



Food and Agriculture
Organization of the
United Nations

COMMISSION ON
GENETIC RESOURCES
FOR FOOD AND
AGRICULTURE



THE THIRD REPORT ON
THE STATE OF THE WORLD'S
**PLANT GENETIC
RESOURCES FOR
FOOD AND AGRICULTURE**

in brief







The role of plant genetic resources for food and agriculture in agrifood systems

Plant genetic resources for food and agriculture (PGRFA) refer to all genetic materials of plant origin of actual or potential value for food and agriculture. They are essential to achieving food security, improving nutrition and ensuring sustainable agricultural livelihoods, as they provide the basis for developing crops and varieties that are well adapted to their environment, rich in nutrients and climate-resilient.

PGRFA are typically found in the wild, in farmers' fields and in experimental fields. They can be conserved *ex situ* in genebanks as germplasm accessions and *in situ* in their natural habitats.

PGRFA diversity provides traits for adaptation and resilience against pests and diseases, drought and other climate threats, as well as other agronomically valuable traits, for example early/late maturity, branching

PGRFA include:

- i crop wild relatives (CWR), i.e. wild populations of species related to cultivated species;
- ii wild food plants (WFP);
- iii farmers' varieties and landraces (FV/LR);
- iv breeding and research materials; and
- v improved varieties.

and dwarfing. PGRFA also possess nutritional qualities and other relevant properties such as different colours, flavours and culinary attributes. PGRFA have cultural heritage and spiritual importance for local communities and Indigenous Peoples. To ensure their continued availability, it is imperative that PGRFA be appropriately conserved and made accessible for current and future generations.

As 80 percent of the world's food is of plant origin, safeguarding these resource requires effective action at global, regional, national and local levels.



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The preparation of the Third Report

The Third Report on the State of the World's Plant Genetic Resources for Food and Agriculture (Third Report) provides the latest global assessment of the status of conservation and sustainable use of PGRFA. The first and the second reports were made available in 1996 and 2010, respectively.

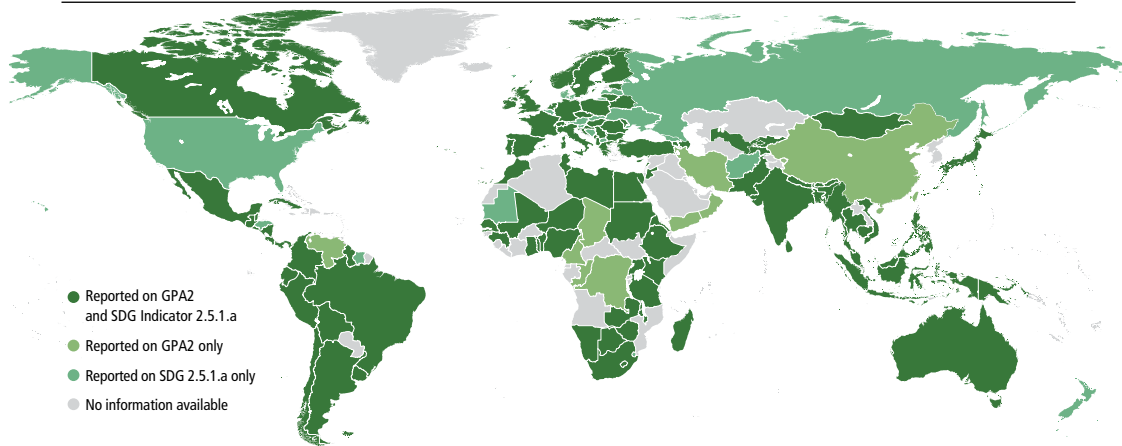
The Third Report is primarily based on information provided by 128 countries, four regional and 13 international research centres. It provides a solid basis for recalibrating national and global policies and strategies, including the Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture, adopted in November 2011.

The Third Report was prepared under the guidance of FAO's Commission on Genetic Resources for Food and Agriculture and in collaboration with the International Treaty on Plant Genetic Resources for Food and Agriculture. Key sources of information used for the report included, in addition to the country reports, thematic background studies commissioned by FAO and prepared by international experts.

The Third Report addresses:

- the current status of plant diversity, how it is being preserved and used;
- the main achievements at the global, regional and national level;
- the key policy and technical advances; and
- the major gaps and needs that require urgent attention.

FIGURE 1
Participation in the reporting process



Notes: Refer to the disclaimer on the back cover for the names and boundaries used in this map. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined.



Inventorying PGRFA diversity in the wild and on-farm

Identifying, cataloguing and documenting the diversity of PGRFA is essential for preserving valuable genetic traits that enhance resilience, adaptability, and food security.

Inventorying PGRFA is a crucial for documenting and conserving diversity both in the wild and on-farm. It involves cataloguing the whole range of diversity, from wild relatives of cultivated crops to traditional varieties maintained by farmers. The process includes the documentation of valuable information on traits, such as drought tolerance, pest resistance and nutritional content.

Since the publication of the previous report in 2010, progress has been made in the number of surveys and inventories of PGRFA undertaken in the wild and on-farm. A total of 80 countries reported more than 6 200 taxa surveyed, of which approximately 43 percent were food crops from nine groups: fruit plants, vegetables, roots and tubers, herbs and spices, pulses, cereals, oil plants, pseudo cereals and nuts.

Approximately 42 percent of surveyed taxa were found to be threatened at the species or variety level in at least one survey, including about 35 percent of 1 050 crop wild relatives (CWR) and 38 percent of 405 wild food plants (WFP) taxa. Surveys of farmers' varieties/landraces (FV/LR) found that an average of six percent of their diversity was threatened globally. The findings from nine of 18 subregions were even more concerning, with at least 18 percent of FV/LR diversity identified as threatened.

The systematic collection of data on PGRFA diversity is key for a better understanding of the status and distribution of these resources, for identifying gaps in conservation efforts and for prioritizing areas that require protection or intensified management efforts. Data on PGRFA diversity are also fundamental in supporting research, breeding programmes and policy decisions, ensuring that plant genetic resources continue to contribute to the long-term security and sustainability of agrifood systems worldwide.

