

Conservation, evaluation and utilisation of plant genetic resources from the Central Asian republics and Caucasus (CIM/2000/078)

Clive Francis

Project number	CIM/2000/078
Project name	Conservation, evaluation and utilisation of plant genetic resources from the Central Asian republics and Caucasus
Collaborating institutions	<ul style="list-style-type: none">■ Syria: Genetic Resources Unit, International Center for Agricultural Research in the Dry Areas (ICARDA)■ Australia: Centre for Legumes in Mediterranean Agriculture (CLIMA), University of Western Australia; Australian Winter Cereals Collection (AWCC), NSW Department of Agriculture; Australian Temperate Field Crops Collection (ATFCC), Department of Natural Resources, Victoria■ Research institutions in Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan
Project leaders	Dr Jan Valkoun (ICARDA), Dr Ken Street (ICARDA) and Professor C.M. Francis (CLIMA)
Duration of project	1 July 2001 – 30 June 2004
Funding:	\$476,100
Countries involved	Armenia, Australia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Russia, Syria, Tajikistan, Turkmenistan, Uzbekistan.

Commodities involved	Grain and pasture legumes; cereals—wheat and barley; wild relatives of wheat, chickpea and lentil
Related projects	CS1/1993/817, CS1/1997/056, AS1/1998/026, GRDC: UWA-308. International linkages for plant genetic resources.

Motivation for the project and what it aimed to achieve

The project aimed to build on the linkage established between ICARDA and Australian Genetic Resource Centres. To this liaison the project would add strong links to the renowned Vavilov Institute in St Petersburg, Russia, home of the father of plant genetic resources Nikolai Vavilov, and countries in the Central Asian and Caucasian network established by ICARDA. The project was considered timely in Central Asia where the native genetic diversity is being eroded. This is due to intensification of agriculture without adequate inputs or crop husbandry, overgrazing of non-cropped land, deforestation, industrialisation and amelioration of the soil. These factors have adversely affected the agroecosystem of the region. A valuable component of the farming system is the prevalence of land races and old native cultivars of cereal and legume crops. This is because in countries such as Armenia, Georgia, Turkmenistan, Uzbekistan, Tajikistan and Kyrgyzstan, many of the numerous subsistence farmers are still using local cultivars, which are gradually being replaced by current commercial cultivars. This process is expected to gather momentum in the coming years as the national programs attempt to meet the demand for food security and insist on the use of high-yielding but less stable varieties.

Germplasm in the region was previously collected by Vavilov Institute scientists when these countries were part of the former Soviet Union. The emphasis was on major field crops and horticultural crops, with little or no coverage of the wild relatives of major crop species. Additionally, there is a major worldwide concern for the security and availability of germplasm in the Vavilov collections. CLIMA and ICARDA have received funding from Australia's Grains Research and Development Corporation (GRDC) for a special project (UWA308) to investigate what can be done to remove this concern. In doing so there are spin-off benefits to this ACIAR-funded Central Asia – Caucasus (CAC) project in that germplasm will again be freely available to the CAC states. In addition, the highly skilled Vavilov Institute staff, who are experienced plant collectors and botanists, are keen to accompany the collection missions. This adds greatly to the missions' capacity and provides a cross link with the GRDC Vavilov project.

What the research project produced

The progress to date has been consistent with the project aims:

1. This major initiative has coupled the ICARDA-network countries with the Vavilov Institute to complete an Australian-linked genetic-resource network unparalleled in the past.
2. Through the network, access has been gained to the regions with the richest sources of crop and forage germplasm and the host countries have been helped to improve their germplasm base.
3. The linkage with ICARDA has facilitated germplasm exchange, strategic collection missions, offshore screening and characterisation of the germplasm prior to importation into Australia.

The partnership between CLIMA, ICARDA and the Vavilov Institute has seen perhaps the greatest-ever single influx of crop-plant germplasm into Australian collections. In 2002 and 2003 alone more than 6,000 accessions were landed in Australia. The Australian Temperate Field Crops collection at Horsham, Victoria, has received over 1,000 lines of chickpeas and relatives as well as almost 1,000 of lentils, peas and faba beans. The Winter Cereals Collection at the Agricultural Research Centre, Tamworth, NSW, will, after quarantine, lodge some 1,300 barley and more than 2,500 wheat and relatives (including 1380 durum wheats) in the national collection. All the lines were characterised and classified at ICARDA with the aid



Dr Tamara Smekalova, botanist and herbarium specialist from the Vavilov Institute (VI), St Petersburg, during a collecting trip for wild crop-plant germplasm at a historical site in Armenia. The link with VI is important for the project's success.

of specialist staff from the Vavilov Institute. This project, together with the GRDC-funded project, adds a new dimension to Australian breeding programs because, in the main, the accessions were land races and sourced from regions of the world such as the Central Asian republics whose genetic base is little represented in Australian cultivars.

