Elements of a National Strategy for Management and Use of Plant Genetic Resources in Armenia

Patrick E. McGuire
National Study

ELEMENTS OF A NATIONAL STRATEGY FOR MANAGEMENT AND USE OF PLANT GENETIC RESOURCES IN ARMENIA

GCP/GLO/162/EC – Armenia (5)
Designing an Integrated Strategy to Improve Armenia’s Food Security through Improved Management and utilization of Plant Genetic Resources

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ACRONYMS, ABBREVIATIONS AND TERMINOLOGY

ACIAR ......................... Australian Centre for International Agricultural Research
AGPC .......................... FAO, Agriculture Department, Plant Protection & Production Division, Crop
AGPS .......................... FAO, Agriculture Department, Plant Protection & Production Division, Seed
AGPC and Grassland Service
AGPS and Plant Genetic Resources Service
Agroecosystem .................. association of biotic components related to agriculture: crops, pastures, live-
Agroecosystem and other flora and fauna; abiotic components: atmosphere, soils, and
and the processes by which they interact
ASAU ............................ Armenian State Agrarian University
ASEAN .......................... Association of Southeast Asian Nations
AUA .............................. American University of Armenia
CAC .............................. Central Asia and the Caucasus
CARD ........................... USDA Center for Agribusiness and Rural Development
CATCN/PGR .................. Central Asian and Transcaucasian Network on Plant Genetic Resources
CBD .............................. Convention on Biological Diversity
CGIAR .......................... Consultative Group for International Agricultural Research
CIMMYT ...................... International Center for the Improvement of Maize and Wheat, one of the
CIMMYT CGIAR centers
CIP .............................. International Potato Center, one of the CGIAR centers
CWR ............................. Crop wild relatives
EU ............................... European Union
EC ............................... European Commission

Ex situ conservation .......... Conservation of components of biological diversity outside their natural habi-
Ex situ tats
FAO .............................. Food and Agricultural Organization of the United Nations
Genebank ...................... a repository to preserve genetic resources as living seeds, tissues, or reproduc-
Genebank tive cells, the condition of preservation is ex situ
Gene pool ..................... for a species or a population, it is the complete set of unique alleles that would
Gene pool be found by inspecting the genetic material of every living member of that
Gene pool species or population
Global Plan .................... Global Plan of Action on Conservation and Sustainable Utilization of Plant
Global Plan Genetic Resources for Food and Agriculture
GMO ............................. Genetically modified organisms
GRID ............................ UNEP/Global Resource Information Database
IBGB ............................ Genebank in the Institute of Botany, National Academy of Sciences
ICARDA ....................... International Center for Agricultural Research in the Dry Areas, one of the
ICARDA CGIAR centers
ICRISAT .......................... International Crops Research Institute for Semi-Arid Tropics, one of the
ICRISAT CGIAR centers
In situ conservation .......... conservation of ecosystems and natural habitats and the maintenance and re-
In situ co coverty of viable populations of species in their natural surroundings and, in
coverty the case of domesticated or cultivated species, in the surroundings where they
coverty have developed their distinctive properties
IT-PGRFA ..................... International Treaty on Plant Genetic Resources for Food and Agriculture
Landrace ...................... a crop cultivar or animal breed that evolved with and has been genetically im-
Landrace proved by traditional agriculturalists, but has not been influenced by modern
Landrace breeding practices
MoA .............................. Ministry of Agriculture of the Republic of Armenia
MAGB .......................... Genebank in the MA, Research Center for Agrobiotechnology
MAP ............................. USDA Marketing Assistance Project
Marz ......................... Armenia is divided into 10 administrative regions or provinces called “mar-
Marz zones”. The capital city, Yerevan, independently has the status of a marz
MCA ............................. Millennium Challenge Account
On-farm conservation ... the sustainable management of genetic diversity of locally developed traditional crop varieties along with associated wild and weedy species or forms within traditional agricultural, horticultural, or agri-silvicultural cultivation systems.
EXECUTIVE SUMMARY

Preamble

The wide range of altitudinal variation and climate zones in Armenia has produced great plant diversity. The country is extremely rich in crop wild relatives, landraces as well as different breeding varieties of cultivated plants that offer a rich pool of gene resources for utilization in agriculture at present and in the future. However many of these resources are at risk of loss due to lack of awareness, growing human pressure, climate change, environmental disturbances and related factors. The efficient conservation of plant genetic resources and their sustainable utilization are of high priority in Armenia as it strives for greater economic strength through sustainable agricultural development.

Within the framework of FAO-EC project “Designing an Integrated Strategy to Improve Armenia’s Food Security through Improved Management and Utilisation of Plant Genetic Resources”, a Study was conducted jointly by FAO, ICARDA and Ministry of Agriculture of the Republic of Armenia on “Elements of a National Strategy for Management and Use of Plant Genetic Resources in Armenia”. The main objective of the project was to conduct a national study and identify elements that would contribute to effective management and use of Armenian plant genetic resource for food and agriculture (PGRFA) for improvement of agriculture production and food security through effective use of PGRFA. The Study reviewed the current status of PGRFA management in Armenia, identified the emerging challenges and presented key recommendations towards developing a national policy on PGRFA conservation and use through a comprehensive integrated approach. It covered all the sectors related to the management of PGRFA including regulatory frameworks, technology transfer and capacity building. A number of public and private Armenian institutions involved in PGRFA conservation and use provided essential inputs during the two national stakeholders’ workshops held in Yerevan on 2-5 October and 13 November 2007 within the project.

Armenia and International Agreements of relevance to Plant Genetic Resources

Armenia ratified the Convention on Biological Diversity (CBD) in 1993. The CBD aims at the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, and provides for national sovereignty for its biological resources. The Study found that in Armenia many of the necessary legal and technical obligations for implementation of CBD are in place and adequate and many necessary actions have been adopted as national targets. There has been good progress at several levels in evaluating wild areas and creating new reserves. Required reports under the CBD have been produced in a national collaborative process.

The country has also joined the International Treaty for Plant Genetic Resources for Food and Agriculture (IT-PGRFA) in 2007. This Treaty provides for the conservation and sustainable utilization of PGRFA and farmers’ rights, and establishes a multilateral system of access and benefit-sharing for the genetic resources of Annex 1 crop species of major relevance for food security, in harmony with the CBD. Having acceded to the Treaty, Armenia, like all others joining it, is obligated to facilitate the access by other Parties to the Treaty to its PGRFA and to share in a fair and equitable way the benefits arising from the utilization of these resources.

The Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture (GPA) was adopted in 1996 by 150 countries including Armenia. The priority action areas of the GPA include in situ and ex situ conservation, utilization of PGRFA and building the institutions and capacities necessary to conserve and use these resources. The GPA is now a supporting component of the IT-PGRFA and provides the basic framework for actions on PGRFA related activities at national level.
Main Findings of the Study

Armenia maintains a series of germplasm holdings: *ex situ* genebanks, *in situ* reserves, agro-ecosystems and protected natural ecosystems, working collections for research, breeding or teaching purposes, as well as information/documentation systems as a result of a number national and international initiatives. At present, as a signatory to a number of international agreements, several legislations have been passed to advance biodiversity conservation. In addition efforts have been undertaken to develop inventories of plant biodiversity including crop wild relatives.

The Study found that there is a lack of a comprehensive National Strategy for conservation and use of PGRFA. Although several efforts have been undertaken, stakeholders and representatives of different institutions participating in the Study expressed a strong agreement on the need for a national, integrated and coordinated PGRFA management strategy in order to decrease the threat to the loss of the rich diversity of wild and domesticated plants of Armenia. It was also emphasized that this required immediate attention for improvement of Armenian agriculture and increasing production.

The key challenges in developing an integrated and coordinated PGRFA Strategy that were identified by the Study are as follows:

- Institutional boundaries and practices have led to several difficulties in conceptualizing such a programme. There was an urgent need for a common vision to promote cooperation and improve communication among all relevant institutions in order to establish a well-functioning national PGRFA strategy.
- The “Inter-Ministerial Commission on PGRFA of Armenia” that existed in Armenia did not link PGRFA activities and stakeholders or bring them together toward a national strategy.
- Genetic erosion and reduction in population adaptation are taking place due to anthropomorphic impacts and introduction of invasive and non-adapted genotypes of crops and native species. While some laws to prevent and ameliorate the negative results are in place, enforcement is not consistent and can be absent in the face of overriding financial concerns.
- While many academic studies on Armenian PGRFA exist, up-to-date databases linked with inventory and monitoring systems are not in place. Most of the available information is not digitized that could facilitate inter-institutional information exchange.
- Most institutes lack financial resources. They are heavily dependant on external grants or short projects, which causes a lack of long-term planning and leads to demotivation among staff and personnel. As a result PGRFA does not receive adequate recognition as an essential tool for increasing agriculture production and food security.
- The technical skills of personnel is high, however expertise in advanced technical skills are not available. There is also a critical need to attract young specialists to this field.

Key Recommendations

The key recommendations of a National PGRFA Strategy were identified through this Study and grouped in three main sections comprising the most critical areas for development of an integrated National PGRFA Strategy:

1. Adoption of a National Programme on PGRFA linking conservation and use
2. Establishment of a High-Level Coordinating Council dedicated to PGRFA management for food security
3. Capacity building to enhance PGRFA management for food security

1. Adoption of a National Programme on PGRFA linking conservation and use: A National Programme on PGRFA should be developed which provide a strategic technical and policy framework for all national activities related to policy, research and conservation and use of PGRFA. It should also provide a direction on resource mobilization, roles and responsibilities of implementing institutions and a time table. Priority areas should include:
   - Efficient conservation: This would cover requirements for long-term facility for maintaining *ex situ* collections, field genebanks for perennial crops and in vitro storage
for vegetatively propagated crops. Elements for managing and monitoring *in situ* conservation and PGRFA documentation.

- Strengthened linkages among PGR collection holders and users: Enhance inter-institutional collaboration; start involving farmers in conservation and propagation of PGRFA; improve characterization and evaluation of existing collections on ex situ and on farm.
- Improved utilization of PGRFA to address national plant breeding goals: Focus on developing breeding programmes to address national agriculture production goals; public and private sector partnership opportunities; increase resources and institutional capacities for use of advanced plant breeding techniques; related research and other opportunities.
- Strengthened linkages among plant breeders and seed producers: Increased interest of farmers and seed producers to modern varieties and technologies; Improve communication and information exchange; establish breeders and seed producers networks/associations.
- Implementation of national rules and legislations: Improve plant variety protection system, through development of an appropriate regulatory framework.
- Increasing public awareness: Integration of PGRFA issues in educational and public awareness programmes.

2. Establishment of a High-Level Coordinating Council dedicated to PGRFA management for food security:

- The Coordinating Council would operate through a network of specific task forces to deal with legal, policy, technical and economic issues as appropriate. More specifically it was proposed that the Council be supported by a Technical Operations Task Force. The Council would be established at the highest level with representatives designated by each of the key stakeholders including at least the Ministry of Agriculture, the Ministry of Nature Protection, the Ministry of Science and Education and National Academy of Sciences. Its main task would be to ensure coordination in implementation of the various activities in PGRFA for agriculture development. Its responsibilities could include development and periodic updating of the National Strategy on PGRFA, setting priorities and budgets for national support, advance the needs for the implementation of the National Strategy and propose initiatives, collaborations and partnerships.

3. Capacity building to enhance PGRFA management for food security:

- National capacity should be enhanced through adequate training in research and development including through study tours; secure funding for more staff positions on all aspects of PGRFA management; improved equipment and facilities for conservation and use of PGRFA; international exposure and exchange programmes; opening of new opportunities attractive for your specialists. Enhancement of national capacity also requires the development of a national information system for PGRFA conservation and utilization through the implementation and accessibility of databases with inventories of PGRFA and associated information.

The above recommendations should receive high priority by the Government of the Republic of Armenia with the aim of ensuring sustainable financial support by public funds to planning, constructing, training and sustaining the activities. Necessary additional funding should be aggressively solicited from international development agencies and private donors.
1. INTRODUCTION

Armenian biodiversity and agrobiodiversity

Most components of social and economic development in Armenia can be related, directly or indirectly to biodiversity. Humans have hunted, fished and gathered plants and animals of Armenia since ancient times and intensive use of natural resources continues today. Around 3,500 species of vascular plants have been recorded in the country (MNP 1999), including about 120 species of wild berries and nuts (MNP 2006), over 350 species reported to be used as medicinal, around 150 species known to produce essential oils, and many species related to major crops of the world. (MA 1995). With this resource base having been used by humans for millennia, it is not surprising that there are signs of degradation. Large areas are either destroyed or damaged (FAYVUSH ET AL. 2004).

The entire Caucasus region is considered a biodiversity hotspot by many measures (Chemonics International, Inc. 2000, Williams 2003). Armenia itself has a wide range of altitudinal variation (375 m to 4,095 m) and climate zones. These have produced a great biotic diversity with many endemic taxa. Of most interest to the rest of the world is the number of Armenian plant taxa which are wild relatives of economically important crops.

Agriculture remains important for the national economy and together with the associated agro-processing accounts for much of the country’s employment and export earnings accounting for about 23 percent of Armenia’s productivity. Of the gross agricultural production, 64.7 percent is from crop production and 33.3 percent is from livestock production. Farming in Armenia is mostly irrigated (Gabrielyan 2003). According to a World Bank report published in 2005, agriculture is the main source of rural livelihoods, with farm income accounting for some 51% of the total income of rural households. There are about 335,000 farm households with an average landholding of around 1.4 hectares, with irrigated farming accounting for about 80% of crop related agricultural GDP. Farms generally are diversified, with a strong subsistence orientation. Livestock production contributes around 40% of overall production characterized by an equally small-scale ownership structure.

However, Armenia is still a large net importer of food, importing almost a third of food consumption. With about 0.4 hectares of agricultural land per inhabitant, the agricultural resource base of Armenia is among the lowest in Europe and Eurasia.

Armenia’s agriculture sector has some significant strength. The country has multiple agronomic zones, conducive to production of a range of crops and animal products. There are extensive high meadows suitable for goats and sheep that can supply the milk for a variety of cheeses. Lower flatlands can support dairy cows, and grain. The range of elevations and microclimates allow production of several varieties of grapes and tree fruits that were highly regarded in Soviet times. There are food processing enterprises that are producing quality products with the potential to compete in world markets.

International agreements in force for Armenia and resulting obligations relevant to plant genetic resources

The Convention on Biological Diversity (CBD), adopted by Armenia on 14 May 1993, has obligations for both ex situ and in situ conservation of PGR, inventorying and reporting, for developing appropriate legislating regulations and harmonizing existing relevant legislation in line with the CBD. The contact organization in Armenia for interaction with the CBD is the Ministry of Environmental Protection. Armenia has implemented reforms in line with the CBD. Many of the necessary legal bases are in place and are adequate. Many necessary actions have been adopted as national targets. There has been good progress at several levels in evaluating wild areas and creating new reserves. Seed gene-banks have been initiated and rudimentary linkages are in place. Required reports under the CBD have been produced in a national collaborative process.

The International Treaty for Plant Genetic Resources for Food and Agriculture (IT-PGRFA) was acceded to by Armenia on 20 March 2007. The Treaty’s objectives are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of benefits derived from their use, in harmony with the Convention on Biological Diversity, for sustain-
able agriculture and food security. The focus of this treaty is on a subset of plant genetic resources: those that are important for food and agriculture.

The emergence of the Global Crop Diversity Trust provides even more reinforcement for a nation’s adherence to the terms of the Treaty. The Trust offers the possibility of securing funding to assist with a nation’s Treaty obligations. However, the requirements to be eligible include ensuring that the PGRFA covered under the Treaty will be accessible under the terms of the Treaty. Three specific requirements are very relevant to this study: the national programme must have clear links between the conserved PGR and national organizations or institutions who would use them; the recipient national programme must have the human resources and management systems needed to maintain the PGRFA and must demonstrate conformity with agreed scientific and technical standards of management; and the facilities in which the PGRFA are maintained must be adequate to ensure long-term conservation.

The Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture (GPA)\(^2\) was adopted by Armenia in June 1996. This is an evolving plan is now also a component of the IT-PGRFA, and it is Armenia’s responsibility to promote the GPA effective implementation, including through national priority activities. The priority action areas of the GPA include *in situ* and *ex situ* conservation as expected, but it also has a strong focus on utilization of PGRFA and building the institutions and capacity necessary to conserve and use PGRFA.

**Ongoing activities on PGR at the national level**

Armenia is one of the eight countries undertaking a work on conservation of crop wild relatives with funding from a large UNDP/GEF project: “*In situ* conservation of crop wild relatives through enhanced information management and field application” which run from 2003-2008 (http://www.unep-wcmc.org/species/projects/crop_wild.htm).

This project is fully in alignment with national policies and plans for conservation and sustainable use of genetic resources (as set out in Armenia’s NBSAP (MNP 1999). This project focuses on data acquisition and management and is guided by a steering committee appointed at the national level with representatives from the Ministry of Nature Protection, Ministry of Agriculture, and National Academy of Sciences. Under guidance of this body, a national project coordinator and necessary support staff was appointed to assure execution of the project. In addition, an Expert’s Council was formed, composed of local specialists who provide guidance on legal and technical issues.

Another activity was the development of the Third Armenian National Report on Biodiversity to the CBD (MNP 2006). The process that produced the report worked with all relevant ministries and academic institutions, including representatives of the Institutes of Zoology, Botany, and Hydroecology and Ichthyology in the National Academy of Sciences (NAS), the Armenian State Agrarian University, Yerevan State University, Hrachya Acharyan University, the Yerevan State Institute of Economy, the Ministry of Agriculture, the Ministry of Environmental Protection, and Armenian NGOs.

Over the years, the International Center for Agricultural Research in the Dry Areas (ICARDA) Central Asia and Caucasus (ICARDA-CAC), and Bioversity International, have organized several national capacity building activities including training, database support, genebank support, and support for collection missions in Armenia.

**Regional and international collaborations for Armenia which involve plant genetic resources**

The whole Transcaucasus region shares many PGR conservation and use challenges, some trans-boundary and some because of ecological similarities. Regional solutions may offer great economy and efficiency. One model for a regional approach is the establishment of the joint coordination mechanism for implementation of the CEPF Ecosystem Profile (CEPF Investment Strategy) (Williams 2003) and Ecoregional Conservation Plan. The Critical Ecosystem Partnership Foundation (CEPF) represents several foundations and international organizations and has joined efforts for biodiversity conservation with the World Wildlife Fund (WWF). A “Regional Council for Biodiversity Conserva-

\(^2\) http://www.fao.org/ag/AGP/AGPS/GpaEN/gpatoc.htm
"Elements of a National Strategy for Management and Use of Plant Genetic Resources in Armenia" has been established consisting of representatives from governments and NGOs of all five countries of the Caucasus ecoregion (Armenia, Azerbaijan, Georgia, Russia, and Turkey). The key intention of the Regional Council is to improve coordination in the field of biodiversity conservation and sustainable use of natural resources in the Caucasus. Its goal is to promote effective coordination of implementation of all investment priorities within the CEPF Investment Strategy for the Caucasus ecoregion.

Another example is the regional efforts for PGRFA conservation and use advanced by the Central Asian and Transcaucasian Network on Plant Genetic Resources (CATCN-PGR) backed by funds at various times from ICARDA and other CGIAR centers, NGOs, ACIAR, UNEP/GEF; and others (Visser and Smolders 2006). Much of the infrastructure and training in recent years for Armenia for gene-banks and staff has come about through this network.

http://www.panda.org/about_wwf/where_we_work/asia_pacific/our_solutions/caucasus/index.cfm?uProjectID=GG0027
2. KEY FINDINGS OF THE STUDY

Within the framework of FAO-EC project “Designing an Integrated Strategy to Improve Armenia’s Food Security through Improved Management and Utilisation of Plant Genetic Resources”, a Study was conducted jointly by FAO, ICARDA and Ministry of Agriculture of the Republic of Armenia on “Elements of a National Strategy for Management and Use of Plant Genetic Resources in Armenia”. The main objective of the Study was to identify elements that would contribute to effective management and use of Armenian plant genetic resource for food and agriculture (PGRFA) for improvement of agriculture production and food security through effective use of PGRFA.

The Study is based on the information gathered from interviews and discussions and the Country Workshop and the Policy Dialogue meeting. In addition, it has benefited from a rich resource of published reports on conservation and use of Armenian biodiversity. Many of these are documents and reports that have been produced by Armenian agencies as signatories to international conventions such as the CBD, the UN Framework Convention on Climate Change and the UN Convention to Combat Desertification, or which have been elaborated for national capacity self-assessments or as reports of scientific activities in support of conservation and environmental assessments. Still others are reports from projects in Armenia supported by various external agencies such as the United States Agency for International Development, the FAO Commission on Genetic Resources for Food and Agriculture, ICARDA-CAC, the European Cooperative Programme for Crop Genetic Resources Networks, the World Bank, and other FAO projects in Armenia and the region. The methodology used for developing the study is in Annex 2.

A Project Proposal and Action Plan entitled ‘Capacity Building for an Integrated System of Use and Management of PGRFA in Armenia’ was also developed (see Annex 1) which identifies a host of steps that would enhance the capacity of the country to ensure the security and utility of Armenian plant genetic resources for food security. It was a result of collective and collaborative action by representatives from the several units and agencies that would be logically involved in a national strategy for PGRFA conservation and use. The proposal and action plan covers several agencies and organizations. It cuts across ministerial and academic boundaries and can help develop a strong and efficient national programme with visibility.

The Study found that there is a lack of a comprehensive National Strategy for conservation and use of PGRFA. Whereas many stakeholders are involved in PGRFA related activities, they lack cooperation and coordination between them (see box below ‘Main stakeholders in Conservation and Use of PGRFA in Armenia’). Although several efforts have been undertaken, stakeholders and representatives of different institutions participating in the Study expressed a strong agreement on the need for a national, integrated and coordinated PGRFA management strategy to decrease the threat to the loss of the rich diversity of wild and domesticated plants of Armenia. It was also emphasized that this required immediate attention for improvement of Armenian agriculture and increasing production.

The key challenges in developing an integrated and coordinated PGRFA Strategy that were identified by the Study are as follows:

- Institutional boundaries and practices have led to several difficulties in conceptualizing such a strategy. There was an urgent need for a common vision to promote cooperation and improve communication among all relevant institutions in order to establish a well-functioning National PGRFA Strategy.
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- While many academic studies on Armenian PGRFA exist, up-to-date databases linked with inventory and monitoring systems are not in place. Most of the available information is not digitized that could facilitate inter-institutional information exchange.