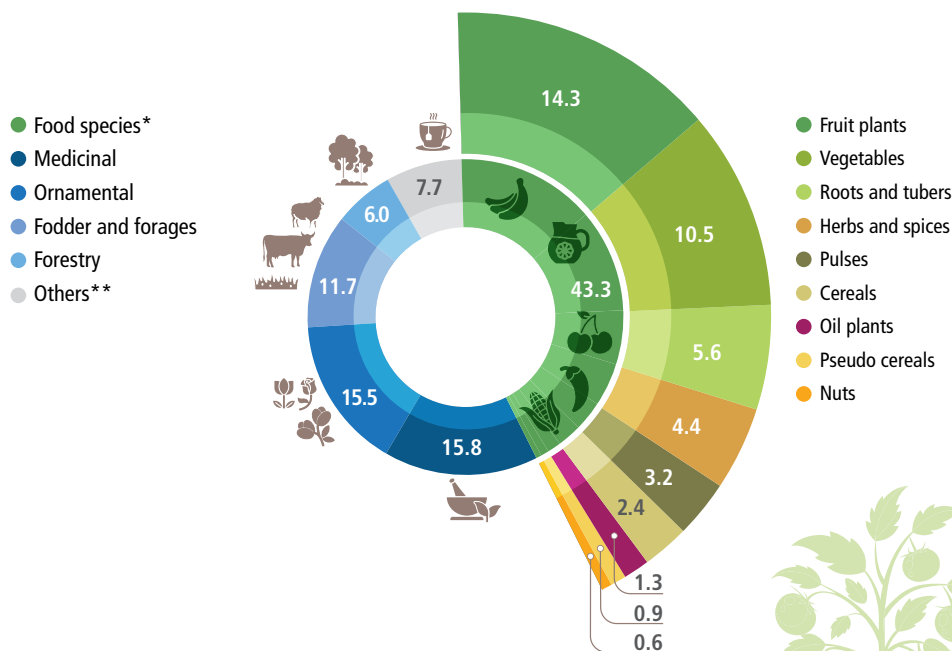
Core messages

Surveying and inventorying plant genetic resources for food and agriculture *in situ* and on-farm has progressed significantly since the *Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture*.

The Third Report clearly shows that considerable knowledge has been gathered over the last 15 years ago. Nevertheless, the Third Report reveals that human capacity is a limiting factor, which needs to be urgently addressed to ensure an adequate availability of specialized staff, including taxonomists, to carry out comprehensive surveys and inventories.

The Third Report reveals concerning threats to global plant diversity, as 42 percent of all taxa surveyed, including many CWR and WFP, were no longer found in at least one of the areas where they occurred naturally or where they were previously cultivated.

FIGURE 2
Percentage of taxa surveyed and inventoried by countries under the different use groups



Notes: * Including fruit plants, vegetables, roots and tubers, herb and spices, pulses, cereals, oil plants, pseudo cereals and nuts.

**Including plants used for other purposes, including research, sweeteners, fibres and stimulants. Based on 80 country reports.

What needs to be done?

- Strengthen efforts to survey and inventory PGRFA *in situ*.
- Develop standardized baseline data and inventories on PGRFA *in situ* and on-farm for monitoring changes over time.
- Expand research on the threat status of local FV/LR, as current knowledge remains limited and requires increased focus.
- Develop greater capacity to conserve and sustainably use PGRFA, including in plant taxonomy, conservation and population genetics, statistics and informatics.
- Establish a globally accepted methodology for assessing the extinction risk and genetic erosion of FV/LR on-farm.



***In situ* conservation sites of wild plant genetic resources for food and agriculture**

Conserving wild PGRFA in their natural habitat (in situ conservation) is an irreplaceable means of safeguarding this diversity and enabling further adaptation.

In situ conservation of wild PGRFA is increasingly being recognized as playing a critical role in enhancing the resilience and sustainability of agrifood systems. The area of protected *in situ* conservation sites increased by 11 percent to 22.4 million km² globally. However, data from 69 countries reveal that about 94 percent of conservation sites, including protected areas, did not have management plans specifically targeting CWR and WFP.

In situ conservation activities included: implementation of management practices to maintain high levels of genetic diversity; involvement of local communities; and, complementary *ex situ* conservation of threatened and endangered populations.

Activities relating to the conservation of wild PGRFA were primarily supported by national institutions either as the sole source of support (51 percent) or in collaboration with others (30 percent). Limited access to information and a lack of information-sharing constrain the effective *in situ* conservation of wild PGRFA.

Insufficient cooperation among relevant institutions (often placed under different ministries) is frequently a major obstacle to *in situ* conservation. Effective and long-term *in situ* conservation requires the collaboration of relevant ministries, institutions and stakeholders and the alignment of policies, resources and expertise across different sectors and disciplines.

Core messages

Wild PGRFA are an important source of valuable nutrients and of traits for crop improvement.

With wild PGRFA diversity increasingly threatened by land-use changes, climate change and other factors, conserving CWR and WFP has become a top priority.

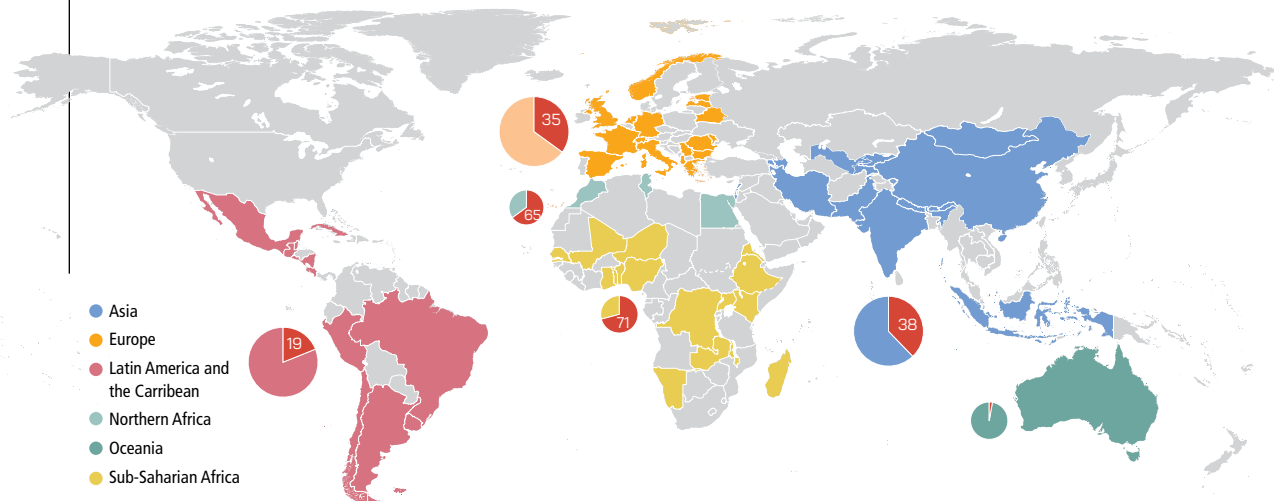
Areas of *in situ* conservation sites have increased around the globe. However, most of them do not specifically target the conservation of CWR and WFP.

