

CONSERVATION OF GENETIC RESOURCES OF INDIGENOUS PADDY VARIETIES OF ODISHA; AN INITIATIVE TO DEVELOP POTENTIAL PRODUCTION OF RICE.

Category

Agriculture – Natural resources management with special reference to Genetic resources conservation in relation to farmers' varieties and realization of the rights of farmers as per the Protection Plant Variety & Farmers Right Act. The productivity enhancement strategy in agriculture crops would necessitate bringing in a few changes of their cultivation practices. Among them, the availability and use of right type of quality seeds for right variety in time is most essential. Production potential of such new varieties needs to be assured. Under such circumstances if good seeds are available in time, the farmers may be encouraged to give away with their time tested well adapted varieties from cultivation. This necessitates conservation of such farmers' varieties for posterity.

Challenges

The Protection of Plant varieties and Farmers rights act has ushered in an era of business proposition for the plant breeders for developing new plant varieties. It is a known fact that no new variety can be produced / developed without the involvement of basic materials i.e. the parent varieties. These parents are the varieties of farmers which have evolved through generations of continuous growing in their fields with natural and/or conscious selection of plants in the population.

Before the introduction of so-called HYVs the farmers in India and more particularly in the State of Odisha used to cultivate a huge number of rice varieties. For example, a small area of Koraput district of Odisha alone had more than 1750 varieties cultivated in the 1950s when the Jeypore Botanical Survey (JBS) was undertaken by the Scientists of CRRI, Cuttack. The number

of varieties was drastically reduced to less than 150 in the 1990s when such a survey was again undertaken by CRRRI Scientists. Further erosion of such traditional varieties has been taking place as a continuous process giving way to a few HYVs. Many of such varieties were collected and conserved in different national and international Gene Banks for research purpose. However, the *ex-situ* conservation resulted in an arrest of evolution through natural selection which would have taken place *in-situ*.

In spite of aggressive efforts by the Government to spread modern varieties by providing different types of incentives to the farmers, many traditional / farmers' varieties have still been preferred for growing because of their special quality character / trait association. The *sui-generis* system of plant variety protection in India has provided a chance to register such farmers' varieties and the farming community is expected to benefit under the clause of Benefit Sharing of the PPV& FRA Act.

Initiative

Hence, efforts were made by the Department of Agriculture, Odisha to make an inventory of the extant rice varieties of the farming community. It was realized that nearly 1250 varieties of rice were still existing with the farmers besides the HYVs distributed by the Department. Thus the DDAs, DAOs and the AAOs were assigned to contact the farmers involved in cultivating the traditional varieties of rice and request them to deposit samples in adequate quantity along with some basic information to the State Seed Testing Laboratory of the Directorate of Agriculture. A series of sensitization workshops were held at different districts to appraise the farmers about the PPV &FR Act and its provision to register the farmers' varieties for acquiring their ownership rights. In the process a large number of samples of different rice varieties (about 897 varieties) with adequate quantity of seeds were received by the SSSL. However, it was observed that in spite of good care the seed samples

started reducing viability. It was soon realized the need of a suitable seed bank which can help in retaining the seed viability of original seeds without repeated rejuvenation under *ex-situ* condition. The proposal was thus put forwarded for establishment of medium term Gene Bank/seed bank (4 degree centigrade and 33 % humidity) during 2011 at State Seed Testing Laboratory Bhubaneswar to the RKVY which was duly approved. The said