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• Most institutes lack financial resources. They are heavily dependant on external grants or short projects, which causes a lack of long-term planning and leads to demotivation among staff and personnel. As a result PGRFA does not receive adequate recognition as an essential tool for increasing agriculture production and food security.
• The technical skills of personnel is high, however expertise in advanced technical skills are not available. There is also a critical need to attract young specialists to this field.
• A number of laws have been adopted over the last few years: Law on Environmental Impact Assessment, Law on Payments for Bio-resources Use, Law on Flora, Law on Seeds, Law on Specially Protected Nature Areas, Law on Protection of Selection Achievements, Law on Quarantine and Plant Protection (see References). However, a number of key regulations are still missing. Breeders’ rights should be recognized and a national PVP system should be established. Phytosanitary regulations should also be enforced.

<table>
<thead>
<tr>
<th>Component</th>
<th>Status or comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex situ genebanks</td>
<td>One in the Research Center for Agrobiotechnology, MA and one in the Institute of Botany, NAS have been initiated and physical conditions are being improved, they have slightly overlapping missions, coordination between them needs improvement</td>
</tr>
<tr>
<td>Seed gene banks</td>
<td></td>
</tr>
<tr>
<td>In vitro gene banks</td>
<td>In the Research Center for Agrobiotechnology, MA, in vitro storage and propagation takes place, but without systematic attention to monitoring and maintaining genetic diversity throughout the culturing and regeneration process</td>
</tr>
<tr>
<td>Field gene banks</td>
<td>Field plantings exist for crops not typically propagated as seed, but no systematic attempt has been made to establish these as ‘genebanks’ for conservation, and e.g., Research Center for Viticulture, Fruit-Growing and Wine-Making, MA and Botanic Garden, IoB, NAS</td>
</tr>
<tr>
<td>In situ reserves</td>
<td>Some specially protected natural areas have high concentrations of CWR but there’s no clear management strategy to maintain the genetic integrity of the CWR populations</td>
</tr>
<tr>
<td>Arboreta/botanic gardens</td>
<td>These exist, but they are not seen as having a PGR role</td>
</tr>
<tr>
<td>Agroecosystems</td>
<td>No systematic collection of landraces and CWR and no effort to involve farmers to serve as ‘curators’ of in situ repositories</td>
</tr>
<tr>
<td>Natural ecosystems (both protected and not)</td>
<td>Significant threats to biotic components exist protected or not; protected areas number national parks (2), state reserves (3), and state reservations (23); inventories are good</td>
</tr>
<tr>
<td>Working collections (research/breeding/teaching)</td>
<td>These exist, but are not seen as components of a national PGR system, connections between these and the genebanks are not well established Botanic Garden, IoB, NAS, Research Center for Land Management and Plant Protection, MA, Research Center for Vegetables-Melons and Industrial Crops, MA, Research Center for Viticulture, Fruit-Growing and Wine-Making, MA, Gyumri Breeding Station, MA, ASAU Laboratory of Crops and Wild Relatives Gene Pool</td>
</tr>
<tr>
<td>Information system/documentation (dynamic)</td>
<td>Good for biodiversity inventories in reserves and protected areas, not well established for genebanks, no apparent attention is being paid to inter-communication among the various databases</td>
</tr>
<tr>
<td>Long-term backup repositories</td>
<td>Not part of the current scenario for a national strategy</td>
</tr>
</tbody>
</table>
3. RECOMMENDATIONS

The current situation for conservation and use in Armenia is a piecemeal one, with little-to-no coordination among the functional entities. To make the PGRFA management more integrated and effective in order to contribute to food security and national development, a long term vision and a critical decision making are required that can implement the changes in the structure, the coordination, the operation and the funding of PGRFA activities. A National Strategy on PGRFA is needed with coordination and oversight ensured by a single organization or institution.

The recommendations below are articulated to develop a coherent and sustainable National Strategy on PGRFA. They were elaborated during the multi-stakeholder workshop, the policy dialogue meeting and discussions with the various national authorities such as the Ministry of Agriculture, the Ministry of Nature Protection, the Ministry of Education and Science and the National Academy of Sciences. They are grouped in three main sections comprising the most critical areas for development of an integrated National PGRFA Strategy:

1. Adoption of a National Programme on PGRFA linking conservation and use,
2. Establishment of a High-Level Coordinating Council dedicated to the PGRFA management for food security,
3. Capacity building to enhance PGRFA management for food security

The various implementing aspects of these recommendations are elaborated below. In addition, a project proposal and action plan ‘Capacity Building for an Integrated System of Use and Management of PGRFA in Armenia’ were also developed by stakeholders in Capacity Building (see Annex 1).

3.1 Develop a National Programme on PGRFA linking conservation and use

3.1.1 Efficient conservation of PGRFA

- Increased capacity for genebanks’ accessions

- Germplasm holdings should be expanded through acquisition and collections based on assessments of extent of coverage of Armenia’s genetic agrobiodiversity. Some specially protected areas have high concentrations of PGRFA, in particular of crop wild relatives.

- Collections for Armenian landraces and crop wild relatives should be an annual activity of the genebanks in collaboration with research center staff and teaching academics from the Institute of Botany and universities as well as interested persons from NGOs and conservation and environmental advocacy groups. With better understanding of crop improvement targets from the proposed crop breeding programmes (see 3.1.3), missions can be directed to relevant environments and taxa; with easier access to species inventory data on a national basis, areas underrepresented with respect to accessions can be targeted.

- The practices for transfer of germplasm set out by the FAO Commission on Genetic Resources for Food and Agriculture should be followed by the components of the national programme for each distribution of an accession (FAO 1994, 2004). With Armenia adopting the IT-PGRFA, it can also use the material transfer agreement (MTA) as standard policy involved in PGR activity.

- The newly established genebank needs urgently to be strengthened including through acquisitions within the country and its various centers as well as through collecting missions. Donating genebanks will be encouraged by the presence of viable Armenian repositories, both seed genebanks and field genebanks being necessary.
• **Increased capacity to manage and monitor PGRFA under in situ conditions**

There should be a systematic and coordinated approach to evaluate and manage specially protected areas to maintain the genetic integrity of CWR populations. Genetic erosion and contamination and reduction in population adaptation will take place in reserves and agro-ecosystems from anthropomorphic impacts and by introduction of invasive and non-adapted genotypes of crops and native species. While some laws to both prevent and ameliorate the negative results are in place, enforcement is not consistent and can be absent in the face of overriding development pressure (see References)

• **Long-term conservation of vegetatively propagated crops and perennial crops (in vitro storage, field genebanks)**

- There should be a systematic and coordinated approach to establish new and maintain existing living collections as ‘field genebanks’ for sustainable conservation. The ‘working collections’ at the various institutions must be recognized and supported as fundamental elements within the national programme. This should include improved seed storage facilities and, for perennial fruit crops and grapes, reestablishment of orchards and vineyards and acquisition of germplasm materials as necessary.

- The research efforts at *in vitro* storage and propagation should be enhanced for crops whose genetic resources cannot be maintained as seed. It is essential that there be systematic attention to monitoring and maintaining genetic diversity throughout the culturing and regeneration process.

• **Improved documentation on PGRFA**

- Improving documentation of PGRFA and widening its access to all potential users is absolutely necessary to achieve the full and efficient implementation of the National Strategy. The components that need to be strengthened are accession identity and passport information (source, date and season, habitat information, associates, collector, etc.), evaluation and characterization data, distribution data, and ecological and biological data. Secondary information such as learning materials/documents/posters/presentations/videos/etc. to answer PGRFA-related information gaps (seed sources, genetic material, crop varieties available in local, regional and international PGR collections, technology and related matters, uses of economic plants) should be prepared and disseminated in collaboration with educational institutions, NGOs, and advocacy groups.

- The establishment of a National Information Sharing Mechanism on the Implementation of the Global Plan of Action for Conservation and Sustainable Use of PGRFA is ongoing⁴. It will need supervision and periodic updating of records for sharing information and enhancing national plans and activities on conservation and sustainable utilization of PGRFA amongst stakeholders for priority setting for the GPA implementation.

• **Long-term storage facility**

- There should be a long-term storage facility available for Armenia’s genebank accessions. The facility would not distribute unless in the case of a loss of national genebank collections and would not regenerate accessions. Instead, when viability is low, new samples would be acquired from genebanks or working collections.

- A regional solution to the need for long-term storage and back up for Armenia’s genebank collections should be found. This would be the most efficient solution, perhaps facilitated by ICARDA-PGU, in contrast to providing this level of storage and security within each individual country of the region.

⁴www.pgrfa.org
3.1.2 Strengthen inter-institutional collaboration and linkages among PGR collection holders and users

- **Improved characterization and evaluation of existing PGR collections**
  - Efforts at characterizing and evaluating germplasm in genebanks should be increased, driven by the priorities defined in the recommended crop-by-crop breeding strategy.
  - Pre-breeding activities should be carried out jointly by PGR curators, staff of the research centers and staff of the ASAU Laboratory of Crops and Wild Relatives Gene Pool, for the specific crops that were identified as warranting full-scale breeding efforts as a result of the recommended crop-by-crop plant breeding programmes to be elaborated by the MoA. This would readily enhance entry of more accessions into breeding programmes.

- **Involvement of farmers in conservation and propagation of PGR through application of on-farm conservation approaches**
  - An understanding by breeders and staff involved in PGR evaluation of farmers’ issues regarding crops can lead to crop improvements by utilizing PGR with specific traits. Would farmers benefit from a greater understanding of the role of agro-ecosystems as sites that harbor useful PGR, they could take on a role in on-farm conservation and propagation of PGR.

  Within the national programme more efforts should be made to involve farmers in conservation and propagation of PGR through application of on-farm conservation approaches in collaboration with on-farm and participatory breeding efforts that research centers may be carrying out. Participation of local NGOs and communities should also be sought.

3.1.3 Improve utilization of PGRFA to address national crop production goals

- **Development and adoption of specific crop breeding programmes**
  - Specific crop breeding programmes should be urgently developed by the Ministry of Agriculture for addressing the declining state of use of PGRFA in Armenia. For some crops such as wheat and maize, a full-scale breeding programme should be sustained in Armenia while for others adaptive breeding may be adequate. For some crops, the longer term and plans should be made at least to acquire improved germplasm and initiate breeding programmes. The private-sector efforts would need to be integrated and harmonized with the public-sector activities in order to achieve effective results. An assessment of the state of crop breeding programmes could guide the rebuilding of the breeding programmes at many research centers. The tools for plant breeding have advanced to such a stage that higher throughput and handling of larger segregating populations is useful and achievable for many crops. The crop breeding programmes should be informed by international and regional designations of priority crops.

- **Training on use of molecular tools and biotechnology methods in PGR evaluation and modern approaches in conventional and adaptive breeding and biotechnology tools**
  - Staff involved in PGRFA related activities will need training on understanding and use of molecular genetic tools and other biotechnology applications and analyses as well as their utility for PGR conservation and use through evaluation, monitoring, characterization, deploying and selection. Training should also include modern approaches and novel techniques in conventional and adaptive breeding and biotechnology tools.

  - Field days and study tours should be organized to introduce advantages of modern breeding varieties and demonstrate marketable features of traditional varieties.
- Enhanced facilities and equipment for plant breeding

- Enhanced facilities and equipment for plant breeding are required, including facilities for pre-breeding research, methodologies, technical facilities, and tools; biotechnology tools and appropriate laboratories; equipment for analysis of markers used for diversity analysis and for marker-assisted selection;

- Better recognition of breeders’ rights.

- There should be adequate recognition and incentives within the Ministry of Agriculture for breeders, including breeders’ rights recognition.

3.1.4 Strengthened linkages among plant breeders and seed producers

- Increased interest of farmers and seed producers to modern varieties and technologies should be pursued and promoted. Training of seed producers on economics of seed production, seed quality control and seed health testing, seed standards, seed production practices and methodologies and organic farming should be ensured. Establishment of breeders and seed producers associations to lobby their interests should also be promoted by NGOs and trade advocacy groups.

3.1.5 Implementation of national rules and legislation

- A national PVP system should be established by the Ministry of Agriculture through the adoption of an appropriate regulatory framework for joining UPOV and creating an enabling and promoting environment for public breeders within Armenia.

- There should be greater publicity and enforcement by the Ministry of Agriculture of regulations limiting the importation and growing of seed without adequate field testing in a range of appropriate environments.

3.1.6 Increase awareness among policy-making bodies, university students and general public on PGRFA and related issues as a national target

- Public awareness

- Awareness among policy-making bodies (Ministries of Agriculture, Nature Protection and Education and Science) should be promoted on the international legal instruments addressing management of PGRFA and the obligations Armenia incurs by being signatory to those instruments. Workshops and seminars created for policy makers might be one means, organizing panels of presenters as adjunct presentations at events organized for other purposes might be possible too.

- Topics and subject matter related to the importance of PGRFA conservation and use should be integrated into educational and public-awareness national programmes. The Ministry of Sciences and Education should keep track of curriculum revisions at universities and lower division education units. Many government organizations and NGOs organize events at which awareness on conservation and use of PGRFA could be promoted.

- PGR conservation field days could be organized for the public and educational institutions at the units involved with *ex situ* conservation and at *in situ* conservation sites (reserves). Stages when the most diversity is visible, such as regeneration or harvest for the *ex situ* situations and at flowering time in the reserves, have the most impact on displaying and understanding the concept and value of diversity. The Agricultural Support Republican Center is a logical partner in such events.
- **Socio-economic impact and value of PGRFA conservation and use**
  - Researchers from the universities and state research centers should investigate the actual and potential impacts on livelihoods, especially rural agricultural livelihoods. Economic and sociology researchers from the universities and state research centers should establish networks with different sectors involved in seed matters for information access and distribution and research.
  - Economic and sociology researchers from the universities, NGOs, and trade advocacy groups should carry out market assessments and provide training in conducting market assessments for products that make use of Armenian PGR in a sustainable way. Staff of the various institutions involved in PGRFA related activities could assist with case studies of how PGR can be used, if available through conservation.

- **Promoting agro-tourism**
  - NGOs, marketing boards, and growers groups should promote and facilitate agro-tourism. The various institutions involved in PGRFA related activities could participate with demonstrations of agricultural practices that promote on-farm conservation practices. The end result can be greater public awareness of the importance of PGR conservation and use.

3.2 **Establish a High Level Coordinating Council dedicated to the PGRFA management for food security**

A Coordinating Council (Council) for the conservation and use of PGRFA in Armenia should be established at the ministerial level with the mission to coordinate national activities, undertakings, plans and programmes on PGRFA. The Council would be the focal point for PGRFA mandated by the Government and given official recognition to at the highest level. The Council could operate through specific Task Forces to deal with specific legal-policy, technical, or economic issues related to PGRFA. For instance, it was more particularly specified that the Council be supported by a Technical Operations Task Force.

Among the recommendations reached by consensus among the participants from diverse organizations in the country workshop, it was strongly recommended that an effective national PGR coordinating body be initiated: “developing the mechanisms for effective coordination and distribution of mandates on PGRFA activities in Armenia”. It was clear that reviving the past Inter-ministerial Council was not attractive, as it met rarely and did not have a clear operational or advocacy roles. It was emphasized that the establishment of the National Coordinating Council would facilitate implementing many of the other recommendations of this Study. Consequently it is the most urgent need identified in this Study.

- **Proposed Structure of the Council**
  - The Council is comprised of appointees from Ministry of Agriculture, Ministry of Nature Protection, National Academy of Sciences, the Armenian State Agriculture University, the Institute of Botany, the Yerevan State University, the American University of Armenia, the Ministry of Science and Education and other units as appropriate. It would have an advisory role to the Government and would meet regularly in order to coordinate all PGRFA conservation and use activities and information. At least one of these meetings would coincide with one Operations Task Force meeting.

- **Proposed functions of the Council**
  - The Council would advance financial and human needs to the governing agencies, secure budget and facilities, propose initiatives, coordinate PGRFA activities and act as the national focal point for PGRFA. More specifically the Council would:
    - Coordinate all PGRFA conservation and use related issues
    - Promote PGRFA uses to the government and general public
- Solve problems in service to the individual objectives of the many institutions involved in PGRFA related activities
- Undertake planning for coordinating PGRFA related operations
- Develop an operational budget that may partially come from the budgets of the individual member units but will be managed by the Coordinating Council independently from any component unit administration
- Oversee information capabilities to serve needs of each institution involved in PGRFA related activities with respect to training and assistance
- Maintain a website, serving the plan, the assessments and connections to the various institutions involved in PGRFA related activities
- Undertake a review and study of recommendations made over the past several years for capacity building to enhance the use of PGR
- Review available funding opportunities for PGRFA conservation and use and pursue them
- Encourage linkages among institutions on national, regional and international levels, strengthening the coordination of plant genetic resources activities
- Advocate that mission statements or mandates for the MoA crop research centers should be rewritten to recognize, authorize and support their roles with respect to the Council.

**Proposed functions of the Technical Operations Task Force**

The Operations Task Force would meet regularly to discuss operational conservation and use issues. It will be responsible for:

- managing the overall information and germplasm flow within the system;
- carrying out a periodic assessment of protocols for all the activities of conservation: accessioning, evaluation, characterization, storage, monitoring, regeneration, distribution, and documentation;
- carrying out a periodic assessment of personnel needs (training, recruitment);
- carrying out a periodic assessment of facilities and equipment. Suggestions for needed facilities include: enhancement of facilities for field genebanks for perennial crops; enhancement of facilities for in vitro conservation for recalcitrant seeds; enhancement of facilities for pre-breeding research, including methodology, technical facilities, and tools; biotechnology tools and appropriate laboratories; equipment for analysis of markers used for diversity analysis and for marker-assisted selection; enhancement of facilities and methods for screening for resistance to biotic and abiotic stresses; restoration or rebuilding of seed storage facilities for working collections at research centers;
- incorporating crops not typically reproduced by seed into the PGR discussion. This means developing an enhanced network of field genebanks and protocols for monitoring genetic diversity as collections are advanced with tissue culture;
- informing the Council of needs, opportunities and achievements as well as generating proposals and strategies to address those needs

### 3.3 Increase national capacity building to enhance PGRFA management for food security

A strong national capacity is fundamental to the success of the implementation of an integrated national strategy to contribute to food security and national development. However, this is currently very limited capacity, in particular for sustainable and effective use of PGRFA through plant breeding and seed sector development. Enhancement of the PGR use for creating new varieties is strongly needed. Emphasis is required on application of modern breeding technologies, a greater recognition of breeders’ contribution and the establishment of a mechanism to recognize breeders’ rights.

In this context the Project Proposal and Action Plan document ‘Capacity Building for an Integrated System of Use and Management of PGRFA in Armenia’ (Annex 7.1) identifies a host of steps that would enhance the capacity of the country to ensure the security and utility of Armenian plant genetic resources for food security.

**Adequate training and education among staff involved in PGRFA conservation and use**
- Staff involved in PGRFA activities will need training for functions that may be new to them or that represent advances in how PGR functions are carried out. Opportunities for training range from courses and workshops hosted by other national, regional and international genebanks, conservation and research institutions to courses initiated by the Council itself, in response to needs and carried out by staff or others brought in for that purpose.

Suggested topics for which training will be useful include:

a) Monitoring implementation and management of crop wild relatives both in protected areas and outside of them
b) Conservation and management of *ex situ* living plant collections and seed collections of PGRFA
c) Data collection and database management strategies and techniques for *ex situ* and *in situ* conservation
d) Germplasm health assessment
e) Concepts of intellectual property rights (IPR) in plant breeding and plant variety protection (PVP) systems

- Collaboration for carrying out training and education activities should be enhanced among PGR managers, research center staff and universities. Agronomy students from ASAU and ecology and biodiversity students from YSU may have interest in internships within the various institutions involved in PGRFA related activities.

- As the various organizations and institutions involved in PGRFA related activities upgrade their technology basis for genetic resources work, training curriculum at the universities should keep pace. This is true not only for genetics of crop breeding but also for the genetics of conservation. The reverse is also possible: research as the universities may lead to enhanced technology for conservation and use within the various institutions involved in PGRFA.

- Presentations of the basic genetic principles of conservation should be organized by the Technical Operations Task Force for organizations such as NGOs involved in conservation, local crop production, organic crop production, etc.; seed trade representatives; the agro-tourism proponents; and marketing organizations at every opportunity.

**Improvement of equipment and facilities for conservation and use of PGRFA**

The most critical infrastructure needs are for the genebanks themselves. While international, regional, and other country support has provided renovations, provision and stabilization of utilities, and equipment, more will be necessary.

**Secure funding for core staff positions (managers, curators) as well as for technical staff involved in PGRFA activities**

- Core staff positions such as curators and managers should be identified within the various organizations involved in PGRFA and supported with secure state funding. Since similar tasks are necessary for both PGRFA activities and other activities conducted by research centers, MNP, ASAU and IoB, staff could be shared between the various institutions involved in PGRFA related activities and the research, academic and teaching programmes. In addition, salary support for current staff needs upgrading. Too many PGR staff are underfunded or without-funding status or on grant or other one-time funding.

- Additional staff will be needed, for example to develop and maintain information systems, for handling accessioning, viability testing, regenerations, evaluations and distribution in the *ex situ* genebanks, and for carrying out additional inventorying and collections and for monitoring population status in *in situ* reserves. Qualification levels for such positions as well as the level of training available in university curriculums will have to be determined.
- **Development, maintaining and update of an information system**

- Up-to-date databases linked with inventory and monitoring systems and accessible from the Internet are needed to facilitate management and access. The linked databases would facilitate exchange networks among genebanks and other *ex situ* collection holders.

- All various organizations and institutions involved in PGRFA should adopt whatever inventory and documentation database platform is being advocated by ICARDA-CAC and for which they are providing training. While there may be some inconvenience in converting existing databases to that format, it will be easier when the datasets are smaller in number. The advantage of intercommunication between units with respect to inventory data that would be possible with a common system outweighs any inconvenience in conversion. It is likely that the database at the IBGB is already compatible with the ICARDA-CAC model, since the user and developer received training from ICARDA. At the MAGB, the active database is just beginning, so it will be simpler to convert.

- The establishment of a National Information Sharing Mechanism on the Implementation of the Global Plan of Action for Conservation and Sustainable Use of PGRFA is ongoing and it will need supervision and periodic updating of records for sharing information and enhancing national plans and activities on conservation and sustainable utilization of PGRFA amongst stakeholders for priority setting for the GPA implementation (www.pgrfa.org).

- A central library should be established and made widely known and available. This central library would play a *clearinghouse role*. The various institutions involved in PGRFA should be able to direct organic growers to accessible organic seeds and planting material. The international, regional and other national organizations that promote conservation and use of PGRFA should ensure that the central library receives all relevant documentation that has been produced.
4. CONCLUSIONS

It is well documented that Armenia is rich in PGRFA; however, there is a great need for a comprehensive program for conservation and practical use of this national wealth. The current situation for conservation and use is a piecemeal one, with not a single organization or institution in charge and little-to-no coordination among them. If the status quo does not change, there will be little or no medium- or long-term security for PGR collections ex situ or in situ that are now conserved by a variety of organizations or any significant utilization of these resources for the benefit of Armenia.

