


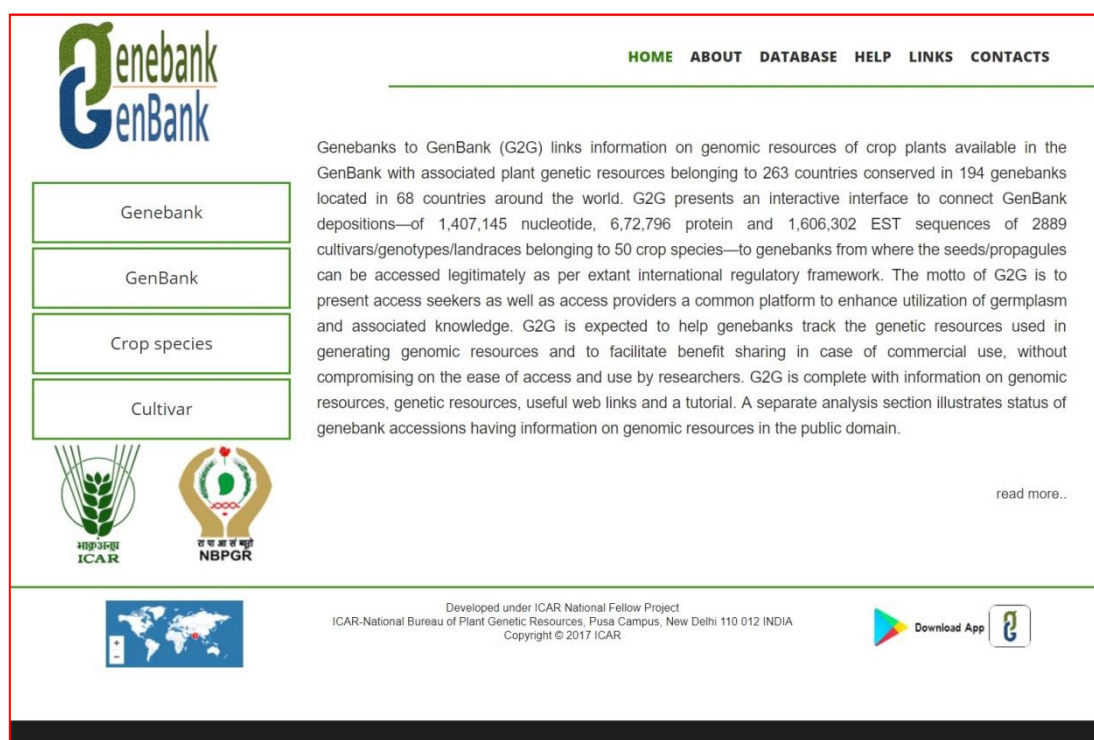
ICAR National Fellow Project on Development and implementation of Novel Algorithms and Software Modules for PGR Informatics

1. Development of G2G portal

(Project objective: Developing software and schema for a distributed network of data providers)

Digital Sequence Information (DSI) has assumed great significance in the field of genetic resources. Serious deliberations are going on to deem DSI as genetic resources and hence to be regulated as sovereign right. Today, no information system exists anywhere in the world that can assess the contribution of genebanks around the world to genomic resource generation and use.

