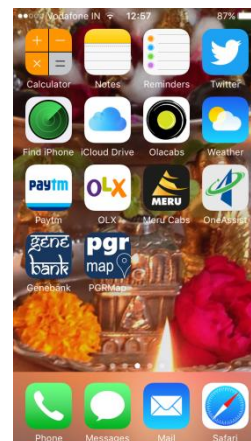


# ICAR National Fellow Project on Development and implementation of Novel Algorithms and Software Modules for PGR Informatics

## 1. Development of mobile apps in PGR Informatics

*(Project objective: Developing novel modules for PGR informatics)*

- Two mobile apps "Genebank" and "PGR Map" have been developed to enhance access to PGR information with an easy user interface.
- The apps have been developed for both Android and iOS.
- Software like *Ionic 2.0*, *Node 6.3.1*, *Java 1.7.0*, *Angular JS*, *Cordova 6.3.1* were employed for framing, coding and laying out. *Android SDK 6.0* (marshmallow) and *iOS Xcode 8.0* were used for building the application for android and iOS respectively. For web service, *MS .NET 4.0*, *MSSQL* were used at the backend and *HTML5*, *CSS3*, *Ajax*, *JQuery* were used in the front-end.
- Licenses were purchased and the apps have been hosted on Google Play and App Store.



"Genebank App" provides a dashboard view of indigenous collections (state-wise), exotic collections (country-wise), addition of accessions to genebank, etc. The app also helps generate routine genebank reports. The app uses databases live on the backend and hence always gives updated information.

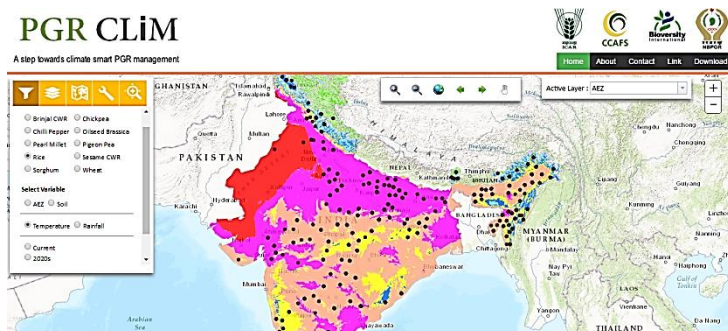


"PGR Map App" offers three benefits: "*What's around me*" helps user to obtain quickly the accessions that have been collected and conserved in the genebank from a particular location in India where the user is located at the moment; "*Search the map*" helps user to list the accessions that have been collected and conserved in the genebank from any selected location in India; "*Search for species*" helps user to map the collection sites of a crop species.

These apps are yet to be launched officially.

## 2. Establishment of geo-informatics portal in PGR

(Project objective: Developing novel modules for PGR informatics)



A study to link germplasm to changing climatic regimes was earlier carried out with the funding of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CAAFS). A web interface named **PGR CLIM** was also developed to access information ([www.nbpgr.ernet.in:8080/climate](http://www.nbpgr.ernet.in:8080/climate)).

It was improved to be a portal running on a GIS-server that is now interactive to choose layers of germplasm accessions (ten crops); soil type; AEZ; temperature and rainfall (current, 2020 and 2030). It is maintained under national fellow project and is available at <http://pgrinformatics.nbpgr.ernet.in/pgrclim>

## 3. Development of Germplasm Registration Information System

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

NBPGR is mandated by ICAR to implement the process of registering promising germplasm with novel, unique, and distinct traits either with academic or scientific or agronomic value. To facilitate smooth registration process, a fully online system of filing registration applications, their scrutiny, review and communications at every stage has been developed.

It is under beta testing.

## 4. Development of database of germplasm characterization

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

Database schema and database developed in collaboration with AKMU. Database is being populated with characterization data from various sources particularly from the CRP on Agrobiodiversity project.

## 5. Development of Genbank to Genebank database

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

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Work reported last year is being continued with addition of more crop species, their germplasm holdings across the world and their genomic resources from NCBI.

## 6. Post-graduate teaching

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I have a dual faculty position in Faculty of Plant Genetic Resources and Faculty of Bioinformatics, IARI, New Delhi. During 2016-17 taught three courses:

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

One M.Sc. student submitted thesis; currently guiding one M.Sc. and three Ph.D. students of PG School, IARI.

## 7. Publications

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### Research articles

1. Archak S, Singh A, Ahmad F. (2017). PGR-Clim: climate atlas of genetic resources of five crops. *Indian Journal of Plant Genetic Resources* 30(1): 77-79.
2. Archak S, Rana JC, Singh P, Gaikwad AB. (2017). Potential of gene-specific sequence-tagged-sites (STS) as trait specific markers in buckwheat (*Fagopyrum* spp.). *Journal of Plant Biochemistry and Biotechnology* 26(2):160–171.
3. Archak, Tyagi RK, Agrawal A, Mathur PN (2017). Delhi Declaration provides a roadmap for agrobiodiversity management. *Indian Journal of Plant Genetic Resources* 30(1): 88-91.
4. Kumar S, Archak S, Tyagi RK, Kumar J, VK Vikas, et al. (2016). Evaluation of 19,460 Wheat Accessions Conserved in the Indian National Genebank to Identify New Sources of Resistance to Rust and Spot Blotch Diseases. *PLoS ONE* 11(12):e0167702. doi:10.1371/journal.pone.0167702.
5. Archak S, Tyagi RK, et al. (2016). Characterization of chickpea germplasm conserved in the Indian National Genebank and development of a core set using qualitative and quantitative trait data. *The Crop Journal* 4: 417–424.

