# Development and implementation of Novel Algorithms and Software Modules for PGR Informatics

1. Map-based data retrieval provides easy and intuitive access to PGR information. The process is vital for developing mobile apps. Computational algorithms for map based applications in PGR were developed and were implemented as an interactive application called "**PGR Map**".
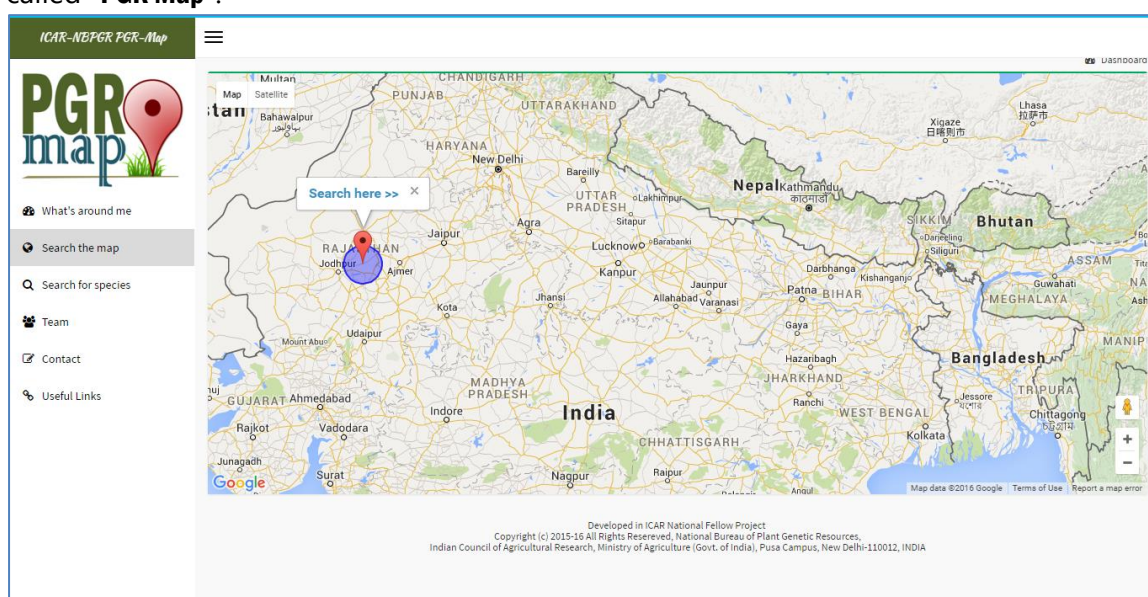
PGR Map offers three benefits:
   o "What's around me" helps user to obtain quickly the accessions that have been collected and conserved in the genebank from a particular location in India where the user is located at the moment
   o "Search the map" helps user to list the accessions that have been collected and conserved in the genebank from any selected location in India
   o "Search for species" helps user to map the collection sites of a crop species

PGR Map is available at http://www.nbpgr.ernet.in:8080/pgrmap/Default.aspx

2. Globally, there has been an explosion in the generation of genomic resources due to reduced cost and improved technology of genome sequencing. The knowledge so generated has been driving the biotechnology based billion dollar agricultural research. However, the genotypes that have been contributing to this knowledge and the associated national and community ownership, if any, remain deliberately ignored. Computational algorithm was developed to link information on genomic resources submitted to Genbank (public database) with the source cultivar, genotype or landrace

conserved in genebanks around the world. Algorithm is tested in a module **Genbank to Genebank**. This module has been implemented for native crops *Vigna* and *Phaseolus* species, which demonstrated that four genotypes from Indian National Genebank have contributed to 12,031 genomic resources in Genbank.

3. A quick access to the information on number of germplasm accessions conserved in the National Genebank has been a long pending demand. A user friendly **Genebank Dashboard** was designed, developed and implemented to provide a personalized quick access to genebank information to PGR workers, breeders, students, research managers and administrators. The dashboard is designed to be compatible with old and new computers, tablets and smart phones. The dashboard figures are dynamically updated as and when genebank database is updated. (genebank.nbpgr.ernet.in)

4. NBPGR houses National Herbarium of Cultivated Plants (NHCP), one of the major Indian herbaria with collections of cultivated taxa (native or introduced) and their wild/weedy relatives. An interactive web-based application **NHCP** was designed and developed to improve the accessibility and enhance the use of herbarium remotely for the purpose of taxonomic identification and study of taxa of PGR relevance.

5. Utilization of PGR and associated knowledge and technologies is governed by national laws. In compliance, PGR-associated intellectual properties need appropriate documentation. To facilitate this, an application **iP-PGR** is being developed. Similarly, to facilitate registration of unique germplasm, an online facility **PGR Registration** is being developed.

6. Improvements in **PGR Portal** are being executed under NF project. A dedicated module of Core collections was created. **PGR Portal** is being accessed globally and in 2015, PGR Portal had 39,673 page views by 7695 users amounting to >100 visits a day. It was evident that the simple technology used to develop PGR Portal made it very fast with average server connection time (<0.01 sec), average page download time (0.2 sec) and 6.29 sec average page load time (Google Analytics). PGR Portal is now protected by a copyright (**SW-8439/2015** 09/10/2015).

Post graduate teaching

I have a dual faculty position in Faculty of Plant Genetic Resources and Faculty of Bioinformatics, IARI, New Delhi. During 2015-16 taught four courses (about 60 theory and 20 practical classes):

1. BI 504   Evolutionary Biology (2+1)
2. PGR 507   Information Management in Plant Genetic Resources (2+1)
3. PGS 503   Intellectual Property and its Management In Agriculture (1+0) [in each trimester]
4. BI 624   Genome Wide Association Study (2+1)

Two M.Sc. students submitted thesis and currently guiding one Ph.D. and two M.Sc. students.

Research articles

1. M Dutta et al (2015) Development of core set of wheat (*Triticum* spp.) germplasm conserved in the national genebank in India. Advances in Wheat Genetics: From Genome to Field, 33-45.
2. Archak et al (2015) Molecular genetic diversity analysis of commercial mango (*Mangifera indica* L.) cultivars employed as parents in hybrid development in India. Indian Journal of Plant Genetic Resources 27: 209-216.
3. Saxena et al (2015) Development of novel simple sequence repeat markers in bitter gourd (*Momordica charantia* L.) through enriched genomic libraries and their utilization in analysis of genetic diversity and cross-species transferability. Applied Biochemistry and Biotechnology 175: 93-118.

Participation in conference/workshop/trainings/visits etc.

1. International Conference on Low Temperature Science and Biotechnological Advances organized by ICAR, SLTB, NAAS, Kew and NBPGR from 27-30th April 2015, NASC, New Delhi, India.
2. Delivered invited talk on "Eco-geographic surveys and GIS in PGR management" during ICAR-Sponsored Short Course on Crop Wild Relatives: Identification, Collecting and Utilization, NBPGR, New Delhi on 27 Aug 2015.
3. Visited four Central Asian countries as part of the exploratory visit of delegation of ICAR scientists from 14-27 Sept 2015.
4. International Workshop on Genebank operation and advanced learning (GOAL) organized by Crop Trust, Crawford Fund, Bioversity International and ICAR-NBPGR from 16-21 Nov 2015, NASC, New Delhi, India.
5. 3rd International Plant Physiology Congress, JNU, New Delhi 11-14, Dec 2015.