

National Germplasm Programmes

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re plant genetic resources?

- “ Plant genetic resources for food and agriculture means any genetic material of plant origin of actual or potential value for food and agriculture.
- “ Genetic material means any material of plant origin, including reproductive and vegetative propagating material, containing functional units of heredity.
- “ Recognized as a natural resource similar to mineral, oil, soil and water



es of plant genetic resources?

- “ Modern cultivars
- “ Breeding lines and genetic stocks
- “ Landraces and Farmers’ varieties
- “ Obsolete cultivars
- “ Wild relatives
- “ Weedy races
- “ Potential domesticates or other wild species
- “ Biotechnological cell lines/GMOs



Importance of Plant Genetic Resources



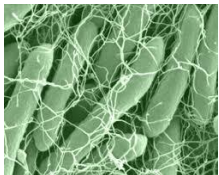
- Agricultural crops / varieties *per se*
- Raw materials for crop improvement
- Species diversity and ecological stability
- Storehouse of genetic variability
- Diversification of cropping and farming systems
- Adaptation to changes in climate
- Food, nutritional and environmental security



of Plant sources : Global & Indian

Number of species

Taxa	India	World	Percentage
Bacteria	850	4000	21.25
Algae	6,500	40,000	16.25
Fungi	14,500	72,000	20.14
Lichens	2,000	17,000	11.80
Bryophyta	2,850	16,000	17.80
Pteridophyta	1,100	13,000	8.46
Gymnperms	64	750	8.53
Angiosperms	17,500	250,000	7.0
Total (Biodiversity)	126,656	1,719,183	7.36



of Origin & Centre of Diversity

NI Vavilov (1926), a Russian Botanist coined the terms of center of diversity and center of origin

Center of Origin

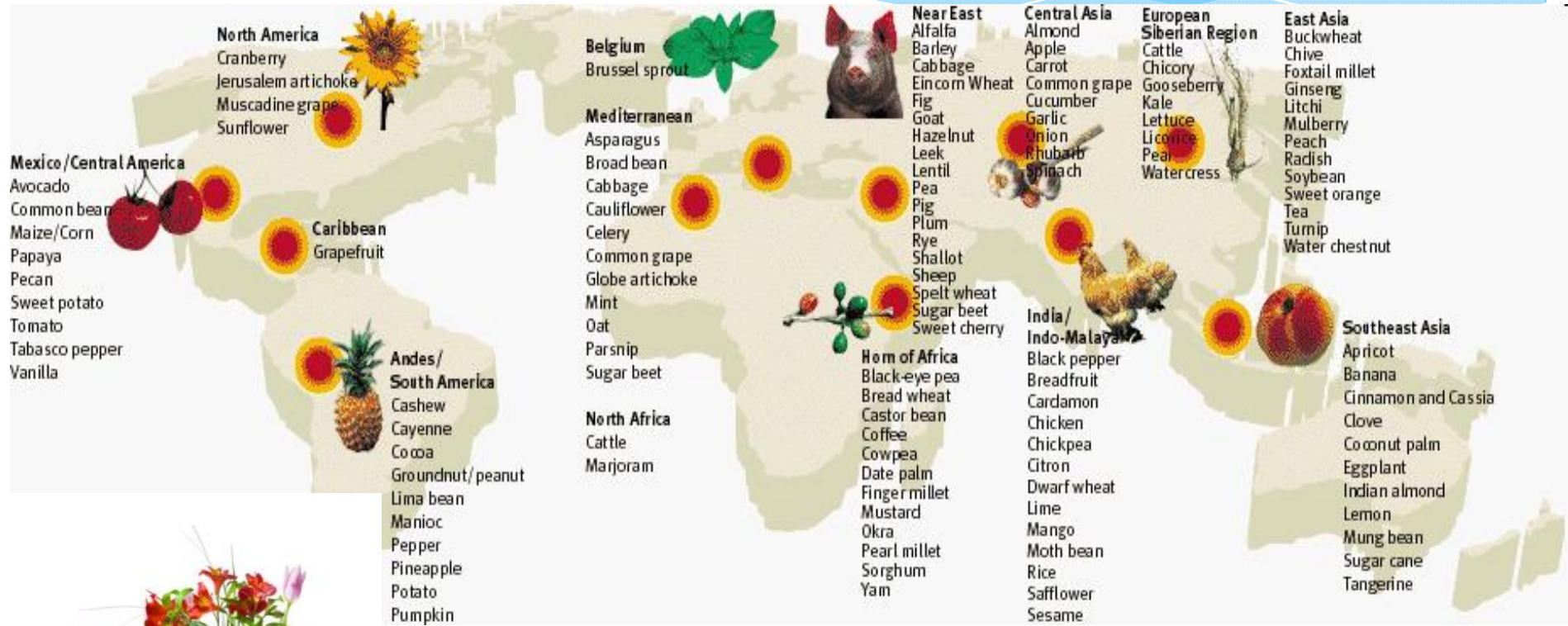
- “ Primary Centres of Origin
 - “ Areas where crop plants were domesticated
- “ Secondary Centres of Origin
 - “ areas where variation continued after domestication



