on the conservation and sustainable use of plant species and varieties. All these data are compiled by the national focal points for plant genetic resources in each country.

How are data in WIEWS used?

At the national level, WIEWS data are used to:

- report on progress in implementation of international agreements.
- make informed decisions about our plant genetic resources, their conservation and sustainable use.
- develop strategies and policies.

At national level

WIEWS is designed to gather and disseminate data on national implementation of the **Second GPA** and the plant component of **SDG Indicator 2.5.1**.

The Second GPA covers a set of **Priority Activities** ranging from *in si*tu and *ex situ* conservation, to sustainable use, to human and institutional capacity. Its **monitoring framework** addresses all priority activities, so it is quite comprehensive. It allows countries to:

- assess the status of their plant genetic resources;
- identify gaps and needs; and
- see how these evolve over time.

For example, in the case of *ex situ* collections, WIEWS offers a convenient way to bring together data from different genebanks in a standardized format. This makes analysis and assessment of *ex situ* efforts a great deal easier.

At the international level, WIEWS data are used to:

- conduct global assessments on implementation of the Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture (Second GPA).
- calculate SDG Indicator 2.5.1.
- develop strategies and policies….prepare periodic reports on the state of the world's plant genetic resources for food and agriculture (PGRFA).
- update global priorities for PGRFA conservation and sustainable use.

At international level

At FAO, the data in WIEWS is used to prepare various reports. These include:

- **Global assessments** on implementation of the **Second GPA**. These are based on data and narrative reports prepared by the National Focal Points through the Second Global Plan of Action monitoring framework to the **FAO Commission on Genetic Resources for Food and Agriculture**.
  Click the link to download the latest assessment: www.fao.org/3/a-mr796e.pdf
- **SDG Indicator 2.5.1**
  Click the link to access the FAO web page on SDG indicators:
  www.fao.org/sustainable-development-goals/indicators/en/
- **Periodic reports on the state of the world's plant genetic resources.** These were published in 1998 and 2010. The reports draw on WIEWS, reports from FAO member countries and international organizations, and on inputs from experts and reviewers.
  Click the link to download **the Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture**:
  www.fao.org/docrep/013/i1500e/i1500e.pdf

How to display and extract data from WIEWS

While FAO will analyse the data from a regional and international perspective, National Focal Points are responsible for **interpreting data for their own country**.

WIEWS can help them to do this.

www.fao.org/wiews

EX SITU ACCESSIONS

WIEWS lets you view and download a range of **summary data** relevant to SDG Indicator 2.5.1.

You can see this by clicking on:

1. Data
2. *Ex Situ* (SDG 2.5.1)
3. Overview

MAPS OF *EX SITU* COLLECTIONS

Visitors to WIEWS can also see **maps** showing the locations of genebanks and the number of accessions, genera and species that each one holds, by clicking on: **Data - *Ex situ* (SDG 2.5.1) – Maps**.

You can **click on one of the circles** to show details of a particular genebank's collection(s). The size of the circles reflects the size of each collection.

The entire list of accessions and details associated with them can be seen by clicking on To the *ex situ* collection.

COUNTRY LEVEL DATA

WIEWS also lets you search for and view information about individual accessions conserved *ex situ*.

For each country or holding institute, you can see and download information on accessions of a crop (including or excluding its wild relatives), genus or species, by accession number, biological status, storage type, country of origin, and status under the Multilateral System of the International Treaty on Plant Genetic Resources for Food and Agriculture.

If the search for a specific country gives no results, you might still find information about accessions that originate from that country by selecting it as "**country of origin**".

ORGANIZATION LEVEL DATA

You can also search for **organizations** involved in the conservation and sustainable use of plant genetic resources for food and agriculture, for example genebanks holding long-term collections.

Simple search by organization name, WIEWS instcode, location of the organization. **Advanced search** for retrieving organizations by filtering specific fields[1]. Existing organizations are marked as "valid". Detailed information about a specific organization can also be viewed and downloaded.

Interpreting SDG Indicator 2.5.1

Indicators can send mixed signals, so interpreting them has to take into consideration a number of aspects. This also applies to **Indicator 2.5.1** of the Sustainable Development Goals.

The number of accessions[2] conserved *ex situ* (Indicator 2.5.1) is an indirect measure of the total **plant genetic diversity** that we are securing for future use.

In general, if the number of accessions **increases**, we can assume that more **agrobiodiversity is preserved**. A **decrease** in the number of accessions means a **loss of conserved agrobiodiversity**.

However, **caution is needed in interpreting** the indicator. Let's see some examples in the next pages.