Support for *in situ* conservation of wild PGRFA is provided mainly by national institutions. However, insufficient cooperation among relevant institutions and the limited availability of information associated with wild PGRFA represent two major constraints to their conservation *in situ*.

Combining *in situ* and *ex situ* strategies is crucial to the sustainable, secure, and cost-effective long-term conservation of wild PGRFA.



FIGURE 3
Regional percentages of crop wild relatives taxa identified as threatened in at least one *in situ* survey reported by countries



Notes: The size of the pie charts is proportional to the total number of crop wild relatives taxa surveyed. Refer to the disclaimer on back cover for the names and boundaries used in this map. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined. Based on 71 country reports.

What needs to be done?

- Address wild PGRFA in national strategies, including National Biodiversity Strategies and Action Plans.
- Adopt coherent policies and regulations to promote *in situ* conservation of PGRFA and increase linkages between *in situ* and *ex situ* conservation strategies and activities.
- Enhance coordination among ministries of agriculture, forestry and environment.
- Facilitate access to specific information on wild PGRFA, for example on their occurrences in protected areas, other effective area-based conservation measures, herbaria, genebanks, community seed banks and botanic gardens, via national, regional and global databases.



Managing crop diversity on-farm

Managing crop diversity on-farm is crucial for enhancing resilience to climate change, pests and diseases, while preserving traditional agricultural practices and ensuring long-term food security.

The diversity of crops on-farm is the result of farmers' continued cultivation and selection for preferred traits, such as drought tolerance, pest resistance and taste preferences. Approximately 35 million hectares in 51 countries – equivalent to 44 percent of the total crop area of reported sites within areas of high diversity – were cultivated with FV/LR. This includes more than 160 crops and 60 mixed crop groups in over 400 localities globally.

The number of programmes, projects and activities for on-farm conservation and management of FV/LR increased since 2010, totalling more than 1 100 initiatives in 81 countries. These initiatives included activities for the characterization of FV/LR, assessment of the utilization and management of local varieties and traditional knowledge for on-farm PGRFA management, and implementation of participatory plant

breeding. In addition, many countries adopted community-based approaches for managing local crop diversity, such as community seed banks. Over 600 community seed banks were reported operating in 21 countries.

Capacity development and marketing initiatives that target farmers, Indigenous Peoples and other stakeholders have been undertaken with the aim of strengthening on-farm crop diversity management.

Core messages

On-farm management of FV/LR is important to the livelihoods of many farmers around the world and contributes to the supply of ecosystem services.

FV/LR, which are primarily grown by small-scale farmers in traditional farming systems, are at risk of disappearing as a result of their continued marginalization and the abandonment of rural areas.

Community seed banks help farmers, in particular smallholder farmers, to conserve and distribute seeds to grow FV/LR.

Indigenous Peoples, farmers and local communities are increasingly involved in research and training activities to strengthen the management of crop diversity on-farm.

What needs to be done?

- Foster greater cooperation among breeders, genebanks, farmers and community seed banks to enhance the adoption of a diverse range of well-adapted quality seeds and planting materials.
- Strengthen participatory variety selection and plant breeding with farmers.
- Improve the documentation of ethnobotanical information.
- Enhance linkages between genebanks, Indigenous Peoples, farmers/landowners and local communities in order to facilitate the implementation of joint diversity assessments, community-based monitoring of on-farm diversity and targeted collecting missions to ensure safety backup in genebanks.
- Consider registration of farmers' varieties to provide a pathway towards their conservation and commercialization.

Restoring cropping systems

Restoring cropping systems is essential for ensuring sustainable food production in the face of disasters and conflict.

Over 4 000 disasters, affecting 1.3 billion people, were recorded worldwide during 2012–2019.

The agricultural sector – crop and livestock production, forestry, fisheries and aquaculture – absorbed 26 percent of the overall damages and losses caused by medium- to large-scale disaster events. This results in substantial effects on the livelihoods and nutritional well-being of affected populations.

Climatic events, mainly drought and floods, were the cause of about two-thirds of more than 400 interventions to restore cropping systems in 48 countries, through the distribution of quality seeds and planting materials to farmers and communities as part of emergency aid.

Many countries reported continued concern over the extent of crop genetic vulnerability and the need for a greater deployment of diversity in cropping systems. Awareness

increased on the importance of establishing mechanisms for monitoring genetic erosion in the wild and on-farm.

Core messages

The frequency and severity of erratic extreme weather events, the effects of civil unrest and war as well as the increasing incidence of pests and diseases, have driven a considerable rise in the demand for seed aid to restart crop production after crises.

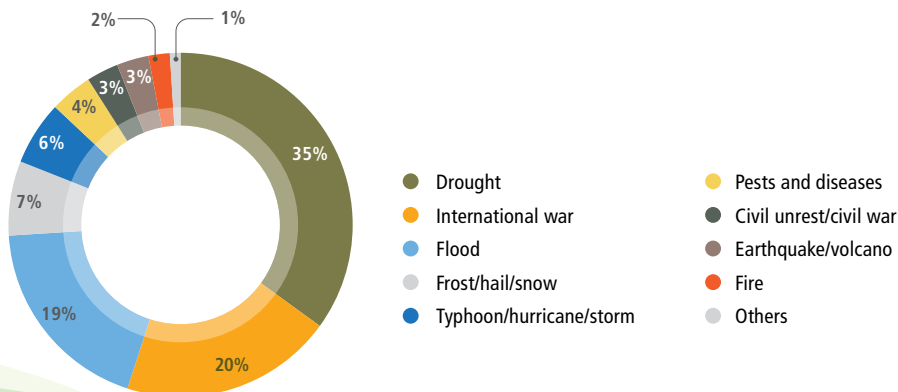
The restoration of agricultural productivity, as opposed to the restoration of crop diversity, was the primary focus of most of the interventions reported, with only a few crop species and varieties per crop selected for distribution.

What needs to be done?