Center of Diversity

Area where vast genetic diversity existed for a cultivated crop species

Domestic Animals and Plant Species



Centers of Diversity

- Chinese Centre: Soybean, millet, sesame, oats
- * Indian Centre: Rice, sugarcane, arboreum cotton, chickpea
- * Indomalayan centre: banana, coconut
- * Central Asiatic Centre: Wheat, flax, lentil, pea
- * Near Eastern Centre: Alfalfa, barley, melon
- * Mediterranean Centre: Durum wheat, lettuce, cabbage
- * Ethiopian Centre: barley, chickpea, pea, lentil, sesame, tetraploid wheat
- * South Mexican and Central American Centre: bean, corn, upland cotton,
- * South American Centre: Sea-island cotton, potato, tomato, tobacco
- * Chiloe Centre: Potato
- * Brazilian-Paraguayan: Peanut, pineapple, rubber

A gene rich centre of PGR

- * 17,500 species of higher plants
(About 29% of flowering plants are endemic)
- * 5,000 total economically useful species
- * 583 crop species cultivated
- * 166 crop species of Hindustani Centre
- * 334 wild relatives of crop species
- * 1,000 wild edible plant species

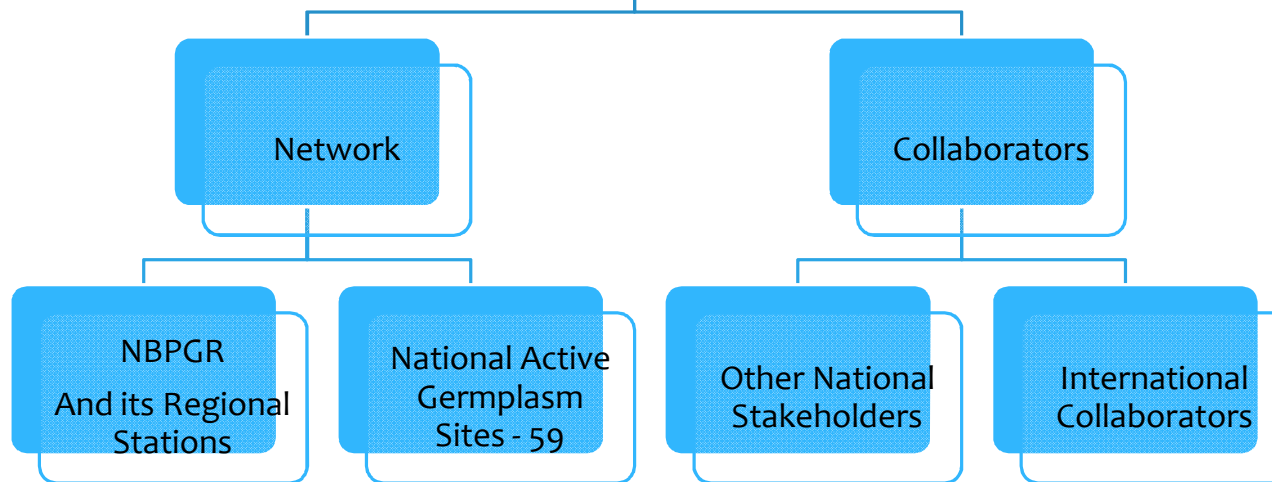


Genetic resources management system



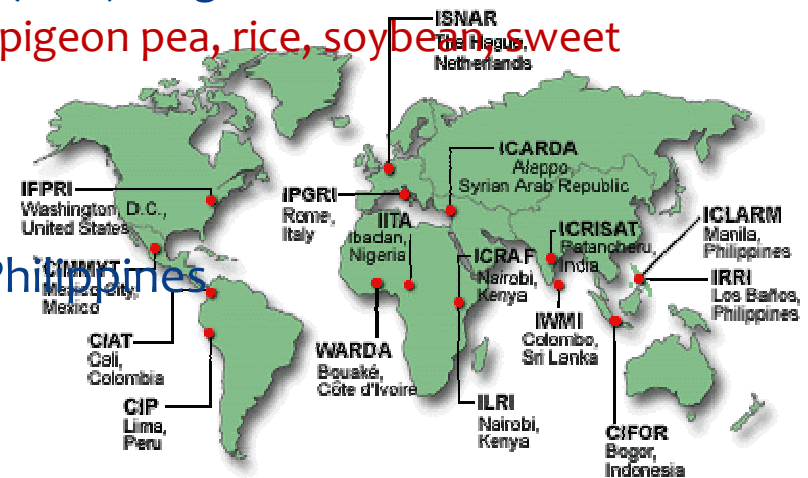
The umbrella
DARE/ICAR

The Nodal
Organization
NBPGR



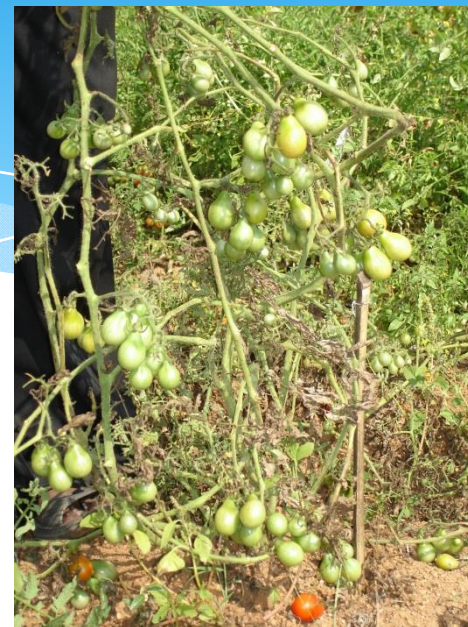
Organizations engaged in plant breeding

- * Asian vegetable Research and Development Center (AVRDC), Taiwan
 - * Cabbage, Pepper, tomato, soybean & Mung bean
- * International center for Agriculture Research in Dry Areas (ICARDA), Syria