As you can see in the examples below, **a single figure - the number of accessions - requires careful consideration**.

- A rise in the total number of accessions might reflect a big increase in accessions of **one species,** but mask a decrease in the number of accessions of other species.
- The accessions may be of **widely cultivated** crop species; crop wild relatives that are at risk of extinction may not be represented.
- The accessions may be mainly of **species that are not particularly significant for food security and nutrition**, with more important species less well secured.
- A variety or a wild population may be conserved *ex situ,* but be **no longer in the field or in its natural habitat,** and therefore no longer evolving and adapting to changing environmental conditions.

Valuable **complementary information** can come **from other indicators** that measure the conservation and use of plant genetic resources for food and agriculture and **that are part of monitoring of the Second Global Plan of Action**.

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[1] Specific fields include name, acronym, WIEWS instcode, organization role, existing/no longer existing organizations, etc.

[2] **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 original sample provided.

In addition, **variations in the number of accessions** conserved may be due to factors that **do not affect the total diversity conserved**. These factors include:

- **UNDETECTED DUPLICATES**

A genebank may hold **duplicate samples of the same variety** but treat them as separate accessions. The same may happen among genebanks.

This will inflate the number of accessions and therefore the indicator

- **ADDITION OF DUPLICATES**

Adding accessions that are in fact **duplicates** of samples already conserved and/or accounted for may lead to a wrong interpretation.

The same is true if the redundant duplicates are deleted from the list.

- GROUPING OR SPLITTING ACCESSIONS

Grouping or splitting accessions may lead to an **apparent change** in the indicator - but does not reflect a real change in the plant genetic diversity conserved.

Similarly, a failure to apply the norms and procedures[3], which every genebank that conserves collections for the medium- or long-term should routinely perform, may result in a net loss of the diversity conserved. Such a loss, if undetected, will not be reflected in the indicator and will cause an overestimation of the progress achieved towards the SDG target.

Having more detailed information can help to understand the status and trend of plant genetic resources' conservation. As you have seen, using WIEWS it is possible to **break down the number of accessions** in various ways. This allows us to detect many potential problems.

By region, subregion and country	HELPS TO…

[3] For example, testing of viability and rejuvenation of stored materials.

…identify needs for strengthening conservation, including through collaboration with other countries.

WIEWS shows the numbers of accessions in different parts of the world.

- It shows which regions and countries have conservation programmes (and have reported them to WIEWS) and which do not.
- It shows the relative size of the conservation programmes in each country.

Countries with small or non-existent conservation programmes should consider strengthening or creating them, and establishing collaborative projects with neighbouring countries or international institutions to ensure or improve the conservation of their genetic resources.

By status (i.e. types of plants) **HELPS TO…**

verify that several types of plants are conserved, for example wild and weedy types.

Accessions may represent different types of populations. These include:

- 100) Wild
- 200) Weedy
- 300) Traditional cultivar or landrace
- 400) Breeding or research material
- 500) Advanced or improved cultivar
- 600) Genetically modified organism

WIEWS shows the numbers of accessions of each population type.

Many conservation programmes concentrate on traditional cultivars, research material and improved cultivars. They should ensure that wild and weedy types are also collected, conserved and characterized.

This is especially important for those regions where particular crops originate or were first cultivated, as this is where the wild relatives are most likely to be found. Countries in such centres of diversity should make special efforts to collect and conserve these wild germplasm.

By storage type **HELPS TO…**

understand how secure and resource intensive the management of the *ex situ* collections are.

WIEWS classifies accessions by the type of germplasm storage:

- Seed long-term

- Seed medium-term
- Field
- *In vitro*
- Cryopreserved
- DNA

For Sustainable Development Goal Indicator 2.5.1, accessions in all the above types of storage are counted.

By species **HELPS TO…**

identify gaps in the conservation efforts, set priorities and monitor progress.

National conservation programmes may wish to prioritize certain species or populations. For example, they may wish to focus on:

- **Major crops** that are crucial for food security, or are economically important.
- Other crops that are **nutritionally** important, or support particular **industries** (such as vegetables, pulses or oil crops).
- Species or populations that are particularly **at risk** due to their limited range, or because of changes in land use, farming techniques or the climate.
- Species that have evolved or were domesticated in the country where they have their primary or secondary **centre of diversity** (such as potatoes in the Andes).
- Species that have particular **economic potential**.

WIEWS provides information that national conservation programmes can use to set such priorities and monitor progress.

WIEWS can help to identify gaps in conservation efforts: for example, if a particular species is underrepresented in the ex situ collections.

