Indian J. Plant Genet. Resour. 29(3): 438-441 (2016)
DOI 10.5958/0976-1926.2016.00095.4

Conservation and Use of Genetic Resources through Implementation of Suwon Agrobiodiversity Framework and Partnerships in Asia and the Pacific

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Agrobiodiversity forms the foundation of sustainable agricultural growth and development. Plant genetic resources for food and agriculture (PGRFA) provide the biological basis for agricultural production and food security. The plant genetic diversity allows crops and varieties to adapt to ever changing conditions and to overcome the constraints caused by biotic (pests, diseases) and abiotic (drought, heat, flood) stresses. However, the genetic diversity has been eroding at an alarming pace due to developmental activities, climate change and ill-planned use leading to irreversible and irreparable loss. Genetic erosion of plants occurs through replacement of local varieties of crops, and other cumulative effects from invasive alien species, pests, weeds, diseases, landuse change and environmental degradation. The world's aquatic diversity is threatened by over-exploitation of fish genetic stocks and environmental pollution.

The conservation, sustainable use, and fair and equitable sharing of benefits from their use, are both an international concern and an imperative as these are the objectives of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), which is in harmony with the Convention on Biological Diversity (CBD). In reaffirming the context of the sovereign rights of states over their biological resources and the interdependence of countries regarding PGRFA, the second Global Plan of Action (GPA) of FAO addressing plant genetic resources for food and agriculture, adopted by FAO Council, is an appropriate manifestation of the international community's continued concern and responsibility in this area. The Second Report on the State of the World's PGRFA has shown that interdependence on plant genetic resources is increasing at a global level. However in many countries, efforts on conservation, *on-farm* management, crop improvement and seed systems are insufficiently integrated to adequately address present and future challenges, particularly food security, sustainable development and climate change

Consequently, managing PGRFA has become a collective global responsibility and international cooperative efforts are essential to enhance conservation through exchange and utilisation. National and international genebanks have been working towards collecting and conservation of genetic resources for food and agriculture. Effective use of genebank materials for breeding purposes is, however, extremely low, due to existence of technical and policy barriers and constraints.

Suwon Agrobiodiversity Framework

As a part of the ongoing efforts, and in recognition of 2010 as an International Year of Biodiversity, APAARI had organized an International Symposium on "Sustainable Agricultural Development and Use of Agrobiodiversity in the Asia-Pacific Region" from October 13-15, 2010 in Suwon, Republic of Korea (Mathur *et al*., 2011). This was done in partnership with Rural Development Administration (RDA), Republic of Korea; Global Forum for Agricultural Research (GFAR); Bioversity International, FAO and other International Centers such as CIMMYT, ICARDA, ICRISAT, IRRI, ILRI and AVRDC. The symposium provided an excellent opportunity to review, identify and redefine the role and directions of agricultural R&D, especially in the context of conservation through use of valuable agrobiodiversity for sustainable agricultural development. It also helped in agreeing on a 'Way Forward' for the access and benefit sharing of valuable genetic resources. The agrobiodiversity research and development framework for the Asia-Pacific region, adopted during the symposium provided a strategic approach, towards both management and use through regional collaboration and partnerships among stakeholders. The framework published as "The Suwon Agrobiodiversity Framework" agreed by national partners to be used for developing their own national programmes for conservation and sustainable use of plant genetic resources. The following are the key elements of the Suwon Agrobiodiversity Framework.

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(a) Challenges and Opportunities

The Asia-Pacific region is the center of diversity of many important species of crops, livestock and many other bio-resources. Resource poor producers in the region are largely dependent on the agrobiodiversity of staple crops, minor crops, their wild relatives and other species of plants and animals for their food security and livelihood. It is also evident that the contribution of agrobiodiversity in ensuring sustainable and productive agriculture remains vital. The reservoir of genetic resources remains a main resource for food security, and equally important for improving nutrition, product quality, product diversification and food safety. The genetic diversity in both indigenous and introduced species has been enhanced through extensive exchange of germplasm within the region.

However, while the threats to these resources are growing, the efforts to conserve and use genetic diversity are insufficient in the region. Also, the traditional knowledge, associated with the use of old varieties/landraces, has remained undocumented and is rapidly vanishing. Therefore, reduction of agricultural biodiversity can significantly increase the vulnerability of farmers and existing agro-ecosystems. Therefore, initiatives through conservation and use of agrobiodiversity must respond to these challenges.