 - * Barley, Chick pea, faba bean, tropical forages, lentil & wheat
- * International center for wheat and maize Improvement (CIMMYT), Mexico
 - * Maize, triticale and wheat
- * International center for Tropical Agriculture (CIAT), Colombia
 - * Dry beans, cassava, rice and tropical forages
- * International Crop Research Institute for the Semi Arid Tropics (ICRISAT), India
 - * Chickpea, millet, peanut, pigeon pea and sorghum
- * International Institute of Tropical Agriculture (IITA), Nigeria
 - * Cassava, cocoyam, cowpeas, lima bean, maize, pigeon pea, rice, soybean, sweet potato, winged bean and yam
- * International Potato Center (CIP), Peru
 - * Potato and sweet potato
- * International Rice Research Institute (IRRI), Philippines
 - * Rice



Genetic Germplasm Resources

- ❑ Before the CBD, GR were considered as the “heritage of mankind” and were freely available to all.
- ❑ After the enforcement of CBD in 1993, the national sovereign rights of countries to their biological wealth as well as to contributions of indigenous communities for the knowledge about conservation, were recognized.
- ❑ The provisions of CBD have strengthened the rights of country of origin.
- ❑ This has led to a whole lot of new international developments with a debate on access and utilization of GR.
- ❑ During the last two decades, many treaties, laws, and conventions have changed the way GR are collected, evaluated, conserved, exchanged and utilized.