- Increase efforts to undertake pre- and post-disaster assessments to determine the impacts of disasters on crop diversity.
- Promote targeted restoration of cropping systems.

FIGURE 4

Types of disasters leading to interventions to restore cropping systems, 2010–2019



Notes: Based on 48 country reports.



Safeguarding plant genetic resources for food and agriculture *ex situ*

Safeguarding PGRFA ex situ continues to represent the most significant and widespread means of conserving PGRFA.

Ex situ conservation safeguards PGRFA in a controlled environment and facilitates access to crop diversity by stakeholders. It also provides a complementary backup for material conserved and managed *in situ* and on-farm.

Germplasm collections totalling over 5.9 million accessions are conserved under medium- and long-term storage conditions in base collections of over 850 national genebanks in 116 countries (holding 84 percent of all germplasm conserved), as well as four regional and 13 international genebanks. This total represents an 8 percent increase compared to 2009. The number of botanic gardens in the world is more than 3 000, significantly more than in 2009. The expansion of *ex situ* conservation efforts has led to an increase in research on the seed physiology of wild species, which is essential for determining seed-storage protocols.

The biological status of the germplasm conserved in genebanks is documented for 72 percent of the accessions reported. The country of origin is known for approximately 70 percent of the accessions. The crop groups with the largest numbers of accessions conserved are the major food crops, including cereals, pulses, roots and tubers, and vegetables.

Most accessions are conserved as seed; less than 10 percent are in field collections and one percent *in vitro*. Cryopreservation has limited global application, though it can be a valid option for non-orthodox seeded and vegetatively reproducing species.

Core messages

Genebanks conserve an ever-increasing amount of intra- and inter-specific genetic diversity of crops and wild species. These include samples of populations of CWR and WFP, FV/LR, advanced varieties and research materials. Since 2009, global holdings of accessions increased by approximately 8 percent.

However, genebanks in many countries still suffer from poor facilities, inadequate staffing and insufficient funding, which may result in serious threats to *ex situ* collections.

Food crops account for 73 percent of all the germplasm conserved. The vast majority of this germplasm is conserved in seed genebanks, followed by field collections and *in vitro*.

Continued rationalization, driven by molecular techniques and improved information management, have resulted in progress being made with regard to unwanted duplications.

The level of safety duplicated *ex situ* accessions has significantly increased in the past few years. 43 percent of safety-duplicated accessions are stored at the Svalbard Global Seed Vault. However, some species are conserved in only one or very few genebanks without safety duplications, putting these unique collections at risk of being lost.

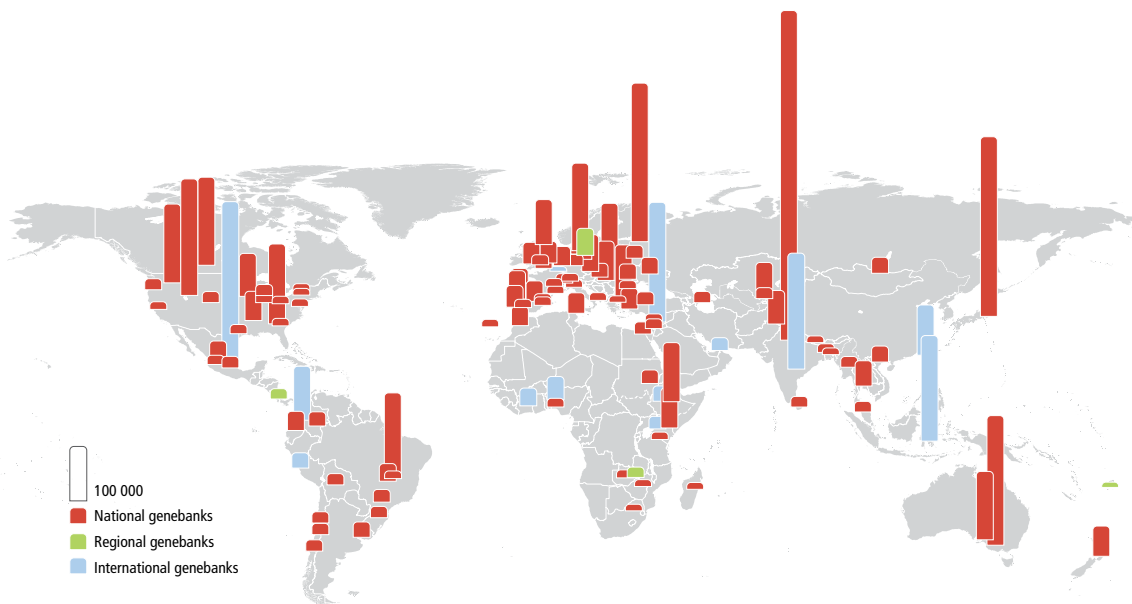
The establishment of a sustainable, long-term cryostorage backup for species that are vegetatively propagated or produce non-orthodox seeds would be desirable as the Svalbard Global Seed Vault conserves only species with orthodox seeds.



At the end of 2022, approximately 41 percent of all *ex situ* holdings were safety duplicated, a significant increase from 15 percent in 2014. Over one million accessions (43 percent of the safety duplicated holdings) were deposited at the Svalbard Global Seed Vault, demonstrating that countries are taking increasing advantage of the vault as a long-term black-box storage facility.

Continued rationalization efforts have resulted in some progress made at both the country level and within international genebanks, with a level of uniqueness of the total *ex situ* holdings estimated to be approximately 37 percent. However, some species are conserved in only one or very few genebanks, which poses a risk that failure to conserve the germplasm in these genebanks could lead to a complete loss of the conserved species.