Here's a snapshot of the WIEWS figures for **accessions worldwide:**

Based on the latest data available, at the end of 2017 there were approximately **4.9 million accessions** of plant genetic resources for food and agriculture conserved under medium- or long-term conditions. These were held in more than **570 genebanks** in **90 countries** and **16 regional and international centres**.

We are making progress! If we compare it with **2014**, that's a moderate but steady rise in overall genebank accessions (about 3%). We can also see a **3.5% rise** in the number of genera, and **5.4% more** species conserved.

The 2014 baseline

The initial **baseline**, against which progress towards the SDG target is measured, is given by the number of accessions as of June 2014, as reported for monitoring implementation of the Second Global Plan of Action.

Such a baseline is adjusted according to subsequent reports, whenever these allow for a more accurate estimate of the indicator and the diversity actually conserved.

Setting up priority activities

Which activities can be undertaken to improve the management of crop diversity?

The **Second GPA** lays out a series of priority activities to safeguard and sustainably use crop diversity, which cover **four main areas**:

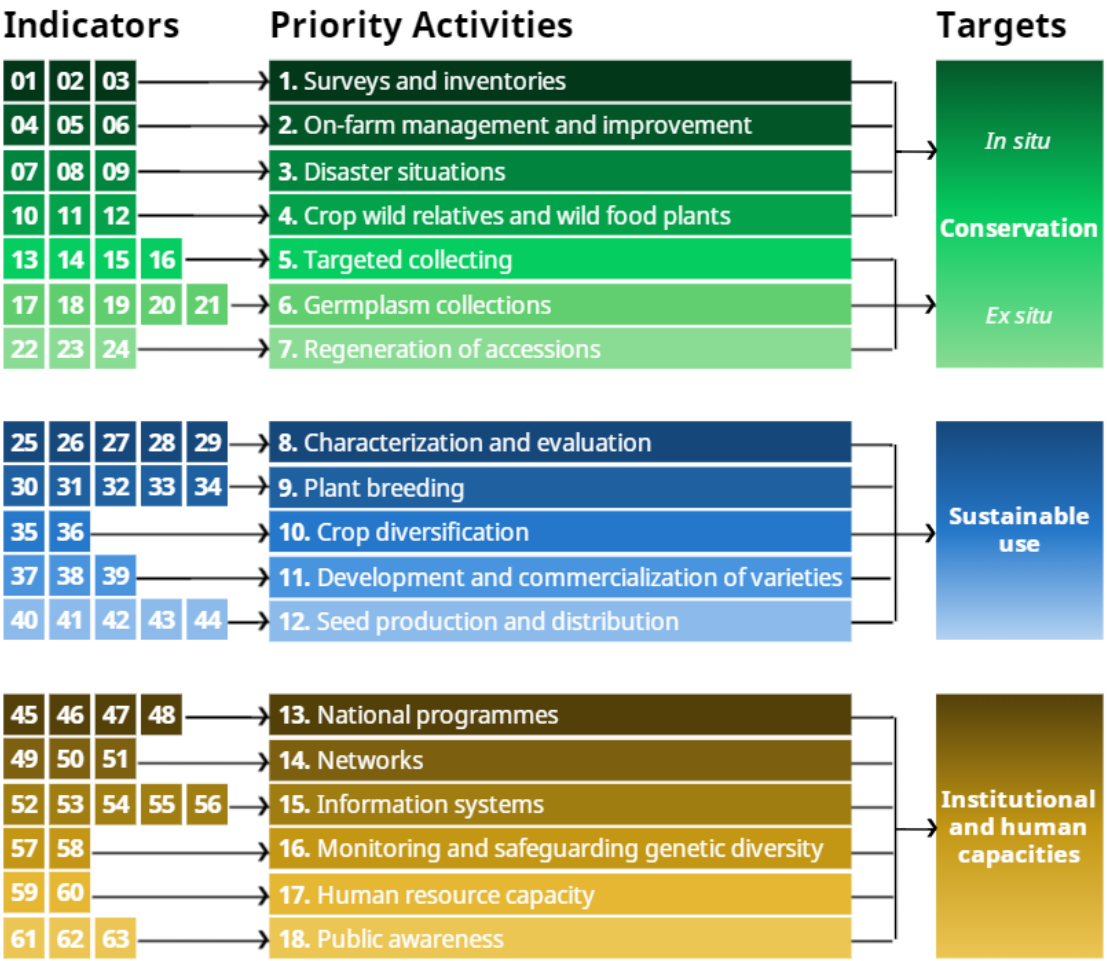
- *In situ* conservation and management
- *Ex situ* conservation
- Sustainable use
- Sustainable institutional and human capacities

The Second GPA monitoring framework

Overall progress in implementation of the Second GPA is monitored and guided by FAO Members through the Commission on Genetic Resources for Food and Agriculture. The agreed **monitoring framework** measures progress towards:

- **Three targets** for plant genetic resources for food and agriculture (Conservation; Sustainable use; Institutional and human capacities) through three Higher-order Composite Indices; and
- **18 Priority Activities** of the Second GPA through **63 indicators**.

