

## PGR Informatics: Sustaining PGR Management and Supporting PGR Policy

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### Introduction

Researchers and policy makers recommend increased use of plant genetic resources (PGR) available as *ex situ* collections in genebanks as part of the strategy to fight food and nutritional insecurity as well as to mitigate the impact of climate change on crop husbandry. However, in the absence of a robust information management system, genebanks will have problems managing their collections and users face a daunting task of choosing appropriate accessions for research. Enhanced use of PGR can only be facilitated by enhanced access to information. An organized digital information system provides fair and just opportunity for all to access. PGR Informatics is the management (creation, storage, retrieval and presentation) and analyses (discovery, exploration and extraction) of diverse information (facts, figures, images, statistics, knowledge and news) related to plant genetic resources.

PGR documentation assists in recording observations and data and to convert them into useful information. PGR informatics is expected to facilitate creation of knowledge in an interactive manner based on awareness and perceptions of the users. Ultimate aim is to achieve wisdom by integrating traditional knowledge and synthesized digital knowledge.

PGR Informatics deals with (1) Accession Level Data (Passport. Data), describing the identity and origin of the material recorded at the stage of augmentation (collecting/import); (2) Trait Level Data (phenotypic data), describing the phenotypic traits of the material observed in field/lab generated by systematic characterization and evaluation experiments; (3) Genotypic Data (Omics data), describing information about the DNA/RNA/protein sequence, metabolomic products, often in association with the results of high-throughput phenotypic data. Other significant datasets include (i) Quarantine data

(pest interception, salvage); (ii) genebank data (storage, seed quality); (iii) Germplasm Distribution (international and domestic supply); etc.

### Seminal Changes

The “PGR information” comprises of accession level information (static) and trait information (evolving). PGR informatics is essential to facilitate efficient PGR management by genebanks (setting priorities, planning activities and managing resources), to enhance the utilization by breeders and researchers (genotype selection and indenting; genotype Registration), and to assist policy makers and funding agencies (allocation of funds; political approval of programs; compliance with obligations of global developments including CBD and ITPGRFA). Therefore, information must be up to date, accurate, reliable, systematically stored and easily accessible.

PGR Informatics has come into the limelight since a decade because of (i) Increased awareness about PGR; (ii) Various international agreements coming into force; (iii) Increased availability of information in text, images, maps, videos, etc. (iv) Accessibility to technologies to record, link and archive such diverse types of information; and (v) Ever-increasing power of computers and internet to facilitate access and retrieval.

There have been seminal changes in (i) Technology (from sequential processing to random access) enabling use of computer technologies by non-specialists; (ii) Policy (from open access to regulated access) forcing national genebanks develop own information systems rather than adopt a common global system; and (iii) Objective of genebanking (from conservation to utilization) requiring information systems to expand and build databases around traits and develop relevant online applications.

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### Status of PGR Informatics

Globally, all the major genebanks (CGIAR or national) maintain information in on or the other form. Recently, all the CG genebanks have moved to GRIN Global system and their data are available on Genesys-PGR (1). Researchers can access PGR information from various sources that maintain primarily accession level data (Fig 1). Efforts are on to provide access to trait data for facilitating use. Additionally, novel initiatives aim to link accessions with the composition and the function of food (2) or with genomic and phenomic information (3).

PGR Informatics in India: At present NBPGR is maintaining accession level data in Passport Database (>600K entries) and Exchange Database (>950K), Conservation Database (>400K) and Characterization Database (>200K). The databases are accessible through

various online open access applications including PGR Portal ([pgrportal.nbpgr.ernet.in](http://pgrportal.nbpgr.ernet.in)), Import Permit and EC Data Search ([exchange.nbpgr.ernet.in](http://exchange.nbpgr.ernet.in)), Genebank Dashboard (<http://genebank.nbpgr.ernet.in/>), National Herbarium of Crop Plants ([pgrinformatics.nbpgr.ernet.in/nhcp](http://pgrinformatics.nbpgr.ernet.in/nhcp)), Germplasm Registration Information System ([www.nbpgr.ernet.in:8080/registration](http://www.nbpgr.ernet.in:8080/registration)), PGR Map ([pgrinformatics.nbpgr.ernet.in/pgrmap](http://pgrinformatics.nbpgr.ernet.in/pgrmap)), and ipPGR ([pgrinformatics.nbpgr.ernet.in/ip-pgr](http://pgrinformatics.nbpgr.ernet.in/ip-pgr)). The applications are widely used by PGR researchers indicated by over 70K page views annually. Links to other PGR informatics applications are available on NBPGR server (4).