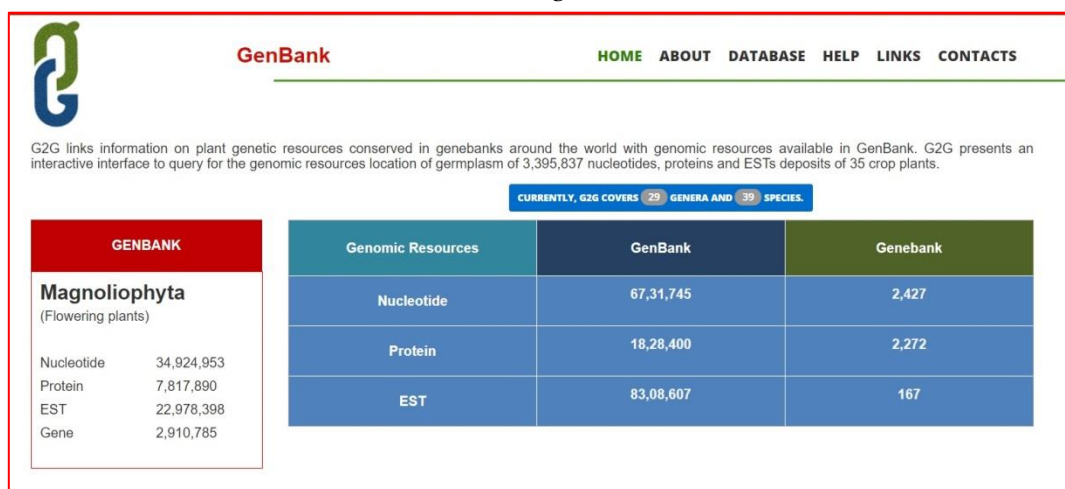
In the past year, Algorithms were created to connect GenBank sequence depositions to Genebanks around the world. Based on this algorithm, an interactive application called G2G (Genebank to Genbank)  was developed. Data are being updated in Genebank module (1.2 million → 2.2 million) and GenBank module (15.9 million → 41.5 million). G2G is under beta testing. It may be accessed at pgrinformatics.nbpg.ernet.in/G2G/



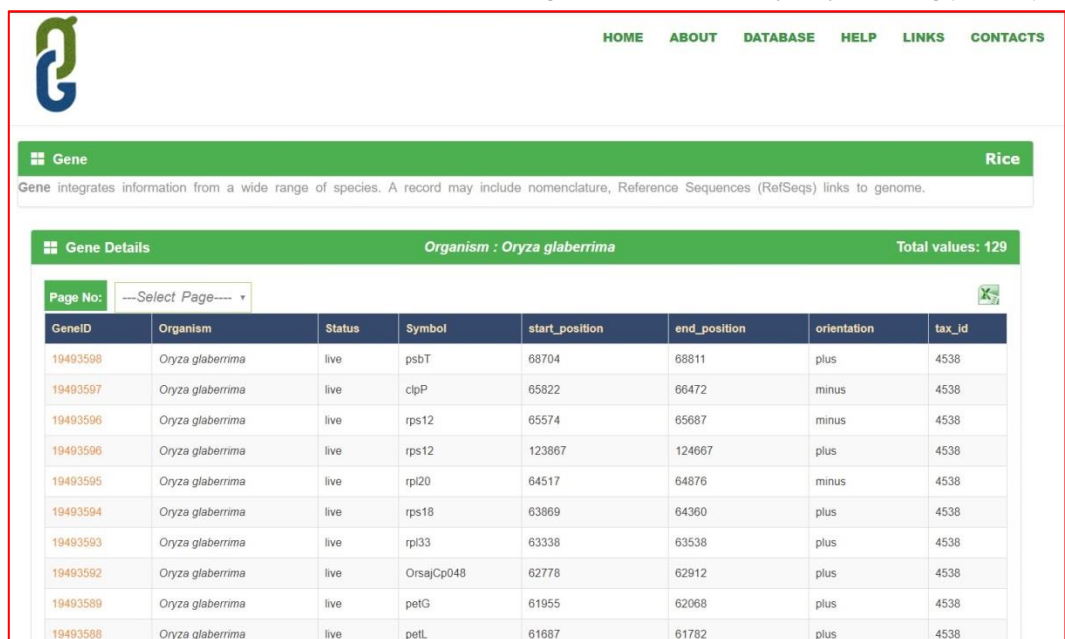
Homepage of G2G: Provides objective of the portal and links to specific modules



