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INTERVIEW

Genetic Resources Must be Accessible and Used: Dr RS Paroda

By **Sunil Archak**

Q1. Everyone knows about your immense contributions to Indian agriculture in general and agricultural research, education and extension in particular. However, your passion and unending quest for genetic resources has altogether a different dimension. When and how did your interest in genetic resources begin?

Hailing from the Thar desert of Rajasthan, while helping often my mother in farm operations, I understood the importance of plants, crops, animals, especially for the livelihood and survival of the people right from my childhood. Later, as student of Genetics and Plant Breeding, I got fascinated by Darwin's theory of evolution and Mendel's laws of inheritance. While being a Ph.D. student at IARI, under the guidance of Dr AB Joshi, I could appreciate the importance of genetic resources for crop improvement. At that time, I was impressed by Dr Harbhajan Singh's valuable work while heading the Division of Plant Introduction. Later, while working for my post-doctorate with Prof. Hugh Rees, FRS at University of Wales, Aberystwyth on cytogenetics of Eu-sorghums, I got more convinced of the importance of related wild species as useful source of resistance to biotic and abiotic stresses. The success of nobilization of sugarcane by TS Venkataraman at SBI, Coimbatore had fascinated me more towards the importance and management of genetic resources. The first multi-cut sorghum variety SSG 59-3, released at the national level, was an outcome of sorghum × sweet Sudan grass hybridization work carried out at HAU, Hisar when I was working as Forage Breeder. The successful release of more than ten varieties at the national level of sorghum, oats, cowpea, guar and berseem by our team was mainly due to the use of rich germplasm that we had, many of those accessions were obtained from NBPGR.

My interest in genetic resources further got intensified after I visited the deserts of Australia, America and Central Asia. I realized that Thar desert is fortunate to have rich genetic resources of plants, trees and animals. However, there is an urgent need to collect, evaluate and conserve them before they become extinct in view of harsh climate and vagaries of weather.

As destiny would have it, I got an opportunity in 1985 to lead NBPGR – an institute on plant genetic resources. However, I understood immediately that for improved efficiency the system needed good infrastructure facilities, including the construction of a modern Genebank, which was indeed a great challenge since neither land nor funds were available then.

Q2. World has witnessed a paradigm shift in the way we access and use plant genetic resources. You have not only observed these changes but you also provided

With Dr AB Joshi: Teacher, guide and mentor

As forage breeder with Dr MS Swaminathan

policy guidance at national and global levels. Could you let the readers know about your first-hand experience? Have we achieved what we set-out for?

As a student of genetics and plant breeding, two cardinal principles were taught to us. These are: i) Genetic resources are common heritage of mankind (humankind) and ii) Genetic resources are exchanged freely.

Somehow, after the Convention on Biological Diversity (CBD) came into force in 1993, with a call to nation members to have their *sui generis* system to protect biodiversity, both these principles hold no good. There is though better awareness of rights now but in general lack of appreciation for mutual exchange of genetic resources. The current protectionist approach will be counter-productive. No doubt, we shall have to adapt to paradigm shift from free to better understood and agreed access and benefit sharing (ABS) system for bilateral exchanges as per Nagoya Protocol. On the contrary, in retrospect, had such restrictions been there earlier, our food basket would have not been so diversified as today. The current challenge is to protect what we possess but then we need to be wise to have in place ABS mechanisms by which needed exchange continues uninterrupted for future food, nutrition and environmental sustainability.

Fortunately, for multilateral exchanges, a well understood inter-governmental mechanism exists under FAO in the form of International Treaty on Genetic Resources for Food and Agriculture - ITPGRFA (signed 2001), which is in harmony with CBD and guaranteeing food security through the conservation, exchange (multilateral) and sustainable use of world's plant genetic resources. I was personally involved as head of Indian delegation in very long debates and meetings to put its framework in place, especially to have an agreement on definition of farmer's rights. During the Third Extraordinary Session of the CGRFA (mid-December 1996), I was made the chairman of Working Group on Farmers' Rights and had experienced fierce long debates, often inconclusive, for almost two years to finally have an agreement on farmer's rights on genetic resources, considered on par with those of breeder's rights. Similarly, it was not easy to agree on the list of 64 crops under Annex I of the Treaty that was approved in 1995. I was personally disappointed that despite strong justifications, crops like Soybean and Cotton were not included. Since then, almost 25 years have passed but