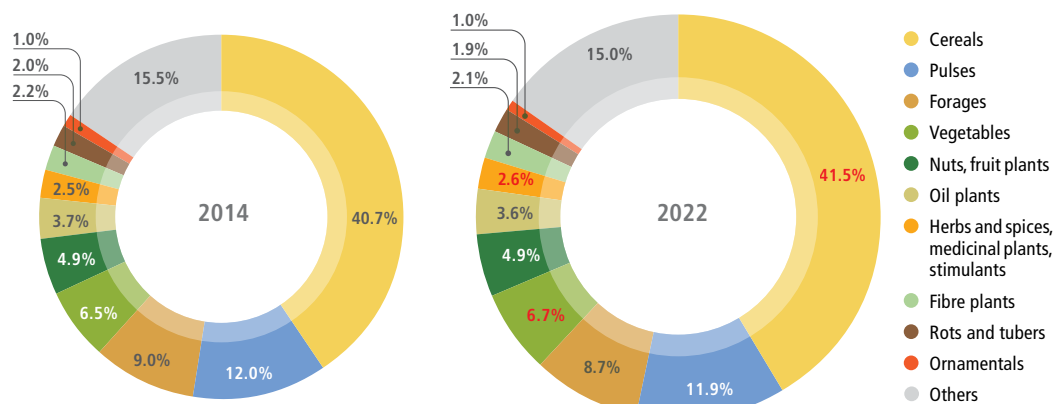
FIGURE 5
Geographical distribution of national genebanks holding more than 6 000 accessions, regional genebanks and international genebanks



Notes: The Nottingham Arabidopsis Stock Centre is not included. *Arabidopsis thaliana* is widely used as a model species for plant biology research. In 2000, it was the first plant to have its genome sequenced. Refer to the disclaimer on the back cover for the names and boundaries used in this map. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined.

Source: FAO. 2023. *World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture (WIEWS)*. [Cited 19 December 2023]. <https://www.fao.org/wiews/en/>

FIGURE 6
Contribution of crop groups to total *ex situ* collections in 2014 and 2022



Notes: Number of accessions in 2014 = 5 384 351 and in 2022 = 5 941 616. 2022 percentages that are higher than the 2014 equivalents are shown in red.

Source: Elaborated from FAO. 2023. *World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture (WIEWS)*. [Cited 19 December 2023]. <https://www.fao.org/wiews/en/>

Approximately one-third of the accessions reported by countries were regenerated between 2012 and 2019, while 24 percent are in need of regeneration. In particular, the regeneration of CWR and out-crossing species is problematic for many genebanks.

Although capacity in national genebanks globally showed progress since 2010, notable differences between and within regions persist, and many genebanks are still suffering from insufficient financial support.

Existing regional genebanks provide a model for collaboration that could support national programmes by coordinating and pooling resources for training, backup storage and collaboration on essential activities, such as viability and germplasm health testing, regeneration and characterization, including at molecular level.

TABLE 1

Direction of trends in the status of human resources, financial resources and infrastructure at national genebanks since the SoW2

| Region | Number of countries | | | | | | | | |
|---------------------------------|---------------------|----|----|---------------------|---|----|----------------|----|----|
| | Human resources | | | Financial resources | | | Infrastructure | | |
| | ↘ | = | ↗ | ↘ | = | ↗ | ↘ | = | ↗ |
| Northern Africa | 0 | 2 | 2 | 0 | 2 | 2 | 0 | 2 | 2 |
| Sub-Saharan Africa | 7 | 2 | 7 | 10 | 0 | 6 | 8 | 2 | 6 |
| Latin America and the Caribbean | 8 | 0 | 5 | 7 | 0 | 5 | 7 | 2 | 3 |
| Oceania | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| Asia | 7 | 2 | 9 | 4 | 2 | 12 | 3 | 5 | 10 |
| Europe | 5 | 6 | 9 | 3 | 2 | 15 | 3 | 6 | 11 |
| World | 28 | 12 | 32 | 25 | 6 | 40 | 21 | 17 | 33 |

Notes: ↗ indicates increased capacity in 2019 as compared to 2010; = indicates no change in capacity; ↘ indicates decreased capacity.

What needs to be done?

- Ensure long-term financial stability to facilitate proper planning and adequate staffing of genebanks and other *ex situ* conservation activities.
- Increase capacity and technical expertise in critical subjects such as botany, plant taxonomy, plant ecology, conservation and population genetics, physiology, pathology, statistics and informatics.
- Encourage national genebanks to develop and implement standard operating procedures and quality management systems that define in detail how these operations should be carried out.
- Promote the regeneration of germplasm as it remains a key challenge for many countries and genebanks due to technical constraints, lack of properly trained staff, insufficient funding and poor infrastructure.
- Advance the adoption of genebank management information systems as many countries still struggle to document passport and other genebank management data.
- Foster increased cooperation among genebanks and institutions involved in the conservation and sustainable use of PGRFA at the national, regional and international levels to strengthen human and technical capacity and share facilities and knowledge.



Increasing the use of plant genetic resources for food and agriculture

Increasing the use of PGRFA is vital for food security, enhancing crop productivity, adapting to environmental changes and ensuring sustainable agrifood systems.

Considerable progress has been made in the sustainable use of PGRFA, in particular through germplasm characterization, pre-breeding (broadening the genetic base of crops), plant breeding, the utilization of locally adapted varieties and underutilized species, the release of crop varieties and seed delivery systems, and the promotion of diverse cropping systems.

Since 2010, almost 800 000 germplasm accessions in national collections have been characterized for an average of 24 traits. The increase in the number of accessions characterized also resulted in a significant development of thematic collections for traits of interest, facilitating a better understanding and improved exploitation of germplasm collections.

Over 350 national research organizations from 76 countries reported the use of pre-breeding (introgression of novel traits from non-adapted materials into breeding populations) for a total of 322 crop species. Recent advances in biotechnologies, especially next-generation sequencing and high-throughput phenotyping, are increasingly utilized to enhance efficiencies in germplasm characterization and evaluation. An overall increase in the adoption of DNA

marker technologies for the assessment of genetic variation was reported in all regions.

However, the technology gap is widening. While developed countries increasingly apply modern technologies, most developing countries are lagging behind due to a lack of capacity and financial resources.

Core messages

Knowledge and use of germplasm collections have overall improved following a significant increase in the number of accessions characterized and the identification of collection subsets.

Biotechnologies, such as genome sequencing, selection and editing, are increasingly applied, though they remain too costly for regular use in crop breeding by many national programmes. While pre-breeding activities were reported by all regions, they are yet to become a routine crop improvement strategy, therefore affecting/limiting breeding potentials.