WIEWS is designed to keep track of progress on implementation of the Second GPA.



TARGETS

Target 1: Conservation

Higher proportion of the genetic diversity of cultivated plants and their wild relatives, as well as of wild food plant species, is maintained *in situ*, on farm and *ex situ* in a complementary manner.

Target 2: Sustainable use

Increased use of plant genetic resources for food and agriculture to improve sustainable crop production intensification and livelihoods while reducing genetic vulnerability of crops and cropping systems.

Target 3: Sustainable institutional and human capacities

More people are aware of the value of plant genetic resources and institutional and human capacities are strengthened to conserve and use them sustainably while minimizing genetic erosion and safeguarding their genetic diversity.

PRIORITY ACTIVITIES

Priority Activity 1: Surveys and inventories

Surveying and inventorying plant genetic resources for food and agriculture.

Indicators

1.Number of *in situ* (including on farm) **surveys/inventories** of plant genetic resources for food and agriculture carried out.

2.Number of **genetic resources** surveyed/inventoried.

3.Percentage of plant genetic resources for food and agriculture **threatened** out of those surveyed/inventoried.

Priority Activity 2: On-farm management and improvement

Supporting on-farm management and improvement of plant genetic resources for food and agriculture.

Indicators

4.Number of **farming communities** involved in on-farm plant genetic resources for food and agriculture management and improvement activities.

5.Percentage of cultivated **land** under farmers' varieties/landraces in areas of high diversity and/or risk.

6.Number of farmers' varieties/landraces **delivered** from national or local genebanks to farmers (either directly or through intermediaries).

Priority Activity 3: Disaster situations

Assisting farmers in disaster situations to restore crop systems.

Indicators

7.Number of households that **received seeds** for planting as an aid after disaster situations.

8.Percentage of seed produced at the **local level** out of that made available through disaster response interventions.

9.Existence of disaster risk management **policies** for restoring crop systems that include seed security provisions.

Priority Activity 4: Crop wild relatives and wild food plants

Promoting *in situ* conservation and management of crop wild relatives and wild food plants.

Indicators

10.Percentage of national *in situ* conservation sites with **management plans** addressing crop wild relatives and wild food plants.

11.Number of crop wild relatives and wild food plants *in situ* **conservation and management actions** with institutional support.

12.Number of crop wild relatives and wild food plant species **actively conserved** *in situ*.

Priority Activity 5: Targeted collecting

Supporting targeted collecting of plant genetic resources for food and agriculture.

Indicators

13. Existence of a **strategy** for identification of gaps in national gene bank holdings and for targeted collecting missions to fill identified gaps.
14. Number of **crops** conserved in the national gene bank(s) that **require targeted collecting**.
15. Number of targeted collecting **missions** in the country.

Number of **accessions** resulting from targeted collecting missions in the country.

Priority Activity 6: Germplasm collections

Sustaining and expanding *ex situ* conservation of germplasm.

Indicators

17. Trend in annual **capacity** for sustaining *ex situ* collections.
18. Number of **crops** conserved *ex situ* under medium- or long-term conditions.
19. Number of **species** conserved *ex situ* under medium- or long-term conditions.
20. Number of **accessions** conserved *ex situ* under medium- or long-term conditions ***(corresponding to SDG Indicator 2.5.1)***.

Percentage of *ex situ* accessions safety **duplicated**.

Priority Activity 7: Regeneration of accessions

Regenerating and multiplying *ex situ* accessions.

Indicators

22. Percentage of *ex situ* accessions in need of regeneration for which a **budget** for regeneration does not exist.
23. Number of *ex situ* accessions **regenerated** and/or multiplied.
24. Percentage of *ex situ* accessions **in need of regeneration**.

Priority Activity 8: Characterization and evaluation

Expanding the characterization, evaluation and further development of specific collection sub-sets to facilitate use.

Indicators

25. Average number of morphological **traits** characterized per accession for the *ex situ* collections.
26. Number of **publications** on germplasm evaluation and molecular characterization
27. Number of trait-specific collection **subsets** published.
28. Number of **accessions distributed** by genebanks to users of germplasm.

