



ICARDA, Near Aleppo, Syria in 2008. 'Terra Rossa' red Mediterranean soil.

Staff Stories

Ardeshir Damania

When I was young, my father asked me, as all parents do, “What would you like to be when you grow up?” I replied that I wanted to be an engine driver on the railways. Dad was a powerful and self-made man and he had much bigger ambitions for his youngest son. After my mother passed away in 1961, I changed my reply to, “I want to be a doctor.” Everyone was pleased since my mother was a doctor and I would carry on her work. But it was not meant to be. My grades were not high enough to make it to medical school, and so I was in a great dilemma as to what subjects I should take for my graduation. While walking in deep thought, a friend happened to come from the opposite side and inquired about my serious and worried look. I told him. He said, “Adi, take botany as your main subject. Plants are easy to understand and they don’t change like animals.” So my mind was made up. I will become a botanist!

With that I graduated from the Bombay University in Botany, and liked the subject so much that I went on to do a Master’s degree in plant ecology and geography. A chance visit to my department by a professor from the University of Birmingham, UK in 1973 prompted me to take up the study of conservation and utilization of plant genetic resources, and in one year I had a second Master’s degree. In the meantime, my course tutor at Birmingham was enticed away to work at the Food and Agriculture Organization of the U.N. in Rome, Italy and he hired me as a plant collector for the FAO. Under this designation, my first trip was to Nigeria in 1975 to collect germplasm of early millets (*Pennisetum glaucum*). I arrived at the northern Nigerian city of Kaduna without a clue of what to do, so I reported to the agricultural station there. I requested a vehicle from them, but no reliable one was available. Dejected, I ran into a tall Texan with a hat who was there on an USAID project, and after hearing my story, he gave me his own personal vehicle – an air-conditioned Chevy Suburban.

My first day out on the road should have been my last, as I was

used to driving on the left side of the road in India and UK; but I survived against all odds, even escaping sword-wielding Nigerian farmers who mistook me and my Nigerian counterpart for poachers.

From the northeastern Nigerian city of Maidugri, my team drove towards Lake Chad. The heads of millets became smaller and smaller as the lake got nearer, until there was no agriculture possible. The last couple of miles to the lake could only be traversed by sitting on top of a trailer pulled by a tractor through the sandy terrain. The area was known for considerable fishing activity, and dried fish were stored safely in giant hollowed-out calabashes the size of oil drums.

My successful collection trip to Nigeria led to another collection trip to the Sudan for sorghum landraces. This included exploring the Nuba Mountains with the Nubian tribespeople, who had skin that appeared almost dark blue. The sorghum (*Sorghum bicolor*) they had been growing for centuries was small-headed, round, and flame-red in color. The University of Sudan provided my team with a Land Rover, but the tires and tubes of the vehicle were not meant for off-road use in the desert sand. As soon as the tires would come across soft sand, the valve stem would break off. We got very tired and wasted a lot of time changing tires and mending tubes. At one point the car just rolled sideways and the windscreen popped out.



Sampling wheat & barley landrace germplasm. With altimeter. Tibet (China), 1991.

My next collection trip was in Somalia in 1979, when it was a relatively peaceful place ruled over by a dictator. I had to drive an FAO vehicle from Nairobi to Mogadishu - a journey of two full days with an overnight stay at the border. The roads in Somalia were terrible. They were not really roads at all - just mud tracks. We had to fill our gas tanks by the roadside from a barrel with a hand crank pump. As we traveled on the narrow unpaved roads, we came across elephants, giraffes, wild partridges, and baboons near the coastline. The Somali farmers were very hospitable and provided me with their seed samples readily.

I had to make do with the most basic amenities while staying overnight in the bush. The most primitive hotels rented beds by the night, so if I wanted the room to myself I had to book all 6 beds in the room. The water was undrinkable and would not be suitable even for washing. Having finished all my drinking water, I took to purchasing mango juice which was kept cool in refrigerators running on kerosene. There was no electricity. The harsh conditions and cultural references of Somalia meant that introduced cattle and poultry did not fare well and soon died. White, branching heads of sorghum introduced from Georgia, USA were rejected by the Somalis as they preferred only compact and round dark brown/reddish heads.