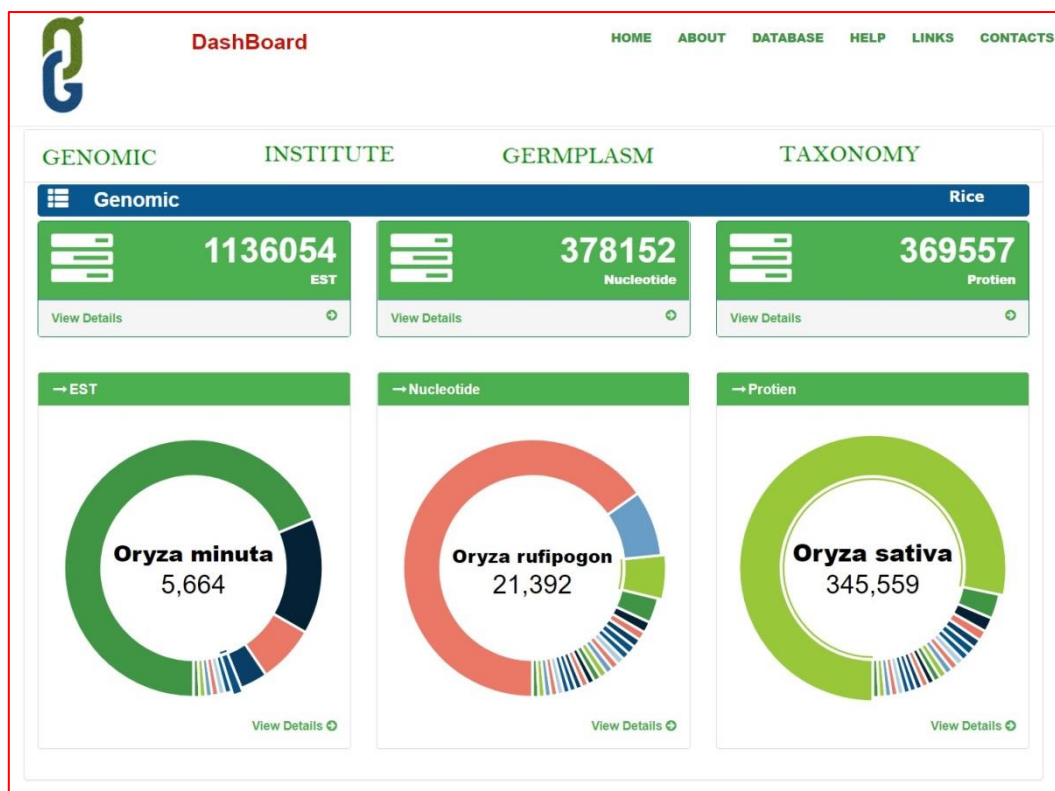
Genebank module: Provides interactive links to genebanks with details



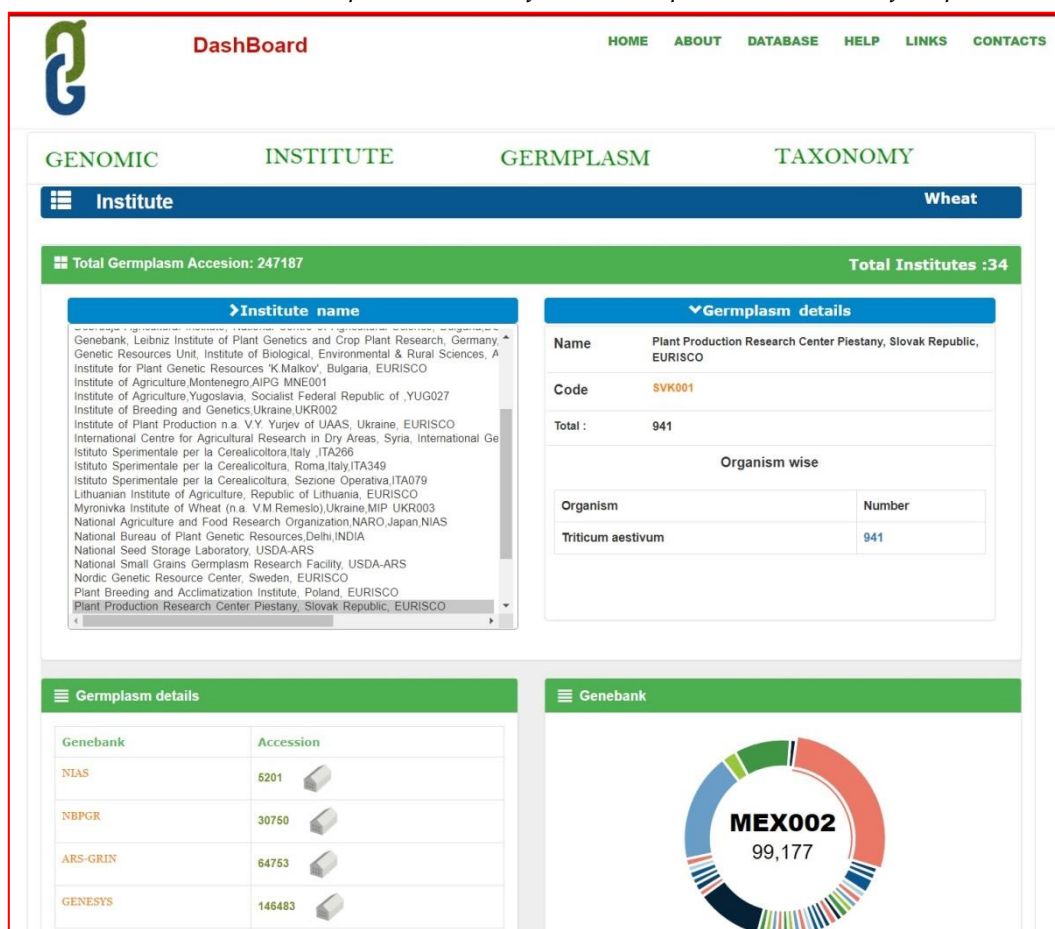
GenBank module: Provides interactive links to genomic resources of 39 flowering plant species