### PGR Informatics Aiding PGR Policy Implementation

PGR Informatics also serves the major objectives of the Convention on Biological Diversity, rolling Global Plan of Action and International Treaty on Plant Genetic

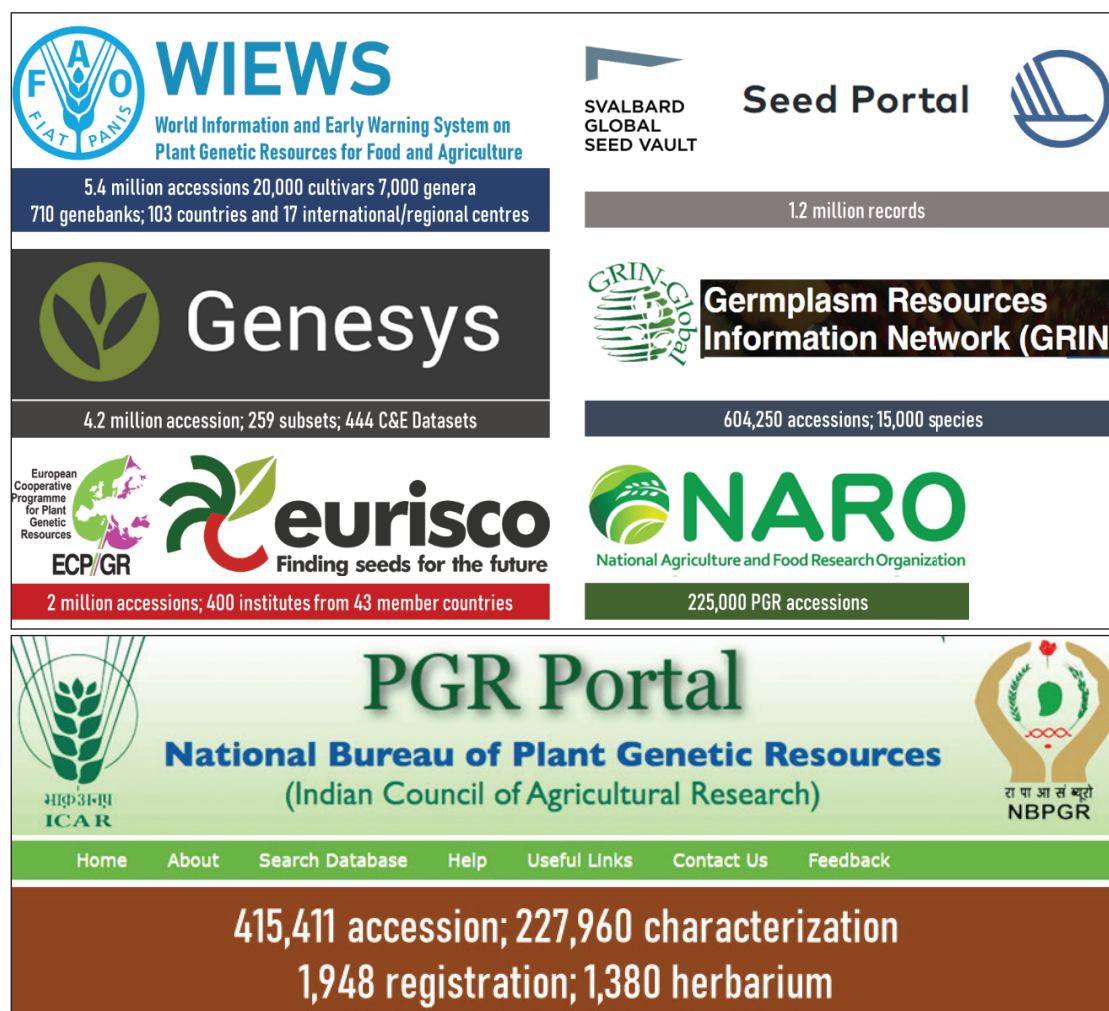


Fig. 1. Major web portals of plant genetic resources information

Resources for Food and Agriculture (Fig 2). For instance, the Global Information System for PGRFA aims to integrate and augment existing systems to create the global entry point to information and knowledge (5).

This service assigns Digital Object Identifiers (DOIs) to plant genetic resources for food and agriculture for reference in third party systems and scientific literature to facilitate tracking eventually benefit sharing.

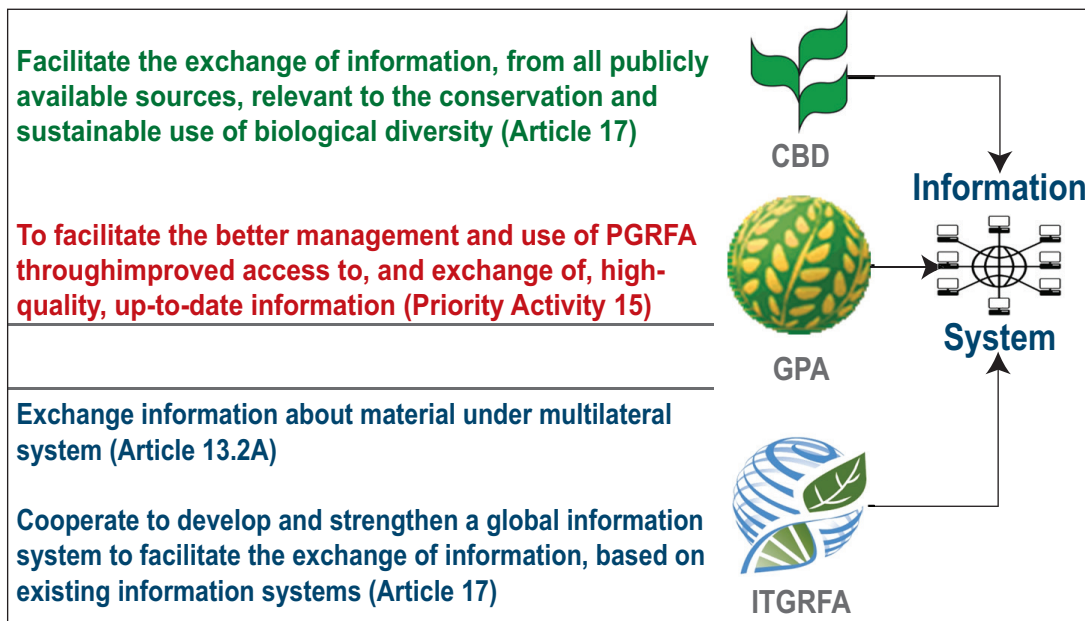


Fig. 2. Interface between PGR Informatics and PGR policy

	<p><b>Data quality</b></p> <p><b>Trait specific evaluation data</b></p> <p><b>Genomic data</b></p> <p><b>GIS and AI ready</b></p>
	<p><b>Information services in local languages</b></p> <p><b>Accessibility &amp; Inter-operability</b></p> <p><b>Dynamic linking and updating</b></p> <p><b>Efficient data delivery</b></p>
	<p><b>Harmonization</b></p> <p><b>Dedicated funding</b></p> <p><b>Institutional mechanism for sustainability</b></p> <p><b>Capacity building</b></p>

Fig. 3. Challenges for PGR Informatics in India

### Challenges and Action Points

It is imperative, for achieving effective management and utilization of plant genetic resources, to maintain and expand of PGR Informatics in India. Success depends upon the action aimed at addressing the technical, financial and policy challenges periodically (Fig. 3).

### References

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