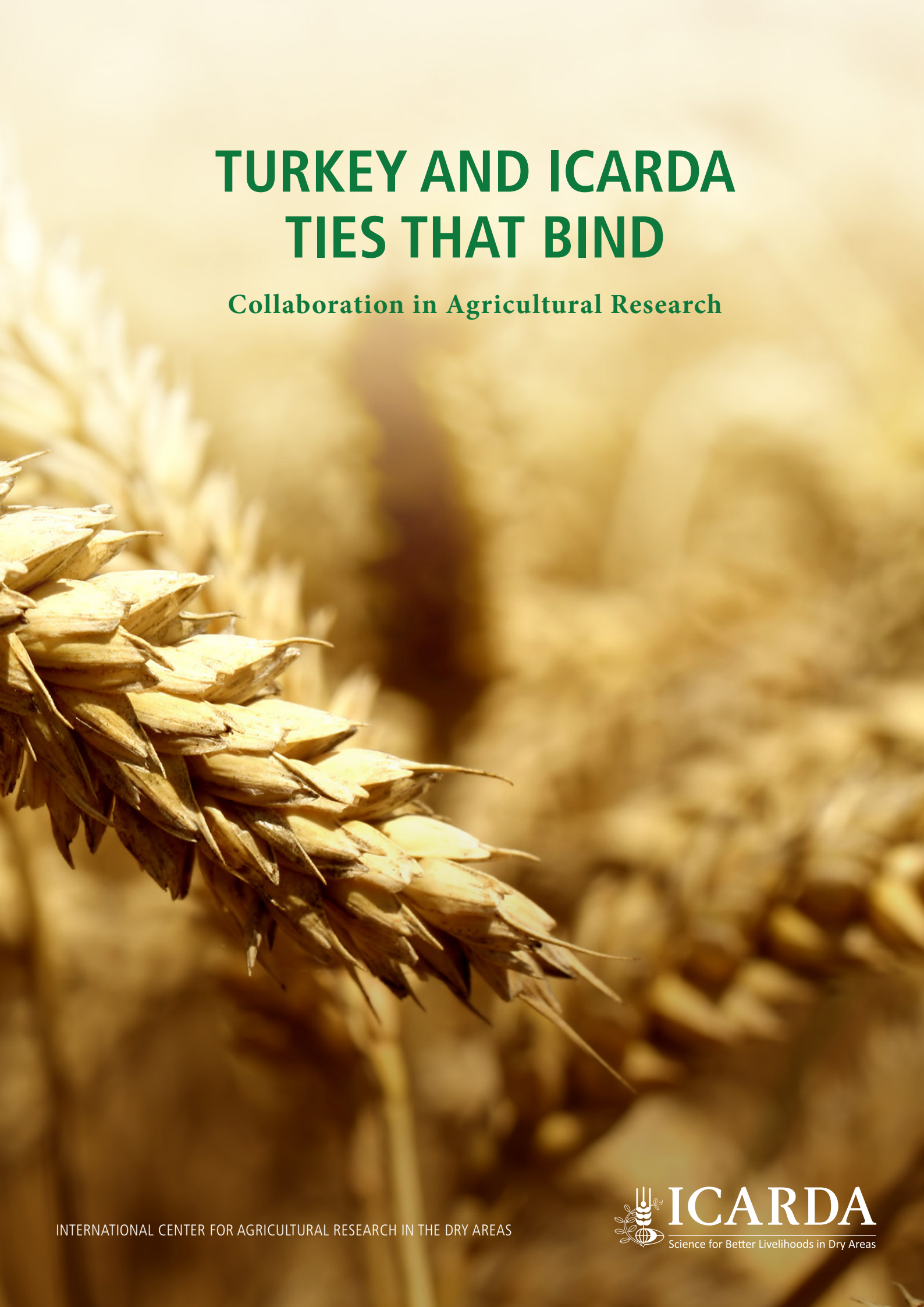
TURKEY AND ICARDA TIES THAT BIND

Collaboration in Agricultural Research



INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS

ICARDA
Science for Better Livelihoods in Dry Areas

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TURKEY'S AGRICULTURE – *an introduction*

Turkey is located in the Fertile Crescent, where - some 10,000 years ago - barley, wheat, lentil, pea, flax and vetch were domesticated—indicating the country's rich potential and experience in agricultural production on more than 40 million hectares of arable land. Turkey is endowed with favorable climate and geographical conditions, fertile soils, and biological diversity. Although the agricultural sector represents only 7.1% of GDP, farming is an important occupation for 20 million Turkish people.

Turkey is one of the few self-sufficient countries in the world in terms of food. It ranks among the top 10 countries for many crops, fruits and vegetables and is the world's largest producer of hazelnuts, figs and apricots. Turkey also focuses on cereals, pulses, sugar beet, nuts, fresh and dried fruits, vegetables, and olive oil production.

Turkey's extraordinary ecosystems have produced considerable diversity in plant species. Anatolia is the homeland of many crops that have been cultivated for food since the advent of agriculture. Those crops and their wild ancestors still grow on traditional farms, rangelands and forest areas in Turkey. Over 3000 out of the 9500 plant species in the flora of Turkey are endemic to the region and represent an important source for developing new varieties. Many of the crops that grow originally grown in Turkey have adapted to drought and heat, pests and diseases and might be useful in breeding varieties with similar traits, in particular in climate adaptation programs.