Gene module: Provides crop-wise details of genes isolated from crops and their CWR



Genomic module: Provides crop-wise details of DNA and protein resources of crops and CWR



Institute module: Provides crop-wise details of genebanks and their holdings



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GENOMIC
INSTITUTE
GERMPLASM
TAXONOMY

Germplasm
Rice

Taxon details

Organism name

Oryza aita
Oryza australiensis
Oryza barthii
Oryza brachyantha
Oryza coarctata
Oryza eichingeri
Oryza glaberrima
Oryza glumipatula
Oryza grandiglumis
Oryza granulata
Oryza latifolia
Oryza longiglumis
Oryza longistaminata
Oryza malampuzhaensis
Oryza meridionalis
Oryza meyeriana
Oryza minuta
Oryza neocaledonia
Oryza nivara
Oryza punctata
Oryza rhizomatis
Oryza ridleyi
Oryza rufipogon
Oryza sativa

Genomic details

Organism

Oryza barthii

Germplasm
EST
Nucleotide
Protein
Gene
Probe
Total

271

0

1464


1683

125

62

3605

Germplasm module: Provides crop-wise details of species and available genomic resources



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GENOMIC
INSTITUTE
GERMPLASM
TAXONOMY

Taxonomy
Wheat

Details

Organism name

Aegilops longissima
Aegilops neglecta
Aegilops ovata
Aegilops peregrina
Aegilops searsii
Aegilops sharonensis
Aegilops speltoides
Aegilops squarrosa
Aegilops tauschii
Aegilops triaristata
Aegilops triuncialis
Aegilops umbellulata
Aegilops uniaristata
Aegilops vavilovi
Aegilops ventricosa
Triticum aestivum
Triticum aestivum subsp. aestivum
Triticum cartholicum
Triticum compactum
Triticum dicoccoides
Triticum dicoccum
Triticum durum
Triticum fungicidum
Triticum jakubzineri

Taxonomy details

Comman_name

Wild Wheat

Chromosome_2n
Family
Genus
Species
Sub_species
Details:

28

Poaceae

Triticum

jakubzineri

Wheat

Taxonomy module: Provides crop-wise minimum taxonomic details

4

Cultivar HOME ABOUT DATABASE HELP LINKS CONTACTS

G2G links information on plant genetic resources conserved in genebanks around the world with genomic resources available in GenBank. There are 35 crops available in this resources.

Jeerakasala Find G2G COVERS GENE BANK CULTIVAR 627587 GEN BANK CULTIVAR HIT IS 4866 CULTIVAR.

CULTIVAR **Jeerakasala** **CROP** **Rice** **TOTAL HIT** **33**

Organism	Cultivar	GenBank ID	Genebank ID	Genebank	Source Country	Date_of_Collection	GI Number	Type
Oryza sativa	Jeerakasala	HQ687208	IC349677	NBPGR	India	Jul 31 2001	320383878	NUC
Oryza sativa	Jeerakasala	HQ687208	IC573406	NBPGR	India	-	320383878	NUC
Oryza sativa	Jeerakasala	HQ687208	IC520332	NBPGR	India	Nov 4 2004	320383878	NUC
Oryza sativa	Jeerakasala	HQ687208	IRGC 54723	PHL001	India	02-05-1978	320383878	NUC
Oryza sativa	Jeerakasala	HQ687208	IC422089	NBPGR	India	May 29 2004	320383878	NUC

Cultivar module: Links a cultivar with genebank and GenBank details

Cultivar HOME ABOUT DATABASE HELP LINKS CONTACTS

G2G links information on plant genetic resources conserved in genebanks around the world with genomic resources available in GenBank. There are 35 crops available in this resources.