The Somalis, like the Yemenis, are prone to chewing the twigs of narcotic “khat” (*Catha edulis*) after lunch, and so many times they were reluctant to do any work after 2 PM. We had to call it a day.

With funding provided by the FAO, I was given an opportunity to do research in Bari, Italy on genetics of wheat and barley from Nepal and the Yemen, which I later presented, as an external student, to the University of Birmingham as a PhD thesis and was accepted. After that I was once again employed by FAO. By this time, I was living permanently in Rome. It was very easy to pick up Italian by watching cartoons on TV. In addition, many Italian words are similar to the language in the western part of India, the result of trade connections from a branch of the Silk Road.

I began collecting germplasm in South Asia in such exotic places as the Seychelle Islands, Mauritius and Rodrigues, and the Reunion Islands. The Seychelles are a group of islands with several endemic species of plant (e.g., the double coconut *Lodoicea maldivica*) and bird life (e.g., the black parrot *Coracopsis barklyi*). There are plenty of local fruits and vegetables that were brought in by the Chinese, African, French and Indian settlers during the 1800s. The mixtures of these races gave the population of Seychelles distinctive features and the language of Creole, which is a sing-song sounding tongue mixture of French, Indian and Swahili.

My travel to the islands ended when I took up a post at the International Center for Agricultural Research in the Dry Areas (ICARDA) in Aleppo, Syria. ICARDA was granted 1000 acres of prime soil farmland by the Syrian Government at a nominal rent of \$1/year. Different environments and soils within a two-hour drive from the research station meant I could evaluate the world wheat collection under different biotic and abiotic stresses. I was able to do some interesting scientific research and published over 50 papers in refereed journals. I was also able to organize three international symposia on wheat and another on the origins of agriculture and crop domestication, since the area formed part of the Fertile Crescent where farming first began about 10,000 years ago.

During my stay in Syria from 1986 to 1998 it was a very peaceful place devoid of crime or any kind of hostilities. I did not see a single fist fight. Even if you dropped your wallet with money and credit cards in the middle of the busiest street you would always get it back intact. It was safe for women to walk alone even at 2AM on the streets. The historical places in Syria at that time were un-spoilt and often totally unguarded. The great castles of the Crusaders and Saladin, their nemesis, were largely intact.

While I was in service for ICARDA I travelled to countries in West Asia and North Africa, but the most memorable trips were to Morocco, Iran and Tibet. In 1986 I led a team of Moroccan and Japanese scientists in search of original landraces of durum wheat and wild barley in Morocco. The Japanese scientists were ecstatic whenever they came across a wild barley or wheat since their only knowledge of these came from books. In 1991 I participated in an international team with scientists from China, Canada, CIMMYT, Mexico, and ICARDA on a most interesting expedition in to the interiors of Tibet. We flew into Beijing from all different directions and airlines, but somehow managed to arrive around the same time.

A brief visit to the Chinese national gene bank, the long-term conservation center for all crop genetic resources in China, was in order. Next, we flew to Lhasa in one of the very first Boeing 707 aircraft of China Airlines. Upon landing, one of the Canadian scientists felt unwell and his face turned blue – it was altitude sickness (Lhasa is at just under 12,000 feet altitude) and after a couple of days in the hospital, he was evacuated back to Chengdu. We travelled to many towns in the interior of Tibet where we saw farmers growing barley, wheat, and other minor crops. We also came across the so-called “wild” 6-row barley *Hordeum agriocithon* first reported by Swedish botanist Aberg. This wild barley always matures 2 weeks ahead of the cultivated 6-row barley and could be made out in the field easily due to its black-purple colored spike, which soon shattered. We had tea with yak milk, and had tender yak steak for dinner. The Tibetan

hosts demonstrated the technique of incubating the “100-year eggs” whereby a raw egg is buried in the ground for many months, if not years, and then dug up and consumed. By that time the egg is black even after the shell is removed.