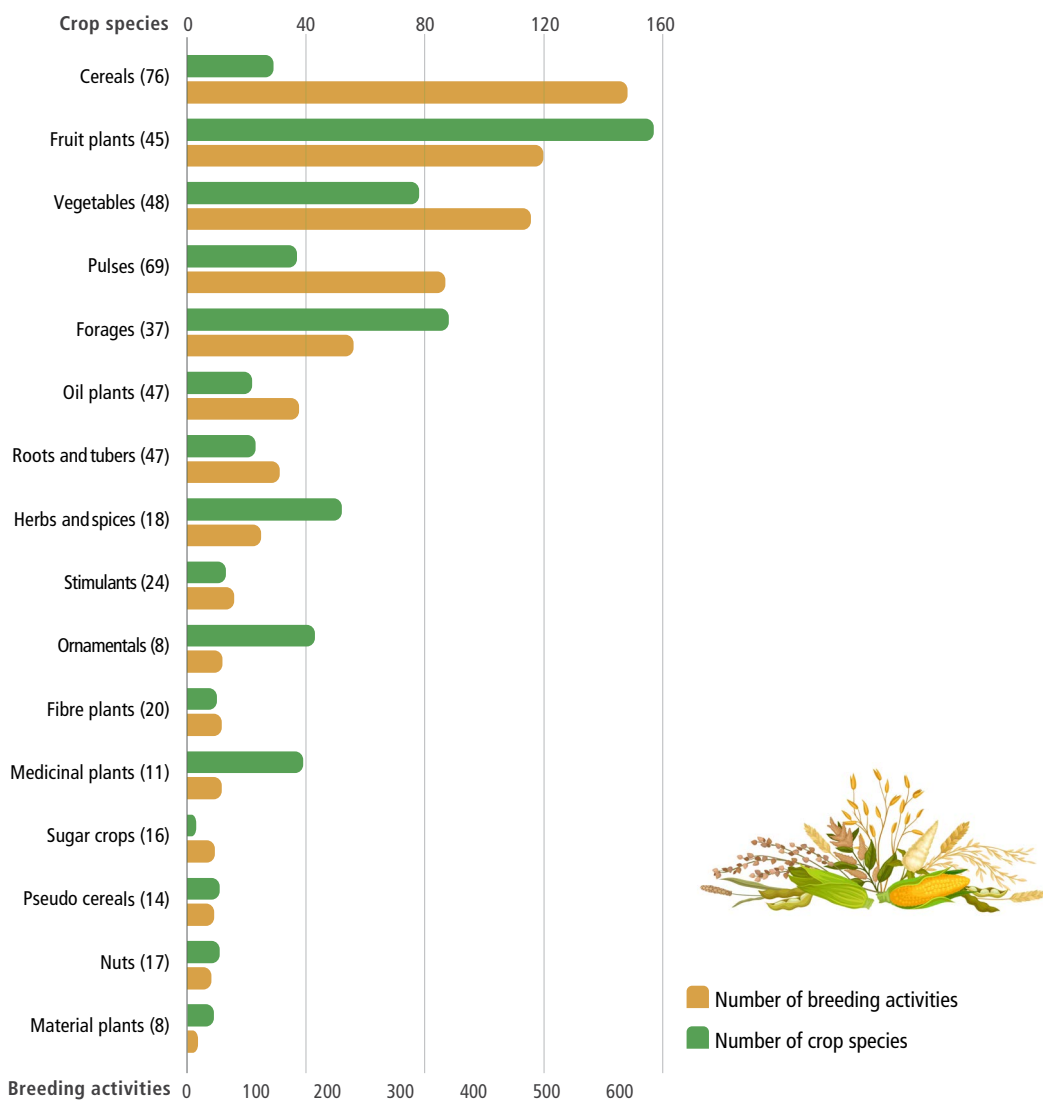
Diversity in crop production systems has increased through mixed cropping and crop rotation, introduction of new crops, re-introduction of crops and domestication of wild species.

Crop improvement and efficient seed delivery systems remain key to leveraging plant genetic diversity for food security.

The cost of quality seeds of suitable crop varieties remains an important constraint to their wider application in most developing countries.



FIGURE 7
Number of breeding activities and number of crop species targeted, 2014–2019, by crop group



Notes: The number of countries reporting each crop group is shown in parenthesis after the name of the group. Based on 87 country reports.



Breeding activities were reported for almost 500 crop species across all major crop groups. While yield continues to be the prioritized trait in crop breeding programmes, resistance to biotic and abiotic stresses – especially as a climate change adaptation strategy – and quality traits for enhanced nutrition, are more frequently cited as breeding objectives than in the past.

Mixed cropping and crop rotation, introduction of new crops, re-introduction of crops and domestication of wild species were undertaken to increase diversity in crop

production systems. Nearly 1 400 programmes addressing FV/LR and underutilized crops were implemented, focusing on research, crop improvement, processing, seed distribution, market and policy development, and public awareness.

The global seed market increased in value from USD 36 billion in 2007 to more than USD 50 billion in 2020. Forty countries, more than two-thirds of which were developing countries, reported improvements in their seed systems, facilitating farmers' adoption of the most suitable crop varieties.

What needs to be done?

- Increase access to biotechnologies and promote collaboration, capacity building and technology transfer to maximize benefits from the use of PGRFA diversity in all countries.
- Enhance access to characterization and evaluation data through improved information and data management systems.
- Identify trait-specific subsets to enhance the use of PGRFA in research and plant breeding.
- Develop and implement national policies and legal frameworks that address the improvement and commercialization of FV/LR and underutilized species.
- Create targeted policies and incentives to reduce the high cost of quality seeds of suitable crop varieties.



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Building sustainable institutional and human capacities

The conservation and sustainable use of PGRFA require building sustainable institutional and human capacities, involving policy, legislation, infrastructure, education and networking.

Strong institutions and adequate capacity are essential for the effective conservation and sustainable use of PGRFA. Well-designed national programmes allow policymakers to set clear goals and priorities and to effectively allocate resources, assign roles and responsibilities, and identify and strengthen linkages among relevant actors.

Since 2010, incremental progress has been made in the establishment and strengthening of national programmes, as well as the development of strategies to guide their operations. The development of National Biodiversity Strategies and Action Plans has been identified as a catalyzing factor in this regard. However, only less than half of the countries reported progress in the development of PGRFA-specific strategies or relevant legislation.

Education and training opportunities, particularly at the secondary school level, have increased slightly since 2010. A significant increase was observed in the number of personnel working in key institutions with higher levels of educational qualifications, typically at the master and doctoral levels.

Core messages

Human and institutional capacities to use and conserve PGRFA have increased since 2010. Progress, however, has been uneven across the different areas of conservation and use of PGRFA, as well as across regions and countries.

Several countries have developed strategies to guide the operations of national programmes, although in many cases these strategies address biodiversity as a whole and their focus on PGRFA is sometimes vague or limited.