Boradhan Find G2G COVERS GENE BANK CULTIVAR 627587 GEN BANK CULTIVAR HIT IS 4866 CULTIVAR.

CULTIVAR **Boradhan** **CROP** **Rice** **TOTAL HIT** **33**

Organism	Cultivar	GenBank ID	Genebank ID	Genebank	Source Country	Date_of_Collection	GI Number	Type
Oryza sativa	Boradhan	KF731448	IC349677	NBPGR	India	Jul 31 2001	320383878	NUC
Oryza sativa	Boradhan	KF731448	IC573406	NBPGR	India	-	320383878	NUC
Oryza sativa	Boradhan	KF731448	IC520332	NBPGR	India	Nov 4 2004	320383878	NUC
Oryza sativa	Boradhan	KF731448	IRGC 54723	PHL001	India	02-05-1978	320383878	NUC
Oryza sativa	Boradhan	KF731448	IC422089	NBPGR	India	May 29 2004	320383878	NUC

GenBank Details

GenBank ID KF731448

GI 577859418

Organism Oryza sativa

Version KF731448.1

Length 738 bp

Molecule Type DNA

Cultivar Boradhan

PubMed

DEFINITION Oryza sativa voucher CR490 SCAR marker genomic sequence.

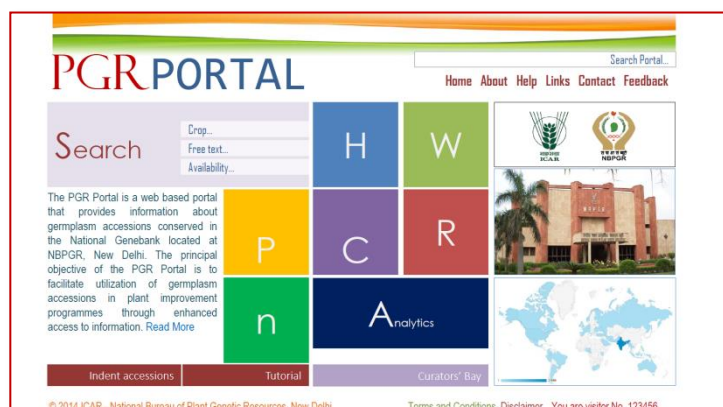
AUTHORS George,V., Suresh Kumar,U., Vinitha,M.R., Dinesh Raj,R. and George,T.

Cultivar module: Provides links to GenBank submission details and publication information

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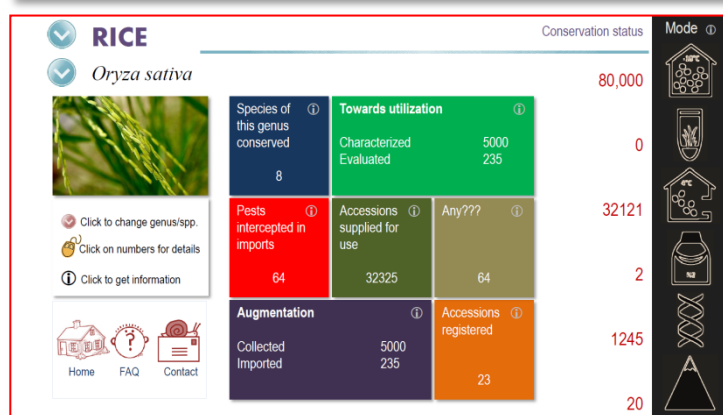
2. Development of PGR Portal version 2.0

(Project objective: Design, development and implementation central and provider databases)



PGR Portal version 1.0 has been functioning uninterruptedly for the past six years. It was first of its kind in a national genebank of a gene-rich country.