Responding to the emerging challenge of climate change, greater access to a range of varieties that can help farmers deal with drought or flood, will be required. Exploring the genetic resources available will require new tools (Genomics, GIS, ICT), technologies and innovative approaches for their conservation and use.

All these challenges are compounded by the continuing loss of genetic diversity of plants, livestock and aquatic resources. Hence, effective conservation and sustainable use of available genetic resources becomes a major priority in the region.

(b) Integrated Approach

The Suwon Framework proposed an integrated approach which seeks to ensure the continued availability of critical genetic resources not only for the improvement of agricultural productivity and resilience of the production systems but also to improve the quality of the supply chains through effective collaboration of different stakeholders working on a broad range of genetic resources. It also builds on current partnerships and eco-regional experiences involving national and international organizations and for integrating partnerships across the different sectors involved in genetic resources. The approach draws lessons from existing collaboration between different CGIAR centres, AIRCA members, NARS, Regional Fora and many other stakeholders in the region – a collaboration that needed to be strengthened to a higher level of effectiveness and accountability.

This integrated approach would intrinsically be more effective in the long run since it brings together work on microbes, bios, crop plants, forest trees, livestock and fish genetic resources. It should also combine research on genetic, biological, agronomical, socio-cultural, market, trade, economic and policy aspects. It would encourage development of national plans, focussing not only on major crop commodities but also on other neglected and underutilized minor crops, livestock, aquatic resources and tree and forest species. The approach encourages the different organizations and local communities to work in partnership for collective actions. This approach will maximise the resources and opportunities to have an agile response to new, yet unforeseen developments in understanding diversity and promoting its use through research, conservation, evaluation and documentation.

(c) Research and Development

Various focus areas of research and development as proposed in the Suwon Agrobiodiversity Framework are as below:

- Studies to enhance use of genetic resources through sub-set approaches
- Pre-breeding and participatory breeding to enhance utilisation of genetic resources in commodity improvement programmes
- Strategies and technologies to enhance *in situ* and *ex situ* conservation through use
- Assessment of the agrobiodiversity richness and the status in terms of economic, social and cultural (traditional knowledge) factors
- Interdisciplinary studies on the invaluable ecosystem services for agriculture that agricultural landscapes, forests and other mainly wild ecosystems provide
- Information systems and tools for data exchange
- Supportive policies, laws and strategies to enable enhanced PGR exchange and use

(d) Areas of Regional Collaboration

The important areas of regional collaboration indicated

in the Suwon Agrobiodiversity Framework are given below:

- Developing national agrobiodiversity plans and integrating them into regional and global collaborative frameworks
- Increasing R&D collaboration on agrobiodiversity conservation and use in the region
- Increased sharing of information and data on genebank collections
- Strengthening agrobiodiversity capacity, education and public awareness
- Enhancing exchange and use of genetic resources
- Facilitating involvement of stakeholders in strengthening agrobiodiversity conservation and use

(e) Collaboration and Partnerships

The Suwon Agrobiodiversity Framework builds on partnerships and eco-regional experiences involving national and international organisations and for integrating partnerships across the different sectors of genetic resources. The vision of the proposed framework approach draws lessons from collaboration between different CGIAR centres, NARS, regional fora and all the stakeholders in the region – a collaboration that needs to be strengthened to a higher level of performance and accountability.

With a view to enhance conservation and use of these genetic resources, APAARI, in collaboration with its stakeholders, especially Bioversity International and other CGIAR Centers, viz., CIMMYT, IRRI, ICRISAT, ICARDA, CIP, ICRAF, CIFOR ILRI, World Fish Center, IFPRI, IWMI, International Research Centers, viz., AVRDC, ICBA, ICIMOD, CFF, CABI, other international organisations as FAO, GFAR, GFRAS, Regional Fora, and the National Agricultural Research Systems (NARS) continue to review the role and direction of agricultural R&D to efficiently address above challenges.

Four sub-regional PGR networks engaged in promoting regional collaboration for strengthening PGRFA conservation and use include: (i) South Asia Network on Plant Genetic Resources (SANPGR), (ii) the East Asia PGR Network (EA-PGR), (iii) Regional Cooperation for Plant Genetic Resources in Southeast Asia (RECSEA-PGR), and (iv) Pacific Plant Genetic Resources Network (PAPGREN). In addition, there were also several commodity focused PGR networks like the Banana Asia-Pacific Network (BAPNET), the International Coconut Genetic Resources Network (COGENT), Cereals and Legumes Asia Network (CLAN), and the International Network for the Genetic Evaluation of Rice (INGER).