GR Management Programmes

- ❑ Research and development, teaching and training of all aspects of GR is mandated ICAR through its network of institutions.
- ❑ In 2010, the ICAR constituted a high level 'National Advisory Board on Management of Genetic Resources (NABMGR)' to advice on issues related to efficient management of GR.
- ❑ NBPGR, NBFGR, NBAGR, NBAII, NBAIM are five National Bureaux acting as nodal organizations for GR Management under ICAR
- ❑ NABGR directed all the Bureaux to prepare guidelines for management of respective GR

Bureau of Plant Genetic Resources

NBPGR . Historical perspective

- Dr B P Pal initiated PGR activities with the formation of **Plant Introduction** activity in the Division of Botany at IARI in 1946
- It was further expanded under Dr Harbhajan Singh in 1956 as **Plant Introduction and Exploration**
- Established as a separate Division in 1961 and as a separate Institute in 1976
- Rechristined as NBPGR in 1977



ent of Germplasm Resources

1. [Shimla](#): Established in 1960 at Phagli, Shimla. Station's mandate is the collection, evaluation, characterization and maintenance of temperate crops.
2. [Jodhpur](#): Established in 1965, in the CAZRI Campus. Mandate is exploration, evaluation and seed increase for agri-horticultural crops of arid, semi-arid zones.
3. [Thrissur](#): Established in 1977. Responsible for collection and evaluation of germplasm of peninsular region with particular emphasis on spices and plantation crops.
4. [Akola](#): Established in 1977. Responsible for exploring Maharashtra, Karnataka, Goa, Daman and Diu. It also undertakes evaluation and maintenance of crops suited to Central India and Deccan Plateau.
5. [Shillong](#): Established in 1978. Involved in collection and evaluation of PGR of North-Eastern region including Sikkim and parts of northern Bengal.
6. [Bhowali](#): Established in 1985. Responsible for exploration, characterization, evaluation and multiplication of PGR sub-tropical and sub-temperate regions.
7. [Cuttack](#): Established in 1985 in CRRI Campus. The mandate is exploration for PGR in Eastern peninsular region with main emphasis on rice germplasm.
8. [Hyderabad](#): Established in 1985. Engaged in speedy repatriation of pest and pathogen-free material as well as quarantine clearance of germplasm. Undertakes exploration, evaluation and seed increase for agri-horticultural crops of Andhra Pradesh and adjoining areas.
9. [Ranchi](#): Established in 1988. A centre for evaluation and maintenance of germplasm of tropical fruits and other field crops of Bihar, eastern Uttar Pradesh and Wst Bengal.
10. [Srinagar](#): Established in 1988. Responsible for exploration, collection and maintenance of agri-horticultural germplasm of temperate crops of J & K region.

ent of Germplasm Resources

1. Germplasm Exploration
2. Germplasm Characterization & Evaluation
3. Germplasm Exchange
4. Plant Quarantine
5. Germplasm Conservation
6. Documentation

on and Germplasm Collection

1. Planning Exploration & Collection Mission

“ Collection pre-requisites etc

2. Collection Procedure

“ Sampling, Sampling procedure, propagules & collection time, Transportation etc.

3. Post Collection Handling

“ Seed extraction, cleaning, drying, packaging, sharing, taxonomic identification, multiplication, conservation, etc.

4. Recording Information and Documentation

“ Passport data, additional information, mission report, accessioning and documentation etc.

5. Dos & Don'ts



ons carried out by NBPGR in India

Collections until 2013: Total of 2, 62,255
Cultivated: 1,98,595
wild species: 32,425
Total explorations: 2,543

Crop-group wise Collections

1. Cereals: 57,926
2. Pseudocereals: 6,742
3. Millets & minor millets: 21,334
4. Vegetables: 50,863
5. Pulses: 39,268
6. Oilseeds: 24,414
7. Fruit crops: 12,902
8. Fibres and allied crops: 4,957
9. Fodder species & grasses: 1,904
10. Medicinal and aromatic plants
(M&AP)/spices and condiments:
26,428
11. Sugar yielding species: 1,229
12. Other economic species: 14,308

National Herbarium of
Cultivated Plants (NHCP) holds
20,991 herbarium specimens
(representative of 3,962 species
belonging to 1,466 genera and
265 families), 3,007 seed
samples and 633 economic
products.