Gene Bank was established during 2013 with an expenditure of Rs 189.25 lakhs and Genetic resources of

paddy of 1000 variety and non paddy of 200 varieties has been preserved as *ex-situ* condition. Further a proposal was submitted for establishment of another Gene bank/ seed bank (minus 20 degree



centigrade) at State Seed Testing Laboratory, Bhubaneswar under RKVY for long term conservation of genetic resources. The long term gene bank was established during 2017 with expenditure Rs 250.00 lakh. The main objective of such a Gene Bank is to provide a support system to the farmers for conservation of their varieties in addition to the *in situ* condition. Any loss of his variety (or any variety of a farming community) due to unforeseen reason can be recovered

by him / farming community by accessing the seeds from such a Seed Bank. Smaller seed sample size of the farmers' varieties would risk genetic drift and hence importance was given in favor of a greater sample size for the Gene Bank deposit for conservation and recovery. Land races have certain genetic integrity. They are recognizable morphologically, farmers have names for them. Different land races differ in adaptation to soil types, seeding time, maturity, height, nutritive value, use and other properties. They are genetically diverse and genetically dynamic. Such balanced populations are variable and maintain equilibrium with both environment and pathogens and therefore genetically dynamic.



The varieties thus received needed morpho-agronomic characterization as per the DUS test guidelines for submission of applications to the PPVFRA for registration. For this purpose 19 NGOs located all over the state were involved. They were provided with seed samples for grow-out-test (GOT) in different locations. The personals involved were trained by the Scientists of CRRI, Cuttack and the whole job was coordinated by the SSTL, Bhubaneswar. The GOTs were monitored and data recording was accomplished.



Further the DNA fingerprinting Laboratory at State Seed Testing Laboratory for Molecular Characterization of all crop varieties including the



genetic resources (farmers varieties collected from different location of Odisha) preserved in the Gene Bank of SSTL. The Molecular Characterization is carried out for authentication and protection of farmers' varieties and al so required DNA finger printing

data were also produced for release of farmers' varieties for public interest as in case of "Kalachampa". This technique can also be used to find out true to typeness of the varieties.

The Under Graduate and Post Graduate student of College of Agriculture OUAT are frequently visiting this laboratory for the RAWE course on seed technology as well as practical classes.



Key results

The recorded data were processed and the applications in given formats were compiled. Thus about 897 applications on behalf of the farmers were submitted to the PPVFRA for their registration as Farmers' extant varieties. Finally registration was received in the names of farmers for around 750 farmers' varieties.

To provide an *ex-situ* conservation support a Gene Bank was established in the SSTL, Bhubaneswar where the whole set of different varieties is deposited.

N.B. While going through such an intensive characterization work, a few varieties were noticed to be performing better than others. Such a variety was Kalachampa submitted by the farmers from different locations. Existing variability within the variety was due to admixture of pure lines and hence pure-line selection was practiced to end up with a pure variety by only one cycle of selection. Multi-location testing encouraged its release by the Director, Agriculture and was duly notified by Govt of India for cultivation by the farmers of Odisha.

Impact

- The farmers are encouraged to maintain their extant varieties *in-situ* as they are the owners of such registered varieties.
- Secondary selection in such varieties appears to provide varieties with greater adaptation and higher return for the farmers.
- Basic materials would be available for research and development in the posterity.
- The indigenous material preserved in the Gene Bank would be available to the farmers on request in case of extinct of that variety.
- Development of value addition varieties like scented, red rice & excellent cooking quality with export potential from the land races which may enhance the farmer's income.
- Selection of pure lines from the farmers' varieties (as in case of the variety "Kalachampa") may acclimatize better under the stress situations resulting from the climate change phenomenon.

Supporting Quotes and Images

- 1) The country which has more germplasms, the more secure in food security for future generation.
- 2) If conservation of natural resources goes wrong, nothing else will go right." — M. S. Swaminathan, As quoted in *India Today* (2008)
- 3) "The flowers of tomorrow are in the seeds of today" - Indian Proverb.
- 4) Indigenous varieties are our heritage and are the result of millennia of natural and artificial selections – Harlan 1975.
- 5) Most of us take seeds for granted. The fate of human kind is resting on these genetic resources: Seeds. So nothing could be more important.- Cary Fowler
- 6) Indigenous seed benefit marginal farmers who dominate the agriculture sector in India
- 7) The more variety, the better society- The French Quot