The diversity of wheat and barley outside of Lhasa was tremendous, so on returning to our hotel back in Beijing we sat and separated them into different morphotypes and gave them unique numbers. The Chinese did not allow us to take the samples with us, but promised to send them on after multiplying them. They never did.

Iran was an altogether different experience. I and three Iranian scientists from the Seed and Plant Improvement Institute (SPII) in Karaj traveled all of the Iranian plateau over the next 15 days in 1993 in search of landraces of wheat. We also came across plenty of sites where we found *Aegilops squarrosa*, a wild progenitor of wheat, found growing on the borders of cultivated fields. Some introgression between the wild and cultivated types could also be observed, which we collected; these were sterile. Centuries of use of melted snow water from the mountains, and the underground canal system called qanats, had made the soil slightly saline and we could clearly see white crystals of NaCl on the surface of soils.

In Iran, which falls within the center of diversity for watermelons (*Citrullus lanatus*), I observed three types of commercial watermelons: the first was round and large and basically used for eating when cut into slices; the second was a very dark green smaller variety with deep red flesh also used for eating when cut into cubes; the third was a long, sausage-shaped variety which was used to make watermelon ‘sherbet’, a very cooling drink in the very hot summer months on the plateau. Some Iranians would take the hollowed-out half watermelon and place it on their heads for coolness.

In 1994 I began a one-year terminal sabbatical leave from ICARDA to the Genetic Resources Conservation Program (GRCP) of the DANR at UC Davis. I began to work for Prof. Emeritus Cal Qualset, who put me to work on his



Gene bank at ICRISAT. Hyderabad, India, 2005.

Iranian wheats and their evaluation. During this time I read through hand-written notes left behind by the late Prof. Paulden F. Knowles and his travels in other countries in search of germplasm to improve oil crops in California. I made a draft of what was later to become the report “Safflower in California.” Before Prof. Knowles arrived on the scene, safflower was only an incidental crop and grown very little. By the time of his death in 1990, safflower was a well-established California oil-crop.

In June 2014 I was invited by ICARDA to organize an international workshop. From this workshop we put together a book titled *Applied Mathematics and Omics to Assess Crop Genetic Resources for Climate Change Adaptive Traits* (2016). This book shares the collective knowledge of leading scientists and practitioners, giving readers a broader appreciation and heightened awareness of the stakes involved in improving and sustaining agricultural production systems in the face of climate change. We are in the midst of significant changes in global climates, and its effects are already being felt throughout the world. The increasing frequency of droughts and heat waves has had negative impacts on agricultural production, especially in the drylands of the world.

These are just a few of the highlights of my career in international agricultural research; findings that have been published in over 250 papers.

UC DAVIS NEWS

5TH ANNUAL UC DAVIS PLANT BREEDING SYMPOSIUM “BREEDING FOR STRESS RESILIENCE” APRIL 18TH, 2016 UC DAVIS CONFERENCE CENTER

UC Davis is hosting its 5th Annual Plant Breeding Symposium, a student-organized event that brings together researchers in academia, industry, and the non-profit sector to discuss the latest advances in the field of plant breeding.

This year's theme is “Breeding for Stress Resilience” and the symposium has invited speakers from around the world to present on this crucial issue.

JILL FARRANT

“Resurrection Plants as Models for Production of Extremely Drought-Tolerant Crops”

Jill Farrant is a full professor and serves as a South African Research Chair at University of Cape Town. She researches the use of a systems biology approach to understand the protection mechanisms in orthodox seeds and vegetative tissue of resurrection plants, with the ultimate aim of using key protectants identified to make drought-tolerant crops.

LUIS HERRERA ESTRELLA

“Engineering Plants to Develop Novel Phosphorus Fertilization Systems”

Luis Herrera Estrella is the director of the National Laboratory of Genomics for Biodiversity. His research focuses on the molecular mechanisms that regulate the development of plant roots in response to environmental factors. In addition, Dr. Herrera Estrella studies functional genomics of several endemic species of Mexico.