Carried out by NBPGR in other countries

Number of species

Year	Crops	No of collections	Country
1977-78	Winged bean, velvet bean, green gram	84	Indonesia (Java)
1977-78	Almond, walnut, filbert, cucurbits, <i>Capsicum</i> , tomato	152	USSR (Central Asian Republics)
1979-80	Deep water rice and legumes	330	Mali & Nigeria
1979-80	Rice, grain legumes, millets, vegetables	2900	Nigeria & West Africa
1980	Rice, maize, pearl millet, sorghum, vegetables & tuber crops	1799	Malawi & Zambia
1989-93	Okra, eggplant and their wild relatives	4665 (India), 381(Bangladesh), 182(Sri Lanka)	India, Nepal, Sri Lanka & Bangladesh
1991	Sunflower	144	USA
1991	Sesame & wild relatives	1998 (India), 70 (Bangladesh)	India & parts of Bangladesh

Gen Exchange – Import of Germplasm

Statutory Framework

- “ **Import Permit, Phytosanitary certificate etc are mandatory**
- “ **Director, NBPGR is designated Permit Issuing Authority for import of germplasm, transgenics/genetically modified organisms (GMOs) for research/experimental purpose by public/private sector institutions**
- “ **Private organizations/seed companies requesting for IP must be certified R&D organizations (DSIR recognition)**
- “ **The IP for Transgenics/GMOs by NBPGR is subject to prior approval of Review Committee on Genetic Manipulation (RCGM) of the Department of Biotechnology**

Gen Exchange – Import of Germplasm

Indenter to meet the requirements . Under Para 4 of DBT
Import clearance

- ” No transgenic material is permitted for experimentation without prior authorization from Government of India.
- ” Full account of the transgenic plants raised from the imported seeds would be kept in a bound book, which should be available for inspection by the authority in case such a need arises.
- ” All transgenic material preserved by the indenters should be available for inspection, whenever required.
- ” All the unwanted transgenic material should be destroyed by burning after the experiments have been conducted.
- ” For any use of transgenic material for propagation in the open environment, the indenter will make a separate application to RCGM through Institute Biosafety Committee (IBSC).

Gen Exchange – Export of Germplasm

Statutory Framework

- “ Access to all biological resources of India is governed by the **Biological Diversity Act (BDA), 2002**, under the Ministry of Environment and Forests, **GOI**
- “ As per provisions of Section 3 of the BDA *“no person from outside India or a body corporate, association, organization incorporated or registered in India having non-Indian participation in its share capital or management, can access any biological resources or knowledge associated, for research, commercial utilization, bio-prospecting or bio-utilization, without prior approval of National Biodiversity Authority (NBA)”* (www.nbaindia.org).
- “ Accordingly, person(s) who shall be required to take the approval of the **NBA** are the following:
 - (a) a person who is not a citizen of India
 - (b) a citizen of India, who is a non-resident (as defined in clause (30) of section 2 of the Income Tax Act, 1961);
 - (c) a body corporate, association or organization
 - (i) not incorporated or registered in India; or
 - (ii) incorporated or registered in India under any law for the time being in force which has any non-Indian participation in its share capital or management..

Gen Exchange – Export of Germplasm

Statutory Framework

As per Section 5 of BDA 2002, exchange of germplasm for collaborative research projects under the bilateral/multilateral agreements, which conform to the Central Government Guidelines made in this regard and approved by the Central Government (*Annexure IX*) are exempted from the above.

This section includes Government sponsored institutions of India and such institutions in other countries, engaged in collaborative research projects. A copy of the approval from the Central Government along with all relevant details needs to be submitted to the NBA, prior to exchange of germplasm. In such cases, approval for export of PGR is given by the Department of Agricultural Research and Education, Ministry of Agriculture.

Genetic Exchange – Export of Germplasm

Categories of germplasm export

NBPGR facilitates export of plant germplasm (for research, breeding and conservation) in the following three categories, subject to approval from appropriate agency:

- Category 1 Export of germplasm not covered under any collaborative research project with research institutes/counter parts, public-private transfer, private entities (Indian Citizen/Non-Indian), as per Section 3 (2) of BDA, 2002.
- Category 2 Export of germplasm under collaborative research projects/work plans, under Section 5 of BDA, 2002.
- Category 3 Export of germplasm of Annex I crops under the ITPGRFA.