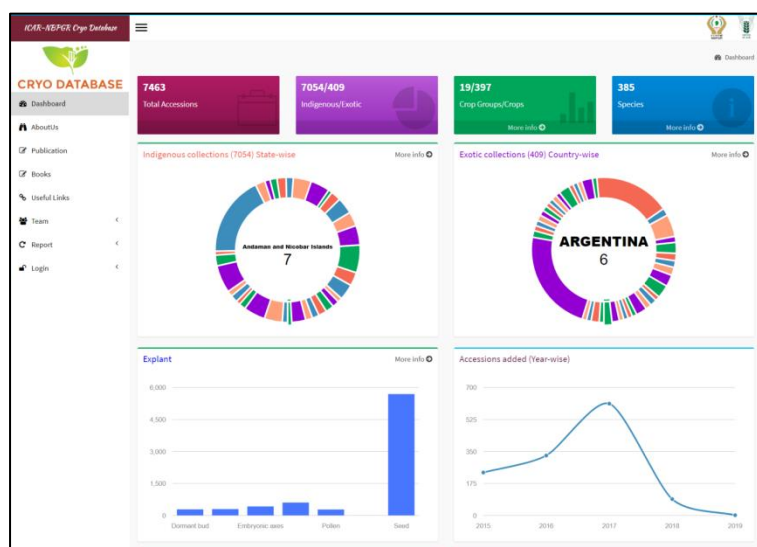
Based on the experience, PGR Portal version 2.0 is being developed using latest technology and with a host of advanced features.



PGR Portal version 2.0 is designed to be user-centric and interactive to provide the sought information. It is designed to facilitate convergence of all the PGR databases and applications developed and hosted by NBPGR in one portal.

However, implementation of the second version requires development of databases and applications that have been conspicuous by their absence. E.g. Cryo genebank database, In vitro genebank database, Field genebank database, MTS database, etc. In the past year, work was initiated on all these and Cryo genebank database and application was completed. Others will be completed in the current year and PGR Portal version 2.0 is also expected to be completed within this year.

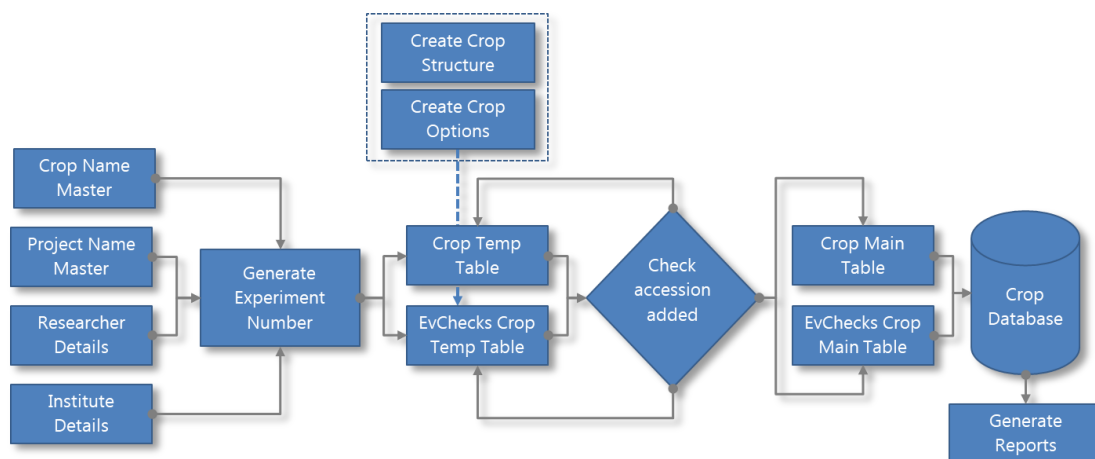
Cryo Database (Cryobase was launched on the NBPGR Foundation Day 2018)



Cryobanking started at NBPGR in 1987. Currently NBPGR cryobank is the 3rd largest in the world with more than 13,000 samples. In order to make status and details of cryobank, an online application Cryobase was developed replete with infographics and structured back-end for up-to-date management. The application also hosts protocols developed and published as peer reviewed papers.