Number of **samples distributed** by genebanks to users of germplasm.

Priority Activity 9: Plant breeding

Supporting plant breeding, genetic enhancement and base-broadening efforts.

Indicators

30. Number of crops with active **public** pre-breeding and breeding programmes.

31. Number of crops with active **private** pre-breeding and breeding programmes.

32. Number of breeding **activities** oriented to small scale farmers, villages or traditional communities.

33. Number of active **public crop breeders**.

34. Number of active **private crop breeders**.

Priority Activity 10: Crop diversification

Promoting diversification of crop production and broadening crop diversity for sustainable agriculture.

Indicators

35. Number of **programmes**/projects/activities to increase genetic heterogeneity of crop species and diversity within the agro-ecosystem.

36. Number of new crops and/or wild species **introduced** into cultivation.

Priority Activity 11: Development and commercialization of varieties

Promoting development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species.

Indicators

37. Existence of national policies that promote development and commercialization of farmers' varieties/landraces and underutilized species.

38. Number of **programmes**/projects/activities promoting development and commercialization of all varieties.

39. Number of **farmers' varieties/landraces and underutilized species** with potential for commercialization identified.

Priority Activity 12: Seed production and distribution

Supporting seed production and distribution.

Indicators

40. Number of new varieties **released**.

41. Number of formal/registered seed **enterprises**.

42. The least number of varieties that together account for **80% of the total area** for each of the five most widely cultivated crops.

43.Percentage of area supplied with seed meeting the quality standards of the **formal seed sector** for the five most widely cultivated crops.

44.Existence of a national **seed policy** and seed laws.

Priority Activity 13: National programmes

Building and strengthening national programmes.

Indicators

45.Existence of a national entity (agency, committee, etc.) functioning as a **coordination mechanism** for plant genetic resources for food and agriculture activities and/or strategies.

46.Existence of a formally appointed National **Focal Point** or coordinator for plant genetic resources for food and agriculture.

47.Existence of a governmental **policy framework** and strategies for conservation and use of plant genetic resources for food and agriculture.

48.Existence of a national **information sharing** mechanism for plant genetic resources for food and agriculture.

Priority Activity 14: Networks

Promoting and strengthening networks for plant genetic resources for food and agriculture.

Indicators

49.Membership of a **regional network** for plant genetic resources for food and agriculture.

50.Number of **crop improvement networks** in which national stakeholders are members.

51.Number of **publications** produced by national stakeholders within the framework of networks.

Priority Activity 15: Information systems

Constructing and strengthening comprehensive information systems for plant genetic resources for food and agriculture.

Indicators

52.Number of **crop wild relatives** conserved *in situ* and **documented** in a publicly available information system.

53.Number of **farmers' varieties**/landraces cultivated on-farm and documented in a publicly available information system.

54.Number of **accessions** from *ex situ* collections **documented** in a publicly available information system.

55.Number of **released varieties documented** in a publicly available information system.

56.Participation in publicly accessible, **international/regional information systems** for plant genetic resources for food and agriculture.

Priority Activity 16: Monitoring and safeguarding genetic diversity

Developing and strengthening systems for monitoring and safeguarding genetic diversity and minimizing genetic erosion of plant genetic resources for food and agriculture.

Indicators

57. Existence of national systems to **monitor** and safeguard genetic diversity **and minimize genetic erosion**.

58. Number of **remedial actions** resulting from the existing national systems to monitor and safeguard genetic diversity and minimize genetic erosion.

Priority Activity 17: Human resource capacity

Building and strengthening human resource capacity.

Indicators

59. Existence of post-graduate, graduate and secondary **educational and training programmes** with incorporated aspects on conservation and sustainable use of plant genetic resources for food and agriculture.

60. Percentage of staff whose **skills** in conserving and using plant genetic resources for food and agriculture have been upgraded.

Priority Activity 18: Public awareness

Promoting and strengthening public awareness of the importance of plant genetic resources for food and agriculture.

Indicators

61. Existence of a **public awareness** programme promoting conservation and utilization of plant genetic resources for food and agriculture.