Actions Required to Implement Suwon Agro-biodiversity Framework

The following actions are needed in ensuring optimal participation of different actors, and the building of new partnership opportunities:

- Benefitting from the new tools and technologies through new alliances among researchers working on plant and animal breeding, molecular biology, bioinformatics and biometrics that integrate genetic resources, genomics and genetic improvement programmes;
- Laying focus on genetic resources in different CGIAR research programmes for better integration into national plans and regional and global collaborative frameworks, to avoid gaps and overlaps;
- Enhanced regional crop improvement programmes and PGR networks to ensure capacity development and improved exchange of materials and their use in the Asia-Pacific region;
- Network activities to focus more on underutilized and neglected species in the region.
- The different sub-regional and crop networks would also be more sustainable if linked with regional or global initiatives, such as those of APAARI and other regional and global fora. These networks need to be revitalised;
- Strengthening partnerships with CSOs and the private sector to contribute more effectively towards public awareness, education and policy advocacy; and
- Finally, there is a need to form new partnerships involving farmers and other stakeholders who ultimately guard the agrobiodiversity and its associated knowledge.

Moving Forward with the Framework

Concerted efforts needed to move forward with the implementation of Suwon Agrobiodiversity Framework are as follows:

- Encourage national systems to adopt the framework in their national agrobiodiversity work plans

- Encourage donor/funding organisations to use the framework as the basis in supporting initiatives on agrobiodiversity
- Strengthen capacity of sub-regional and genetic resources networks to follow through the framework
- Develop regional collaborative projects based on the framework
- Catalyse national systems in enhancing their breeding programmes through the use of germplasm, and
- Support activities that promote the use of under-utilised crops

Priority Activities Underataken

(a) Priority projects identified during Kuala Lumpur Workshop

As a follow-up of Suwon Agrobiodiversity Framework, a Regional Workshop on Implementation of Suwon Agrobiodiversity Framework, was organized at Kuala Lumpur, Malaysia on November 4-6,, 2011 (APAARI, 2012) in which the following priority projects were identified:

- Enhanced utilisation of germplasm for sustainable crop production – for Pacific countries
- Acquisition of crop wild relatives and accessing novel alleles
- Increasing availability and accessibility to the rich agrobiodiversity for conservation and improvement of livelihoods of farmers
- Enhancing use of underutilised species for improved livelihoods and diversified diets
- Agrobiodiversity transition and deficits: understanding and managing changes in diversity and local thresholds to the sustainability of ecosystem services

(b) Matching Seeds for Needs: PNG-Bioversity Efforts

The following activities were undertaken with joint efforts of PNG and Bioversity International under the programme "Matching Seeds for Needs"**:**

- Crop suitability models for taro and sweet potato for current and future climatic conditions
- Identification of crop production areas most threatened by climate change
- Identification of varieties adapted to future climatic conditions
- Development of improved seed multiplication and delivery systems
- Improved genetic production potential of staple crops in Papua New Guinea (PNG)

Recent Initiatives by APAARI in Strategic Partnership and Networking

In recently developed APAARI Vision 2030 (APAARI, 2016) and thereby articulated Strategic Plan – 2017-22, APAARI has assigned a high priority in terms of its time, effort and resources in developing and implementing partnership and networking programmes to: i) effectively manage and utilise agrobiodiversity and ii) promote and improve the application of advanced biotechnologies and regulatory systems in agri-food systems in Asia and the Pacific region. This will be undertaken through strengthening of agri-food research and innovation systems. The *modus operandi* will be the collective actions between APAARI, agri-food research and innovations systems, their partners and other stakeholders, including governments, CSOs (NGOs, FOs), the private sector and regional and global agencies. The major focus of these efforts will be on:

- Conservation and use of underutilised, marginalised and neglected species;
- Scientific research, technological advancement, innovation, economic and policy considerations, and regional and global treaties and arrangements covering various aspects of agrobiodiversity;
- Looking at comprehensive dimensions of agrobiodiversity covering not only plants but also animals, fishes, microbes, bios, insects, etc.

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