Representing India at an ITPGRFA session

the list of crops under Annex I has not been extended despite the presumption that Treaty would ensure this to happen. Hope the 9th Governing Body meeting being held in New Delhi next month would succeed in expanding it. Another concern that I have is about contributions towards Gene Fund, for which provision was made under the Treaty. Unfortunately, not much has happened since then. A significant development is, however, seen in the form of standard Material transfer agreement (SMTA) for the exchanges of genetic resources held in the Genebanks of International Centers under the umbrella of this treaty. Many developing countries, including India, have adopted this STA for multilateral exchanges of 64 crops listed under Annex I. This is likely to help considerably in opening the doors for sharing of genetic resources.

Q3. You are credited with building modern infrastructure for genetic resources conservation and management. Was it not thinking ahead of time and how difficult it was to

Project negotiation with USAID team

get government support to accomplish your dreams? When you look at these Bureaus, how you would consider their achievements?

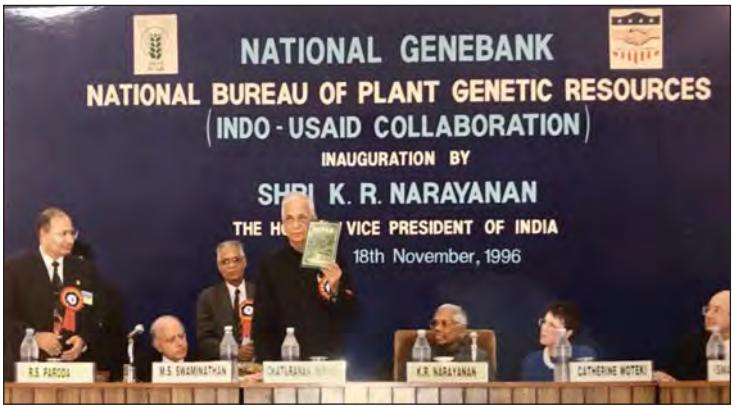
When I joined as Director, NBPGR in 1985, the institute was located in an old building. It needed good research laboratories, equipment and the Genebank to conserve existing valuable genetic resources. With the help of colleagues and within available meagre budget, we tried to renovate the laboratory facilities. For building the Genebank, neither there were funds nor the land on Pusa campus. When I approached Dr. N.S. Randhawa, the then Director General and Dr. M.V. Rao, DDG (Crop Science), ICAR for additional funds, both expressed helplessness and advised to explore the options of external grant. Accordingly, considering it my first priority, I started negotiating with organizations like JICA and USAID for needed support.

Fortunately, I could approach Dr. Nyle C. Brady, former Director General, IRRI, who then was Assistant Administrator for Science and Technology in USAID, Washington. Besides him, I received good support of Dr. D.S. Athwal, then working with Winrock International as Vice-President. In fact, both of them had worked closely at IRRI. After intense negotiation, and keeping in mind the facilities and infrastructure at the Genebanks at Fort Collins, USA and at Tsukuba, Japan, we submitted a project for the construction of institute building, scientific equipment and also projected the requirement of training in the US labs of most NBPGR scientists. As luck would have it, I could get the project finally sanctioned in 1987 with an outlay of US $25 million. This led to the allocation of land and start of construction of a new campus of NBPGR housing the most modern Genebank with capacity to store one million accessions, which then was completed and inaugurated during the 2nd International Crop Science Congress in November, 1996 by the then Vice President KR Narayanan. Today, this Genebank is the second largest with over 0.45 million seed samples stored safely, which has a capacity of 1 million accessions. In addition, facilities for Tissue Culture and Cryo-preservation Bank for vegetatively propagated plants were also created. Besides, a centre of excellence on DNA Fingerprinting was established at NBPGR.