62. Number of **stakeholder groups** participating in implementation of the public awareness programme.

63. Number of types of **products** developed to raise public awareness.

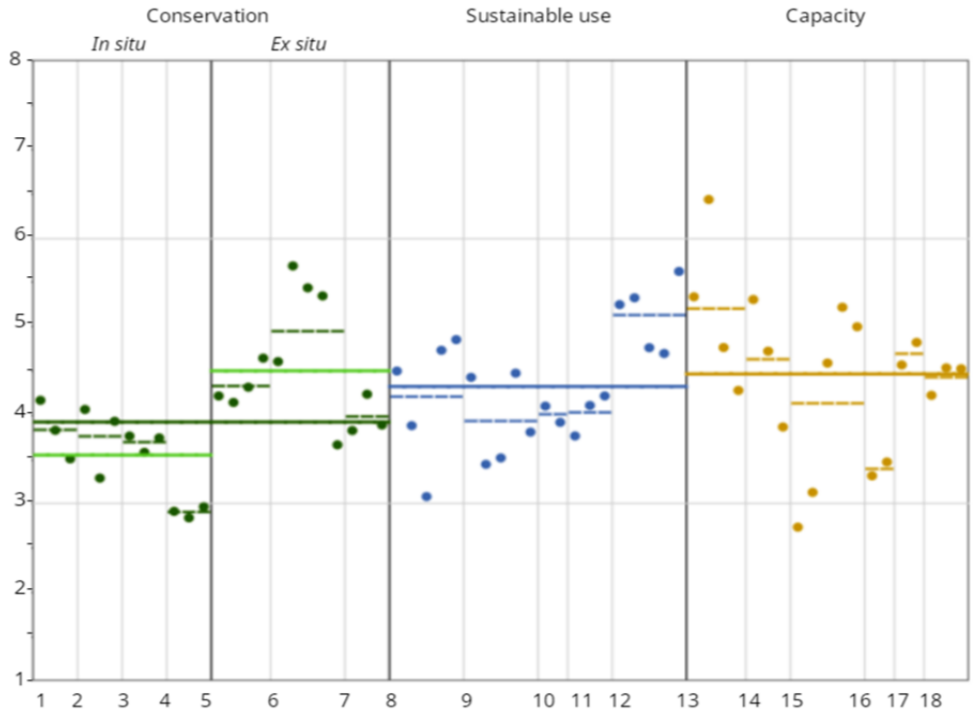
Calculating higher-order composite indices

To help keep track of all activities and indicators, FAO has proposed a set of **higher-order composite indices**. The approach uses ratings provided by the National Focal Points for the 63 indicators. These ratings are used to develop **three higher-order indices**:

- Conservation (subindices cover *in situ* and *ex situ* conservation)
- Sustainable use
- Institutional and human capacities

By checking the level of these indices, we can **judge overall progress** towards the targets at different levels of detail.

This graph shows higher-order indices for Asha's country.



This graph depicts the Higher Order Composite Indices, the NFP ratings for the indicators and the Priority Activities. The Y-axis corresponds to the NFP rating ranging from 1 to 8. The X-axis lists the Second GPA Priority Activities. The shorter, dashed lines show the progress of each **priority activity** (higher = more progress). They are calculated using the NFP ratings for the corresponding indicators. The length of each segment reflects the number of indicators in each priority activity.

Dots represent the rating values for the 63 **indicators**.

The longer, solid lines show the **Higher Order Composite Indices** for the three targets. Each one is developed using the values of the corresponding Priority Activities.

Steps for calculating higher-order indices for WIEWS

Creating the higher-order indices involves several steps:

Step 1 Data selection

Data for the 63 indicators are inevitably uneven in terms of their availability and accuracy. In addition, for some, it is necessary to understand the context in order to interpret them correctly. Ratings are meant to provide a synthetic evaluation of the situation within the country with regard to what was planned, and what has actually been achieved on the subject addressed by each indicator.

Step 2 Dealing with missing data

Progress on each of the 18 Priority Activities is measured by two to five indicators. If **some** of the indicator ratings are missing for a priority activity, they are simply ignored.

If the ratings of **all** the indicators for a particular priority activity are missing, a figure must be extrapolated based on the average values from neighboring countries in the region.

Step 3 Putting the indicators on an 8-point scale

The indicators for each priority activity are rated on a scale from **1 to 8**, where: 1 = least implementation or achievement; 8 = full implementation or achievement. For each indicator, the National Focal Point uses his or her **expert judgement** to determine the appropriate rating. This process is known as **normalization**.

Asha: *"For example, I can give a relatively low rate to an indicator if the situation it is addressing remains critical, even though there has been progress since the latest assessment. Or, I can give a relatively high rate if the situation is not particularly critical, though there has been no progress since the previous assessment."*

Step 4 Aggregating the indicators

All 63 indicators and 18 priority activities are treated as equally important: they are not given weights.

The normalized scores for the indicators and priority activities can then simply be averaged together to form the three **higher-order composite indices**:

- Conservation
- Sustainable use
- Institutional and human capacities

How can policy-makers use available information?