The consignment for export received at NBPGR should be registered and all details (crop name, no. of packages and the source country) should be documented.

Germplasm Exchange – Domestic supply

- “ Requests for germplasm available/maintained by NBPGR/NAGS should be sent to the Director, NBPGR, Pusa Campus, New Delhi, in a requisition form (GEX 01, *Annexure XI*) along with a signed MTA (*Annexure XII*) by the indentor or germplasm. The GEX 01 and MTA can be downloaded from NBPGR website (www.nbpgr.ernet.in).
- “ Acknowledgement of receipt of germplasm from NBPGR should be provided by the indentor immediately after receipt of material.
- “ Feedback information (in the prescribed format) on the performance or utilization of material must be sent to Director, NBPGR, New Delhi (*Annexure XIII*).
- “ Whenever indicated, sufficient quantity of multiplied seed must be sent to back to NBPGR at the earliest.

Gen Exchange – Significant Exchange

Germplasm introductions that have had tremendous impact on Indian agriculture

1. Wheat varieties namely Ridley from Australia, Lerma Rojo and Sonora 64 from Mexico
2. Rice varieties 1R 8, IR 20, IR 36, IR 50 from Philippines
3. Oat varieties namely Kent from Australia and Rapida from USA
4. Pea varieties: Bonneville and Early Badger from USA, Arkel from UK
5. Cowpea varieties: Pusa Barsati from Philippines and Pusa Phalguni from Canada
6. French bean varieties: Kentucky wonder from USA, Contender from USA
7. Soybean varieties: Bragg and Lee from USA
8. Sunflower varieties: Peredovik from erstwhile USSR
9. Tomato varieties: Sioux USA and La Bonita from USA, Dwarf Money maker from Israel
10. Onion varieties: Pusa Ratnar and Early Grano from USA
11. Cabbage varieties: Pusa drumhead and press from USA

During 1976-2013, Introduction of PGR was facilitated from more than 147 countries and several International Agricultural Research Centres (IARCs).

During this period 28,46,039 samples of seed/planting were imported and 7,55,457 samples were exported to different countries while 4,40,174 samples of various crops were supplied to various users in different institutes/ organizations across the country

Conservation of Germplasm

Conservation of germplasm is one of the most important activities in PGR management. To ensure availability of maximum genetic diversity, a complementary approach involving *ex situ* and *in situ* conservation is currently advocated.

The table below provides an overview of the options for *ex situ* conservation of PGR, based on

Type of conservation	Conditions	Categories	Storage Form
Seed genebank	Low temperatures, usually -18 to -20°C (long-term storage) or 4 - 10°C (medium-term storage)	Species producing orthodox seeds	Seeds, that are dried to low moisture content without loss of viability
<i>In vitro</i> genebank	Ambient temperatures, $25 \pm 3^{\circ}\text{C}$ (short-term storage) or low temperatures of 4 - 15°C (medium-term storage)	Species which do not produce seeds, or if they do, produce few seeds (threatened, wild and/or endemic species); species which are propagated vegetatively or as clones; species that produce non-orthodox seeds; species that require a long life cycle to generate breeding and/or planting materials	Tissue cultures (plantlets, shoot cultures, somatic embryos, root cultures, meristem cultures, embryogenic callus cultures, cell suspensions) which may be active or slow growing

Conservation of Germplasm

The table below provides an overview of the options for *ex situ* conservation of PGR, based on

Type of conservation	Conditions	Categories	Storage Form
Cryogenebank	Ultra-low temperatures, ranging from -130 to -196°C (using liquid nitrogen)	As in previous case	Seeds, embryos, embryonic axes, buds, shoot tips, meristems, pollen, cell suspensions, DNA
Field genebank including clonal repository	Ambient temperature and conditions of an open field or in screenhouse/nethouse/greenhouse	As in previous case	Whole plants
DNA Bank	Low temperatures of 4°C (short-term storage for 1-2 years) and -20°C (medium-term storage for 3-5 years); ultra-low temperatures, ranging from -70 to -196°C (long-term storage of > 5 years)	Any species, especially wherever genomic resources are being generated	Genomic, mitochondrial or chloroplast DNA; cloned genes, promoters fused to reporter genes; sub-genomic, cDNA, EST, repeat enriched libraries; cloning vectors, expression vectors, binary vectors, RFLP probes; BAC, YAC, PAC clones.