To make the PGRFA management more integrated and effective in order to contribute to food security and national development, a vision and a critical decision making are required to implement changes in the structure, the coordination, the operation and the funding of PGRFA activities. Many of the components that would be necessary for a national programme for conservation and use of PGRFA are in place, but scattered in different administrative units e.g. the Ministry of Agriculture, the Ministry of Nature Protection, the Institute of Botany, and the Armenian State Agrarian University. Other institutions such as the Yerevan State University, the American University of Armenia, NGOs, seed producers, private land owners, farmers and marz-level administrations may have roles to play as well. Incentives are strongly needed to foster cooperation and coordination among the various organizations and institutions involved in PGRFA related activities.

In order to reverse the trend, three key recommendations were identified in this Study for the development of a National integrated PGRFA Strategy. These are the adoption of a National Programme linking conservation and use of PGRFA, the establishment of a High-Level Coordinating Council dedicated to the PGRFA management for food security and capacity building to enhance PGRFA management for food security. It is crucial that the actors responsible for the implementation of these recommendations operate in a coordinating manner breaking traditional barriers...

In conclusion, there are both needs and opportunities for promoting the value of conservation and use of PGRFA. If the principles of conservation biology and genetic resources conservation are well incorporated into university curriculum, this can lead to a better understanding by the general public of the value and uses of plant genetic resources for food security in Armenia. Public awareness is necessary because an informed public will enhance the ability for public institutions to support new efforts. Public awareness should be raised on issues such as climate change; food quality, safety, and security; environmental quality; sustainable agriculture; organic agriculture; and growing and marketing traditional and new food crops. There are many social and advocate organizations already supporting biodiversity conservation. An active Coordinating Council could engender similar organizations devoted to genetic resources conservation and use for food security and national development in Armenia.
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The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal and development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.
A- Reports


Results and summary of a survey completed in 2006 as part of a larger effort coordinated by FAO and ICARDA involving all three Transcaucasus countries. A summary of these results was also presented by Dr Amyan at the Country Workshop held in Yerevan, 2-5 October 2007, as part of this project.


Summarizes the status of biodiversity and its conservation in Armenia and analyzes threats, identifies opportunities, and makes recommendations for the improved conservation of biodiversity, especially with respect to actions that USAID could undertake.


Introduction to biodiversity status in Caucasus countries and summaries of each country’s national and donor investments in the environment and biodiversity conservation; the CEPF’s focus is on five target biodiversity corridors in the region.


A component of the National Capacity Self Assessment studies funded by UNDP/GEF and UNECE grants to the Ministry of Nature Protection. Has analysis of potentials and impacts of consumptive use of Armenian native plant biodiversity.


Summarizes well biotechnologies and their applications to conservation and monitoring and to deployment of PGR: DNA sequencing, marker assisted selection, functional genomics, informatics, gene cloning, etc.


Aims to promote the rational collection and sustainable use of genetic resources, to prevent genetic erosion, and to protect the interests of both donors and collectors of germplasm.


Provides the rationale and protocol for use of the standard agreement.


The recommendations for policy makers and for NARS would be relevant for the nascent NPGRS to review in its formative stages.

Sponsored by a UNDP/GEF grant to the Ministry of Nature Protection to ensure the continuation of activities and further development and strengthening of national capacities for solving climate change related problems. Has relevant analysis of Armenian agriculture sector.

GUIMARÃES EP, E KUENEMAN, M PAGANINI, D BEDOSHVILI and A MORGOUNOV. 2007. Final report on Workshop Series: Assessing and designing strategies to strengthen regional plant breeding and associated biotechnology capacity in the Caucasus, April 2007. ICARDA Regional Office for Central Asia and the Caucasus (CAC), PFU CGIAR Programme for CAC. Tashkent, Uzbekistan. Summarizes results of three country workshops and studies (Armenia, Azerbaijan, and Georgia) presented at a regional meeting and reports priorities for such topics as capacity building for plant breeding, information systems, seed production systems, research and education, etc.


Prepared under the “National Capacity Self-Assessment for Global Environmental Management” Project, UNDP/GEF/ARM/02/G31/A/1G/99, this is the most recent consolidated report. Has descriptions of the current conservation areas (national parks-2, state reserves-3, and state reservations-23), along with history and targets for new conservation areas.


Dated, but still valuable compendium of 1995 status and potential for Armenian PGR. Itemizes ‘needs’, the majority of which are still unmet.


Presents review of Armenian agricultural situation. Several targets relate to PGR use and indirectly then to conservation: support for local production, advancing food security, enhancing crop production, and facilitating organic production. Sub-objectives of crop production are conservation of crop genetic diversity and enhancing breeding programmes.


Prepared as part of Armenia’s obligations under the CBD with support from UNDP/GEF, national director of the project to prepare the document was S Baloyan and national coordinator was S Shashikyan. Good summary of Armenian environmental descriptors and status of biodiversity.


Most recent report to the CBD, as required by Armenia as signatory to the Convention, the effort was funded by UNDP/GEF award to the MNP. The document provides a good assessment of status of Armenian biodiversity and research and infrastructure needs. While generating the report was the overall responsibility of one Ministry, the process of generating the report is a good example of an across-administrative-boundaries collaboration. The process could be a good model for generating an NPGRS in Armenia.


Explains in detail how the Millennium Challenge Account-Armenia (MCA-Armenia) SNCO will monitor the various Projects undertaken in the MCA-Armenia Compact. Has description of the status of agriculture in Armenia.


Summary of recommendations and recommended partnerships to achieve them on topics grouped under genetic resource management, natural resource management, and socioeconomic, policy research and capacity building.

Provides good recent characterization of the status of agricultural production, history of changes since independence, and assessment of potential.

http://www.nature-ic.am/NCSA/Report/NCSA_Report_eng.htm

Sponsored by a UNDP/GEF grant to the Ministry of Nature Protection with objective of assessing capacity needs for fulfillment of Armenian commitments under the CBD and UN Conventions on Climate Change and to Combat Desertification. Has section with descriptions of responsible management bodies within Armenia.


One of the networks reviewed in this paper was CATCN-PGR of which Armenia is a member. History, goals, and projects underway are described.

http://www.cepf.net/ImageCache/cepf/content/pdfs/final_2ecaucasus_2eep_2epdf/v1/final.caucasus.ep.pdf

Presents an overview of Armenia’s biodiversity profile in the context of the similar regional habitat conditions: the Caucasus hotspot. The study produced targets for conservation on the basis of species and sites.


While this project does not emphasize PGR directly, its assessment documents describe the status of Armenian agriculture and discuss components of the Armenian government’s Agricultural Sustainable Development Strategy. The Project did benefit PGR indirectly, for example, some funds were directed to the MA Gyumri Field Station for infrastructure improvement and lab equipment involved in seed production.
B- National legislation relevant to PGRFA

Law on Principles of Environmental Protection (1991)

Law on Protected Areas (1991)


Law on Protection of Selection Achievements (1999)
   http://www.nature-ic.am/ccarmenia/download.php?fid=973480800

Law on Flora (1999)


Law on Seeds (2005)

Law on Environmental Control (2005)

Law on Tariffs for Compensation of Harm Caused to Flora and Fauna due to Environmental Legislation Violations (2005)

Law on Amendments in the RA Law on Environmental Fees (2005)

Law on Specially Protected Nature Areas (2006)
C- Relevant Websites for Armenia and PGRFA


Climate Change Information Center of Armenia. Environmental NGOs. [http://www.nature-ic.am/ClimateChange/Env_NGO/EnvNGO.htm](http://www.nature-ic.am/ClimateChange/Env_NGO/EnvNGO.htm)
Maintains a roster with contact information and brief description of purpose for almost 50 organizations.

*The Trust is developing crop-based conservation strategies and regional strategies. This link reaches the page on which progress toward strategy for the region that includes Armenia is described, summarizing recent activities involving CATCN-PGR, ICARDA-CAC, and representatives of the eight CAC countries.*

*Exposition of the Compact to reduce rural poverty in Armenia signed between the Millennium Challenge Corporation (a foundation established by the Government of the United States of America to provide special financial support to countries in need of assistance to counter the challenges of the Millennium) and the Government of Armenia. The Millennium Challenge Account–Armenia is the State Non-Commercial Organization established by the Government of Armenia to oversee the implementation of the Compact.*

*Ministry’s official website has extensive presentation of the status of Armenian agriculture, links to relevant national legislation. There is evidence of difficulty in sustaining the site: several pages are ‘coming soon’ and event information is dated.*

*Presented by Environmental Conservation and Research Center, AUA; MNP; and UNEP/GRID.*

Plant Genetic Resources in Central Asia and Caucasus: Armenia: [http://www.cac-biodiversity.org/arm/index.htm](http://www.cac-biodiversity.org/arm/index.htm) and a specific page is devoted to a roster (as of 2004) of ex situ PGR accessions purported to be available in various research centers: [http://www.cac-biodiversity.org/arm/arm_database.htm](http://www.cac-biodiversity.org/arm/arm_database.htm)
*Very comprehensive site supported by ICARDA, Bioversity International, and ACIAR and created to facilitate an ICARDA-led initiative to develop genetic resources units in each of the eight CAC countries. It has geopolitical, environmental, legislative, historical, and biodiversity information for Armenia (along with the seven other CAC countries). Some sections do not seem to have been updated since 2003 or 2004.*
7. ANNEXES

Annex 1

Project proposal and action plan
Capacity Building for an Integrated System of Use and Management of PGRFA in Armenia

Initiated at the Country Workshop, 2–5 October 2007 by participants, reviewed and revised by representatives of agencies and organizations with interest in PGRFA, presented at the Policy Dialogue Meeting, 13 November 2007 and subsequently further revised by A. Ayagan, PGRFA Focal Point.

Project background

**International and national actions and concern for conservation.** The Government of the Republic has classified the prevention of degradation of ecosystems and biodiversity among the priorities of the country. In 1993 the Republic of Armenia ratified the Convention on Biological Diversity and started to implement reforms in line with this document of global significance targeted on *in situ* and *ex situ* conservation, utilization, information management, building the institutions and capacity necessary to manage PGRFA. In compliance with signed international agreements several projects on plant gene pool conservation, sustainable use of agrobiodiversity, development of adequate legal basis for PGR conservation and use were developed, adopted and fulfilled in the republic. This commitment is demonstrated through the improvement of environmental and agriculture related legislation over the last years. The strategic approaches and principles to resolving the fundamental issues facing the assessment, conservation and sustainable use of plant genetic resources for food and agriculture are incorporated in a number of strategic documents, which contribute to biodiversity conservation, sustainable use and regulation of PGR access and benefit-sharing.

**Armenian biodiversity and agrobiodiversity.** Biodiversity in Armenia has an important environmental role in regulation of thermal and water regimes, influence climate, maintaining atmospheric air quality, protection the soil from erosion and in ensuring a healthy ecological environment for humans. Widely diversified physical geographical conditions of the republic, preconditioned mainly by the mountainous relief, diversity of altitudes, climates and landscapes have provided favorable conditions for the formation of the highly diverse vegetation cover. Around 3,500 species of vascular plants have been recorded in the country, including about 120 species of wild berries and nuts, over 250 species reported to be used as medicinal, around 150 species known to produce essential oils, and many species related to major crops of the world. Being essential for food security and poverty alleviation the agricultural biodiversity is of great socioeconomic value for the well-being of humankind and society. The plant biological diversity of the country has been reported to have been used traditionally for nearly 6,000 years as a source for food, fodder, fiber and medicine. High concentration of wild progenitors of cultivated plants represents very rich gene pool for creation new crop varieties resistant to diseases, drought, cold and possessing other adaptive characteristics. Consequently, reliable conservation and better usage of agricultural biodiversity may provide environmental, economic and socio-cultural benefits on national, regional and global levels.

Project justification

**Conservation of PGRFA.** Maintenance conditions for seed collections are being considerably improved due to two genebanks. Genebanks cover only a part of the genetic agrobiodiversity, and relatively few accessions have been fully characterized and evaluated for useful attributes. Genebanks have slightly overlapping missions, hence collaboration and coordination between the two genebanks and their potential users require further improvement. The main working seed collections used for research/breeding/teaching purposes are concentrated in the different scientific-research institutions. Present working collections are not seen as components of a national PGR system, connections
between these and the genebanks are not well established. In vitro storage and propagation is in place, but without systematic attention to monitoring and maintaining genetic diversity throughout the culturing and regeneration process. Living collections for not typically seed propagated crops exist in several research institutes and include samples of modern varieties, landraces and wild relatives of fruits, berries and vine, collected from various eco-geographical zones of Armenia. There is no systematic or coordinated approach to establish and maintain these living collections as ‘genebanks’ for sustainable conservation. Armenia's existing protected areas system consists of three state nature reserves, two national parks 23 small protected areas. Some specially protected areas have high concentrations of plant genetic resources for food and agriculture in particular of crop wild relatives, but there’s no clear management strategy to maintain the genetic integrity of these populations. The existing system of protected areas does not fully represent the biological and landscape diversity of Armenia, in particular arid and semi-arid ecosystems as well as majority of steppe and meadow ecosystems are nor adequately covered and representing in the protected areas network.

**Information management and capacity building.** Up-to-date databases linked with inventory and monitoring systems are not in place, which makes the access to seed collection difficult for breeders. No apparent attention is being paid to inter-communication among the various databases. In spite of availability of qualified and dedicated staff, additional staff is needed to carry out various tasks: develop and maintain information systems, perform regeneration activities, evaluations and monitoring of the population status in protected areas.

**Coordination and cooperation.** Institutional boundaries and practices have led to some deficiencies. A well-functioning national PGR system must have efficient communication and germplasm channels that cut across the institutional boundaries.

**Project description**

**Long-term goal:** improved agricultural productivity and food security through enhanced use and effective management of PGR for food and agriculture

**Specific objectives:** To enhance capacity to strengthen the national plant genetic resources management system

**Expected outcome**

Biological diversity important to food and agriculture on global and local levels is conserved and used in a sustainable manner

**Specific objectives**

1) Increased awareness in PGRFA related policy through integrating PGRFA conservation and sustainable use issues in educational and public awareness programmes
2) Improved coordination to promote cooperation among stakeholders through strengthening the functions of the inter-institutional body on PGRFA for Armenia
3) Improved national policy framework through establishment of national PVP system and development of national crop breeding strategy
4) Increased access to germplasm and information on PGRFA through establishment of information exchange and dissemination mechanisms
5) Enhanced capacities and strengthened institutions for *ex situ* and *in situ* conservation
6) Established favorable environment for effective utilization of PGRFA through applying techniques for sustainable management of agrobiodiversity
7) Improved agricultural productivity and food security through promoting the development of markets and business opportunities for diverse production systems such as organic agriculture.

**Activities by objectives**

1) Increased awareness in PGRFA related policy through integrating PGRFA conservation and sustainable use issues in educational and public awareness programmes
   a) raising awareness among policy-makers (Ministries of Agriculture, Nature Protection and Education and Science) on international legal instruments addressing management of plant genetic resources for food and agriculture through organizing workshops and seminars
b) identifying means of integrating awareness of the importance of PGRFA into education through revision of curricula and elaboration of public awareness programmes at national level

2) Improved coordination to promote cooperation among stakeholders through strengthening the functions of the inter-institutional Commission on PGRFA for Armenia and encouraging links between institutions on national, regional and international level

3) Improved national policy framework through establishment of national PVP system and development of national crop breeding strategy
   a) creating favorable environment for establishment of national PVP systems through development of appropriate regulatory framework for joining UPOV
   b) development of national crop breeding strategy on a crop-by-crop basis

4) Increased access to germplasm and information on PGRFA through establishment of information exchange and dissemination mechanisms
   a) establishment of data exchange networks between genebanks and other ex situ collections holders for plant genetic resources for food and agriculture
   b) design and establishment of an integrated web site to support access to the national, regional and international plant genetic resources and information by all stakeholders
   c) generation of data, producing and dissemination among breeders, farmers and seed producers of information/learning materials, booklets to address the gaps of PGRFA related information (seed sources, genetic material, crop varieties available in local, regional and international PGR collections, technology and related matters, utilization of economic plants)
   d) development and maintenance of training/learning resource facility (e.g. videos, posters, slides, etc.)
   e) undertaking a review of available funding opportunities for PGRFA conservation and use on the appropriate website

5) Strengthening institutions to address the capacity building needs in PGRFA conservation
   a) training on monitoring implementation and management of crop wild relatives on protected areas and out of them
   b) trainings on conservation, management and germplasm health assessment of living and seed collections of PGRFS maintained under ex situ conditions
   c) enhancing facilities for in vitro conservation for recalcitrant seeds and for living collections of perennial crops, for pre-breeding research (including methodologies, technical facilities and tools)
   d) training on database management for ex situ and in situ conservation
   e) involving farmers in conservation and propagation of PGRFA through application of on-farm conservation approaches
   f) training on modern biotechnology methods and use of molecular tools in conventional and adaptive breeding and conservation of plant genetic resources

6) Creating favorable environment for effective utilization of PGRFA through applying techniques for sustainable management of agrobiodiversity
   a) training on use of molecular tools and biotechnology methods in plant genetic resources evaluation, market assisted selection
   b) enhancing facilities (including up to date methods, techniques and equipment for genetic material screening for resistance to biotic factors and abiotic stress tolerance)
   c) training on IPR in plant breeding and PVP systems
   d) organization of field demonstration days to introduce advantages of modern breeding varieties
   e) establishing an association of breeders and seed producers
   f) trainings for seed producers on economics of seed production, quality control and health testing, updated seed standards and seed production practices and methodologies

7) Improved agricultural productivity and food security through promoting the development of markets and business opportunities for diverse production systems such as organic agriculture.
a) conducting study to assess present status of PGRFA use and development and its impact on livelihoods
b) establishing a network with different sectors involved in seed matters
c) market assessment and training in conducting market assessment
d) promotion and facilitation of agro-tourism
e) facilitating access of organic growers to organic seeds and planting material

Impacts
1) Improved \textit{ex situ} and \textit{in situ} conservation of crops of socioeconomic importance to address the breeding goals and prevent agricultural biodiversity losses
2) Enhanced capacity of national breeding programmes to effective usage of plant genetic resources for food and agriculture
3) Genetic resources for food and agriculture and related information made accessible to researchers characterizing, evaluating genetic material and farmers communities using PGRFA in seed producing and crop production
4) Improved agricultural productivity and food security through a greater understanding of a role of PGRFA and effective management of plant genetic resources for food and agriculture

Potential partners
- Ministry of Agriculture
  - Genebank of the Ministry of Agriculture
  - Agriculture Support Republic Center
- Ministry of Nature Protection
  - Bioresources Management Agency
- National Academy of Science
  - Institute of Botany
  - Genebank of the National Academy of Science
- Ministry of Education and Science
  - Armenian State Agrarian University (Laboratory of Plants Gene Pool and Breeding)

Beneficiaries
- \textit{National genebanks}
- \textit{Researchers}
  - involved in crop breeding, trained and having facilitated access to germplams and related information
  - involved in PGRFA conservation including in living collections maintenance
  - involved in market assessment
  - analyzing traits of genetic material to be used in breeding programmes
- \textit{Farmers} to be acquaintance with techniques to sustainable manage biodiversity important to agriculture
- \textit{Seed producers} trained in seed quality control, health testing updated seed standards and seed production practices and methodologies
- \textit{Students, post-graduate students} to be trained in modern molecular and biotechnology tools in plant genetic resources evaluation
- \textit{NGOs and farmers} dealing with organic agriculture
- \textit{National programmes} concerned with conservation of PGRFA, their study and evaluation and use in breeding
- \textit{CGIAR and other major genebanks} and their crop improvement programmes
## Capacity Building for an Integrated System of Use and Management of PGR in Armenia (Proposal Logical Framework)