Soon after joining as Director General, ICAR and being fully convinced of the importance and need of institutional support for genetic resources other than plants, I could convince policy makers to get sufficient funds and create the Bureaus of Animals, Fish, Microorganisms and Useful Insects. The National Bureau of Fish Genetic Resources at Lucknow was built in a record time of five years and it was inaugurated by the then Hon'ble Prime Minister Atal Bihari Vajpayee. Similarly, The Bureau of Animal Genetic Resources at Karnal was built in five years. As a result, all these four institutions, besides NBPGR, are serving a great cause and jointly they form a unique national network on management of genetic resources for posterity. Today, we do not find such a strong national program elsewhere in the world. Hence, we can legitimately feel proud of such a strong network of genetic resources.

It must also be mentioned that considering the need for trained Human Resource, a post-graduate program in the discipline of PGR was initiated for the first time in 1997, under which 73 M.Sc. and 31 Ph.D. degrees have been conferred.

With regard to my impression about the functioning of these bureaus, over the last two decades, I think overall they have done a good job. This was evident from an excellent display of their activities in the



Inauguration of Indian National Genebank, a dream project of Dr Paroda

At NBPGR genebank module

Felicitating Dr APJ Abdul Kalam during Indian Science Congress

exhibition that was organized during the 1st International Agrobiodiversity Congress in November, 2016. The foreign participants from several countries were highly impressed by the quality of papers presented by our scientists.

However, an aggressive well monitored network effort in a Mission mode is warranted, as was done when a Mission on exploration and conservation was undertaken under NATP when we almost doubled (from 2 lac to 4 lac) the accessions in just five years. In retrospect I must say that if these institutions were not created then, we would have needed them now. We are better placed as they already exist and it is our responsibility to nurture them well.

As the Chairman of the Working Group on Farmers' Rights of FAO Commission on Plant Genetic Resources (1995-97), I could get the Farmers' Right defined and agreed by the Commission. While serving as the member of the International Committee constituted for Plant Genetic Resources by the Board on Agriculture, National Academy of Sciences, Washington for the period 1990-94, I got recommended the much-needed renovation and strengthening of the Genebanks. I also worked passionately and closely with Dr Ismail Serageldin, the then Chairman, CGIAR and Dr Geoff Hawtin, the then Director General, IBPGR and succeeded in convincing the Funders, through constant dialogue and events at the meetings that I chaired, to support the cause of conserving global genetic resources. These efforts eventually led to the establishment of Global Crop Diversity Trust (GCDT) in 2004. In fact, it was Dr Jecques Diouf, the then Director General, who kindly agreed to our request to host GCDT at FAO, Rome. It is sad that the primary objective of extending support to the national Genebanks for rejuvenation and conservation of genetic resources in the developing countries has not yet been realized. Instead, focus got shifted to fund the Genebanks of CGIAR Centers. Another disappointment was that its headquarters got shifted to Germany.

Q4. You have organized important national and international conferences, symposia, brainstorming on PGR and have brought out world-class policy

Naming of ICRISAT genebank after RS Paroda

Establishment of Kazak Genebank: Named as Raj Paroda Genebank

documents. Also, you are credited to have established some PGR networks. Do you see them as opportunities for strengthening R&D on PGR? Is there awareness among researchers about the significance of enabling policy environment for the management of genetic resources?

I have always felt strongly about the importance of establishing links and partnerships among agricultural institutions at state, national, regional and international levels. Hence, I had organised a number of networks on PGR and also the conferences, symposia, expert consultations, workshops and brainstorming sessions considering them important for strengthening research and development.

To ensure a platform for publishing scientific work of researchers, it was considered necessary to establish Indian Society of Plant Genetic Resources (ISPGR) at NBPGR in 1986. This Society has served a great cause of publishing scientific papers through its Journal IJPGR and by organising a number of national and international conferences. It also published a number of proceedings and promoted scientific collaboration among its more than 850 members.

