that tailed off in the 1980s because the importance of conserving the genetic resources began when early explorers sent materials in a viable state for long-term storage. It is the largest collection in a network of 11 international genebanks around the world that, in total, hold 600,000 materials in a viable state for long-term storage. CIMMYT wheat germplasm collection head Thomas Payne said the material in the collection in Mexico was an important resource for plant breeders around the world. Interest in the world’s botanical resources began when early explorers sent materials back to their ‘home countries’, but it was only in the past century that the importance of conserving the materials in a viable state for long-term storage was recognised.

“People started to recognise the fragility of genetic resources and the fact that varieties could, and were, becoming extinct.”

Mr Payne said that prompted a flurry of plant exploration and germplasm collection around the world for much of the 1900s. But it was only in the past century that the genetic resources within the boundaries of a country belonged to that country.”

The resulting Convention on Biological Diversity recognised that the genetic resources within the territory of a sovereign nation were the property of that nation. It was enacted because countries were concerned, for instance, that the genetic material represented millions of dollars out of acquiring a medicinal plant.

But Mr Payne said an inadvertent consequence of the convention was it stopped germplasm sharing – in particular, sharing of agricultural crops. “So it was recognised there needed to be another legal instrument to facilitate the exchange of germplasm and the sharing of agricultural crops. A wheat variety that has been developed over the past 10,000 years and bred over the past 50 or 100 years has parentage representing many different countries. So how can you say who is the legal owner of, say, triticum aestivum – bread wheat – which originally evolved 10,000 years ago in what is now the Caucasion Sea area of Iran.

“Is Iran the owner of all bread wheat in the world? We know many important varieties have come from Australia. Would you say Australia is the owner? So it was recognised that for crops humanity depends on, we can’t assign a single owner.”

Mr Payne said under the International Treaty on Plant Genetic Resources for Food and Agriculture, which was ratified in 2004 and came into action in 2007, agricultural germplasms are elevated to a special status that recognised their global significance.

“The intent of the treaty is to open up the sharing of agricultural genetic material. ‘It says the recipient of materials from CIMMYT or any of the genebanks under the treaty are free to do anything they want to with the material. They are encouraged to share the materials they develop from the materials they receive from CIMMYT.

“They are also free to patent or restrict access to the material, but if they choose to restrict access to the materials, they have to pay a percentage of the income they receive into an international benefit-sharing fund.”

Australian scientist and CIMMYT’s Generation Challenge Program transition manager Peter Ninnes said Australia was one of the first countries to sign up to the international treaty to share genetic resources.

Mr Ninnes has been instrumental in putting in place a structure from which Australia benefits from the genetic diversity of the wheat at CIMMYT.

“Australian breeders make their selections in the field in Mexico, the seed goes into quarantine in Australia, their selections in the field in Mexico are then made available to the Australian breeding teams. That is how Australia gets access to the genetic diversity. The intention is that the information that comes out of the assessments in Australia feeds back into the program at CIMMYT.”

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THE Yaqui Valley in north-west Mexico is an oasis of irrigated agriculture surrounded by a vast desert—an environment which is surprisingly ideal for breeding and developing wheat varieties suited to Australian conditions.

Many of Australia’s wheat varieties have been developed by the Mexico-based international research organisation CIMMYT, in the Yaqui Valley. Key to the research is one of CIMMYT’s largest research stations, the Norman E. Borlaug Experimental Station (CENEB), which sits in the middle of the valley’s 220,000-hectare irrigation scheme, where the average annual rainfall is only 250–300 millimetres.

CIMMYT Board of Trustees chairman and South Australian farmer Andrew Barr said the advantage of the station for developing Australian-suitable varieties was it was in an irrigated desert where researchers could tightly control water and growing conditions. Mr Barr said in earlier years, researchers used to fully irrigate the trial conditions. Mr Barr said in earlier years, researchers used to fully irrigate the trial conditions, which masked genetic variation for some of the stresses that were important in different parts of the world, particularly Australia, “where we know way too much about drought and heat stress.”

But in the past 10 years, CIMMYT has purposely refocused its trials to target a range of different sowing times and moisture regimes.

“They still have early sown, full irrigation with 8 t/ha, late sown, 4 t/ha and 2 t/ha, have drought and heat; heat alone; or full potential crops.”

Mr Barr said it was more difficult to run such a range of different climatic scenarios, including testing for drought, under Australian conditions.

“In Australia the irony is that rain always gets in the way of a good drought from a breeder’s perspective.”

You have a drought every four or five years, but in the Australian environment it becomes difficult for a breeder because you make progress in a drought year but the next one is a bumper crop, whereas in Mexico there is no rain to get in the way.

“CIMMYT can generate the different conditions year-in, year-out.”

The dry climate and capacity to control crop development through irrigation have also seen farmers in the Yaqui Valley modify the type of crops they produce. Mexican wheat specialist and CIMMYT Conservation Agriculture Program principal scientist Ivan Ortiz-Monasterio said where the valley was once a major bread wheat-producing area, today the emphasis is on durum wheat supplying both the domestic market and lucrative niche markets around the world.

“Where we have a comparative advantage in terms of producing very high-quality durum is because we have a very dry climate and irrigation. The type of durum people have access to in Europe, for instance, varies a lot from year to year because it’s rainfed. The variation in quality is a hassle for the industry. But here we can produce very consistent quality year after year. With good fertiliser management we can produce the same quality year after year and the industry loves that.”

Unusually, durum yields in the Yaqui Valley are higher than bread wheat yields—sometimes 0.5 t/ha more. And over the past two years, thanks to the introduction of a new variety, Cirnio, irrigated durum yields have risen from an average of 5.6–6.0 t/ha to 7–7.5 t/ha. “That is something that hasn’t happened over the past 35 years,” Mr Ortiz-Monasterio said.

He said with such a focus on wheat production in the valley, the World Bank and Mexican government had been trying to diversify production.

“They ask why the farmers are using so much water to grow wheat and not higher value crops. It is a good question, but if you start to grow vegetable crops, you start to saturate markets we have access to very quickly. Wheat is a very easy crop to manage. And farmers have been making very good money.”

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**Wheat thrives in Mexico**

**ABOVE AND RIGHT:** The Alvaro Obregon Dam supplies water to the 220,000 hectares of irrigation farming in Mexico’s Yaqui Valley.

**LEFT:** Australian wheat scientist and former CIMMYT director of wheat research Tony Fischer in a wheat trial at Obregon, Mexico, with CIMMYT scientist Ivan Ortiz-Monasterio.

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**Farmers strike issues**

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