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<thead>
<tr>
<th>Objectives</th>
<th>Actions</th>
<th>Expected results</th>
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| **Objective 1.1.** To promote PGRFA related policy awareness at the policy maker level | - raising awareness among policy-makers in the international legal instruments addressing management of plant genetic resources for food and agriculture  
- identifying means of integrating subjects related to PGRFA conservation and use into educational and public awareness programmes at national level | - enhanced awareness in role of international agreements related to PGRFA conservation, use and effective management  
- increased funding for PGRFA related research programmes, incorporation of the problem of conservation and sustainable use of PGRFA as a priority area for research  
- availability of PGR related subjects in the university's curriculum |
| **Objective 1.2.** To strengthen a coordination of plant genetic resources activities | - strengthening the coordination of plant genetic resources activities to encourage linkages between institutions on national, regional and international level  
- developing the mechanisms for effective coordination and distribution of mandates on PGRFA activities in Armenia  
- creating enabling environment for establishment national PVP systems through development of appropriate regulatory framework for joining UPOV | - increased coordination promoting cooperation among stakeholders, efficient communication and germplasm channels that cut across the institutional boundaries  
- strengthen the functions of the inter-institutional Commission on PGRFA  
- harmonization of PVP system with international standards  
- established priorities for full-scale and adaptive breeding |
| **Objective 1.3.** To improve national policy framework | - establishment of data exchange networks between genebanks and other ex situ collections holders for plant genetic resources for food and agriculture  
- design and establishment of an integrated web site to support access to the national, regional and international plant genetic resources and information by all stakeholders  
- generation of data, producing and dissemination among breeders, farmers and seed producers of information/learning materials, booklets to answer PGRFA related information gaps (seed sources, genetic material, crop varieties available in local, regional and international PGR collections, technology and related matters, utilization of economic plants)  
- development and maintenance of training/learning resource facility (e.g., videos, posters, slides, etc.)  
- undertaking a review of available funding opportunities for PGRFA conservation and use on the appropriate website | - optimized and rationalized ex situ collections of PGRFA, greater access to genetic resources  
- up-to-date databases linked with inventory and monitoring systems  
- increased awareness in seed sources, crop varieties  
- published information leaflets, publications, catalogues, booklets  
- produced training/learning materials  
- a database of funding opportunities for PGRFA conservation and use published on the appropriate website |
| **Component 2. Information Management** | **Objective 2.1.** To facilitate access to germplasm and information on PGRFA through exchange and provision of useful information | - establishment of data exchange networks between genebanks and other ex situ collections holders for plant genetic resources for food and agriculture  
- design and establishment of an integrated web site to support access to the national, regional and international plant genetic resources and information by all stakeholders | - optimized and rationalized ex situ collections of PGRFA, greater access to genetic resources  
- up-to-date databases linked with inventory and monitoring systems |
| | **Objective 2.2.** To increase awareness on PGRFA role in crop production, food security and livelihoods | - generation of data, producing and dissemination among breeders, farmers and seed producers of information/learning materials, booklets to answer PGRFA related information gaps (seed sources, genetic material, crop varieties available in local, regional and international PGR collections, technology and related matters, utilization of economic plants)  
- development and maintenance of training/learning resource facility (e.g., videos, posters, slides, etc.) | - increased awareness in seed sources, crop varieties  
- published information leaflets, publications, catalogues, booklets |
| | **Objective 2.3.** To support enlargement of activities on PGRFA conservation and use | - undertaking a review of available funding opportunities for PGRFA conservation and use on the appropriate website | - produced training/learning materials  
- a database of funding opportunities for PGRFA conservation and use published on the appropriate website |
<table>
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<tr>
<th>Component 3. Research and Development</th>
<th>Actions</th>
<th>Expected results</th>
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<tbody>
<tr>
<td><strong>Objective 3.1</strong>&lt;br&gt;To ensure reliable <em>ex situ</em> and <em>in situ</em> conservation of PGRFA</td>
<td>- training on monitoring implementation and management of crop wild relatives on protected area and out of them&lt;br&gt;- training on conservation and management of living and seed collections of PGRFA maintained under <em>ex situ</em> conditions&lt;br&gt;- enhancing facilities for in-vitro conservation for recalcitrant seeds&lt;br&gt;- enhancing facilities for living collections of perennial crops&lt;br&gt;- training on database management for <em>ex-situ</em> and <em>in situ</em> conservation&lt;br&gt;- training on use of molecular tools and biotechnology methods in plant genetic resources conservation&lt;br&gt;- training on germplasm health assessment</td>
<td>- increased capacity to conserve PGRFA <em>ex situ</em> and manage and monitor them under the <em>in situ</em> conditions&lt;br&gt;- long-term conservation of vegetatively propagated crops&lt;br&gt;- insurance of reliable conservation of perennial crops gene pool&lt;br&gt;- improved documentation on PGRFA&lt;br&gt;- increased value of seed collections of PGRFA&lt;br&gt;- increased quality of seed collections of PGRFA</td>
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<td><strong>Objective 3.2.</strong>&lt;br&gt;To strengthen inter-institutional collaboration and linkages among PGRFA collection holders and users through germplasm enhancement programmes</td>
<td>- involving farmers in conservation and propagation of PGRFA through application of on-farm conservation approaches&lt;br&gt;- enhancing facilities for pre-breeding research, including methodologies, technical facilities and tools&lt;br&gt;- training on modern approaches and novel techniques in conventional and adaptive breeding and biotechnology tools</td>
<td>- prevention of impoverishment of traditional crop varieties and landraces gene pool in Armenia&lt;br&gt;- linking university-level research to applied crop improvement through provision of breeders with characterized initial genetic material adapted to agro-ecological conditions&lt;br&gt;- capacity building in crop breeding, encourage involvement of young specialist in breeding activities&lt;br&gt;- germplasm characterization and evaluation data entered into appropriate national, regional and international databases&lt;br&gt;- provision of users with evaluated germplasm for usage by national breeding programmes and researchers&lt;br&gt;- increased awareness and practical understanding of the intellectual property system&lt;br&gt;- increased interest of farmers and seed producers to modern varieties and technologies&lt;br&gt;- created linkages between breeders and seed producers to lobby for their interests&lt;br&gt;- raised awareness of seed producers and farmers of the value of use of quality and appropriate seed, seed practices and farming systems</td>
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<td><strong>Objective 3.3</strong>&lt;br&gt;To encourage an effective utilization of PGRFA in addressing national plant breeding goals</td>
<td>- training on use of molecular tools and biotechnology methods in plant genetic resources evaluation, market assisted selection&lt;br&gt;- enhancing facilities (including up to day methods, techniques and equipment for genetic material screening for resistance to biotic factors and abiotic stress tolerance)&lt;br&gt;- training on IPR in plant breeding and PVP systems&lt;br&gt;- organization of field days, demonstration fields to introduce advantages of modern breeding varieties&lt;br&gt;- establish breeders and seed producers association to lobby their interests&lt;br&gt;- training for seed producers on economics of seed production&lt;br&gt;- training for seed producers on seed quality control and seed health testing&lt;br&gt;- training on updated seed standards&lt;br&gt;- training on seed production practices and methodologies</td>
<td>- prevention of impoverishment of traditional crop varieties and landraces gene pool in Armenia&lt;br&gt;- linking university-level research to applied crop improvement through provision of breeders with characterized initial genetic material adapted to agro-ecological conditions&lt;br&gt;- capacity building in crop breeding, encourage involvement of young specialist in breeding activities&lt;br&gt;- germplasm characterization and evaluation data entered into appropriate national, regional and international databases&lt;br&gt;- provision of users with evaluated germplasm for usage by national breeding programmes and researchers&lt;br&gt;- increased awareness and practical understanding of the intellectual property system&lt;br&gt;- increased interest of farmers and seed producers to modern varieties and technologies&lt;br&gt;- created linkages between breeders and seed producers to lobby for their interests&lt;br&gt;- raised awareness of seed producers and farmers of the value of use of quality and appropriate seed, seed practices and farming systems</td>
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<td><strong>Objective 3.4.</strong>&lt;br&gt;To strengthen linkages among PGRFA users and seed producers</td>
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<td><strong>Objective 3.5</strong>&lt;br&gt;To promote development of seed industry using the sustainable agriculture framework</td>
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<tr>
<td>Objectives</td>
<td>Actions</td>
<td>Expected results</td>
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<td><strong>Objective 4.1</strong>&lt;br&gt; To improve agricultural productivity and food security through enhanced use and effective management of PGR for food and agriculture</td>
<td>• conduct study to assess present status of PGRFA use and development and its impact on livelihoods&lt;br&gt;• establish a network with different sectors involved in seed matters&lt;br&gt;• market assessment and training in conducting market assessment&lt;br&gt;• promotion and facilitation of agro-tourism&lt;br&gt;• facilitate access of organic growers to organic seeds and planting material</td>
<td>• economic and environmental impact assessment of PGRFA use, developed mechanisms for their sustainable management&lt;br&gt;• promotion of farmers’ and stakeholders’ participation in plant breeding and seed production activities&lt;br&gt;• developed mechanisms for promoting marketing of diversity rich varieties&lt;br&gt;• encouraging agro-tourism and ecological production</td>
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Annex 2

Methodology of the Study

A- Study Process

Within the framework of FAO-EC project “Designing an Integrated Strategy to Improve Armenia’s Food Security through Improved Management and Utilisation of Plant Genetic Resources”, the Study was conducted jointly by FAO, ICARDA and Ministry of Agriculture of the Republic of Armenia on “Elements of a National Strategy for Management and Use of Plant Genetic Resources in Armenia”. To have a maximum number of public and private Armenian institutions involved in the Study and providing essential inputs, two national stakeholders’ workshops held in Yerevan on 2-5 October and 13 November 2007 within the project. The reports of these workshops are in Annex 3 and 4 respectively. An international consultant was recruited for the assignment with the Terms of Reference as below. He spent three weeks in Armenia in two missions in the fall of 2007 conducting interviews and participating in discussions and workshops. The national consultant, Dr Alvina Avagyan, arranged, facilitated, translated, and contributed to these activities of the international consultant and was instrumental in eliciting the participation of the many relevant Armenian agencies and organizations in the workshop and policy dialogue meeting. Dr David Bedoshvili (CGIAR-PFU/ICARDA/CIMMYT-Caucasus) represented ICARDA in planning and carrying out the country workshop and policy dialogue meeting and in the production of the reports of these two events. The CGIAR-PFU/ICARDA-CAC was represented at the country workshop by Drs Zakir Khalikulov, Bitore Djumahanov, and Alisher Mirzabaev who provided background information on conservation and use of PGR.
B. List of Interviewees


4. Discussion at Research Center for Land Management and Plant Protection, State Non-Commercial Organization (SNCO), Ministry of Agriculture (MA), Echmiadzin, Armavir Marz. Participants were: **Semerdjian, Souren**, Deputy Director; **Kazaryan, Roland**, Staff member; and **Epremyan, Jemma**, Breeder.

5. **Sahakyan, Aghvan**, Director, Research Center for Agribiotechnology, MA, Echmiadzin, Armavir Marz.

6. **Manucharyan, Gagik**, Head, Plant Cultivation Development Division, Department of Crop Production, Forestry and Plant Protection, MA.

7. **Sargsyan, Gayane**, Director, Research Center for Vegetable-Melons and Industrial Crops, MA, Darakert Community, Masis Region, Ararat Marz.

8. **Hovhannisyan, Ashot**, Head, Department of Animal Husbandry and Pedigree Breeding, MA, currently National Coordinator for Plant Genetic Resources, also Head, Department of Science, Education and Consultancy, MA.

9. **Voskanyan, Ashot**, Director, Agriculture Support Republican Center, MA.


11. **Danielyan, Tatiania**, Head, Division of Biodiversity Protection, Department of Environmental Protection, Ministry of Nature Protection (MNP) and Armenian Focal Point for the Conservation on Biological Diversity.


13. Discussion at the Laboratory of Crops and Wild Relatives Gene Pool, Armenian State Agrarian University. Participants were: **Gyulkhasyan, Michael**, Laboratory Head and staff members **Shakaryan, Zanna; Harutyunyan, Margarita; Hovhannisyan, Marina**; and **Melikyan, Andreas**.

14. Discussion at Institute of Botany, National Academy of Sciences. Participants were:
Vardanyan, Zhairair, Director; Oganessian, Michael, Head, Biotechnology Department; and Rukhkyan, Natalya, Deputy Head, Genebank of the Institute of Botany.

15. Roundtable on possibilities of utilization of crop wild relatives in Armenia, chaired by Danielyan, Armen, National Coordinator, UNEP/GEF “In-situ Conservation of Crop Wild Relatives Through Enhanced Information Management and Field Application” Project, Implementation Unit. There were four formal presentations on uses of cereals (Avagyan, A.); perennial crops (Poghosyan, Karen S., Academician of the Armenian National Academy of Sciences); vegetables, and legumes.

16. Discussion at Scientific Center for Viticulture, Fruit-Growing and Wine Making, MA, Merdzavan village, Armavir Marz. Participants were:
   Harutyunyan, Firdous, Director, Melyan, Gagik, Deputy Director, and Dr. Kozon, staff member.

17. Discussion at Seeds Agency, SNCO, MA, Merdzavan village, Armavir Marz. Participants were:
   Vardanyan, Armen, Head and Khachatryan, Hamlet, Deputy Head.

18. Ghazaryan, Hunan, Director, Scientific Center for Soil Studies, Agrichemistry and Melioration, MA.

19. Discussion at Agro Project Center, Armenia-Holland. Participants were:
   Hovakimian, Korion, Executive Director and Khachatryan, Alfred, Production Manager.

20. Discussion at Gyumri Breeding Station, SNCO, MA, Akhuryan, Shirak Marz. Participants were:
   Karakhanyan, Ruben, Director and Avetisyan, Hegel, Barley Breeder.

21. Discussion at Genebank of the Institute of Botany, National Academy of Sciences. Participants were:
   Oganessian, Michael, Head, Biotechnology Department, Institute of Botany; Rukhkyan, Natalya, Deputy Head, Genebank; and Avagyan, Vache A., Professor, Armenian State Agrarian University.

22. Marmaryan, Yuri G., Pro-Rector for Academic Affairs, Armenian State Agrarian University.

23. Santrosian, Gagik, Dean, Department of Agronomy and Hayrapetyan, Edvard, Head, Agroecology Chair.

24. Discussion with Shinn, Glen C., Professor, Texas A&M University and Resident Advisor, ASAU and Briers, Gary E., Professor, Department of Agricultural Leadership, Education, and Communications, Texas A&M University. Advisors with the Bologna Process with ASAU.
C. Terms of Reference of the International Consultant

**Duties:** Under the overall supervision of the Regional Representative for Europe, and technical supervision of AGPC and AGPS officers, the incumbent will prepare a Multi-stakeholder Study on *Elements of a National Strategy for Management and Use of Plant Genetic Resources in Armenia*. The study would comprehensively cover all aspects related to improvement and use of plant genetic resources such as regulatory frameworks, technology transfer and adoption, capacity building and collaborations. It will propose a set of policy options for an integrated strategy in the sector for future growth and food security.

In conducting the National Study the consultant will:

a. Review and assess the present status of plant genetic resources management and use taking into account all ongoing initiatives in the country and in the region.

b. Analyse the opportunities, gaps and challenges in the national environment for management and use of biotechnologies for plant genetic resources, establishment of relevant regulatory frameworks, transfer and adoption of improved technologies;

c. Liaise with all relevant national agencies while preparing the study, review the institutional approaches and suggest areas for partnerships working with the local governments and institutes;

d. Provide a set of policy options in the thematic areas to provide guidance for developing a national strategy;

e. Present information in visual format where applicable, diagrams and charts as applicable;

f. Review and assist the national consultant in preparation of the project proposal on ‘Strengthening national capacities for PGR management and Use’ to ensure that it addresses capacity building needs, budget estimates and all other related issue.

g. Undertake three missions as below including for a) briefing, b) multi-stakeholder workshop and c) Policy Dialogue meeting;

h. Incorporate additional improvements and assist with the publication of the National Study; and

i. Prepare a mission report, including possible recommendations for improvements and project needs.

**First mission (15 days)**

**Duty Station:** Yerevan, Armenia

To conduct a multi-stakeholder study to design and develop the national integrated strategy for PGR management and use. In a first mission of three weeks the international consultant working in close contacts with the National consultant will:

a. Meet all the relevant stakeholders;

b. Discuss strategies and draft study with the Government representatives;

c. Present a draft of the Study at the stakeholder workshop;

d. Participate in the national multi-stakeholder workshop;

e. Incorporate inputs, recommendations of stakeholders in the National study

f. Present an outline of the Project Proposal for capacity building for further development during the stakeholder workshop;

g. Assist in facilitating the workshop.

**Second mission (7 days)**

**Duty Station:** Yerevan, Armenia

*Elements of a National Strategy for Management and Use of Plant Genetic Resources in Armenia* 40
Once the Study is near completion, the international consultant will conduct a mission to be finalising it with national stakeholders, validate and revise as necessary. In this mission the international consultant will:

a. Acquire additional data and information;
b. Share the document with stakeholders;
c. Incorporate additional improvements and finalize the study;
d. Deliver a lecture/presentation on the Study

e. Participate in the Policy Dialogue Meeting

f. Provide inputs and assistance as necessary.
g. Prepare a mission report

Deliverables/Output

A mission report describing the multi-stakeholder study and the strategic proposal to support development of a national integrated strategy to boost sustainable management and use of PGR for increasing national food security. Key elements of this report are:

- A study called “Elements of a National Integrated Strategy for PGR Management and Use in Armenia”;
- A project proposal for strengthening national capacities for plant genetic resources management and Use’; and
- Final Consultant Report with Objective description of mission achievements towards strengthening capacity of decision makers, institutions, scientists and local stakeholders to comprehend and respond to international regulations relevant to PGR management and use.

Required Expertise and Qualifications: The International Consultant must have significant international experience and ample knowledge of sustainable management and use of PGR. S/he will have the following qualifications and experience:

a. Advanced degree in agriculture science and related subjects;
b. At least ten years experience in agriculture research on crop improvement and sustainable use of PGR and national policy issues;
c. Knowledge of governance, institutional and development issues;
d. Fluency in English and preferably also a working knowledge of Russian;
e. Working experience in European countries in transition will be an advantage;
f. Ability to work independently while being able to provide guidance and transfer knowledge and skills to stakeholders;
g. Computer literacy, with high proficiency in the use of standard software packages;
h. Excellent written and oral communication skills in English.

Duty Station: Yerevan, Armenia and his/her home country.

Duration: Total thirty-three working days including twenty-two days in two missions to Yerevan, Armenia and eleven days at home station for preparatory work and report writing.
Annex 3

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

Project GCP/GLO/162/EC - Armenia (5)

Report of the Country Workshop

ELEMENTS OF A NATIONAL INTEGRATED STRATEGY
FOR PLANT GENETIC RESOURCES MANAGEMENT
AND USE

2–5 October 2007

Yerevan, Armenia

edited by:

Alvina Avagyan, EC Food Security Programme in Armenia
David Bedoshvili, Caucasus Sub-Office, PFU/ICARDA/CIMMYT
Kakoli Ghosh, Seed and Plant Genetic Resources Service, Plant
Production and Protection Division, FAO
Patrick McGuire, University of California Genetic Resources
Conservation Programme

Organized by:
International Center for Agricultural
Research in Dry Areas (ICARDA)
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Background information

The International Center for Agricultural Research in the Dry Areas (ICARDA), with the support of Food and Agriculture Organization (FAO) of the United Nations organized a four-day multi-stakeholder workshop “Elements of a National Integrated Strategy for Plant Genetic Resources Management and Use” in Yerevan, Armenia, 2-5 October 2007.

The workshop was preceded by a study on Elements of National Integrated Strategy for Plant Genetic Resources Management and Use in Armenia, which was conducted by International Consultant Dr. Patrick McGuire (University of California, Davis). In his study, the consultant covered all aspects related to improvement and use of plant genetic resources (PGR), such as regulatory frameworks, technology transfer and adoption, capacity building and collaborations.

The objective of the multi-stakeholder workshop was to gather critical inputs from the key national partners including ministries, governmental institutions, private sector, etc. through participatory approach and develop a project proposal for the PGR sector through national consensus. Some 50 persons participated over the four-day period. The ultimate goal of the workshop, as well as the study was to facilitate developing an integrated strategy that would strengthen Armenia’s capacity for effective management and use of plant genetic resources to contribute to food security and agricultural development.

ICARDA, in close consultation with FAO, provided technical and logistical support to the consultant during his mission in Armenia, developed detailed agenda of the meeting, invited participants, and made all necessary arrangements for successful implementation of the project. The workshop provided a forum to exchange experience on PGRFA management in the country, and to identify gaps, needs and concerns of stakeholders in this regard and develop project proposal outline through consensus.

Summary of the workshop presentations

The First Day
02 October, 2007

The inaugural welcoming session on Day 1 was co-chaired by First Deputy Minister of Agriculture Dr. Samvel Avetisyan and Dr. Zakir Khalikulov (PFU/ICARDA-CAC). The 45 persons present at the opening included Dr. Kakoli Ghosh (AGPS/FAO), Mr. Sean Carmody (USDA/FAS/IDC), and representatives of Ministry of Agriculture, Ministry of Nature Protection, Institute of Botany and Gene Bank of the National Academy of Science, Research Centers of the Ministry of Agriculture, the Armenian State Agrarian University, the Center for Agribusiness and Rural Development, various NGOs, private seed production companies, ICARDA, other local and international organizations.

Dr. Khalikulov greeted the workshop participants on behalf of ICARDA-CAC and PFU, CGIAR Programme for CAC, and indicated that the successful results achieved through the collaboration of Armenian NARS with ICARDA, and other CGIAR Centers in the areas of plant genetic resources and germplasm enhancement can serve as an important element for further joint initiatives of various national and international stakeholders, especially in such highly important areas as development of integrated national strategy for management and use of PGR in Armenia for strengthening national and international collaborative initiatives for effective management of plant genetic resources. Dr. Avetisyan in his opening remarks...
thanked international organizations for their support in improvement of ex situ conservation of PGRFA and stressed the importance of the workshop in development of elements for a strategy for effective PGRFA management. Dr. Ghosh in her opening statement emphasized the objectives of the workshop; she noted the progress of Armenia in PGRFA conservation and improvement of the legislative basis and underlined the importance of establishing links between conservation and use for building national capacity of PGRFA management for future generations. Dr. David Bedoshvili (Caucasus Sub-Office of PFU/ICARDA/ CIMMYT) thanked all the participants for their participation and noted the role of CGIAR centers in establishment of close cooperation links in PGR conservation and use. In his special remarks Dr. Patrick McGuire (UC Davis, USA) noted the significance of his meetings with stakeholders during the previous week, identified several ways in which this workshop could be successful, and urged active participation. Mr. Carmody emphasized the role of the strategy to be developed in effective organization and implementation of the projects in the area of PGRFA conservation and use, underlined the significance of cooperation between relevant organizations in effective management of PGR.

Session I. Role of agriculture in economy of the country

Dr. Samvel Avetisyan (First Deputy Minister, Ministry of Agriculture) briefly introduced the current state of the Armenian agricultural sector, identifying its share in the country’s GDP. Dr. Avetisyan also emphasized the role of agriculture in reducing social pressure and increasing employment. He noted that the current problems in agriculture are particularly related to low crop productivity, desertification, low milk productivity of cows, lack of appropriate infrastructure in rural areas, lack of specialists, absence of an insurance system, and lack of highly productive and resistant crop varieties. He reviewed the latest achievements in implementation of projects targeted at development of social infrastructure in rural areas, constructions of roads, establishment of irrigation systems, development and introduction of subsidizing mechanisms, and improvement of food safety system. During the question-answer session after Dr. Avetisyan’s presentation, issues related to pasture degradation and actions necessary for their improvement, raising the potential of the organic food market in Armenia, the role of training in capacity building, state budget allocations for the agricultural sector, marketing aspects of GMOs and their applications, efforts for providing farmers with new, improved crop varieties, development of mechanisms for renewal of agricultural machinery, as well as food-safety legislation were discussed with workshop participants.

Dr. Armen Harutyunyan and Mr. Artak Khachatryan, Center for Agribusiness and Rural Development (CARD), briefed the participants on the mission and vision of CARD, its approach to market development which involves market assessment and identification of market demand, product design and development, provision of services and technologies, conducting cost and pricing analyses, implementation and networking, and promotion, monitoring, and evaluation of products. They presented results of some projects related to PGR, in particular, the introduction of world famous vine grape varieties to Armenia, sweet corn production and its marketing, and the introduction of a new feed crop to Armenia. The new crop is a grass propagated by hybrid seed derived from complex crosses among species of the genus Brachiaria and marketed by the Mexican company Papalotla. A number of issues such as sowing rate, productivity, vegetation period, and seed production for the new crop, and a mechanism of collaboration with the Ministry of Agriculture and the Armenian State Agrarian University in designing and implementing projects were also discussed.
Session II. Introduction to Management of PGRFA in Armenia

Dr. Zakir Khalikulov (PFU/ICARDA-CAC) briefed the participants about the mission and activities of CGIAR centers in the area of PGR conservation and sustainable use in Central Asia and the Caucasus (CAC) region. He highlighted the role of ICARDA in supporting a local and regional PGR collection networks through organization of joint collection missions and establishment of storage facilities for PGR long-term conservation, as well as making inventories and capacity building. He stressed the importance of germplasm screening and characterization of accessions for their better use in breeding programmes. He underlined the role of national strategies on PGRFA management, which should be in synergetic coherence with regional strategies on PGR.

Ms. Armine Amyan, Research Center of Agrobiotechnology, introduced the results of a survey of plant breeding and biotechnology capacity in Armenia. She informed about the number and educational levels of the main institutions involved in crop breeding, budget allocations by crops, germplasm enhancement activities by institutions, budget distributions by major areas of breeding research, average numbers of crosses, numbers of segregating populations, trials, and locations managed by the breeding programmes, sources of germplasm used in the breeding programmes, as well as the most limiting constraints for the success of the crop breeding programmes. The presentation was followed by a discussion, which emphasized the lack of modern equipment and young specialists in plant breeding and seed production.