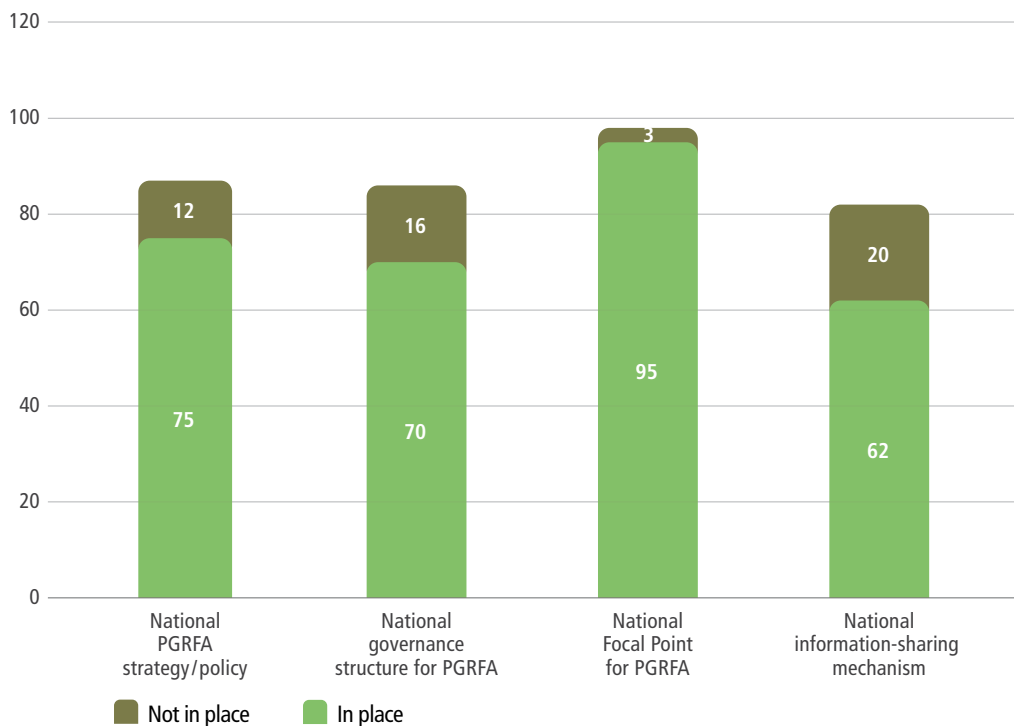
Strengthening human and institutional capacities remains essential for the effective conservation and sustainable use of PGRFA and requires close coordination with the implementation of relevant instruments, such as the International Treaty and the rolling Second GPA, the Sustainable Development Goals and the Kunming-Montreal Global Biodiversity Framework.

Awareness-raising activities increased, resulting in an improved public understanding of the complexities of the management of PGRFA. However, very few countries have national communication strategies and targeted public-awareness programmes on the value of PGRFA and the threats affecting them, which reduces the scope and sustainability of the existing efforts.





FIGURE 8
Number of countries with elements of national plant genetic resources for food and agriculture programmes in place

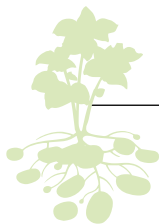


Note: Based on 98 country reports.

In addition to educational institutions, other stakeholders, such as botanic gardens, genebanks and seed networks, contributed to strengthen capacity of national programmes. Cooperation among universities, networks, research institutes, and regional and international genebanks also improved, leading to joint educational

and research activities in 43 percent of reporting countries. The increased use of online tools and platforms, coupled with the development of several innovative teaching materials – including videos and e-learning resources – enhanced participation in training programmes from remote locations.





Over 90 percent of reporting countries are members of networks for the management of PGRFA. These networks remain important hubs of activities for promoting the conservation and sustainable use of PGRFA, and the important benefits of international collaboration are widely recognized among stakeholders. For example, a large number of publications have been produced through participation in these networks.

Decision-makers, civil society and farming communities have become more aware of the importance of PGRFA and their associated challenges. Greater attention is given to the importance of conserving local crop diversity by promoting the diversity of native varieties, as well as local seeds and traditional food products and their nutritional value.

New actors with strong linkages to Indigenous Peoples, farmers and local communities – such as civil society

organizations, social movements and seed networks – increasingly participate in the dissemination of information. The use of digital and social media platforms has expanded the reach of information dissemination on PGRFA to a much broader audience, including young people.



What needs to be done?

- Improve the coordination of PGRFA initiatives, ensuring they are better integrated into national programmes and strategies, rather than relying on ad hoc, time-bound projects.
- Strengthen academic institutions and develop educational programmes on plant breeding, genetic improvement and biotechnology in all regions, with targeted training courses developed on all technical and legal aspects of PGRFA.
- Ensure a younger generation of professionals is available to replace retiring experts in many countries, with efforts to build sufficient capacity and transfer knowledge.
- Promote greater collaboration and partnerships within and among national higher education institutions, research centres, networks and international institutions.
- Develop and continuously update national communication strategies and targeted public-awareness programmes on the value of PGRFA and the threats affecting them.





IR64
International Rice Research Institute
NÔNG DÂN 1

IR64



Information systems and monitoring mechanisms

Effective information systems are critical for managing PGRFA, ensuring informed decision-making and enhancing the accessibility, sharing and integration of data across platforms.

International information systems have expanded and proliferated. Cross-platform interoperability and data-sharing initiatives have been further advanced.

Despite the increasing availability of improved open-source software for genebank data management, many countries still lack genebank management information systems and struggle to document passport and other genebank management data.

The application of digital object identifiers has continued to provide opportunities to improve efficiencies in tracing germplasm through research publications. Increasingly, partnerships and connections have been developed and strengthened for the sharing of information.

The UN General Assembly's adoption in 2017 of Sustainable Development Goal indicator 2.5.1.a on *ex situ* conservation stressed the key role of genebanks in preserving PGRFA and fostered country reporting and dissemination of standardized information.

Only a few countries have a national system in place for monitoring and safeguarding genetic diversity and minimizing genetic erosion. To varying degrees, countries mainly monitored the state of conservation of their PGRFA conserved *ex situ* and to a lesser extent *in situ*.

Monitoring activities were often just part of individual research projects and did not form part of wider, more comprehensive programmes. Awareness increased on the importance of establishing mechanisms for monitoring genetic erosion, especially as part of *in situ* conservation approaches.