Conservation of Germplasm

Germplasm Holdings: National Genebank

Crop Group	Current status	
	Species	Accessions
Cereals	90	1,56,526
Millet and forages	178	56,472
Pseudo cereals	30	6,825
Grain legumes	69	58,160
Oilseeds	58	57,479
Fibre crops	51	11,943
Vegetables	151	25,084
Fruits	35	530
Medicinal and aromatic plants and narcotics	661	6,771
Spices & condiments	17	3,721
Agroforestry species	244	2,443
Duplicate safety samples		10,235
Total	1,584	3,96,189*

Conservation of Germplasm

Germplasm Holdings:

In Vitro Genebank

A total of 2082 accessions belonging to 138 species of fruits, tuber and bulbous crops, spices, plantation and industrial crops, medicinal, aromatic and rare/endangered plants are maintained in vitro, under culture room conditions and/or at low temperature, in the form of 40,000 cultures.

Cryogenebank

More than 9915 accessions of diverse crops (729 species) have been maintained in the National Cryogenebank. These belong to (i) seeds and embryonic axes of difficult-to-store seeds species under the category of spices, fruits and nuts, agroforestry, plantation and industrial crops (ii) dormant buds of temperate fruits (iii) pollen of highly recalcitrant seeded species and (iv) prioritised orthodox seeded species. Regular monitoring of viability of cryostored germplasm (2-24 years) has been carried out. Original viability was retained after cryostorage for various periods (2-12years).

ation & Evaluation of Germplasm

- Characteristics of a germplasm collection not only distinguishes accessions within a species, but also enables grouping of accessions, development of core collections, identification of gaps and retrieval of valuable germplasm for breeding programmes.
- Characterization refers to description of highly heritable traits that are uniformly expressed in all environments.
- These range from morphological, physiological and agronomical features to molecular markers. Molecular markers and genomics are increasingly being used as they are less influenced by environments
- The major abiotic stresses are moisture stress (deficient or excess), temperature (heat and cold) and salinity. Abiotic stresses are gaining importance in context of changing climate.
- The ultimate objective of germplasm evaluation is to develop trait-specific reference sets comprising best promising accessions for a given trait, to facilitate their utilization in crop improvement programmes.

ation & Evaluation of Germplasm

Multilocation Evaluation

Crops	Centres	Traits/parameters (Centre)	Acc.
Rice	20	Agronomic (7), Biotic (12), Abiotic (1)	2645
Wheat	18	Agronomic (8), Biotic (8), Abiotic (1), Quality (1)	7273
Maize	5	Agronomic (5)	530
Chickpea	16	Agronomic (8), Biotic (7), Quality (1)	2113
Pigeonpea	12	Agronomic (8), Biotic (4)	1900
Lentil	7	Biotic (6), Quality (1)	900
Mustard	9	Biotic (7), Abiotic (1), Quality (1)	720
Okra	8	Biotic (6), Abiotic (2)	500
Brinjal	8	Biotic (6)	500
Giloe	3	Agronomic and Quality (3)	14

ation & Evaluation of Germplasm

1. Characterization

- Pre-requisites, sites for characterization, experimental details, descriptors and descriptor states, documentation. Core and mini core sets are some issues that need to be worked out

2. Evaluation

- All similar issues are to be worked out as in characterization in addition to parameters for agronomic traits, biotic stresses, abiotic stresses, quality traits, molecular characterization etc.

3. Documentation

4. Dos and Donts



Registration of Plant Germplasm

Plant Germplasm Registration Committee

1. The Plant Germplasm Registration Committee (PGRC) is constituted under the Chairmanship of Deputy Director General (Crop Science), Indian Council of Agricultural Research, New Delhi.
2. It includes Director, National Bureau of Plant Genetic Resources (NBPGR), New Delhi, as a permanent member and a senior level scientist from NBPGR to function as Member Secretary, which would be identified by the Chairman, PGRC. The other members will be co-opted as per the advice of the Chairman.
3. It has provision for adoption of need-based crop specialists with reference to the material under consideration, with the approval of the Chairman.