Dr. Andreas Melikyan, Armenian State Agrarian University, made a presentation about the historical, geographical, and archeological evidences of remarkable variability of the crop wild relatives and landraces in Armenia. The speaker gave a comprehensive review of wild species of wheat and barley found in Armenia and discussed local landraces of winter and spring wheat and barley which are important sources of resistance to abiotic and biotic stresses. Species of other cereals and legumes such as goat grasses, alfalfa, sainfoin, chickpea, common bean, melon, watermelon, spinach, asparagus, onion, beet, apple, pear, apricot, peach, and other fruit, nuts, and berries were also briefly described.

The presentations and discussions during the fist day of the meeting brought out several issues and potential recommendations that may have an important place in a national integrated strategy for PGR conservation and use in Armenia. Several questions on management of protected areas, private sector involvement in PGRFA management, the need for better coordination and governmental support to PGR were flagged and discussed by the workshop participants.

Dr. McGuire, Consultant, summarized the presentations from Sessions I and II, highlighting the main priorities of agriculture development in general, as presented by Dr. Avetisyan and the CARD representatives (Dr. Harutyunyan and Mr. Khachatryan), and PGRFA management in particular, as presented by Dr. Khalikulov, Dr. Amyan, and Dr. Melikyan.

The Second Day
03 October, 2007

The second day of the meeting began with a summary by Dr. McGuire of the potential recommendations suggested by the participants during day 1. They included:

- Invigorating the national PGR Council, beginning with a redefinition of its functions
- Improving the governance of reserved areas
- Addressing equipment shortage at state research laboratories
- Training, retraining, and capacity building
- Training specifically for extension about breeding & PGR
- Identifying subject areas needing faculty recruitment in the universities
- Identifying funding schemes for PGR: endowments, grants, donors
- Improving linkages between national and regional levels in agriculture and research
- Technology transfer to crop breeding and seed production
- Channels for feedback from markets to growers
- Coordination between institutions holding collections
- Identifying needs for access to germplasm

**Session III. Policy framework for effective management of PGRFA in Armenia**

**Dr. Artashes Ziroyan**, Director, Bioresources Management Agency, Ministry of Nature Protection, made a presentation on the legislative basis for in situ PGR conservation and mentioned laws and by-laws developed and adopted during the last 15 years. There has been significant improvement in in-situ conservation due to establishment of two new protected areas and the development of management plans for two national parks of Armenia. Among the problems existing in conservation of PGR, the lack of integration of different organizations involved in biodiversity protection and the lack of knowledge in biodiversity protection were mentioned. The presentation was followed by a comprehensive discussion of issues related with inclusion of nature protection in school curricula, protection of natural historical monuments, the main reasons for reduction of the forests in Armenia, necessity of afforestation actions to be carried out in the central part of the country close to nuclear power stations, protection of biodiversity in pastures, status of staff and budget of protected areas, and perspectives for development of ecotourism in the country.

**Mr. Gagik Manucharyan**, Head, Crop Production Development Division of the Crop Production, Forestry and Plant Protection Department, Ministry of Agriculture, briefed about the role of crop production in the country’s economy, agriculture, and food security and reviewed the laws which regulate the crop production and seed production sectors in Armenia. The “Law on Protection of Breeding Achievements” (1999), the “Law on Seeds” (2005), the draft “Law on Protection of New Crop Varieties” (2007), secondary legislation on sampling procedures, the list of crops whose seeds are subject to mandatory certification, and the introduction of the new system of seed field testing by certified specialists were reviewed. Issues related to release of the barley variety Mamluk and the areas under this variety in Armenia, possibilities of hybrid seed production of different crops, and mechanisms to involve farmers in seed production were addressed in response to questions of the participants.

**Mr. Hamlet Khachatryan**, Deputy Head, “Seed Agency” SNCO, Ministry of Agriculture, in his presentation, indicated major issues related to the state system of variety release in Armenia and described activities of the “Seed Agency”. He underlined the importance of joining the International Union for the Protection of New Varieties of Plants (UPOV) and the International Seed Testing Association (ISTA) for Armenia.

The ensuing discussion highlighted the role of pre-breeding as a link between genetic resources and breeding programmes and the development of organic agriculture side-by-side with conventional agriculture. Also emphasized were issues related to lack of information (scientific journals, bulletins, and internet access), Red Book revision, application of
ecosystem management approach in socio-economic aspects, and ways to attract attention of the policy makers to PGR.

**Session IV. Conservation of PGRFA in Armenia**

**Dr. McGuire** provided an overview of the various components of plant genetic resources in the broad sense and the means available today for their conservation as background for the following presentations.

**Ms. Siranush Muradyan**, Bioresources Management Agency, Ministry of Nature Protection, reported on the distribution of crop wild relatives in Armenia and described existing national parks, state reserves, and small protected areas. She emphasized that the Erebusi State Reserve was established in 1981 and has an area of 89 ha where wild relatives of cereals (*Triticum boeoticum, T. urartu, T. araraticum, Hordeum spontaneum, H. bulbosum, H. glaucum, H. maritinum, H. maritimum, H. geniculatum, H. hrasdanicum, Secale vavilovii, S. montanum, Aegilops tauschii, Ae. cylindrica, Ae. triuncialis, Ae. columnaris, Ae. trivialis, and Amblyopyrum muticum*) are conserved. Approximately 300 species of plants belonging to 196 genera and 46 families are found in Erebusi Reserve. Establishment of two new national parks is envisaged by the “Strategy on Developing Specially Protected Areas and National Action Plan” (2003).

**Mr. Armen Danielyan**, National Coordinator, UNEP/GEF “In-Situ Conservation of Crop Wild Relatives Through Enhanced Information Management and Field Application” Project, presented additional information on actions and capacity development for in-situ conservation of crop wild relatives (CWR), including elaboration of management plans for the populations of wild cereals at Erebusi State Reserve, implementation of participatory research programmes on CWR conservation, and examples of increased public awareness.

**Dr. Gayane Melyan**, Genebank Manager, Research Center of Agrobiotechnology, Ministry of Agriculture, presented an overview of the activities planned for the Genebank, which is being initiated at the Research Center of Agrobiotechnology. She described the methods that can be used for conservation of plant genetic resources, including in vitro conservation for recalcitrant seeds and vegetatively propagated species. She listed partner institutions collaborating in collection, regeneration, and evaluation of PGR and identified a number of problems including the need for improvement of in vitro storage facilities, long-term financing at the governmental level, and provision for staffing of trained specialists.

**Mrs. Marina Hovhannisyan**, Laboratory of Plant Gene Pool and Breeding, Armenian State Agrarian University, briefly introduced the history of the laboratory and the main activities carried out in the area of PGR collection, ex situ conservation, and accession evaluation. The Laboratory’s experience in organization of joint collection missions with ICARDA, VIR, Slovak Agricultural Research Center, and Slovak Agrarian University, the steps in application for permits for PGR collection, as well as the objectives and results of collaborative projects implemented within the framework of the World Bank Agricultural Reform Support Project and with International Center of Agricultural Research in the Dry Areas (ICARDA) were described.

**Ms. Natalya Rukhkyan**, Genebank of the National Academy of Sciences, provided general information about importance of accession characterization, helpfulness of taxonomic, herbarium, and ethno-botanical information for PGR use, and experience in collaboration with the Georgian Institute of Farming in characterization of collected germplasm carried out according to modern standards and descriptors.
Dr. Michael Gyulkhasyan, Head, Crop Production Department of the Armenian State Agrarian University, presented a review of the experience of the Laboratory of Plant Gene Pool and Breeding in the sharing of information and germplasm with students, post-graduated students, breeders, and farmers. He identified the present gaps in linkages between conservation and use of PGRFA.

During the discussion following Session IV, Dr. McGuire provided a brief explanation of the role of molecular cytogenetic studies in accession evaluation and the role of molecular markers in plant breeding.

Session V. Use of PGRFA in Armenia

Dr. McGuire provided an overview of opportunities and strategies for use of plant genetic resources to serve as a context for the following presentations.

Dr. Bitore Djumakhanov, ICARDA-CAC, informed about the field crop germplasm enhancement programme of ICARDA in Central Asia and the Caucasus. He described the winter wheat improvement network, which comprises local research institutions, conducts germplasm exchange and evaluation, and is supplied with improved germplasm through the TURKEY/CIMMYT/ICARDA nurseries. He highlighted the major challenges and objectives in barley improvement and food legume production and presented the list of evaluated and released varieties in the CAC region of wheat, barley, triticale, chickpea, lentil, vetch, and grass pea. He advocated the dissemination of good practices, training field days, and traveling workshops to promote capacity building.

Dr. Gayane Sargsyan, Director of the Research Center of Vegetable-Melons and Industrial Crops, Ministry of Agriculture, discussed PGR issues relevant to vegetable breeding and food security. The importance of linkages between breeders and seed producers was emphasized in the context of technology transfer and marketing of local traditional varieties. In the ensuing discussion, the situation with local traditional varieties of tomato and perspectives in hybrid breeding in the country were highlighted.

Dr. Margarita Harutyunyan, LabArmenian State Agrarian University, highlighted the importance of crop wild relatives for genetic variability and development of new pest-, disease-, drought- and cold-resistant varieties. She touched on problems associated with using crop wild relatives in breeding: often crosses result in non-viability or sterility of F1 hybrids or their progeny, etc. She provided examples of pre-breeding (including cytogenetic, morphological, and phyto-pathological characterization of germplasm) and breeding programmes (varieties of triticale, bread and emmer wheat, barley, and inter- and intraspecific intermediate hybrids) based on use of crop wild relatives.

Dr. Souren Semerjyan, Deputy Director, Research Center of Land Management and Plant Protection, Ministry of Agriculture, introduced the results of the study of lines of cereals and legumes, which were selected from nurseries of ICARDA and CIMMYT. He underlined the importance of adaptive crop breeding for the transition period, which was characterized by a decline of research activity across all crop breeding programmes. Several varieties of wheat have been selected from the international nurseries and released in Armenia by his research center. He emphasized the importance of restoring support for full scale breeding programmes in Armenia, for both better productivity and enhanced training opportunities for students. Support from international organizations has been important, but there must be a national commitment backed up by funding from the Armenian government.
Dr. Jemma Epremyan, Research Center of Land Management and Plant Protection, Ministry of Agriculture, provided examples of establishment of cooperation links between PGRFA users and seed producers, in particular between breeders in her research center and the Syunik Marz Seed Producers Union. She emphasized that such unions are needed in every Marz. She also noted that too little consideration is given to improving nitrogen-fixing crops (many of which were once key crops in Armenia), with the result that high nitrogen fertilizers are currently necessary for cereal production.

Dr. Nune Sarukhanyan, “Green Lane” Agricultural Assistance NGO, briefly described the experience of her organization in organic farming, reviewed the main practices used for production of organic products, and highlighted financial, policy, and environmental risks related to organic farming. The obstacles in development of organic agriculture in the country, such as lack of integrated research and information and absence of organic markets were mentioned. The experience of “Green Lane” in the organization of field days, workshops, seminars, as well as in research programmes was discussed with the participants of the workshop.

The Third Day
04 October, 2007

Session VI. National cooperation and institutional links

Dr. Ashot Voskanyan, Director of Agriculture Support Republican Center, Ministry of Agriculture, characterized the mission of the Center as supporting farmers in management of agricultural production, application of up-to-date technologies, and provision of consultancy services. Its main activities include identification of farmer needs, coordination of technology introduction projects, and provision of consultancy and publishing services and training. The Center had introduced a system to support the flow of new technologies to the agricultural producers. Dr. Voskanyan highlighted the role of information exchange in PGRFA management and gave an example of an effectively coordinated data management system based on available internet resources and a database including agrarian technologies, human resources, and training programmes.

Dr. Aghvan Sahakyan, Director of the Research Center of Agrobiotechnology, Ministry of Agriculture, discussed the importance of national cooperation for conservation and management of PGRFA. He briefly introduced the history of the Genebank establishment in his unit and described the available facilities for long-term PGR storage and in-vitro conservation. He highlighted examples of collaboration with different research institutions in collection and exchange of germplasm and with some farmers with the purpose of regeneration of accessions. In addition to the need for institutional capacity building, the importance of involving appropriate stakeholders in the collection, conservation, and management of PGRFA were also emphasized.

Dr. Ashot Hovhannisyan, PGR National Coordinator and Head of the Department of Animal Husbandry & Pedigree Breeding, Ministry of Agriculture, described the country’s interministerial Commission on PGRFA which was established in 2005 with the purpose of ensuring better coordination of activities in the field of PGR conservation, study, and usage, elaboration of national programmes and strategies, and serving as a forum for discussions on national issues.

Dr. Alvina Avagyan, EC Food Security Programme in Armenia, briefly introduced the PGR-related laws of the Republic of Armenia, which separate the functions of entities involved in
PGRFA management, as well as strategies and national programmes, which are developed and implemented in Armenia, where collaboration among the different ministries is envisaged.

**Session VII. Breakout working groups, focused on five key topics identified in the preceding sessions**

Five themes were identified as topics for analysis by small working groups. The available participants divided themselves evenly among the groups (See Annex 2 for group compositions). Each group was provided with a questionnaire developed by the workshop organizers (Annex 3), which included questions on the national objectives, achievements, and weaknesses relevant to the respective topics. The working groups were also asked to list priorities, actions, and tools relevant to their topics that are needed for enhancing the whole system of PGR conservation and use in Armenia.

At the end of the day, a member of each working group reported on their results. A number of outcomes emerged relating to conservation and use of PGRFA, social-economic aspects, seed production, and coordination at national level. The discussions focused on providing useful and practical ways to improve conservation of PGRFA, creating a strong links between conservation and use as well as between breeding and seed production, and strengthening the coordination and cooperation on national, regional, and international levels for effective management of PGRFA. The role of different ministries, international organizations, agencies, the private sector, and NGOs in strengthening the use of PGRFA and PGRFA management systems was also discussed. The roles of the Ministry of Agriculture and Ministry of Environment Protection were emphasized to be at the level of implementation of institutional reforms, enabling policies, and increased control and coordination functions. The participants called for strengthening agricultural NGOs to provide better extension services, contributions in public advocacy, and awareness raising. The private sector should be expected to invest more into PGR-related activities, marketing, market studies, and raising competitiveness through introduction of modern management methods, GAP, organic certification, etc. The role of research institutes and universities is mostly in PGR conservation, use, and related research and training. International organizations can be responsible for technical backstopping and donor support. Tabulated results of the working group discussions are given in Annexes 4 and 5.

**The Fourth Day**
05 October, 2007

**Session VIII. Conclusions, recommendations, and draft outline of a proposal**

Dr. McGuire presented a proposed scheme of PGRFA conservation and management for Armenia and a first draft of an outline for a proposal on “Capacity Building for an Integrated System of Use and Management of Plant Genetic Resources in Armenia”. Workshop participants agreed with presented scheme for PGRFA management. Ensuing discussion went on to focus on ways to enhance capacity and methodology for use of PGRFA in Armenia. The workshop participants proposed to develop a project that would include capacity building at all levels of PGR conservation and use, including policy, information management, research & development, socio-economic impact, and marketing (see Annex 6).

It was decided that the workshop organizers would establish a working group representing different stakeholders to work on draft proposal. Representatives from the Ministry of Agriculture(G. Manucharyan, H. Khachatryan, S. Semerjan, A. Voskanyan), Ministry of
Nature Protection (H. Ghalachyan, S. Muradyan), National Academy of Science (E. Nazarova, N. Rukhkyan), and NGOs (N. Darbinyan) would be involved in the working group on a volunteer basis. According to the this plan, a draft proposal on “Capacity Building for an Integrated System of Plant Genetic Resources Management and Use in Armenia” shall be developed by the local expert (Dr. Alvina Avagyan) and handed over to these working group members for making suggestions and recommendation. The final draft will be presented to the participants of Policy Dialogue Meeting, which will be held in November 2007.

**Recommendations of the Workshop**

The following general recommendations were distilled from the previous three days of presentations and discussions, presented in the final session, and agreed upon by the participants:

- There is a need to enhance activities of both in-situ and ex-situ conservation, through improvement of quality of collections and information. It is crucial to enhance information and germplasm exchange between relevant institutions, as well as among collection-holder institutions and PGR users, and raise public awareness on the importance of PGRFA.

- There is currently a limited capacity for effective use of PGRFA in breeding; there is a need for strengthening the use of PGR for creation of new productive varieties resistant to abiotic and biotic stresses through capacity building (human resources and facilities) and application of modern breeding technologies; in parallel to this, there needs to be greater recognition for the contribution of breeders and a mechanism established to recognize breeders’ rights.

- In the social-economic context, the effective use and management of PGRFA can be considered as a tool for improvement of livelihoods. There is a need for raising public awareness and improving the investment climate in the PGR area through the inclusion of PGR-related courses in the curricula of educational institutions and providing trainings for researchers, policy-makers, farmers, students, etc.

- A favorable environment for promotion of sustainable seed and planting material multiplication companies in Armenia should be created through provision of agricultural producers with access to quality seed and planting material, and training of seed producers in updated seed standards, seed production technologies, etc.

- There is a need to strengthen the national coordination and cooperation for effective management of PGRFA through mainstreaming of PGRFA conservation and utilization issues into the country’s policy and enhancement of functions and activities of an inter-ministerial committee on PGR.
Annex 1: Workshop agenda

**October 02, 2007 (Tuesday)**

09:00-09:30  Registration
09:30-10:50  Inaugural Session

Chairpersons: **Dr. Samvel Avetisyan** (Ministry of Agriculture) and **Dr. Kakoli Ghosh** (FAO)

- 09:30-09:40  Welcome  
  Dr. Zakir Khalikulov, ICARDA-CAC
- 09:40-09:50  Inaugural Address  
  Dr. S. Avetisyan, First Deputy Minister, Ministry of Agriculture of RA
- 09:50-10:00  Opening statement  
  Dr. K. Ghosh, AGPS/FAO
- 10:00-10:10  Vote of Thanks  
  Dr. David Bedoshvili, PFU/ICARDA/CIMMYT the Caucasus Sub-Office
- 10:10-10:30  Special Remarks  
  Dr. Patrick McGuire, UCDavis, USA
- 10:30-10:50  Special Remarks  
  Mr. Sean Carmody, USDA

10:50 –11:20  Group Photo and Tea/Coffee Break

10:50-13:00  **Session I: Role of agriculture in economy of the country**

Chairpersons: **Dr. G. Petrosyan** (Ministry of Agriculture) and **Dr. Z. Khalikulov** (PFU/ICARDA), Rapporteur: **Dr. Alvina Avagyan**

- 11:20-11:40  Agriculture in Armenia: development strategy, priority issues and marketing opportunities  
  Dr. S. Avetisyan (Ministry of Agriculture)
- 11:40-13:00  Approaches, achievements and perspectives in agricultural marketing  
  Mr. Armen Harutyunyan (CARD), Mr. Artak Khachatryan (CARD)
- 13:00-13:30  General discussion and recommendations

13:30–14:30  Lunch

14:30 - 18:00  **Session II: Introduction to Management of PGRFA in Armenia**

Chairpersons: **Dr. Ashot Voskanyan** (Agriculture Support Republic Center) and **Dr. D. Bedoshvili** (PFU/ICARDA/CIMMYT), Rapporteur: **E. Gevorgyan**

**Dr. D. Bedoshvili** (PFU/ICARDA/CIMMYT), Rapporteur: **E. Gevorgyan**

- 14:30-14:50  The status of PGR research and international cooperation in the CAC region  
  Dr. Z. Khalikulov (Consultant, PFU/ICARDA-CAC)
- 14:50-15:20  Survey of the national plant breeding and biotechnology capacity in Armenia  
  Dr. Armine Amyan (Research Center of Agrobiotechnology)
- 15:20-15:40  Armenian traditional crops, landraces and wild relatives: importance, conservation and usage  
  Dr. Andreas Melikyan (Armenian State Agrarian University)
- 15:40-16:10  Tea/Coffee Break
- 16:10-16:30  Presentation by consultant  
  Dr. P. McGuire (UCDavis, USA)
- 16:30-18:00  General discussion and recommendations

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October 03, 2007 (Wednesday)

09:30-09:35 Summary of recommendations arising from the first day (P. McGuire)

09:35 - 11:20 Session III: Policy framework for effective management of PGRFA in Armenia

Chairpersons: Dr. Ashot Hovhannisyan (Ministry of Agriculture) and Dr. Souren Semerjyan (Research Center of Land Management and Plant Protection), Rapporteur: Dr. Margarita Harutyunyan

09:30-09:50 The activities implemented in the frames of Convention on Biodiversity in Armenia

09:50-10:10 Country policy in the area of crop production

10:10-10:30 Variety release state system in Armenia

10:30-10:45 Presentation by consultant

10:45-11:10 General discussion and recommendations

11:10-11:30 Tea/Coffee Break

11:30–13:30 Session IV: Conservation of PGRFA in Armenia

Chairpersons: Dr. Z. Khalikulov (PFU/ICARDA-CAC) and Dr. K. Ghosh (FAO), Rapporteur: Mrs. Karine Yesayan

11:30-11:35 Overview of conservation of PGR

11:35-11:45 In situ conservation of crop wild relatives in Armenia

11:45-12:00 Ex situ conservation and database management of PGR FA in Armenia

12:00-12:15 Joint collection missions and collaborative projects in collection and study of crop wild relatives

12:15-12:35 PGR and information

12:35-12:55 Problems in establishment of strong links between conservation and use of PGRF

12:55-13:15 Presentation by consultant

13:15-13:30 General discussion and recommendations

13:30-14:30 Lunch

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14:30-18:00 Session V: Use of PGRFA in Armenia

Chairpersons: Dr. Michael Gyulkasyan (Armenian State Agrarian University) and Dr. Zakir Khalikulov (PFU/ICARDA-CAC), Rapporteur: Mrs. M. Hovhannisyan

14:30-14:35 Overview of usage of PGR

Dr. P. McGuire (UCDavis, USA)

14:35-14:50 Germplasm enhancement in Central Asia and the Caucasus

Dr. Bitore Djumakhnov (ICARDA-CAC)

14:50-15:10 Biotechnology, utilization of PGR FA and food security

Dr. Gayane Sargsyan (Research Center of Vegetable-Melons and Industrial Crops of MoA)

15:10-15:25 Experience in usage in breeding of crop wild relatives in Armenia

Dr. Margarita Harutyunyan (Armenian State Agrarian University)

15:25-15:40 The results of the study of variety samples of cereals and legumes crops from ICARDA and CIMMYT collections

Dr. Souren Semerjyan (Research Center of Land Management and Plant Protection)

15:40-16:00 Tea/Coffee Break

Dr. Jemma Epremyan (Research Center of Land Management and Plant Protection)

16:00-16:20 Efforts in establishment of cooperation links between PGRFA users and seed producers

Dr. Nune Sarukhanyan («Green Lane» Agricultural Assistance NGO)

16:20-16:40 Current state and future prospects of organic agriculture in Armenia

16:40-18:00 General discussion and recommendations

October 04, 2007 (Thursday)