Policy-makers in a country should **take advantage of the information available** when developing or reviewing national PGRFA strategies.

However, the indicators just give a snapshot, a quick overview. Policy-makers and managers **need to go into greater depth**, to understand:

- What is the level of complementarity between *in situ* and *ex situ* conservation?
- Which crop wild relatives are actively conserved, and where?

- How genetically uniform and therefore vulnerable are the predominant cropping systems?
- Which gaps and needs are critical and should be prioritized in the allocation of resources?

Problems with germplasm collections

Many collections are maintained below internationally agreed standards. There are problems with facilities and equipment, funding, staff skills, work procedures, documentation, and of course natural disasters.

Here are some issues of germplasm collections that policy-makers should consider:

Gaps in collection coverage

For some major crops, such as wheat and rice, germplasm collections now contain a large part of the existing genetic diversity, including that of their wild relatives.

The situation is different for many other crops. There are **few comprehensive collections of minor crops or of neglected and underutilized species**. Considerable gaps remain to be filled.

Identifying gaps is difficult because for many species, sufficient information is not available.

Banana is one exception. Here, the genetic variability has been studied in some detail. We have enough information to know that some 300-400 cultivars are absent from germplasm collections.

Banana germplasm: The International Musa Germplasm Transit Centre

The **International Musa Germplasm Transit Centre of Bioversity International** is the world's largest collection of banana germplasm. Located in Leuven in Belgium, this genebank holds more than 1 500 accessions of edible and wild species of bananas and plantains. It holds accessions both *in vitro* (as small plants in test tubes) and cryopreserved in liquid nitrogen.

It is estimated that 300-400 key cultivars are still missing from the collection. These include:

- 20 plantains from Africa
- 50 Callimusa species from Borneo
- 20-30 *Musa balbisiana* and 20 other types from China and India
- 10 accessions from Myanmar
- 40 wild types from Indonesia and Thailand
- Up to 100 wild types from the Pacific

Lack of safety duplicates

Germplasm collections are never 100 percent secure.

- A hurricane or other natural disaster may destroy the collection, along with the building housing it.
- A power blackout may knock out the refrigeration of seed collections.
- An interruption in the supply of liquid nitrogen may damage cryopreserved accessions.
- War, conflict or criminality may damage or destroy the collection.
- The collection may be damaged by human error.

Since it is impossible to completely protect a single site physically, it is important to have one or more **backup collections**. These may be held in other genebanks, or in the global seed vault in Svalbard, Norway. While collections of some major crops have adequate backup duplicates, many collections, especially of minor crops, do not. The situation is most critical for species that are propagated vegetatively, or that have recalcitrant seeds.

Regeneration backlogs

Accessions stored as seed in ***ex situ* facilities** gradually decline in viability. Even under optimal storage conditions, all accessions eventually require regeneration.

Unfortunately, many genebanks lack the resources to conduct **regeneration** on a regular basis. Their seed collections are in danger of becoming unviable.

Poor documentation

Documentation plays an important role in the management of germplasm.

Data on the origin, characteristics and management of each accession must be stored in a secure way and made accessible to people who need them.

The success or failure of a programme for the conservation and sustainable use of plant genetic resources depends largely on the amount and quality of information that is available about these resources, and the environments to which they are adapted, as well as on the effectiveness of the systems used to manage this information.

FAO's **Genebank Standards** provide guidelines on everything from acquisition to documentation and security. They cover genebanks for orthodox seeds, field genebanks, and *in vitro* culture and cryopreservation.

Click here for FAO's genebank standards: www.fao.org/agriculture/crops/thematic-sitemap/theme/seeds-pgr/gbs/en/

Inadequate characterization and evaluation

A packet of seeds (or a tank of liquid nitrogen containing cryopreserved samples) is little use if you don’t know what is in it.

Characterization and evaluation data are extremely important for the targeted use of germplasm. These allow for greater precision in identifying sources of heritable traits for use in breeding programmes. Germplasm information management systems, such as **GRIN-Global**, www.grin-global.org/, are increasingly being used for documenting not only passport but also characterization and evaluation data in genebanks.

Nonetheless, many accessions are inadequately characterized. The records may show basic information, such as the species and collection location, but little else. That is of limited use for plant breeders, or others wishing to restore lost varieties.

Each accession must be carefully **characterized** using a standard set of descriptors. **Bioversity International** has published descriptors for more than 100 different crops. Click here www.bioversityinternational.org/e-library/publications/descriptors/ for the Bioversity International crop descriptors.