JEAN-LUC JANNINK

“To Breed for Stress Resilience, Start with a Resilient Crop: Genomic Selection in Cassava”

Jean-Luc Jannink's research focuses on developing statistical methods to use DNA markers in public sector small grains breeding. He studies the application of genomic prediction, which involves training prediction models that can accelerate and improve selection of high-value parents in a breeding program. Dr. Jannink recently started similar research on cassava, which is key to food security in Sub-Saharan Africa.

LUCA COMAI

“Technologies and Prospective for Accelerating Plant Breeding”

Luca Comai's lab studies genome regulation, hybridization, and heterosis responses in chromosome copy number variants and interspecific hybridization. In addition, they develop a genomic tool called TILLING that allows targeted inactivation of genes in crop plants. The research combines plant genetics and genomics with next-generation sequencing and bioinformatics to identify genes responsible for traits of interest as well as to discover natural and induced variation.

JULIA BAILEY-SERRES

“Waterproofing Crops”

Julia Bailey-Serres is a professor and the Director of the Center for Plant Cell Biology at UC Riverside. Dr. Bailey-Serres' group studies plant responses to extremes in water availability, particularly flooding. Her group has dissected the multiple roles of the SUB1A gene in conferring tolerance to temporary submergence in rice and pioneered methods that enable study of gene activity in specific cell types of complex tissues.

RENEE LAFITTE

“From Physiological Traits to Stress-Resilient Maize”

Renee Lafitte works at the interface of crop ecophysiology and crop improvement to improve the resilience of crops and cropping systems to abiotic stress. She previously worked at the International Center for Maize and Wheat Improvement in Mexico as well as IRRI in the Philippines. Dr. Lafitte joined DuPont Pioneer in 2005, where she manages the high-throughput field evaluation of novel transgenic corn lines to develop products with greater yield stability under drought and nutrient stress.

To view the symposium website, click [here](#).

OPPORTUNITIES AND EVENTS

THIRD THURSDAY ALFOREX SEEDS APRIL 21, 2016 38001 COUNTY ROAD 27 WOODLAND, CA 95695

The PBC invites you to join us on a trip to Alforex Seeds in Woodland on April 21, 2016. We have two carpool vans that will leave Davis at 3:30 PM sharp. The tour will be from 4 to 5:30 PM and will cover projects/topics such as salt screening, nursery, cages, forage yield trial, and Roundup Ready (AP) testing. Register for the trip [here](#).

UC DAVIS PLANT BREEDING SYMPOSIUM APRIL 18TH, 2016 8AM-5PM UC DAVIS CONFERENCE CENTER

The UC Davis Plant Breeding Symposium is an annual student-organized event which brings together researchers in academia, industry, and the non-profit sector to discuss the latest advances in the field of plant breeding. This year's theme is “Breeding for Stress Resilience” and we have invited speakers from around the world to present on this highly relevant and important topic. Register [here](#).

INTERDISCIPLINARY PLANT GROUP SYMPOSIUM MAY 25-27, 2016 UNIVERSITY OF MISSOURI

This symposium will bring together scientists working on heterosis via several approaches - genetics, epigenetics, breeding, development, physiology, proteomics, metabolomics, organelles, apomixis and systems biology. For more information, click [here](#).

SYNGENTA AGRICULTURAL SCHOLARSHIP DEADLINE: MAY 26, 2016

Available to U.S. land-grant university students currently pursuing bachelor's or master's degrees in crop-related disciplines. Students can apply by submitting a 750- to 1,000-word essay for a chance to win part of the \$20,000 in available awards. Visit: <http://bit.ly/1e39a18>

13TH ANNUAL SOLANACEAE CONFERENCE SEPTEMBER 12-16, 2016

To register, click [here](#).

NAPB 2016 ANNUAL MEETING AUGUST 15-18 2016, RALEIGH, NC

To register, click [here](#).

PLANT BREEDING CENTER:

Director - [Charlie Brummer](#) - ecbrummer@ucdavis.edu

Associate Director - [Allen Van Deynze](#) - avandeynze@ucdavis.edu

Program Representative - [Amanda Pietras](#) - ampietras@ucdavis.edu

Student Assistant - [Candice Tandiono](#) - cmtandiono@ucdavis.edu



UC Davis Plant Breeding Center



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