09:30-11:30 Session VI: National cooperation and institutional links

Chairpersons: Dr. A. Hovhannisyan (Ministry of Agriculture) and Dr. Kakoli Ghosh (FAO), Rapporteur: Ms. Gayane Melyan

09:30-09:50 Issues on improvement of agrarian technologies input mechanisms

Dr. Ashot Voskanyan (Agriculture Support Republican Center)

09:50-10:10 National cooperation in collection, conservation and management of PGR FA

Dr. Aghvan Sahakyan (Research Center of Agrobiotechnology)

10:10-10:30 Efforts to improve linkages and cooperation at the policy level

Dr. Ashot Hovhannisyan (MoA, PGR National coordinator)

10:30-11:00 Summary of Armenian legislation relevant to PGR

Dr. Alvina Avagyan (EC Food Security Programme in Armenia)

11:00-11:30 General discussion and recommendations

11:30-12:00 Tea/Coffee Break
12:00-15:00 **Session VII:** Breakout working groups, focused on five key topics identified in the preceding sessions

12:00-13:00 Participants divide into working groups and discuss assigned topics

- **Number/Topic/Leader/Rapporteur**
  1/Conservation of plant genetic resources /E. Nazarova/N. Rukhkyan
  2/Use of plant genetic resources /B. Jumakhnov/ S. Semerjyan
  3/Seed production /H.Khachatryan/ G.Sargsyan
  4/Socio-economic impacts /A. Mirzabaev/Nune Darbinyan
  5/National cooperation /Z. Khalikulov/A. Avagyan

13:00-14:00 **Lunch**

14:00-15:00 Working groups continue

15:00-15:30 **Tea/Coffee Break**

15:30-18:30 Presentation of reports from each working group and general discussion

**October 05, 2007 (Friday)**

09:30-12:30 **Session VIII:** Conclusions, recommendations, and draft outline of a proposal

*Chairpersons: Dr. K. Ghosh (FAO) and Dr. P. McGuire (UC Davis USA), Rapporteur: Dr. Alisher Mirzabaev*

09:30-10:30 Scheme for PGRFA conservation and management  
Presentation of the draft proposal outline  
*Dr. P. McGuire*

10:30-11:30 **Tea/Coffee Break**

11:30-13:00 General discussion of scheme and proposal outline

13:00-14:00 **Lunch**

14:00-14:45 Revision of the project outline
Strategy for developing the proposal for presentation to policy makers
Reflections on the workshop

14:45-15:00 Closing remarks

- Dr. A. Avagyan
- Dr. Z. Khalikulov
- Dr. P. McGuire
- Dr. K. Ghosh
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<tr>
<th>Name</th>
<th>WG</th>
<th>Organization, Position</th>
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<tr>
<td>AMYAN, Armine</td>
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<td>Ministry of Agriculture, Research Center of Agrobiotechnology</td>
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<tr>
<td>AVAGYAN, Alvina</td>
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<td>EC Food Security Programme in Armenia</td>
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<td>AVETISYAN, Samvel</td>
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<td>Gyumri Breeding Station</td>
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<td>BEDOSHVILI, David</td>
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<td>PFU/ICARDA/CIMMYT, the Caucasus Sub-Office</td>
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<td>CARMODY, Sean</td>
<td></td>
<td>USDA/FAS/IDC, Agricultural project coordinator for Armenia and Georgia</td>
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<tr>
<td>DANIELYAN, Armen</td>
<td></td>
<td>Ministry of Nature Protection, UNDP/GEF “CWR In Situ Conservation” project, project coordinator</td>
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<td>DARBINYAN, Nune</td>
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<td>GHALACHYAN, Hasmik</td>
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<td>GHOSH, Kakoli</td>
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<td>GHUKASYAN, Anahit</td>
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<td>GYULKHASYAN, Michael</td>
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<td>Armenian State Agrarian University, Head of Department of Crop Production, Head of Plant Gene Pool &amp; Breeding Laboratory</td>
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<td>Syunik Marz Seed Producers Juridical Persons Union</td>
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<td>McGuire, Patrick</td>
<td>University of California, USA, Genetic Resources Conservation Programme, Director</td>
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<td>Melikyan, Andreas</td>
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<td>Ziroyan, Artashes</td>
<td>Ministry of Nature Protection, Bioresources Management Agency, Director</td>
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1Number indicates participation in corresponding breakout working group during Session VII, as numbered in Annex 4.
Annex 3: Questions and presentation outline for the working groups

What is the main country objective in this particular area?
What are the main achievements, success stories?
What are the weaknesses and obstacles?
What are the priorities (not less than 3) in this particular area, please rank?
Suggested actions to implement the selected priorities?
Suggested tools to address each priority action?

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<tr>
<th>Priorities</th>
<th>Suggested actions</th>
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Role of different institutions in this particular subject:
ministries -
research org. -
communities -
private sector -
universities -
NGOs -
international organizations –

Specific questions

For Group 1 - priority crops for PGRFA conservation
For Group 2 - primary sources of PGRFA
For Group 2 - necessity of full scale breeding programmes versus adaptation breeding
For Group 3 - awareness about applications Treaty and ratified Conventions
For Group 4 - incentive mechanisms to find financing sources
For Group 5 - importance of long-term policies in effective management and utilization of PGRFA
For Group 1 and 2 - how to strengthen linkages between stakeholders in conservation, use and seed production
<table>
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<tr>
<th>Group</th>
<th>Country objective</th>
<th>Achievements</th>
<th>Weaknesses</th>
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<tr>
<td>1) PGR conservation</td>
<td>Conservation of biodiversity: wild flora and cultivated plants</td>
<td>Complete inventory of wild flora – 11 volumes of ‘Flora of Armenia’ “Atlas of chromosome numbers of flowering plants of Flora of Armenia” System of protected areas, reserves, nature parks, dendroparks, botanical gardens; National Inventory of ex situ collections; Two genebanks</td>
<td>Insufficient governmental support (financial and other); Poor coordination of PGR work at national level; Poor awareness of stakeholders of PGR activities in the country; Overlapping of work due to poor links among scientists; Lack of young specialists familiar with modern technologies; Insufficient technical facilities (equipment, lab supplies, etc.) for conservation and research; No funding for collecting missions; Poor inter-institutional collaboration.</td>
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<td>2) PGR use</td>
<td>Strengthening the use of PGR for creating new varieties tolerant to abiotic and biotic stresses, high yielding with quality</td>
<td>Numerous varieties of cereals, legumes, vegetables and melons developed and released in the past.</td>
<td>Lack of: germplasm data, young specialists, financial support, mechanism to stimulate breeder, equipment and machinery for breeding research, access to internet, use of modern breeding technologies, exchange of research information. Poor linkage between research institutions. Unavailability of up-to-date scientific publications</td>
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<tr>
<td>3) Seed production</td>
<td>Provide agricultural producers with access to quality seed and planting material and establish favorable environment to promote sustainable seed and planting material companies in Armenia</td>
<td>Well-organized plant breeding programmes; Research institutes were responsible for primary (basic) seed production; Well-organized seed quality control system; Goal is for only evaluated and officially released varieties to be used in seed and grain production; Trained and educated staff; system of continued education in seed production and plant protection.</td>
<td>Low competitiveness of local seed and planting material; The market is not protected from unregistered and unknown varieties; Inefficient production practices; Obsolete machinery and equipment; Unavailability of high generation seed of the demanded varieties in the local market; Insufficient number of qualified workers; Poor linkages with producers, no access to market information; Insufficient regional and international cooperation; No protection of breeders’ intellectual property; Undeveloped NGOs in the seed production sector.</td>
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<tr>
<td>4) Socio-economic impact</td>
<td>Conservation and use of the national gene pool as a vital economic resource. PGR should become an important policy priority. Improve the livelihoods of people using PGR.</td>
<td>Armenia is signatory to many international treaties and agreements on PGR. Legislature for PGR activities exists. High scientific potential is available. Considerable donor support/interest for PGR activities in Armenia exists.</td>
<td>Lack of long-term sustainable funding for PGR activities. Small size of farming plots. Need for capacity building. Disintegration of markets and earlier existing research collaboration. Need to improve the investment climate in PGR-related areas. Lack of synergies among various existing projects in the area of PGR. Lack of market studies. Poor input supply systems/mechanisms; Inefficient seed multiplication (system of nurseries)</td>
</tr>
<tr>
<td>5) National cooperation</td>
<td>Strengthen coordination and cooperation on national, regional, and international levels for effective management and use of PGRFA</td>
<td>Establishment of inter-institutional National Commission on PGR FA; Development and implementation of strategies and national programmes; Improvement of legal base; Initial steps in cooperation among various research institutes.</td>
<td>Weak awareness among high level policymakers about the Conventions and International treaties/agreements that Armenia is a party to. Insufficient funding for PGR FA activities in the country. Lack of awareness about the activities of the research institutes both on national and regional levels. Absence of evaluation data on accessions in other collections.</td>
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## Annex 5: Priorities, weaknesses, and tools for the PGR sector based on the results of the group discussions.

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<thead>
<tr>
<th>Group</th>
<th>Priorities</th>
<th>Actions</th>
<th>Tools</th>
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<tbody>
<tr>
<td>1) PGR conservation</td>
<td>Improved <em>in situ</em> conservation</td>
<td>Improved administrative and research activities</td>
<td>Training and cooperation.</td>
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<tr>
<td></td>
<td>Improved <em>ex situ</em> conservation</td>
<td>Upgrade facilities and equipment</td>
<td>Governmental support.</td>
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<td>Strengthened use of PGR</td>
<td>Improve inter-institutional collaboration and links between collections holders and PGR users</td>
<td>Information exchange, databases, joint projects and workshops</td>
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<td></td>
<td>Improved regional (CAC region) and international collaboration</td>
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<td>ASNET (Armenian scientists network)</td>
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<tr>
<td>2) PGR use</td>
<td>Development of mechanism to stimulate breeder.</td>
<td>Familiarize breeders and policy makers with experience of application of international laws and breeders’ rights in other countries</td>
<td>Training on IPR in plant breeding and PVP systems.</td>
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<td>Development of improved varieties with tolerance to abiotic and biotic stresses and higher yield and quality.</td>
<td>Provision of modern equipment and small scale machinery for managing breeding trials and nurseries</td>
<td>Increased state funding, donor support.</td>
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<td>Improved access to germplasm</td>
<td>Evaluation and characterization of genebank collections</td>
<td>Strengthening capacity of genebanks.</td>
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<td>Capacity building (human resources).</td>
<td>Involve young breeders</td>
<td>Training (degree and non-degree), workshops, field days</td>
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<td></td>
<td>Application of modern breeding technologies</td>
<td>Training on modern breeding techniques and biotechnology tools</td>
<td>International and regional cooperation, improved state support.</td>
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<td>3) Seed production</td>
<td>Betterment of quality control system</td>
<td>Updated seed standards, upgrading equipment and labs or checking seed quality and seed fields</td>
<td>Training of seed producers and policy-makers. Membership in ISTA. Purchase of equipment.</td>
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<td></td>
<td>Improvement of seed production system</td>
<td>Maintain primary seed production at research institutes and facilitate commercialization of seed multiplication activities</td>
<td>Upgrading equipment and machinery at Research institutes. Facilitate commercialization of seed multiplication through provision of credits and lowering taxation.</td>
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<td></td>
<td>Facilitate establishment of linkages among research institutes, seed producers, extension systems</td>
<td>Joint field days, workshops and discussions, demonstration fields, collection and provision of market information</td>
<td>Establishment of a board (coordination group) at the Ministry of Agriculture.</td>
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<td></td>
<td>Strengthening protection of intellectual properties in plant breeding</td>
<td>Joining UPOV</td>
<td>Updating legislature (PVP system), capacity building through training</td>
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<td></td>
<td>Protection of breeders and seed producers’ interests (advocacy)</td>
<td>Facilitate collection of royalties, increase awareness of international treaties/ratified conventions and legal framework among the breeders, involvement in policy-making</td>
<td>Establishment of breeders and seed producers associations</td>
</tr>
<tr>
<td>4) Socio-economic impact</td>
<td>1. Conduct an economic study/analysis of different development options for management and use of PGR in Armenia using the existing potential</td>
<td>As a part of national strategy</td>
<td>Needs assessment, policy reviews, ex-ante modeling, social, economic and environmental impact assessment, etc</td>
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| 2. Increase funding for PGR activities | Raise public awareness and conduct policy advocacy | a. Stronger State support (ex: more of budget revenues from the use of PGR to be channeled to PGR activities, 1% of tax on alcoholic drinks to go to grapes research, as it is important in exports)
b. Soft long-term credits to farmers (special attention to grape production)
c. Private investments |
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<tr>
<td>3. Improve the investment climate in the PGR area and thereby raise productivity of agriculture in general</td>
<td>Revision of existing laws Consolidation of farm plots</td>
<td>Lower taxes, incentives Supply systems/mechanisms Market studies</td>
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<td>4. Re-establishment of market and research linkages</td>
<td>National and regional information dissemination</td>
<td>Market surveys, branding of Armenian products (PGR) on global market</td>
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<td>5. Capacity building</td>
<td>More trainings for researchers, farmers, students in PGR</td>
<td>Inclusion in the curricula of educational institutions of PGR-related courses</td>
</tr>
<tr>
<td>5) National cooperation</td>
<td>Problem of conservation and sustainable use of PGR FA is a priority for the country</td>
<td>Recommend to the Government to include the problem of conservation and sustainable use of PGR FA as a priority area for research Recommend to include an expert in PGR FA, a member of inter-institutional Commission on PGR FA, to the Expert commission which makes decisions on funding of research themes and programmes</td>
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<td>Effective coordination and collaboration among various Ministries and Agencies</td>
<td>Development and signing of an inter-institutional agreement on coordination and distribution of mandates on PGR FA activities in Armenia Recommend to the appropriate Ministries and Agencies to approve the structure and functions of the Commission/Council on PGR FA</td>
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<td></td>
<td>Effective coordination and cooperation among various national institutions and organizations involved in conservation and use of PGR FA</td>
<td>Strengthen the functions of the inter-institutional Commission on PGR FA To invest the Commission with the functions of coordination and cooperation</td>
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Annex 6: Outline of the project proposal

Capacity Building for an Integrated System of Use and Management of PGR in Armenia

Objective 1: Policy awareness at the policy maker level
- Raising awareness among policy makers on Conventions and International Agreements related to PGR conservation and sustainable use
- Identifying means of integrating awareness of the PGRFA effective management into education and public awareness programmes at national level
- Coordination body for PGR (assistance to establish, identify functions, staff, etc.)
- Joining UPOV and strengthening required capacity, especially on PVP systems

Objective 2: Improved Information Management
- Integrated Web site for the PGR system to provide internet access;
- Internet based integrated database;
- Publishing Catalogues;
- Variety information management and dissemination.

Objective 3: Strengthened Research & Development
3.1 Training in PGRFA conservation
- Conservation techniques and conservation facility and reserve management
- Genetics and general plant breeding
- Biotechnology methods
- Database management
3.2. Training in PGRFA use
- Modern breeding methods
- Biotechnology methods
- Field plot-techniques
- Marker assisted selection (MAS)
3.3. Training in seed production
- Seed production practices
- Quality assurance
- Seed marketing

Objective 4: Socio-Economic Impact
- Study to assess present status of PGR use and development and its impact on livelihoods
- Market assessment and training in conducting market assessments
- Promotion and facilitation of agro-tourism
- Establishment of Union of Breeders and Unions of Seed Producers to lobby for their interests and establish breeder royalty collection mechanisms
Proceedings of the Policy Dialogue Workshop:

National Integrated Strategy for Plant Genetic Resources Management and Use

13 November 2007
Yerevan, Armenia

edited by:
Alvina Avagyan, EC Food Security Programme in Armenia
David Bedoshvili, Caucasus Sub-Office, PFU/ICARDA/CIMMYT
Juan Fajardo, Seed and Plant Genetic Resources Service, Plant Production and Protection Division, FAO
Patrick McGuire, University of California Genetic Resources Conservation Programme

Organized by:
International Center for Agricultural Research in Dry Areas (ICARDA)
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**Background Information**

The Food and Agriculture Organization (FAO) of the United Nations is implementing a European Commission (EC) funded project in Armenia aimed at developing a national integrated strategy that strengthens the in-country capacity for effective management and use of plant genetic resources to contribute to food security and national development. The International Center for Agricultural Research in the Dry Areas (ICARDA), key partner of FAO in the accomplishment of the project, organized a Policy Dialogue Workshop on “National Integrated Strategy for Plant Genetic Resources Management and Use” in Yerevan, Armenia, 13 November 2007.

The Policy Dialogue was preceded by a study of regulatory frameworks, capacity building, ex-situ and in-situ conservation capacities, human and technological resources for plant genetic resources effective management in Armenia, which was conducted by International Consultant Dr. Patrick McGuire (University of California, Davis), and by a four-day multi-stakeholder workshop “Elements of a National Integrated Strategy for Plant Genetic Resources Management and Use” (Yerevan, Armenia, 2-5 October 2007).

The objective of the Policy Dialogue was to discuss the report of the National Study on Elements of a National Integrated Strategy for Plant Genetic Resources Management and Use, which was conducted by Dr. Patrick McGuire, and endorse the project proposal that was developed by the participants of the multi-stakeholder workshop held in October.

ICARDA, in close consultation with FAO, provided technical and logistical support to the consultant during his mission in Armenia, developed a detailed agenda of the meeting, invited participants, and made all necessary arrangements for successful implementation of the project. Twenty-two persons participated in the Policy Dialogue meeting. The programme and the list of participants are attached as Annexes I and II, respectively.

**Summary of the Policy Dialogue Presentations and Comments**

**Inaugural Session**

The inaugural welcoming session was co-chaired by **Dr. Levon Minasyan**, Head of the Department of Science, Education & Consultancy of the Ministry of Agriculture and **Mr. Juan Fajardo**, Agricultural Officer, Plant Production and Protection Division, FAO. The 22 attendees included representatives of the Ministry of Agriculture, the Ministry of Nature Protection, the Ministry of Education and Science, the National Academy of Science (NAS), the NAS Institute of Botany and Gene Bank, several Research Centers of the Ministry of Agriculture, the Armenian State Agrarian University, the Center for Agribusiness and Rural Development, NGO attended the meeting.

**Dr. Minasyan** welcomed the participants on behalf of the Ministry of Agriculture of the Republic of Armenia. He hailed the importance of the meeting for development of a general vision of management of plant genetic resources for food and agriculture in the country and endorsement of the project proposal “Capacity Building for an Integrated System of Use and Management of Plant Genetic Resources (PGR) in Armenia”, the action plan developed by consensus at the October multi-stakeholder workshop. He also emphasized the successful results of that workshop, the necessity for active involvement by policy makers at the national level in discussions of the prepared documents, and enlisted their commitment for support to conservation and effective use of Armenian PGR for food and agriculture (PGRFA).

**Mr. Fajardo** briefly introduced the overall purpose, goals and activities of the FAO project towards a National Integrated Strategy on PGRFA, which had been adopted by the European...
Commission (EC) for financing, and outlined the major achievements of the work done. He indicated the role of the participatory approach in the development of the projects targeting reliable conservation, sustainable use, and effective management of plant genetic resources. The study conducted by Dr Patrick McGuire as well as the previous stakeholder meeting were organized to ensure participation of representatives from various Ministries, research and educational institutions, NGOs, and the private sector in the elaboration of elements of a national integrated strategy for plant genetic resources management and use. Finally, he advised consideration of the study report and action plan that were to be presented and offering recommendations and suggestions for improvement of these papers.

Dr. Hasmik Ghalachyan, Head of the Plant Resources Management Division of the Bioresources Management Agency, Ministry of Nature Protection, thanked the organizers of the Workshop and Policy Dialogue Meeting for conducting the comprehensive study and designing the project proposal action plan by a participatory approach and subsequently distributed among all stakeholders.

Dr. Daniel Petrosyan, Pro-Rector of the Armenian State Agrarian University (ASAU), extended his greetings to the participants. He mentioned the rich biodiversity of Armenia and the importance of plant genetic resources in food security, poverty reduction, and environmental sustainability. Speaking about management of plant genetic resources for food and agriculture, he informed the audience about the research work and activities conducted in the Laboratory of Plant Gene Pool and Breeding at ASAU on ex-situ conservation of PGRFA and its evaluation and use in breeding programmes. He also stressed the importance of involving ASAU students and post-graduate students in workshops and seminars devoted to the problems of conservation and use of plant genetic resources.

Dr. Patrick McGuire, UC Davis, USA, expressed his pleasure at being in Armenia and presenting what he had learned about PGR conservation and use in Armenia during his two visits and in the numerous meetings with local experts. He noted that the support and participation of international and other national representatives in this assessment effort was evidence of the global importance for each nation having a comprehensive strategy for the conservation and use of its plant genetic resources. Dr. McGuire expressed his appreciation for the participation and efforts of representatives of the many Armenian institutions and agencies at effective management of PGR. He stated that those efforts were evidence of a national acknowledgement of the importance of a national strategy for PGR. Finally he underlined the goal of the meeting of receiving feedback on the recommendations and proposals made by the international and national experts and the local working group.

Dr. David Bedoshvili, Caucasus Sub-Office, PFU/ICARDA/CIMMYT, thanked all participants for their interest in plant genetic resources related issues, efforts in developing the project proposal, and active cooperation. ICARDA, in cooperation with FAO, had organized a regional workshop earlier in 2007 with the objective of strengthening national plant breeding and biotechnology capacities through policy advice. As a result of that work, the present status and trends of the plant breeding sector were reviewed and major obstacles in effective usage of plant genetic resources were identified. On behalf of PFU/ICARDA/CIMMYT Dr. David Bedoshvili expressed his appreciation of the support provided by the Ministry of Agriculture, Ministry of Nature Protection, ASAU, research centers of the Ministry of Agriculture, Institute of Botany and Genebank of the NAS, as well as NGOs for the study and workshop. He wished all the participants a successful meeting.
Session I: Importance of Plant Genetic Resources in the Agricultural and Environmental Policies of the Country

Session I was chaired by Dr. Daniel Petrosyan, Ministry of Education and Science, and Dr. Patrick McGuire, UC Davis, USA.

The session began with the presentation of Mr. Fajardo on the importance of PGR for food security and of international instruments for PGR conservation and unitization. He briefed the audience about the role of agricultural biodiversity for human livelihoods and provided an overview of the elements of agrobiodiversity. Great attention was given to the value of PGRFA as creation of the farmers and because of the inter-dependence of countries for the development of their agricultural systems. He stressed the social, economic, scientific, and cultural importance of plant genetic resources and the risks caused by the loss of genetic diversity. He mentioned the four main components of PGRFA management: in situ conservation, including on farm, ex situ conservation, utilization, and institutions and capacity building. Finally Mr. Fajardo listed the major international instruments driving PGRFA management (the Convention on Biological Diversity, the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture, and the International Treaty on Plant Genetic Resources for Food and Agriculture). He stressed their goal of effective conservation and sustainable utilization of PGRFA and the fair and equitable sharing of the benefits arising from their use.