### Students' Publications

6. Sharma S, Jaiswal S, Archak S (2016). Annotation of gene sequence and protein structure of brinjal EDS1. *Bioinformatics* 13(3): 54-59.
7. Chaturvedi KK, Lal SB, Kumar A, Farooqi MS, Majumdar PG, Archak S. (2016). Genome analysis of *Rhizobium* species using codon usage bias tools. *International Conference on Bioinformatics and Systems Biology (BSB)*. <http://ieeexplore.ieee.org/abstract/document/7552158/?part=1>
8. Kumar V, AB Gaikwad, S Archak, Bhat KV. (2016) Expression data analytics of eggplant sequencing reads. *Abstracts of International Conference on Statistics & Big Data Bioinformatics in Agricultural Research*, 21–23 November 2016, ICRISAT-India. Page: 217.

9. Sharma S, Archak S. (2016). *In silico* Identification and Characterization of Enhanced Disease Susceptibility1 (EDS1) in *Solanum melongena*. *Abstracts of International Conference on Statistics & Big Data Bioinformatics in Agricultural Research*, 21–23 November 2016, ICRISAT-India. Page: 94.
10. Jamla M, Gaikwad AB and Archak S. (2016). Identification of molecular markers to screen for heat tolerant wheat (*Triticum* sp.) genotypes. *Abstracts of IAC2016*, 6-9 November 2016, New Delhi, India. Page: 126.
11. Solanki S, Gautam D, Bharathi LK, Archak S, Gaikwad AB. (2016). Genetic diversity analysis of *Momordica subangulata* subsp. *renigera* (Teasel Gourd) collections from Eastern India using ISSR markers. *Abstracts of IAC2016*, 6-9 November 2016, New Delhi, India. Page: 212.
12. Tiwari RK, Gambhir R and Archak S. (2016). PGR Map: A Web Based Tool for Map Based Access to PGR Information. *Abstracts of IAC2016*, 6-9 November 2016, New Delhi, India. Page: 232.
13. Kumar V, Archak S, et al. (2016). National Rice Resource Database. *Abstracts of IAC2016*, 6-9 November 2016, New Delhi, India. Page: 233.
14. Khera S, Tiwari R, Archak S. (2016). An Interactive web application and data management system for hosting and managing PGR and associated intellectual property records. *Abstracts of IAC2016*, 6-9 November 2016, New Delhi, India. Page: 274.

#### **Book Chapter**

15. Rana JC, Singh M, ...and Archak S. (2016). Genetic resources of buckwheat in India. In: Zhou et al. (Eds.), *Molecular Breeding and Nutritional Aspects of Buckwheat*. Academic Press. pp. 109-135.

## **8. Participation in conference/ workshop/ trainings/ meetings etc.**

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1. *Resource person*: Training on "Conservation of Plant Genetic Resources" for the Scientists from Forest Research Institute, Dehradun. ICAR-NBPGR. 28-06-2016.
2. *Oral presentation*: Archak S, Gambhir R. (2016). India as a Crucible to Develop Integrated Information Systems. Abstracts of IAC2016, 6-9 November 2016, New Delhi, India. Page: 227.
3. *Poster presentation*: Gambhir R, Tiwari R, Bhalla S, Archak S. (2016). PGR Portal: A Gateway to Plant Genetic Resources in India. Abstracts of IAC2016, 6-9 November 2016, New Delhi, India. Page: 233.
4. *Resource person*: Centre for Advanced Faculty Training (CAFT) on "Advance Computational and Statistical Tools for Omics Data Analysis", IASRI, New Delhi. 16-11-2016.
5. *Participation*: Awareness Seminar cum Brainstorming Meeting on "Access and Benefit Sharing: Striking the Right Balance" India Habitat Centre, New Delhi. 22-11-2016.
6. *Participation*: 31<sup>st</sup> Meeting of Institute Management Committee of NBFGR, Lucknow, 19-12-2016.
7. *Resource person*: Training on "Forest Genetic Resource Management and Conservation" for Scientists of ICFRE, Institute of Forest Genetics and Tree Breeding, Coimbatore. 16-02-2017.
8. *Resource person*: Training on "Advanced Statistical Techniques in Genetics and Genomics", IASRI, New Delhi. 09-03-2017.
9. *Participation*: Roundtable on "Sustainable Inputs for Agriculture" at Rashtrapati Bhavan, New Delhi organized by National Innovation Foundation-India. 09-03-2017.
10. *Resource person*: Training on "Management of Plant Genetic Resources of Fruit Crops" for the scientists of AICRP (Fruits), ICAR-NBPGR. 23-03-2017.
11. *Participation*: ICAR-KRISHI Geoportal Workshop-Experts, NBSS&LUP, Nagpur. 27-03-2017.