Raising awareness

Asha: *"It is important to **raise awareness** about conserving plant genetic resources. Each of these **audiences** will need different types of information, and we will need to communicate with them in different ways."*

	Channels	Messages
MINISTRY OFFICIALS (AGRICULTURE, ENVIRONMENT)	• Briefings • Information materials • Presentations	• Importance of conserving plant genetic resources • Need for policy and funding support
FARMERS AND GARDENERS	• Radio • TV • Newsletters • Meetings • Seed swaps • Seed distribution services	•Value and use of plant genetic resources •How to conserve them
GENERAL PUBLIC	• Radio • TV • Press • Social media	•Value of plant genetic diversity and conservation efforts •Success stories

	• Websites • Video	
MASS MEDIA	• Press releases • Interviews • Field visits	•Value of plant genetic diversity and conservation efforts •Success stories
SCIENTISTS, PLANT BREEDERS	• Conferences • Field visits • Information materials	•Value of plant genetic diversity •Need for research, especially on neglected species
COMMUNITY ORGANIZATIONS AND NGOS	• Meetings • Diversity fairs • Field visits • Social media • Websites	•Support for conservation efforts •Need to share information
PUBLIC SECTOR	• Meetings • Field visits • Information materials	•Value of plant genetic diversity •Need to preserve varieties

The specific audiences, channels and messages will vary from one country to another. It is also important to keep in close contact with these stakeholders to get their inputs and feedback.

Supporting genebanks

Finally, let's take a moment to reflect on why **genebanks need support from policy-makers**.Genebank work can be highly technical, requiring qualified personnel, specialist equipment and secure facilities, which can make them seem "remote" from the public. However, they are a **vital link in the chain that conserves germplasm and develops new varieties**.

Their primary function is to conserve and make available germplasm to be used for **research and breeding purposes**, as well as in some cases for **reintroduction into local agricultural systems**.

Genebanks therefore have strong linkages with researchers and farmers, who enhance the sustainable use of PGRFA. These two groups are both providers and users of the germplasm conserved by genebanks.

Below are a couple of examples of genebanks offering a **public service**:

Germplasm's distributions by national/international genebanks

During 2012-2014, about 475 000 samples of more than 300 crops/crop groups were distributed by 92 national genebanks from 39 countries around the world. The main recipients of this germplasm were public researchers (48 percent), farmers or NGOs (24 percent) and private companies (14 percent).

During the same period, international genebanks distributed more than 248 000 samples of 51 crops/crop groups, mainly for breeding and research purposes.
Another important source of germplasm are the genebanks of the **US National Plant Germplasm System**, which distributes approximately 250 000 accessions annually to national and international researchers.
Use of such germplasm for plant breeding depends on the size and scope of the collections, the quality and quantity of associated information on accessions, and the level of adaptability and utility of germplasm.

The DA-IRRI Heirloom Rice Project

The genebank at the International Rice Research Institute provides germplasm for the screening and evaluation of important resistance/tolerance to biotic and abiotic stresses.

Selected varieties will become useful for improving traditional heirloom rice varieties favoured by many small landholders in the Philippines.
The genebank is also actively involved in ensuring the conservation and characterization of these treasured varieties.

Summary

The **World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture** or **WIEWS**, is a service to help national governments monitor and conserve their plant genetic resources. The data it contains:

- Enables countries to report on progress in implementation of international agreements.
- Helps countries to make informed decisions about their plant genetic resources. The National Focal Points are responsible for entering and updating information in WIEWS.

One of the indicators in WIEWS (Indicator 20) is used to track the conservation of plant genetic resources for the **Sustainable Development Goals** (Indicator 2.5.1).
WIEWS tracks the **accessions** conserved in genebanks. It is possible to calculate their number according to several descriptors and dimensions, including **region, country, genebank, biological status, storage type** and **species**.

Indicator 20 is just one of **63 indicators** calculated by WIEWS on the basis of data entered by the National Focal Points. The 63 indicators serve to monitor implementation of the **18 Priority Activities** listed in the **Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture (Second GPA).**

These 18 Priority Activities cover four **areas**, corresponding to the three targets in the Second GPA:

- *In situ* and *ex situ* conservation and management.
- Sustainable use.
- Sustainable institutional and human capacities.

FAO has proposed a way of calculating **indices** to measure progress on the 18 Priority Activities and the 3 targets. These indices can provide valuable insights into a particular country's efforts to conserve and sustainably use its genetic resources. However, deeper knowledge and understanding of the situation is important.

National conservation programmes and genebanks need to gain public and **policy support** for their work. The information contained in WIEWS can play an important role in this.