Core messages

International information systems have expanded and proliferated, with cross-platform interoperability and data-sharing initiatives further advancing.

The use of digital object identifiers has improved efficiencies in tracing germplasm throughout research publications.

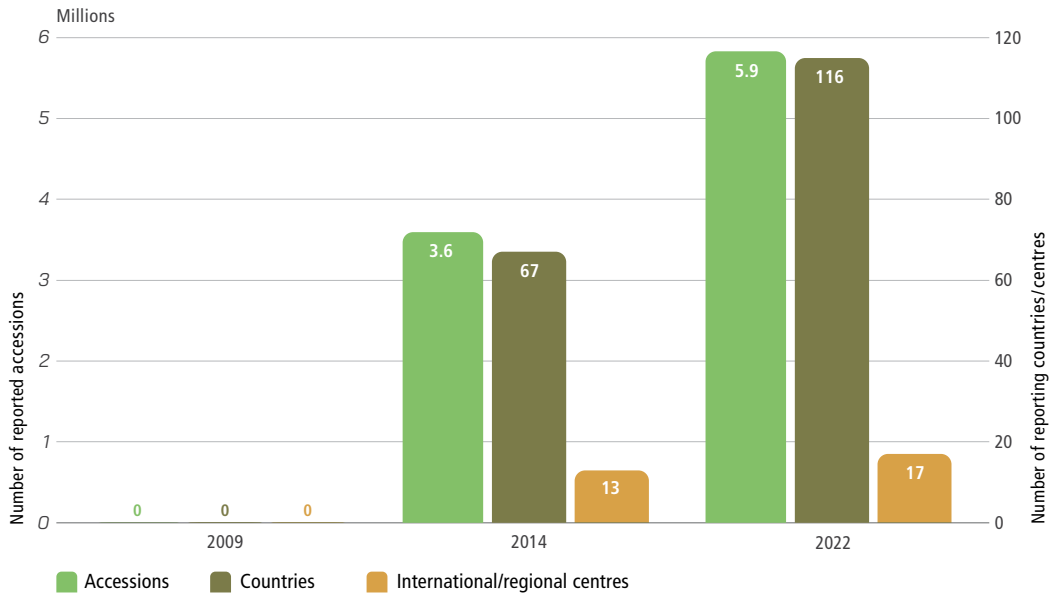
Many national genebanks still lack an operational information management system for PGRFA and a significant amount of data, particularly characterization and evaluation data, are not readily available or publicly accessible, due mainly to suboptimal information and data management systems.

Documenting the geographic distribution of wild PGRFA and FV/LR - required for systematic monitoring and inventory, including of associated traditional knowledge - remains an unattained objective in all countries.

Lack of knowledge and standardized methodologies on assessing genetic diversity have constrained the establishment of baselines, which are important for assessing trends and identifying conservation priorities.

FIGURE 9

Accession-level reporting to World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture (WIEWS) on *ex situ* holdings, 2009–2022



Sources: FAO. 2017. *Assessment of the implementation of the Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture 2012–2014*. FAO Commission on Genetic Resources for Food and Agriculture. Rome. <https://openknowledge.fao.org/handle/20.500.14283/mr796e>; FAO. 2023. *World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture (WIEWS)*. [Cited on 19 December 2023]. <https://www.fao.org/wiews/en/>

What needs to be done?

- Address the challenge of data standardization to ensure consistency and compatibility across systems.
- Prioritize the documentation of traditional knowledge on PGRFA, as this is a major gap.
- Develop and implement monitoring mechanisms for genetic erosion, especially in the context of *in situ* conservation in countries and regions.
- Continue efforts to improve the interoperability of existing information systems through shared, open standards.
- Enhance technical capacity in information management, taxonomy and bioinformatics, as well as digital infrastructure, particularly for genebanks, and funding, to ensure the use and effectiveness of information systems.



The way forward

Despite astonishing progress achieved in science and technology over the past 100 years, global food security and adequate nutrition for all remain unaccomplished, while unprecedented environmental changes are increasingly challenging the resilience of agricultural systems.

Plants provide 80 percent of the world's food, yet less than 10 major crops dominate global crop production. There are, however, over 6 000 important plant species that are cultivated locally or even regionally that could be used to diversify crop production and food systems and make them more resilient. Moreover, there are many wild plant species that have the potential to be used for food, feed or industrial purposes. The recent advances in information management and biotechnologies offer unprecedented opportunities to accelerate, like never before, this transformation towards realizing food security and improving agricultural livelihoods, while minimizing the risks of crop diversity erosion.

The conservation and sustainable use of PGRFA has never been more necessary. Countries must rise to the occasion through appropriate policies and strategies that promote comprehensive, integrated and sustainable systems for conservation and use of PGRFA. These will need to be implemented through enhanced technical capacities and infrastructure, effective collaboration and reliable funding mechanisms. Incentives and opportunities should be considered to ensure a new generation of farmers, scientists and technical experts. Facilitated access to PGRFA will continue to be critical to foster use by farmers, plant breeders and researchers, and to address limitations to crop production. Public awareness remains crucial to mobilize public opinion and policymakers in order to secure support for the conservation and sustainable use of PGRFA and to ensure their availability for global food security and future generations.

“ Strengthening the conservation and sustainable use of PGRFA is not just an agricultural priority – it is a fundamental necessity for ensuring a more sustainable, resilient and food-secure future for all. ”

QU Dongyu,
FAO Director-General





The *Third Report on the State of the World's Plant Genetic Resources for Food and Agriculture*, based on information gathered from 128 countries and 17 international and regional centres, provides a comprehensive overview of recent developments in the conservation and use of plant genetic resources for food and agriculture worldwide. It documents the current state of diversity, conservation and use, as well as the extent and role of national, regional and international efforts that underpin the contributions of plant genetic resources for food and agriculture to food security. The Third Report highlights the key changes that have occurred in the sector between 2012 and 2022, and identifies gaps and needs that remain for setting future priorities.

This In Brief provides a snapshot of the main changes and urgent needs in managing, safeguarding and using plant genetic resources for food and agriculture. It also highlights the importance of national and international collaboration in enhancing the role of plant genetic resources for food and agriculture in supporting global food security. It is a valuable reference document for evidence-based policymaking towards the improved conservation and sustainable use of these valuable resources, at national, regional and international levels.

Full report at: <https://doi.org/10.4060/cd4711en>

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