3. PGR characterization and evaluation data portal design

(Project objective: Design, development and implementation central and provider databases)

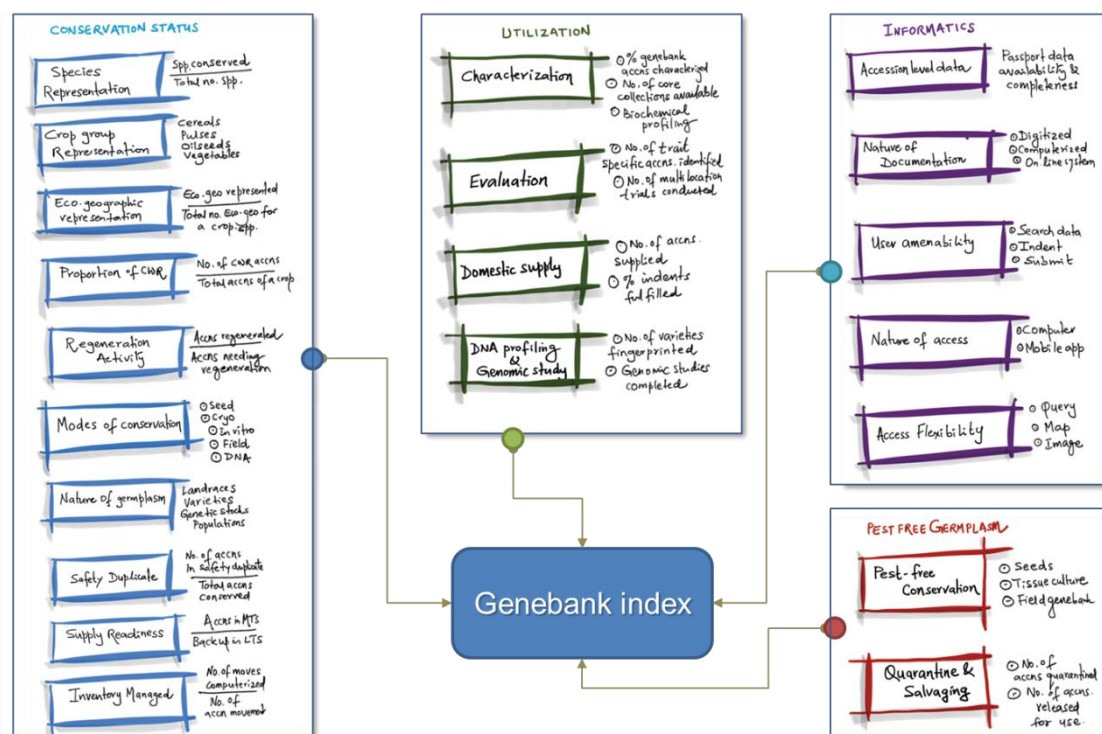


Database structure and function were designed. Database was commissioned. Data on 96 crops populated (>1 lakh accessions). User interface is being developed.

4. Development of algorithm to compute Genebank Index

(Project objective: Developing novel algorithms for PGR informatics)

An operational genebank is an outcome of diverse but linked activities. Each of these multi-disciplinary activities has a serious impact on the overall success of genebanking. In other words, it is possible to establish a measure for every component of the genebank operation. Such measures can be against a possible maximum or the global standard or a target in order to provide an INDEX of the efficiency of the operation. Since genebanking is based on



the principles of *ex situ* conservation and is aimed at germplasm utilization, the activities can be looked at in terms of their success in adherence to the principles and contribution to the use of genetic resources.

Genebank Index must be sensitive to changes in the measures of the components and the amplitude of the Index caused by a component must indicate the significance of that component in the overall operations. As a result Genebank Index must be an indicator to overall efficiency of the genebanking operations (objective assessment) and must provide a means to improve operational components over time and across commodities.

It is proposed that an informatics solution is provided for the computation of Genebank Index in the ICAR National Fellow Project. The user-friendly application must be able to provide the temporal changes as well as commodity- or component-wise contributions. The informatics solution should also guide changes planned and their overall impact thereof on the Index.

Aim of Genebank Index Reckoner is to create a PGR Informatics application to compute dynamically the Index as well as contribution of each indicator to the change.