Dr. Alvina Avagyan, EC Food Security Programmeme in Armenia, started her presentation on the legal framework for management of conservation and use of PGRFA in Armenia with descriptions of the terms «biodiversity», «plant genetic resources», and «plant genetic resources for food and agriculture». She presented an overview of ratified conventions and international agreements related to PGRFA management, their general principles and the main provisions. Talking about national legislation, she stressed that although the existing legislation needs to be improved, it can serve as a reliable legal basis for the implementation of activities envisaged by the National Action Plan. A number of laws related to PGRFA have been developed and adopted by the National Assembly over the last few years: Law on Expertise to Access the Impact on Environment, Law on Payments for Bioresources Use, Law on Flora, Law on Seeds, Law on Specially Protected Nature Areas, Law on Breeding Achievements Protection, Law on Plant Quarantine and Plant Protection. The basis for legislation has been improved due to the development of several recent documents of a strategic nature: “Strategy on Developing Specially Protected Areas and National Action Plan”, “Food Safety Policy of the Republic of Armenia”, Strategy of Agriculture Development, National Action Plan to Combat Desertification in Armenia, etc. Dr. Avagyan listed the main institutions involved in PGRFA conservation and utilization and briefly introduced their mandates and main functions.

During the question-answer session after these two presentations, the term “sustainable utilization of plant genetic resources” was clarified, issues related to necessity of development of new laws, in particular a law on botanical gardens and dendroparks (arboreta), as well as the elaboration of a project on ecological network establishment were discussed with the participants.

Session II: Presentation and Comments on the Study and Policy Recommendations

Session II was chaired by Mr. Fajardo and Dr. Bedoshvili.

Dr. McGuire presented a summary of his study entitled “Elements of a national strategy for management and use of plant genetic resources in Armenia”. First of all, he briefed the audience...
about international agreements in force for Armenia, the specific requirements related to PGR and the country's obligations under the agreements. The findings based on results of analysis of the existing components of a national system for conservation and use of PGRFA in the Republic included availability of qualified and dedicated staff, inadequate level of funding, needs for additional personnel, absence of intranet structure, on-going process of genetic erosion in collections and species populations. With regard to coordination of PGR activities, Dr. McGuire noted the necessity for improvement of national communication and germplasm movement channels and the inadequate functioning of the existing Inter-Ministerial Commission on PGRFA.

A number of recommendations were made as a result of current assessment. Regarding the Inter-Ministerial Commission on PGRFA for Armenia, Dr. McGuire proposed inclusion of professional staff, selection of a Commission head on a rotation basis, regular meetings, a mandate of clear functions and responsibilities which should include undertaking of assessments and planning, producing a comprehensive plan to be presented to the administrations of the organizations involved in PGR conservation and use.

Dr. McGuire highlighted the necessity of development of a national strategy for crop breeding, which should most likely be conducted on a crop-by-crop basis. Full-scale breeding programmes might be recommended for some crops while others might be well served by adaptive breeding programmes. The recommended breeding strategies should consider, but not be limited by, the available facilities, technical capacities, and tools, as well as the value and role of the crops in the country's economy and for people’s livelihoods.

Speaking about enhancement and facilitation of usage of PGR in Armenia, Dr. McGuire emphasized the importance of the involvement of PGR users in the evaluation and characterization of accessions and better planning for collection missions based on understanding of the specific crop traits to be improved. He also noted that upgraded technological capabilities for the research centers and genebanks, necessary for modern conservation and use, may also serve for recruiting new workers. All possible training opportunities, such as collaborations with institutions where new methodology is in use, specific training offered by international centers and universities, and training courses provided by research institutions or commercial organizations should taken advantage of.

Finally Dr. McGuire stressed the importance of a long-term back up strategy for Armenian collections and the possibility of finding a regional, multinational solution for that. He also noted the standard international policy for producing and recording of material transfer agreements and mentioned possible funding opportunities that might arise from such organizations as the Global Crop Diversity Trust for facilities, equipment, and training, access to which would be enhanced by a functioning Armenian national PGR strategy.

The presentation was followed by a comprehensive discussion, which emphasized the lack of proper coordination of PGR activities on the national level and feasible ways for its improvement.

The representatives of the Ministry of Agriculture stressed the importance of effective and strong coordination. In particular, Dr. Voskanyan, Director of the Agriculture Support Republican Center, suggested building up the coordination of plant genetic resources activities through creation of strong linkages between institutions on the national level and strengthening the functions of the Inter-Ministerial Commission on PGR FA. Dr. Minasyan, Head of Department of Science, Education & Consultancy of the Ministry of Agriculture, proposed giving a state status to the PGR coordination body to make it stronger and functional. Dr.
Semerjan, Deputy Director of the Research Center of Land Management and Plant Protection, highlighted the importance of involvement of all stakeholders in the Commission.

The representative of the Ministry of Nature Protection, Dr. Hasmik Ghalachyan, Head of Plant Resources Management Division of the Bioresources Management Agency, supported an idea of reinforcement of existing Inter-Ministerial Commission with coordination functions. He was also interested in an ecosystem approach for assessment and monitoring of plant genetic resources and an inventory of invasive species. He suggested including information about the planned new initiative on Red Book revision in the study report. Responding, Dr. McGuire expressed his appreciation for the work carried out in Armenia in the field of inventory and description of the country’s flora as well as for the new initiatives on Red Book revision and invasive species inventory.

Dr. Daniel Petrosyan, Pro-Rector for Scientific Affairs of ASAU, representing the Ministry of Education and Science, was highly appreciative of the comprehensive work carried out by Dr. McGuire in a very short period. He underlined the importance of including all components in the study report and the significance of the development of a national strategy for plant genetic resources conservation and use. Dr. Petrosyan briefed the meeting participants with information on anew reform in the area of science, new mechanisms of financing of research themes, and submission of proposals. He also mentioned the role of students’ training abroad, which are targeted basically on exchange of experience, not on professional education. Finally Dr. Petrosyan introduced the experience of ASAU in the organization of regional contests on ecology and organic agriculture and expressed the willingness of the University to support organization of field expeditions, conferences, training, and competitions in the field of plant genetic resources.

Acad. Karen Poghosyan representing the National Academy of Science appreciated the results of activities in the field of annual plant genetic resources, especially in the area of crop wild relatives. He expressed his opinion about the situation with the conservation of perennial plant genetic resources and their usage in breeding. The formerly extensive living collections of fruit crops and grapes have been almost destroyed during the years of economic crisis in the country. The technical support of international organizations is not essential in this particular area.

Mr. Fajardo thanked Dr McGuire for the excellent study, which covers all main elements of a system for plant genetic resources in Armenia. The priority problems in PGRFA conservation and utilization in breeding and seed production programmes have been identified and actions to address the revealed gaps have been proposed. Mr. Fajardo’s comments pertained to coordination of activities related to PGRFA conservation, utilization, capacity building, and information management and to development of national strategies on crop breeding and PGR conservation. As for coordination of PGR activities, Mr. Fajardo stressed the significance of having a strong coordination body and its role in development of national PGR programmes and strategies. He highlighted the necessity of having clear mandate, functions, and financial support from the government, participation of representatives from all relevant organizations, including ministries, research, educational, and private organizations, and NGOs. Regarding development of national strategies, Mr. Fajardo underlined the importance of developing integrated national strategies for both crop breeding strategy and PGR conservation.

Dr. Bedoshvili also thanked Dr McGuire for the comprehensive work done. He highlighted in his comments that Armenia should have a clear understanding of existing trends in economic development and the role of PGRFA in this respect and the necessary structure for coordination and effective management of all PGR related activities. Effective and close links with private organizations should be established to ensure the involvement of the seed production sector in a
PGRFA management strategy. Talking about covering all related areas, Dr. Bedoshvili emphasized the role of phytosanitary services and variety release systems in the whole chain from PGR conservation to use.

Session III: Presentation and Comments on the Project Proposal

Session III was chaired by Mr. Fajardo and Gagik Manucharyan, Ministry of Agriculture.

The session began with the presentation by Dr. Bedoshvili of the project proposal “Capacity Building for an Integrated System of Use and Management of PGR in Armenia”. He presented the purpose, background, and the main components of the draft proposal. The main objectives of Component 1. National Policy Framework included increased PGRFA-related policy awareness at the policy maker level, strengthened coordination of plant genetic resources activities, and an improved national policy framework. To address the identified objectives a number of actions were proposed, such as raising awareness among policy-makers of the international legal instruments, integrating PGRFA-related subjects into education and public awareness programmes, strengthening coordination of PGR activities, establishing and reinforcing linkages between institutions on the national, regional, and international levels, and developing an appropriate regulatory framework for joining the International Union for the Protection of New Varieties of Plants (UPOV).

The objectives of Component 2. Information Management included facilitated access to germplasm and information on PGRFA, increased awareness of the PGRFA role in crop production, and nationally supported enlargement of activities on PGRFA conservation and use. Several actions were suggested to address these objectives: establishment of exchange networks, development of an integrated web site, generation and dissemination of data, information/learning materials, training/learning resource tools, and a review of funding opportunities.

The objectives of Component 3. Research and Development included reliable ex situ and in situ PGRFA conservation, strengthened inter-institutional collaborations and linkages; effective utilization of PGRFA to address national crop improvement goals, strengthened linkages between PGRFA users and seed producers, and promoting development of a sustainable seed industry. Among the actions suggested to address these objectives were training on PGRFA monitoring, conservation (ex situ, in situ, in vitro), database management, molecular tools and biotechnology methods, germplasm health assessment; IPR in plant breeding and PVP systems, economics of seed production, and seed quality control and seed standards; enhancement of facilities for such activities as pre-breeding and PGR evaluation; and organization of outreach tools such as field days, demonstration fields, breeders and seed producers associations.

Component 4. Socio-Economic and Environmental Impact had a single objective: Improvement of agricultural productivity and food security through enhanced use and effective management of PGRFA. Proposed actions to address it included conducting studies to assess the present status of PGRFA use and development and impact on livelihoods, establishing networks with the different sectors involved in seed matters, assessing markets, promoting and facilitating agro-tourism, and facilitating access of organic growers to organic seeds and planting materials.

During the ensuing discussion meeting participants expressed their opinions on the presented action plan.

Dr. Minasyan thanked Dr. Bedoshvili for his presentation and for the excellent work done by the working group members and called on the participants to make and submit their
recommendations on the presented action plan in the next several days, so that they may be included in the final version of the action plan.

**Dr. Artashes Ziroyan**, Head of the Bioresources Management Agency, Ministry of Nature Protection addressed several topics in his comments. He urged that because both plant and animal resources are of such great importance for Armenia, any national programmes or strategy should simultaneously address animal and plant genetic resources. He noted that genetically modified organisms (GMOs) had not been mentioned yet, but he sees an increasingly important impact that must be addressed. He urged concern for not only crop wild relatives but for species biodiversity in general in Armenia, noting the increasing anthropogenic impacts on the range and quantity of native Armenian wild species. He suggested that manuals or brochures be produced that could instruct in food and medicinal uses of wild Armenian taxa. He called attention to the need for restoration of many damaged habitats, especially while seed can still be collected for planting. Existing protected areas do not cover all habitat types or many relict species. Existing ones need to be optimized and others are needed. Of the categories of protected areas, the national monuments need special attention, both those highlighting living natural objects and those highlighting non-living natural objects. Further mapping and registry of these are needed which would also help ecotourism in his opinion.

**Dr. Gayane Poghosyan**, Department of Science & Post-Graduate Education, expressed the view of the Ministry of Education and Science on the presented action plan. She supported and endorsed in general the proposed activities, emphasized the urgent needs in encouraging research activities on plant genetic resources and suggested reformulation of the point related to the integrating awareness of the importance of PGRFA into education and public awareness programmes, underlining the necessity of encouraging both formal and nonformal education at the national level and preparation and broadcasting of educational programmes devoted to PGR conservation and utilization issues.

**Acad. Poghosyan** thanked **Dr Bedoshvili** for the detailed presentation and proposed there should be more attention to perennial crops for both ex-situ conservation and utilization. Rehabilitation of vineyards and orchards is needed. Seed storage is not the conservation solution for crops that aren’t seed propagated.

A number of recommendations were made during the following discussion:

**Dr. Hunan Ghazaryan**, Director of Research Center of Soil Science, Land Improvement and Agrochemistry, underlined the role of soil composition and improvement activities in agrocoenosis formation and advised to take into consideration soil-related issues, especially in light of climate change.

**Dr. Zirair Vardanyan**, Director of Institute of Botany of NAS, highlighted that positive results of the project implementation depend on participation of all stakeholders and underlined the availability of human resources in the Institute of Botany.

**Dr. Ashot Voskanyan**, Director of Agriculture Support Republican Center, highlighted the importance of workshops and seminars in development of general approaches in PGR conservation and utilization that can serve as a basis for PGRFA national strategy development. Talking about one of the most important components of PGRFA management, he expressed the willingness of the Agriculture Support Republican Center to participate in project development and implementation.

**Dr. Souren Semerjyan**, Deputy Director of the Research Center of Land Management and Plant Protection, underlining that the main problems and gaps have been identified and the
activities envisaged by the elaborated action plan had covered all basic components of PGRFA management, proposed endorsement of the action plan.

Dr. Avagyan made several points in her summary of the discussion. She noted that land management issues had been discussed at the stakeholder workshop in October, but no any concrete action has been suggested. The focus was on PGR and it’s not clear how to include land management issue. An important objective of the project proposal was to strengthen the linkages between PGR conservation and use. While in the previous workshop, the project proposal was drafted by a volunteer working group, it has also been reviewed and discussed by other stakeholders since then and prior to today’s meeting. She thanked the discussants today for their practical suggestions and assured the group that these would be included. She noted that the tabular presentation of the action plan would be modified by inclusion of two additional columns highlighting the beneficiary of each proposed action and the unit or agency responsible for carrying out each proposed action.

Summarizing the discussion, Mr. Fajardo indicated that all realistic recommendations shall be taken into consideration and shall be included in the action plan. Certainly animal genetic resources issues and land management play a role in sustainability of agriculture in Armenia and this should be acknowledged by the project proposal. However, this project has a specific focus on plant genetic resources and it must be kept in mind what will be the capacity for delivery on its recommendations. For now, the focus should remain on PGR. The final project proposal should be in line with all relevant initiatives of the country as well as with regional and international strategies. The highest priority for both the study and the project proposal should be on national policy. He emphasized that the intent of FAO is that the study and the project proposal serve as tools for Armenia in its endeavor towards an effective management of its local and introduced PGRFA. If funds are made available, FAO can provide technical and policy support to Armenia in the full development and implementation of its adopted national strategy.

Conclusions and next steps

- The workshop participants found the findings of Dr. McGuire’s study to be important and policy recommendations to be relevant.
- Dr. McGuire’s study will be completed in the near future and submitted to FAO, who commissioned it.
- The workshop participants found the project proposal to be comprehensive and worth pursuing. Several key suggestions made by the participants for the proposal will be included as it is revised in the next weeks.
- National consultant Dr. Avagyan will continue compiling inputs efforts to complete the action plan.
- ICARDA will translate the study together with the project proposal into Armenian and disseminate it to all workshop participants, policy-makers, and other stakeholders in the country.
- FAO will present the completed study together with the revised project proposal to national policy leaders in a mission to Armenia. Once both are adopted and supported by the Government, FAO and ICARDA will seek financial support for the full development of the project proposal and for its subsequent implementation.
Annexes

Annex 1: Policy Dialogue Workshop Agenda

09:30-10:00  Registration
10:00-10:50  Inaugural Session

Chairpersons: Dr. Levon Minasyan (Ministry of Agriculture) and Mr. Juan Fajardo (FAO)

10:00-10:05  Welcome  
10:05-10:10  Opening statement  
10:10-10:15  Opening remarks  
10:15-10:20  Opening remarks  
10:20-10:25  Special Remarks  
10:25-10:30  Vote of Thanks

10:30-11:40 Session I: Importance of the plant genetic resources in the agricultural and environmental policies of the country

Chairpersons: Daniel Petrosyan (Ministry of Education and Science) and Dr. Patrick McGuire (UC Davis, USA)  
Rapporteur: Dr. Alvina Avagyan

10:35-10:55  The importance of PGR for food security and international instruments for their conservation and unitization  

11:15-11:35  Discussion of the presentations

11:35-12:00  Group Photo and Tea/Coffee Break

12:00 - 14:00 Session II: Presentation and Comments on the Study and Policy Recommendations

Chairpersons: Mr. Juan Fajardo (FAO) and Dr. David Bedoshvili (PFU/ICARDA/CIMMYT-Caucasus)  
Rapporteur: Dr. Alvina Avagyan

12:00-12:30  Enhancing the efficiency of the PGR conservation and use through better policies, national cooperation and capacity building  

Mr. Juan Fajardo, Seed and Plant Genetic Resources Service, Plant Production and Protection Division, FAO
Dr. Levon Minasyan, Ministry of Agriculture, Head of Department of Science, Education & Consultancy
Dr. Hasmik Ghalachyan, Bioresources Management Agency, Head of Plant Recourses Management Division
Dr. Daniel Petrosyan, State Agrarian University of Armenia, Ministry of Education and Science
Dr. Patrick McGuire, UC Davis, USA
Dr. David Bedoshvili, PFU/ICARDA/CIMMYT-Caucasus
Mr. Juan Fajardo, Agricultural Officer, Seed and Plant Genetic Resources Service, Plant Production and Protection Division, FAO
Dr. Alvina Avagyan (EC Food Security Programmeme in Armenia)
Dr. Patrick McGuire (UC Davis, USA)
12:30-12:40  Ministry of Agriculture  
Dr. Levon Minasyan

12:40-12:50  Ministry of Nature Protection  
Dr. Hasmik Ghalachyan, Head, Plant Resources Management Division, Bioresources Management Agency

12:50-13:00  Ministry of Education and Science  
Dr. Daniel Petrosyan, Pro-Rector for Scientific Affairs of State Agrarian University of Armenia

13:00-13:10  National Academy of Sciences  
Acad. Karen Poghosyan

13:10-13:20  FAO  
Mr. Juan Fajardo, (AGPS/FAO)

13:20-13:30  ICARDA  
Dr. David Bedoshvili

13:30-14:00  General Discussion

14:00–15:00  Lunch

15:00 - 17:00  Session III: Presentation and Comments on the Project Proposal

Chairpersons: Mr. Juan Fajardo (FAO) and Mr. Gagik Manuchrayn (Ministry of Agriculture)
Rapporteur: Dr. Alvina Avagyan

15:00-15:30  Capacity Building for an Integrated System of Use and Management of PGR in Armenia (Project proposal)  
Dr. David Bedoshvili (PFU/ICARDA/CIMMYT-Caucasus)

15:30-15:40  Ministry of Agriculture  
Dr. Levon Minasyan

15:40-15:50  Ministry of Nature Protection  
Dr. Artashes Ziroyan, Head, Bioresources Management Agency

15:50-16:00  Ministry of Education and Science  
Dr. Gayane Poghosyan, Department of Science & Post-Graduate Education

16:00-16:10  National Academy of Sciences  
Acad. Karen Poghosyan

16:10 - 16:30  Tea/Coffee Break

16:30-16:50  FAO  
Mr. Juan Fajardo, Agricultural Officer, Seed and Plant Genetic Resources Service, Plant Production

16:50-17:00  General discussion and recommendations

17:00-17:30  Closing remarks: Mr. Juan Fajardo (FAO); Dr. Patrick McGuire (UC Davis, USA)  
Dr. David Bedoshvili (PFU-ICARDA-CIMMYT-Caucasus).
## Annex 2: List of participants

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<tr>
<th>N</th>
<th>Name, Surname</th>
<th>Organization, Position</th>
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<tbody>
<tr>
<td>1</td>
<td>Juan Fajardo</td>
<td>Agricultural Officer, Seed and Plant Genetic Resources Service, Plant Production and Protection Division, FAO</td>
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<td>2</td>
<td>Patrick McGuire</td>
<td>Director, Genetic Resources Conservation Programme, Univ. of California, USA</td>
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<td>3</td>
<td>David Bedoshvili</td>
<td>PFU/ICARDA/CIMMYT, Caucasus Sub-Office</td>
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<td>4</td>
<td>Gagik Sardaryan</td>
<td>Director, Center for Agribusiness &amp; Rural Development (CARD)</td>
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<td>5</td>
<td>Alvina Avagyan</td>
<td>Plant protection expert, EC Food Security Programmeme in Armenia</td>
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<td>6</td>
<td>Ruzanna Sadoyan</td>
<td>World Bank project “Development of rural enterprise and small-scale trading agriculture”</td>
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<td>7</td>
<td>Daniel Petrosyan</td>
<td>Pro-Rector for Scientific Affairs, State Agrarian University of Armenia</td>
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<td>8</td>
<td>Levon Minasyan</td>
<td>Head, Department of Science, Education &amp; Consultancy, Ministry of Agriculture</td>
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<td>9</td>
<td>Gagik Manucharyan</td>
<td>Head, Crop Production Development Division, Ministry of Agriculture</td>
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<td>10</td>
<td>Ashot Voskanyan</td>
<td>Director, Agriculture Support Republican Center, Ministry of Agriculture</td>
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<td>11</td>
<td>Artashes Ziroyan</td>
<td>Director, Bioresources Management Agency, Ministry of Nature Protection</td>
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<td>12</td>
<td>Hasmik Ghalachyan</td>
<td>Head, Plant Resources Management Division, Bioresources Management Agency, Ministry of Nature Protection</td>
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<td>13</td>
<td>Gayane Poghosyan</td>
<td>Department of Science &amp; Post-Graduate Education, Ministry of Science and Education</td>
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<td>14</td>
<td>Karen Poghosyan</td>
<td>National Academy of Sciences</td>
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<td>15</td>
<td>Hunan Ghazaryan</td>
<td>Research Center of Soil Science, Land Improvement and Agrochemistry, Director</td>
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<td>16</td>
<td>Gayane Sargsyan</td>
<td>Research Center of Vegetable-Melons and Industrial Crops, Director</td>
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<td>17</td>
<td>Aghvan Sahakyan</td>
<td>Director, Research Center of Agrobiotechnology, Ministry of Agriculture</td>
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<td>18</td>
<td>Firdous Harutyunyan</td>
<td>Director, Research Center of Viticulture, Fruit-Growing &amp; Wine-Making, Ministry of Agriculture</td>
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<td>19</td>
<td>Hamlet Khachatryan</td>
<td>Deputy Director, “Seed Agency” SNCO, Ministry of Agriculture</td>
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<td>20</td>
<td>Zirair Vardanyan</td>
<td>Director, Institute of Botany of the National Academy of Sciences</td>
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<td>21</td>
<td>Souren Semerjyan</td>
<td>Deputy Director, Research Center of Land Management and Plant Protection, Ministry of Agriculture</td>
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<td>22</td>
<td>Rafael Sarukhanyan</td>
<td>“Green Lane” NGO</td>
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</tbody>
</table>
Preamble
Various international and national studies and documents have already done a good job of identifying and assessing the different components that would be expected in a national strategy. What is necessary is to determine if every component is needed in Armenia, which of the needed components are in place in Armenia, and which are missing or not working. The next task is to determine the status of the existing components and the reason for the missing or not working components. At this point, recommendations can be made for enhancing and strengthening the existing components and establishing the missing ones. The scope of this study is at a broad level, but there will be a need for more detailed assessments, at the level of individual crops, at the level of individual institutions, and by working groups from among different institutions and organizations. The broad recommendations of this study will point to these areas that need more detailed assessments.