Plant collection tours have backed the introduction program. They have in many cases 'followed the footsteps' of Vavilov himself and provide plenty of evidence of the serious genetic erosion taking place in these unique regions of the world. Most recent missions, with the assistance of the concurrent GRDC project, have covered most Central Asian and trans-Caucasian countries—Armenia, Georgia, Azerbaijan, Kazakhstan, Uzbekistan, Tajikistan and Kyrgyzstan. The exception is Afghanistan. These collections, the most extensive ever undertaken with Australian support, were made possible only through the Central Asian and Caucasian genetic resources network developed by ICARDA. This network was established largely through the outstanding efforts of Dr Ken Street, an Australian scientist who is now curator of grain legumes at ICARDA. He provides a most important link for Australia and one established with ACIAR support.

The collections themselves were greatly aided by the skills and experience in the regions of the accompanying Vavilov Institute scientists. Pasture specialist on many of the tours was Dr Nikolai Dzybenko, now Director of the Vavilov Institute—a wonderful linkage indeed.



The seed stores of village women are an important source of land-race varieties. Ms Natalya Rukhkyan collecting samples at a village in Armenia.

Adoption—how the project outputs are being used

The imports into Australia have largely been in the form of germplasm for use by the plant breeders rather than for direct use by farmers. It is thus a project largely with longer-term benefits to Australian agriculture. Benefits to Australia from the close liaison with ICARDA are many. ICARDA has a world mandate for research on barley, lentil, faba bean and their wild relatives and progenitors, and shared mandates with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) for Kabuli chickpea and the International Centre for Maize and Wheat Improvement (CIMMYT) for bread and durum wheat and wheat wild relatives and progenitors. ICARDA also cooperates closely with the International Plant Genetic Resources Institute (IPGRI) in the conservation of the plant genetic resources of Central and West Asia and North Africa (CWANA) and hosts IPGRI's Regional Program for CWANA.

Although essentially a long-term project some shorter-term benefits have accrued. In most recent times, ICARDA has made available over 500 lines of faba beans resistant to chocolate spot and *Ascochyta*, more than 200 ICARDA lines of chickpea tested for resistance to *Ascochyta*, breeding lines of lentil (released as Cassab and Cumra) and *Lathyrus cicera* (released as Chalus), and has assisted in offshore screening of peas and lupins. Additional benefits will accrue from wider access to the barley and wheat collections and those of the wild relatives of legumes and cereals. Both ICARDA and Australia have well-developed breeding programs that can readily utilise introduced germplasm and transfer partly selected forms to the host countries.



Dr Colin Piggitt of ACIAR, Dr Ken Street of ICARDA and Professor Clive Francis discuss project details in Uzbekistan at the start of the plant genetic resources project.

Impact—the difference the project has made or is expected to make



The major immediate impacts are the strong linkages developed with ICARDA and the Vavilov Institute. It was essentially through these links, and a strong genetic resource program generally, that Australia has become a major partner in the world Global Genetic Resources Trust. Australia has been the major donor to the Trust and Dr Street is a consultant to it.

The project and the initiatives of ICARDA and CLIMA with ACIAR have greatly strengthened linkages with CAC countries and have been instrumental in the creation of a very professional web page created by Ms Natalia Rukhkyan of Armenia. This details personnel and facilities linked to plant genetic resources in all the countries receiving ACIAR project support.

Many developing countries possess a significant amount of genetic resources, but are concerned that they receive little or no return on the technologies or products that may be developed from these resources. Consequently, developing countries are becoming increasingly sensitive about the removal of their plant genetic resources. ICARDA has established long-standing relationships with national programs, which have been instrumental in allowing collections in Ethiopia, India, Turkey, Ecuador, Russia and the Central Asian republics and Caucasus. ICARDA has ensured that the countries concerned benefit from the results of these collections. This is most readily done through the ICARDA gene bank, which now houses one of the world's leading germplasm collections. The germplasm collected is kept both by the host country and stored 'in-trust' in ICARDA's gene bank, providing 'safety net' duplication. Aided by external projects, such as that from ACIAR, ICARDA provides to the participating countries all information and analysis pertaining to the germplasm collected, and supplies related, potentially useful germplasm from its gene bank. This includes improved material that may be developed from the material collected from those countries.