It also organised a number of national symposia and conferences and brought out useful publications and proceedings. The First National symposium on PGR was held in March 1987 at IARI, New Delhi; which was inaugurated by Dr BP Pal, former Director General, ICAR and attended by Dr AB Joshi and Dr MS Swaminathan. Later, in 2013, in collaboration with BI, it had organised a Global Consultation on Use and Management of Agrobiodiversity for Sustainable Food Security at New Delhi. In November, 2016, it also organised successfully the 1st International Agrobiodiversity Congress (IAC) with 1,000 participants from 60 countries at New Delhi, which was inaugurated by the Hon'ble Prime Minister Narendra Modi. Besides its proceedings, the conference also adopted "Delhi Declaration on Agrobiodiversity Management" concerning various aspects of conservation, management, access and use of agrobiodiversity and the Declaration is being used now for defining a 'Road Map' for future management of Agrobiodiversity.

It is also a great satisfaction that IAC has now become an important rolling event. The 2nd IAC was hosted in Rome in November, 2021 and was funded by the Government of Italy. It is expected that 3rd IAC will be hosted by CAAS in China. In my view, such scientific conferences are the best ways to expose young scientists to recent advances and catalyse them to pursue quality research in their career.

While working as Regional Plant Production and Protection Officer, FAO, Bangkok (1992-1994), and later as Executive Secretary, APAARI, I could initiate a number of regional PGR networks for evaluation and use of genetic resources in different countries. These were: on maize -TAMNET involving FAO and CIMMYT; on cereals and legumes – CLAN involving ICRISAT, ICARDA and AVRDC; on rice – CORRA involving IRRI; on cotton – INCANA involving AARINENA, APAARI and CACAARI; and on fish - GoFAR involving WorldFish Center. For these networks, an effort was made to involve more NARS and strengthen three regional PGR networks of IBPGR for i) South Asia, ii) Southeast Asia and iii) the Pacific region. These networks helped in joint evaluation and exchange of useful genetic resources by concerned NARS and derive mutual benefits. It was

Dr BP Pal at the inauguration of First National Symposium on PGR at IARI in 1987

Meeting on Strengthening PGR Networks at FAO, Bangkok

First Global Conference by GFAR in Dresden

great satisfaction to see the willingness of NARS partners to collaborate and identify useful varieties and hybrids that can enhance productivity of these crops.

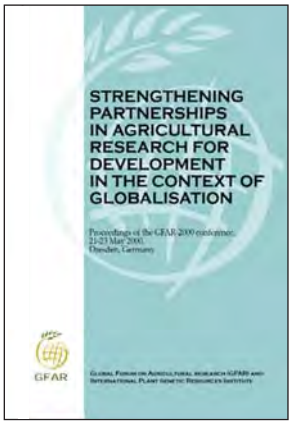
As founder Chairman of the Global Forum on Agricultural Research (GFAR) from 1998-2002, I encouraged partnership building among NARS and the Agricultural Research for Development (AR4D) stakeholders. During the first Global Conference on AR4D organized by GFAR in 2000, a special session was held in collaboration with Bioversity International where the "Dresden Declaration on Plant Genetic Resources for Food and Agriculture" was adopted, defining clearly a Road Map for strengthening PGR activities at the global level. Later, as Executive Secretary, Asia Pacific Association of Agricultural Research Institutions, I could hold in collaboration with BI and other CG Centers, an International Symposium on Agrobiodiversity in Suwon in 2010 which led to the adoption of 'The Suwon Agrobiodiversity Framework', catalysing all stakeholders in the Region to accelerate activities to conserve their valuable genetic resources through use. Subsequently, both GFAR and CGIAR decided to organize jointly every two years the Global Conference on Agricultural Research for Development (GCARD). As chairman of the Program Committee of GFAR, I had the privilege to organize GCARD 1 at Montpelier, France in 2010 and GCARD 2 at Punta del Este in Uruguay in 2012. As an outcome, we could get overwhelming endorsement of 'GCARD Road Map'.