5. Post-graduate teaching

I have a dual faculty position in Faculty of Plant Genetic Resources and Faculty of Bioinformatics, IARI, New Delhi. During 2018-19 taught three courses:

BI 504	Evolutionary Biology (2+1)	[Course Leader]
BI 624	Genome Wide Association Study (2+1)	[Course Leader]
PGR 507	Information Management in Plant Genetic Resources (2+1)	[Course Leader]
PGR 500	Biodiversity and Plant Genetic Resources (2+0)	[Course Leader]

Guiding: I am currently guiding following Ph.D. students of PG School, IARI:

PGR

1. Mr. Shailendra Solanki, 10648, *Analysis of genetic variation in Artocarpus hirsutus (Wild Jack) collections from Western Ghats*
2. Ms. Shephalika Amrapali, 10854, *Olfactory, biochemical and molecular profiling of rose germplasm for fragrance*
3. Mr. Puneeth GM, 11304, *Development of Informatics System to Document On-Farm Conservation: A Case Study*

Bioinformatics

4. Ms. Soumya Sharma, 10778, *Development of database of genes and gene families responsible for nutritional content in field crops*
5. Ms. Sneha Murmu, 11006, *Host-Pathogen Interactions* (tentative area)
6. Ms. Shweta Kumari, 11007, *Domestication characters in minor pulses* (to be associated with DBT funded Minor Pulses project)
7. Mr. Dipro Sinha, 11227, Yet to be decided

6. Peer recognition

I was nominated and functioned as:

- Member of the *Task Force Committee on Complementing DUS characterization through DNA fingerprinting* of the PPV&FR Authority with effect from 07-09-2018.
- Member of *Technical Expert Committee (TEC) on Agriculture Biotechnology* of the Department of Biotechnology with effect from 16-10-2018.
- Member of *Technical Expert Committee (TEC) on Agriculture Biotechnology and Allied Sciences for North East Region* of the Department of Biotechnology with effect from 28-12-2018.
- Convener of Session on *Ethics, IPR and Regulations for use of gene/genetic resources* during the 1st National Genetics Congress, New Delhi on 15-12-2018.
- I am functioning as Editor-in-Chief of *Indian Journal of Plant Genetic Resources* with effect from October 2017.

7. Participation in conference/ workshop/ trainings/ meetings etc.

- Attended the *International Training Workshop for Software Testing to Support DOI Implementation* organized by Indonesian Center of Agricultural Biotechnology and Genetic Resources Research and Development under the aegis of the ITPGRFA-BSF project in Bogor, Indonesia [22 April – 1 May, 2018].
- Attended the strategic meeting on *Biotechnological contributions for increasing farm income* held at Department of Biotechnology, New Delhi [18 May, 2018].
- Attended the Brain storming meeting for establishment of *Platform for Genomics to Breeding* at DBT New Delhi [30 Jan 2018].
- Participated in the group discussion on *Convergence of Plant Biotech Inventions and Plant Variety* during the *Global LES APAC Conference 2018* Le Meridien, New Delhi [12 Nov, 2018].
- Attended the *Indo-German International workshop on DNA based system & Techniques for consolidated DUS* organized by PPV&FRA, New Delhi [20-21 November 2018].
- Attended the *1st National Genetics Congress-2018* organized by ISGPB, New Delhi [15 December 2018].
- Delivered the lead lecture on “Agrobiodiversity Conservation: PGR for Future” during the *National Conference on Biodiversity and Plant Genetic Resources for Future* [UAHS, Shivamogga 15-03-2019].

8. Institutional support/Others

- (i) Officer in Charge, Agriculture Knowledge Management Unit (AKMU)
- (ii) Officer in Charge, Institute Technology Management Unit (ITMU)
- (iii) Member of the committee to coordinate National Committee on Management of Genetic Resources
- (iv) I am member of Institute Management Committees of
 - Central Tobacco Research Institute (CTRI), Rajahmundry (IMC)
 - National Bureau of Fish Genetic Resources, Lucknow (IMC)
 - CDFD, Hyderabad (RAP-SAC)
- (v) I contributed as a local organizer as well as a technical expert for the "*Regional Workshop on the Preparation of the National Reports on the Implementation of the International Treaty on PGRFA*" organized at NASC, Pusa, New Delhi, 11-13 Dec 2018 by the ITPGRFA Secretariat in collaboration with the Ministry of Agriculture and Farmers Welfare, Government of India, the FAO Representation in India and NBPGR.

9. Targets for 2019 (last year of the project)

Launch of PGR Portal version 2.0 and G2G portal