Registration of Plant Germplasm

Eligibility criteria for Registration of Germplasm

1. Germplasm/genetic stock/elite material of field, horticultural and other economic crops, including argo-forestry species, spices, medicinal and aromatic plants, ornamental plants, which is unique, uniform, stable and has potential attributes of academic, scientific or commercial value shall be registered.
2. Exotic germplasm (imported) can be registered for a trait other than those published or registered. Similarly, selections made from exotic germplasm can also be registered.
3. Selection for unique traits from landraces (other than the landrace is known for) may be considered for registration.

Characterization of Plant Germplasm

Proof of uniqueness of Germplasm

1. Performance (yield contributing traits, adaptation traits, quality traits) data for at least four environments (location and year combination)
2. For resistant/tolerance to biotic and abiotic stresses, data should be obtained for at least four environments under established hot spot locations/ under artificial screening (epiphytotic) conditions.
3. Supporting biochemical evaluation data should be obtained from at least four environments
4. Supporting documentary evidence on (i), (ii) and (iii) either in Institute Annual report/AICRP Report/peer reviewed journals.
5. Recommendation of Institute Germplasm Identification Committee (IGIC) regarding the uniqueness of germplasm for trait(s) claimed.

Registration of Plant Germplasm

Germplasm ineligible for registration

1. Germplasm or genetic stock without accompanying documentary evidence for the claim made in the application.
2. Germplasm or genetic stock that does not contain complete passport data (see Annexure XV), including authenticated taxonomic identity, parentage, institutional or national identity, geographical location of origin and all such information relating to the development and contribution, if any, to the uniqueness of the germplasm.
3. Exotic material per se, with no evidence of human intervention in its improvement.
4. Varieties/hybrids of common knowledge or selection from traditional or farmers' varieties.
5. Germplasm which involves any technology, which is injurious to the life or health of human being, animals or plants.
6. Material for which any form of protection has been sought elsewhere.

Registration of Plant Germplasm

Registration of variety of trait specific germplasm

Current Status of registered accessions

Crop

No. of species

Registered germplasm

Cereals	11	376
Millets	4	67
Fibre and Forages	15	81
Grain legumes	16	115
Oilseeds	25	138
Vegetables	23	63
Fruits and nuts	14	32
Medicinal and aromatic plants and spices	39	48
Commercial crops	7	62
Ornamentals	17	41
Tuber crops	9	23
Agro-forestry	3	3
Total	183	1,049

Registration of Plant Germplasm

Examples of registration of trait specific germplasm

Crop	INGR No.	Year	Unique Trait(s)
Lavender (<i>Lavendula stoechas</i>)	INGR10160	2012	High camphor content
Green Gram (<i>Vigna radiata</i>)	INGR 10107	2010	Bold seed (9.43 g/100 seed)
Galangal (<i>Alpinia Calcarata</i>)	INGR 09051	2009	High 1,8-cineole content (37.21%) and alpha fenchyl acetate (19.87%) content in rhizome essential oil
Brinjal (<i>Solanum melongena</i>)	INGR 09122	2009	Resistance to bacterial wilt
Brinjal (<i>Solanum melongena</i>)	INGR 09123	2009	Resistance to bacterial wilt
Babchi (<i>Psoralea corylifolia</i>)	INGR 08054	2008	High psoralen content
Cowpea (<i>Vigna unguiculata</i>)	INGR 08083	2008	Bold seed
Cowpea (<i>Vigna unguiculata</i>)	INGR 08084	2008	Resistance to black eye cowpea mosaic virus
Greater galangal (<i>Alpinia galanga</i>)	INGR 08107	2008	High 1,8-Cineole content (72.49%) in rhizome essential oil
Lentil (<i>Lens culinaris</i>)	INGR 08026	2008	Rust resistance
Tomato (<i>Lycopersicon esculentum</i>)	INGR 08094	2008	Source of resistance to root knot nematodes (<i>Meloidogyne javanica</i>)
Pea (<i>Pisum sativum</i>)	INGR 07048	2007	Bold seed(50.14g/100 seed weight)
Rose geranium (<i>Pelargonium graveolens</i>)	INGR 07042	2007	Quality aroma