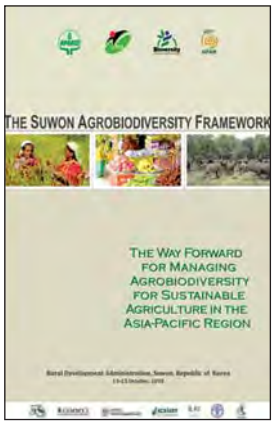
To promote regional cooperation and scientific networks, I took the major initiative to organize a number of Regional Expert Consultations. These were: Regional Roundtable Meeting on Implementation of the International Treaty for Plant Genetic Resources for Food and Agriculture (ITPGRFA) in 2005 in Bangkok; Expert Consultation on Progress of Research Networks at ICRISAT in 2007; Regional Workshop for Implementation of Suwon Agrobiodiversity Framework in 2011 in Kuala Lumpur; Regional Consultation on Genetic Resources in the Pacific held at Fiji (2012); and the Regional Consultation on Medicinal Plants in 2013 in Bangkok.

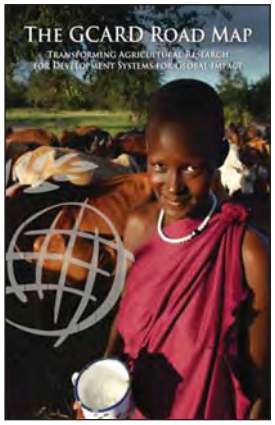
Q5. It is rare to see five dedicated Bureaus working on different genetic resources in any other country. Do you believe these Bureaus have done justice to their existence? Can these be the global research Centers of genetic resources?

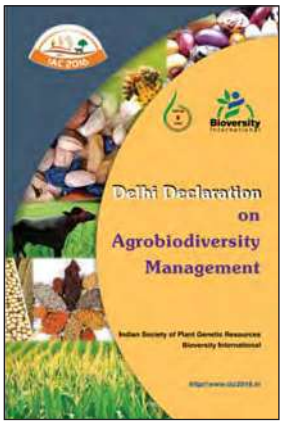
As stated earlier, a well monitored mission mode approach is needed to make these bureaus more effective at global level. India is fortunate to have presently five Bureaus on Genetic Resource management of its rich agrobiodiversity, besides a unique *sui generis* system

1st International Agrobiodiversity Congress organized with 1,000 participants from 60 countries (New Delhi, 6-9 Nov 2016), which was inaugurated by the Prime Minister Narendra Modi.









Dresden Declaration (2000); Suwon Framework (2010); GCARD Roadmap (2012); Delhi Declaration (2016)

through two acts approved by the Parliament, namely, i) Protection of Plant Varieties and Farmers' Rights Act (2001), and ii) National Biodiversity Act (2002). As head of ICAR, and in view of my personal interest in the subject, I was actively involved in drafting and getting these bills approved. These Acts and Bureaux are today serving a great cause for the conservation and use of country's valuable agrobiodiversity. Surely, we can feel proud of having such a strong national system with more than 200 scientists actively engaged in various aspects of genetic resources. They need to have real passion for the genetic resource management activities. Moreover, in my view there is no room for complacency just because we have a strong system now in place.

Q6. Do you think modern technologies like gene editing will make genebanks redundant? What is the role of genebanks in combating climate change? In other words, how can the Indian genebank be a valuable resource to address climate change?

I do not think so. In fact, genome editing is just a technique to accelerate the breeding process –it is rather a disruptive innovation helpful in transferring desired genes in good agronomic background. In any case, gene editing will need new genes for specific traits to be incorporated. Hence, success would obviously depend on whether we have the desired genes for editing. As such, the importance of Genebanks, especially the collections of wild and weedy species, shall remain. On the contrary, there will be an acceleration of conservation through use now than ever before. With regard to the role of Genebanks to combat climate change, India is again much better placed globally in view of existing rich germplasm that has the best-known tolerance to stresses – both abiotic (cold, heat, salinity, drought, flooding etc.) and biotic (diseases, pests, weeds etc.). We are known to have the best salt, heat and drought tolerant materials of wheat, rice sorghum, pearl millet and a number of fruits, vegetables, grasses and trees. These would be valuable sources for breeding crops and animals to adapt well to climate change.

To harness the benefits of genome editing, much would depend on enabling policies and institutional support, besides enhanced funding so critical for harnessing rich genetic resources.