Honble Chief Minister, Odisha Testing the Aroma of the Highly Scented Farmer's Variety (Kalia)



Honble Minister of Agriculture, Govt. of Odisha visiting the Gene Bank at SSTL and Interacting with analyst about "Kalachamna" variety



Hon'ble Minister for State - Govt. of India with Principal Secretary, Commissioner Cum - Director of Agriculture & Director



Hon'ble Minister for State - Govt. of India with assessing the farmers varieties preserved in Gene Bank of SSTL



Deputy Director General, IRRI, Philippines visiting the Gene Bank of SSTL

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Know the rice, mark it & make it pay

BIBHUTI BARIK
Bhubaneswar, March 10: The Seed Testing Laboratory (STL) here is set to create a DNA fingerprinting database of 900 rice varieties to identify the genetic peculiarities of individual types for research, reference and development of new, high-yielding grains.

DNA fingerprinting has become a common term of reference for criminal investigation and paternity identification where the DNA (deoxy-ribose nucleic acid) or the genetic material of a human being can be matched with a sample.

Scientists of STL will do similar molecular analysis on rice plants to know their genetic composition, DNA sequence and study the nature of these sequences.

As genes determine the characteristics of a plant, this information would aid research work for other scientists who are working in fields such as breeding programmes to produce high-yielding, drug, flood, stress and drought-resistant rice varieties.

State director of agriculture R.S. Gopalan told **The Telegraph**: "DNA fingerprints are just like human thumb impressions in that they are unique and never resemble one another. For example, we have found local variety kala champa from western Odisha, which is of more high-yield than the high-yielding varieties developed by rice scientists. If we have the DNA fingerprint of this rice with us and get it registered, the same genetic material used to produce a seed by any company or an institution can be challenged."

Gopalan said traditional farmers having ownership rights on their "land race" or local varieties can file for compensation under the provision of the Protection of Plant Varieties and Farmers' Rights Act (PPVRA), 2001.

Under the Act, the ownership of the rice varieties lies with the farmers.

"From the collection of the rice varieties at STL we will produce seedlings. Chemical extracts from their leaves undergo the DNA fingerprinting tests. The tests are done through polymerase chain reaction (PCR) machines, which produce bar codes similar to the bar code we see on the price tags on goods at departmental stores. The sequencing of the DNA fragments in the genetic material of the rice varieties will appear as a series of bar codes on the PCR machine's report," said assistant agriculture officer-cum-seed analyst Chakradhar Panda at STL.

"With DNA fingerprinting, we will also attach the bar code sequences that indicate the genetic materials of the rice varieties. This will help farmers identify the molecular characteristics of the varieties they own for future authentication. The new lab for fingerprinting of rice varieties will start within a week," Panda said.

Satya Ranjan Das, professor emeritus at Odisha University of Agriculture Technology and a well-known rice breeder, said: "DNA fingerprinting, in a way, is like patenting the traditional varieties. As Odisha is home to several unique rice varieties, farmers and traditional growers will have the genetic identification of their rice varieties."

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Additional Information

- ❖ List of all project partners and / or donors who supported the work.
- ❖ Sri R S Gopalan, IAS. Ex Director of Agriculture & Food Production, Odisha Bhubaneswar.
- ❖ Dr. S.R Dhua, Retd. Principal Scientist, Crop Improvement Division, NRRI, Cuttack.
- ❖ Sri. B.B. Pattnaik, Ex. Seed Certification Officer, SSTL, BBSR now DDA, Jajpur.
- ❖ Sri Subrat Kumar Mishra, Seed Certification Officer, SSTL, Bhubaneswar.
- ❖ Sri Chakradhar Panda, AAO-cum-Seed Analyst, SSTL, Bhubaneswar.
- ❖ Link to supporting materials, such a news items :
- ❖ https://www.telegraphindia.com/1130201/jsp/odisha/story_16506001.jsp

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