Findings
Importance of plant genetic resources for Armenia and for the world
The great diversity in agro-ecosystems in Armenia means that successful crops need to be adapted to several different environments and their biotic and abiotic stresses. The impacts of global climate change will require continued monitoring and adapting of crops to new environments and stresses. The resources for managing crop adaptation are breeding, testing, and selection from available, adequate sources of crop genetic resources. Because of the diversity of environments and the diversity of crops and crop wild relatives that are found in Armenia, there is a reservoir of useful crop genetic diversity that can be found in populations of crop wild relatives, landraces, and in collections. Because so many of the crops for which Armenia is a steward of genetic diversity are also globally important crops, the status of Armenia’s plant genetic resources for food and agriculture (PGRFA) is also globally important. This has been recognized by the many international and regional efforts to date at ensuring that these Armenian resources are identified, managed, and conserved to be available for use.

International agreements in force for Armenia and resulting obligations relevant to plant genetic resources
The Convention on Biological Diversity (CBD), accepted by Armenia on 14 May 1993, has obligations for both ex situ and in situ PGR conservation, for inventorying and reporting, and for legislating regulations for doing these things and harmonizing existing relevant legislation to be in line with the CBD requirements. The contact organization in Armenia for interaction with the CBD is the Ministry of Environmental Protection. Armenia has implemented reforms in line with the CBD. Many of the necessary legal bases are in place and are adequate. Many necessary actions have been adopted as national targets. There has been good progress at several levels in evaluating wild areas and creating new reserves. Seed genebanks have been initiated and rudimentary linkages are in place. Required reports under the CBD have been produced in a national collaborative process.

The International Treaty for Plant Genetic Resources for Food and Agriculture (IT-PGRFA) was acceded to by Armenia just this year (20 March 2007). The focus of the treaty is on a subset of plant genetic resources: those PGR important for food and agriculture. Having acceded to the Treaty, Armenia, like all others joining it, are obligated to promote the Global Plan’s (see below) effective implementation. The emergence of the Global Crop Diversity Trust provides even more reinforcement for a nation’s adherence to the terms of the Treaty. The Trust offers the possibility of securing funding to assist with a nation’s Treaty obligations. However, the requirements to be eligible include ensuring that the PGR covered under the Treaty will be accessible under the terms of the Treaty and that the nation demonstrates a long-term commitment to conservation of the relevant PGR. Three specific requirements are very relevant to this study: the national programme must have clear
The recipient national programme must have the human resources and management systems needed to maintain the PGR and must demonstrate conformity with agreed scientific and technical standards of management; and the facilities in which the PGR are maintained must be adequate to ensure long-term conservation.

**The Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture**, 17-23 June 1996. This is an evolving plan, but by virtue of acceding to the IT-PGRFA, it is Armenia’s responsibility to promote the Global Plan’s effective implementation, including through national actions. The priority action areas of the Global Plan include *in situ* and *ex situ* conservation as expected, but it also has a strong focus on utilization of PGR and building the institutions and capacity necessary to conserve and use PGR.

**Regional collaborations for Armenia which involve plant genetic resources**

International Center for Agricultural Research in the Dry Areas (ICARDA) Central Asia and Caucasus (ICARDA CAC), with support from the Australian Centre for International Agricultural Research (ACIAR) and Bioversity International, has organized a regional approach to PGR conservation and use offering training, database support, genebank support, and support for collection missions. Armenia has already benefited from activities under these auspices, but it remains a resource and facilitator.

**National efforts and activities relevant to PGRFA**

**Examples of legislation**
- Law on Protected Areas (1991)
- Law on Seeds (2005)

**Examples of national projects, reports, and documents**
- National Report on Sustainable Development
- National Scope of the Biosafety of the Republic of Armenia
- Report on Needs Assessment of the Capacities of UN Global Conventions – on Biodiversity; on Change of Climate; and for Combating Desertification
- The State of Environment in Armenia, 2002 national report
- Sustainable agricultural development strategy (2004)
- *In situ* Conservation of Crop Wild Relatives Through Enhanced Information Manage and Field Application, 2005-2009 (a five-country Bioversity/UNDP/GEF project performed in Armenia by the MEP)
- Establishment of the Inter-Ministerial Commission on PGRFA of Armenia (by the order of the Minister of Agriculture, 2005)
- Project for Wheat and Barley Seed Production Development in the RA during 2007-2011
<table>
<thead>
<tr>
<th>Component</th>
<th>Status or comment</th>
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<tbody>
<tr>
<td><strong>Ex situ genebanks</strong></td>
<td>Two have been initiated, one in the Research Center for Agrobiotechnology, MA and one in the Institute of Botany, NAS. Physical conditions are being improved, they have slightly overlapping missions, but coordination between them needs improvement</td>
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<tr>
<td><strong>Seed gene banks</strong></td>
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<tr>
<td><strong>In vitro gene banks</strong></td>
<td>Under auspices of the Research Center for Agrobiotechnology, MA, in vitro storage and propagation takes place, but without systematic attention to monitoring and maintaining genetic diversity throughout the culturing and regeneration process</td>
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<tr>
<td><strong>Field gene banks</strong></td>
<td>Field plantings exist in several research institutes for crops not typically propagated as seed, but no systematic attempt has been made to establish these as ‘genebanks’ for conservation Research Center for Viticulture, Fruit-Growing and Wine-Making, MA and Botanic Garden, IoB, NAS</td>
</tr>
<tr>
<td><strong>In situ reserves</strong></td>
<td>Some specially protected natural areas have high concentrations of CWR but there is no clear management strategy to maintain the genetic integrity of the CWR populations</td>
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<tr>
<td><strong>Arboreta/botanic gardens</strong></td>
<td>These exist, but they are not seen as having a PGR role</td>
</tr>
<tr>
<td><strong>Agro-ecosystems</strong></td>
<td>No systematic collection of landraces and CWR and no effort to involve farmers to serve as ‘curators’ of in-situ repositories</td>
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<tr>
<td><strong>Natural ecosystems</strong></td>
<td>Significant threats to biotic components exist whether protected or not; protected areas number national parks (2), state reserves (3), and state reservations (23); inventories are good</td>
</tr>
<tr>
<td>(both protected and not-protected)</td>
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<tr>
<td><strong>Working collections</strong></td>
<td>These exist, but are not seen as components of a national PGR system, connections between these and the genebanks are not well established Botanic Garden, IoB, NAS, Research Center for Land Management and Plant Protection, MA, Research Center for Vegetables-Melons and Industrial Crops, MA, Research Center for Viticulture, Fruit-Growing and Wine-Making, MA, Gyumri Breeding Station, MA, ASAU Laboratory of Crops and Wild Relatives Gene Pool</td>
</tr>
<tr>
<td>(research/breeding/teaching)</td>
<td></td>
</tr>
<tr>
<td><strong>Information system/ documentation (dynamic)</strong></td>
<td>Good for biodiversity inventories in reserves and protected areas, not well established for genebanks, no apparent attention is being paid to inter-communication among the various databases</td>
</tr>
<tr>
<td><strong>Long-term backup repositories</strong></td>
<td>Not part of the current scenario for a national strategy</td>
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</table>

**Causes of critical findings and deficiencies**
There are many causes, primary of which is inadequate funding.

Current staff are qualified, dedicated, and capable of improving the system as funding becomes available. All have availed themselves of training and resources made available by international and regional PGR organizations.

Source of new staff for the national PGR system: Additional staff will be needed to serve under the current managers for many tasks, for example, to develop and maintain the information systems.
linking the components, for handling accessioning, viability testing, regenerations, evaluations, and distribution in the *ex situ* genebanks, and for carrying out additional inventorying and collections and for monitoring population status in *in situ* reserves. Further study is needed to determine the level of training in these areas found in the curriculum of graduates of the universities, the likely candidates for such positions.

Institutional boundaries and practices have led to some of the deficiencies. While very different entities (such as Ministries, the Institute of Botany, universities (primarily the Armenian State Agrarian University, but also Yerevan State University and American University of Armenia), growers, and NGOs are and should be involved, a well-functioning national PGR system must have efficient communication and germplasm channels that *cut across* the institutional boundaries. While an “Inter-Ministerial Commission on PGRFA of Armenia” exists in principle, in practice it has not served the purpose of linking the various components and bringing them together toward a national system. It has played no role in planning and strategizing how to improve the system as a whole.

Genetic erosion and contamination and reduction in population adaptation will take place in reserves and agro-ecosystems from anthropomorphic impacts and by introduction of invasives and non-adapted genotypes of crops and native species. While some laws to both prevent and ameliorate the negative results are in place, enforcement is not consistent and can be absent in the face of overriding financial concerns.

Up-to-date databases linked with inventory and monitoring systems are not in place. No intranet structure to accommodate such linkages is available, nor are any being used if they are available.

**Opportunities**

“Global Stategy for the *Ex Situ* Conservation with Enhanced Access to Wheat, Rye, and Triticale Genetic Resources”, a 20 September 2007 report organized by CIMMYT, calls for funding to be made available for regeneration of wheat gene pool accessions in Armenia, among other countries, motivated by concern for the wheat genetic resources known from here. This is part of a capacity building strategy recommended in the report. A functioning national PGR strategy and coordination would enhance the opportunity to solicit such funds and deploy them strategically.

The Global Crop Diversity Trust will increasingly have funds available for facilities, equipment, and training and a functioning national PGR strategy and coordination unit will be a requirement for getting this funding.

European Commission funding may be available to improve harmonization of Armenia’s practices in many areas, as a candidate for EU membership, with EU standards. Curriculum standards in the area of genetics for crop improvement, conservation genetics, genetic resources conservation, and conservation biology may be relevant targets for upgrading with EC funding.

Research collaborations are always potential opportunities for reciprocal training arrangements of graduate students and postdoctoral researchers, especially in the fields of molecular genetics related to utilization of PGR.

**Recommendations**

A summary of recommendations is provided here. Several, more detailed recommendations are part of the Project Proposal produced by the Stakeholders Workshop (2-5 October 2007) and which will be presented and reviewed as part of this Policy Dialogue Meeting. In general, recommendations range from areas where more specific assessments are needed before a detailed recommendation for action can be made to areas where specific recommendations can be suggested without further study.

*Re-invigorated national PGR Council.* The development of the Third Armenian National Report to the CBD, April 2006, is an example of a process that worked across ministry boundaries and across ministry and academic institution boundaries. It involved participation of representatives of the Institutes of Zoology, Botany, and Hydroecology and Ichthyology in the National Academy of Sciences (NAS), the Armenian State Agrarian University, Yerevan State University, Hrachya Acharyan University, the Yerevan State Institute of Economy, the Ministry of Agriculture, the Ministry of Environmental Protection, and Armenian NGOs. This is a model that needs to be
enhanced and used for a cross-cutting Commission/Council on PGRFA for Armenia. Members should be PGR professionals from the component units. Rather than a head from one unit, the head should be a two-year position selected on a rotating basis from among the members. The Commission needs a budget independent from any one unit for carrying out its coordination activities. Contributions to that budget could come from the component units.

**Activities of the Commission/Council.** The Council should meet at least quarterly, undertake assessments and planning, and produce a comprehensive plan for the interaction of all units in Armenia involved with PGR. This plan should be presented to the administrations of the involved organizations.

- Topics for this plan should include the overall information and germplasm flow within the system; periodic assessment of protocols for all the activities of conservation: accessioning, evaluation, characterization, storage, monitoring, regeneration, distribution, and documentation; periodic assessment of personnel needs (training, recruitment); and periodic assessment of facilities and equipment. An area of special attention is the full incorporation of crops not typically reproduced by seed into the PGR discussion. This means an enhanced network of field gene banks and protocols for monitoring genetic diversity as collections are advanced with tissue culture.

- The Commission should establish a PGR website, serving the plan, the assessments, connections to component PGR units and their administrative home units,

- As the central voice for PGR in Armenia, the Commission will be in a stronger position, than any one unit is currently, to make proposals to foreign, regional, and international funding opportunities, to establish data and germplasm exchange networks with genebanks outside of Armenia, and to interact with users of PGR.

**Long-term backup repository.** Rather than needing to provide this level of storage and security within Armenia, it would be most efficient to have a regional solution, perhaps facilitated by ICARDA-PGU, that establishes a single, long-term storage facility in the region that does not distribute unless in the case of a loss of national genebank collections, and does not regenerate accessions. When monitoring identifies an accession that needs regeneration, it would be the responsibility of the unit that contributed that accession to do that and deposit a new sample in the backup repository.

**Registry of MTAs.** If the practices for transfer of germplasm set out by FAO Commission on Genetic Resources for Food and Agriculture are followed then for each distribution of a PGR accession, a material transfer agreement (MTA) should be produced and recorded. It is not clear if this is done in all transfers. This should be standard policy and there should be a registry of MTAs accessible and searchable by any unit involved in PGR activity.

**National strategy for crop breeding.** This would best be developed within the Ministry of Agriculture on a crop-by-crop basis. For some crops, one could expect that a full-scale breeding programme should be sustained in Armenia, for others, perhaps all that is needed is adaptive breeding. This assessment would guide the incorporation of modern, molecular techniques in breeding and evaluation, for some crops the tools have advanced to such a stage that higher throughput and handling of larger segregating populations is useful and achievable.

- Along with this effort should come greater enforcement of regulations limiting the importation and growing of seed without adequate field testing in a range of appropriate environments. In addition, since there will be crops for which a full-scale breeding programme is recommended, there should be adequate recognition and incentives for breeders, including breeders rights recognition. To ensure that full-scale breeding is feasible, an assessment of facilities, technical capacity, and tools should be undertaken and a plan for addressing deficiencies should be made.

**Enhancement and facilitation of usage of PGR in Armenia.** There are several steps that could improve the current situation. Users of PGR such as the crop research centers should be involved as partners in evaluation and characterization of accessions. A certain level of prebreeding should be carried out jointly by the PGR curators and staff of the research centers for the crops for which full-scale breeding will be undertaken. With an understanding of the specific crop traits that need improvement, better strategies for collection missions to CWR populations can be planned.
Training issues. Where new methodologies and technologies are to be introduced, there will be a need for training of current staff. Many avenues exist for training and all should be explored: collaborations with institutions where the new methodology is in use, specific training opportunities offered by the international centers and universities, and courses from research institutions or commercial organizations. Funding may be possible as part of PGR support from international organizations.

There is fertile ground for collaboration between the PGR managers, research center staff, and the universities. When a fully operational PGR system is underway, agronomy students may have interest in internships with these units. As PGR units upgrade their technology basis for genetic resources work, training curriculum at the universities should keep pace. This is true not only for genetics of crop breeding, but also for the genetics of conservation.

If the technological capabilities of the research centers and genebanks are upgraded, they may be more attractive for recruiting new workers. If the principles of conservation biology and genetic resources conservation are well incorporated into university curriculum, this can lead to better understanding by the public in general for the value and uses of PGR in Armenia. Students with an improved understanding of PGR issues may become conduits for new collections from their home areas, if they come from outside the immediate Yerevan area. There are many social and advocate organizations supporting biodiversity conservation. An active PGR system could engender similar organizations devoted to genetic resources conservation and use for Armenia.

Outreach by units and staff of a national PGR system. Once the national system is more fully functional, the Commission on PGR could organize PGR conservation field days for the public and educational institutions at all ages. Stages when the most diversity is visible, such as regeneration or harvest, have the most impact on understanding the concept and value of diversity. The Agricultural Support Republican Center is a logical partner in such events. The basic genetic principles of conservation should be presented to NGOs involved in conservation, local crop production, organic crop production, etc.; seed trade representatives; the agro-tourism proponents; and marketing organizations at every opportunity.

Involvement of farmers and growers. An understanding by breeders and persons involved in evaluation of genetic resources for the issues of farmers for their crops can lead more efficiently to desirable crop improvements utilizing PGR with specific traits. If farmers benefited from a greater understanding of the role of agro-ecosystems as sites that harbor useful PGR, they could take on a role in on-farm conservation and propagation of PGR.
### Annex 4: Logical Framework on «Capacity Building for an Integrated System of Use and Management of PGR in Armenia»

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<thead>
<tr>
<th>Objectives</th>
<th>Actions</th>
<th>Expected results</th>
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<tr>
<td>Component 1. National policy framework</td>
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<tr>
<td><strong>Objective 1.1</strong> To promote PGRFA related policy awareness at the policy maker level</td>
<td>• raising awareness among policy-makers in the international legal instruments addressing management of plant genetic resources for food and agriculture&lt;br&gt;• identifying means of integrating awareness of the importance of PGRFA into educational and public awareness programmes at national level</td>
<td>• increased funding for PGRFA related research programmes, incorporation of the problem of conservation and sustainable use of PGRFA as a priority area for research&lt;br&gt;• availability of PGR related subjects in the university’s curriculum</td>
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<tr>
<td><strong>Objective 1.2.</strong> To strengthen a coordination of plant genetic resources activities</td>
<td>• strengthening the coordination of plant genetic resources activities to encourage linkages between institutions on national, regional and international level&lt;br&gt;• developing the mechanisms for effective coordination and distribution of mandates on PGRFA activities in Armenia&lt;br&gt;• creating enabling environment for establishment national PVP systems through development of appropriate regulatory framework for joining UPOV</td>
<td>• increased coordination promoting cooperation among stakeholders, efficient communication and germplasm channels that cut across the institutional boundaries&lt;br&gt;• strengthen the functions of the inter-institutional Commission on PGR FA&lt;br&gt;• harmonization of PVP system with international standards</td>
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<td><strong>Objective 1.3.</strong> To improve national policy framework</td>
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<td>Component 2. Information Management</td>
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<td><strong>Objective 2.1</strong> To facilitate access to germplasm and information on PGRFA through exchange and provision of useful information</td>
<td>• establishment of data exchange networks between genebanks and other ex-situ collections holders for plant genetic resources for food and agriculture&lt;br&gt;• design and establishment of an integrated website to support access to the national, regional and international plant genetic resources and information by all stakeholders</td>
<td>• optimized and rationalized ex situ collections of PGRFA, greater access to genetic resources&lt;br&gt;• up-to-date databases linked with inventory and monitoring systems</td>
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<tr>
<td><strong>Objective 2.2</strong> To increase awareness on PGRFA role in crop production, food security and livelihoods</td>
<td>• generation of data, producing and dissemination among breeders, farmers and seed producers of information/learning materials, booklets to answer PGRFA related information gaps (seed sources, genetic material, crop varieties available in local, regional and international PGR collections, technology and related matters)&lt;br&gt;• development and maintenance of training/learning resource facility (e.g. videos, posters, slides, etc.)&lt;br&gt;• undertaking a review of available funding opportunities for PGRFA conservation and use on the appropriate website</td>
<td>• increased awareness in seed sources, crop varieties&lt;br&gt;• published information leaflets, publications, catalogues, books, etc.&lt;br&gt;• produced training/learning materials&lt;br&gt;• a database of funding opportunities for PGRFA conservation and use published on the appropriate website</td>
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<tr>
<td><strong>Objective 2.3</strong> To support to enlargement of activities on PGRFA conservation and use</td>
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<td></td>
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<tr>
<td>Objectives</td>
<td>Actions</td>
<td>Expected results</td>
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<tr>
<td><strong>Component 3. Research and Development</strong></td>
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| **Objective 3.1** To ensure reliable *ex situ* and *in situ* conservation of PGRFA | • training on monitoring implementation and management of crop wild relatives on protected area and out of them  
• training on conservation and management of PGRFA maintained under *ex-situ* conditions  
• enhancing facilities for *in-vitro* conservation for recalcitrant seeds  
• training on database management for *ex-situ* and *in situ* conservation  
• training on use of molecular tools and biotechnology methods in plant genetic resources conservation  
• training on germplasm health assessment  
• involving farmers in conservation and propagation of PGRFA through application of on-farm conservation approaches  
• enhancing facilities for pre-breeding research, including methodologies, technical facilities and tools  
• training on modern approaches and novel techniques in conventional and adaptive breeding and biotechnology tools  
• training on use of molecular tools and biotechnology methods in plant genetic resources evaluation, market assisted selection  
• enhancing facilities including up to date methods, techniques and equipment for genetic material screening for resistance to biotic factors and abiotic stress tolerance  
• training on IPR in plant breeding and PVP systems  
• organization of field days, demonstration fields to introduce advantages of modern breeding varieties  
• establish breeders and seed producers association  
• training for seed producers on economics of seed production  
• training for seed producers on seed quality control and seed health testing  
• training on updated seed standards  
• training on seed production practices and methodologies | • Increased capacity to conserve PGRFA *ex situ* and manage and monitor them under the *in situ* conditions  
• long-term conservation of vegetatively prorogated crops  
• insurance of reliable conservation of perennial crops gene pool  
• improved documentation on PGRFA  
• increased value of seed collections of PGRFA  
• increased quality of seed collections of PGRFA  
• prevention of impoverishment of traditional crop varieties and landraces gene pool in Armenia  
• linking university-level research to applied crop improvement through provision of breeders with characterized initial genetic material adapted to agro-ecological conditions  
• capacity building in crop breeding, encourage involvement of young specialist in breeding activities  
• germplasm characterization and evaluation data entered into appropriate national, regional and international databases  
• provision of users with evaluated germplasm for usage by national breeding programmes and researchers  
• increased awareness and practical understanding of the intellectual property system  
• increased interest of farmers and seed producers to modern varieties and technologies  
• created linkages between breeders and seed producers to lobby for their interests  
• raised awareness of seed producers and farmers of the value of use of quality and appropriate seed, seed practices and farming systems |

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*Elements of a National Strategy for Management and Use of Plant Genetic Resources in Armenia*
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<thead>
<tr>
<th>Objective</th>
<th>Component 4. Socio-Economic and Environmental Impact</th>
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<tr>
<td><strong>Objective 4.1</strong>&lt;br&gt;To improve agricultural productivity and food security through enhanced use and effective management of PGR for food and agriculture</td>
<td><strong>Action</strong>&lt;br&gt;- conduct study to assess present status of PGRFA use and development and its impact on livelihoods&lt;br&gt;- establish a network with different sectors involved in seed matters&lt;br&gt;- market assessment and training in conducting market assessment&lt;br&gt;- promotion and facilitation of agro-tourism&lt;br&gt;- facilitate access of organic growers to organic seeds and planting material</td>
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Sustainable Agriculture in Central Asia and the Caucasus