TURKEY'S RELATIONS WITH ICARDA

The fruitful collaboration between the International Center for Agricultural Research in the Dry Areas (ICARDA) and Turkey dates back to the establishment of ICARDA in 1977. ICARDA and Turkey signed a Memorandum of Understanding in 1986, and the ICARDA office in Ankara opened in 1990.

Turkey began to make financial contributions to CGIAR in 2005 and acquired the status of a "CGIAR donor country". Turkey has contributed USD 1.6 million to ICARDA during the ten year period between 2005 and 2015.

Many projects have been successfully implemented by Turkey and ICARDA. The Regional Development Agency of the Southeastern Anatolia Project (GAP), a multi-sector and integrated regional development effort directed at the nine administrative provinces of Turkey, signed a Memorandum of Understanding with ICARDA on 26 June 1998, which provided significant momentum for the Turkey / ICARDA relationship.

Another MoU was signed in 2011: The parties agreed to develop joint research projects including transfer of technology and capacity development for research institutes as part of a regional development strategy. The parties also decided to launch joint conferences and workshops and exchange academic publications, science experts, technical staff and information.

The first project was launched in 1999 and developed seed systems aiming to diversify improved crop varieties and enabling farmers to produce seeds in their specific local framework. ICARDA has introduced improved and adapted varieties of wheat, barley, lentil, chickpea and vetch, along with innovative production practices, including the use of raised beds in irrigated fields of wheat to increase yield and water-use efficiency.

Another joint initiative focused on the improvement of natural pastures and incomes at the level of farmers by reinforcing the development of small ruminant production. The efforts led to the introduction of new technologies such as use of agricultural and agro-industrial products, feed blocks, urea-treated straw, strategic feeding and flock management. The target to promote better milk and meat yields was met. GAP continues its cooperation with ICARDA through various activities, which aim at rehabilitating native pastures, supporting future land improvement and rangeland management, improving the production of wheat, barley, lentil and chickpea, and ameliorating the farming conditions.

The collaboration between Turkey and ICARDA was taken one step further with the visit of former H.E. Mr. Mehdi Eker, the Turkish Minister of Agriculture and Rural Affairs, to ICARDA Headquarters in Aleppo on 24-25 March 2011. During this visit, the Memorandum of Understanding between Turkey and ICARDA, was renewed to strengthen further collaboration. A new MoU was signed in 2013 and is currently in the National Assembly for ratification.

SUCCESSFUL PROJECTS AND PARTNERSHIPS IN THE PAST

West Asia and North Africa Dryland Durum Improvement Network

The West Asia and North Africa Dryland Durum Improvement Network (WANADDIN), funded by IFAD, was implemented in the period 1996-1998. The objective was to achieve sustainable improvement in the productivity and production of durum wheat in the dryland environments of the WANA region. This was achieved in collaboration with a formal network involving the joint ICARDA/CIMMYT (International Maize and Wheat Improvement Center) durum wheat research program and the NARS of Algeria, Morocco, Syria, Tunisia and Turkey.

Integrated Research and Durum Economics Network

The Integrated Research and Durum Economics Network (IRDEN) was a four-year project (2002-2006) funded by IFAD to foster wider adoption of low-cost durum technologies for increased income and improved household food security of smallholders in less-favored areas of WANA. Implemented by ICARDA in partnership with NARS of Algeria, Morocco, Syria, Tunisia and Turkey, IRDEN built upon the achievements of its predecessor - the WANADDIN project. The project was successful in providing durum producers, especially resource-poor smallholders, with varieties, technical packages and opportunities to improve their agricultural income and welfare by adopting productive, low-cost, sustainable technology options compatible with their production and consumption needs.

IRDEN activities in Turkey were carried out in Diyarbakir and Gaziantep regions and covered baseline studies, site characterization, on-farm demonstration trials of durum varieties, farmers' field days, backup research on drought tolerance and grain quality of new durum germplasm, and on-the-job-training for scientists and farmers.

Sustainable development of small-scale farmers of the Taurus Mountains of Turkey

ICARDA, in collaboration with the Cukurova University, implemented a collaborative research and development project during the period 1990-1998. The project examined the existing farming systems, developed new and improved technologies through on-farm experimentation with the aim to fit in the local systems of the Taurus Mountains. The project also tested new technologies with farmers, and disseminated research findings among farmers and related organizations for larger areas in the other mountain regions. As a result of the new and improved technologies, the incomes of the participating farmers increased by 65%.

Water Management Research

ICARDA and Turkish scientists have undertaken collaborative studies on water management since 1996. One study was conducted on the potential role of supplemental irrigation in improving wheat yields. Better knowledge was developed within the scientific network on the potential, constraints, and possible research interventions needed for improving wheat production with supplemental irrigation in Central Anatolia. Today, supplemental irrigation, still has a big potential in Turkey.

Seed System Development

During the period 1989-2004, a total of 122 Turkish scientists were trained by ICARDA on various aspects of seed system. The development of effective seed systems is an area of strong collaboration between Turkey and ICARDA. A medium-size seed processing unit was set up in Dicle University.

Rooftop Water Harvesting Project

The project was designed to improve domestic water supply through rainwater harvesting. The project, conceived as a partnership initiative, involved the institutions, organizations and individuals already active in rainwater harvesting. The primary beneficiaries were the local people in Beypazari Tekke village of Ankara, Turkey. Best water management practices were shared with partner institutes through capacity building and training activities, the project also implemented an awareness raising campaign on rainwater harvesting for a broader public, which looked as well into acceptable, practicable and widely used cultures.

Enhanced smallholder wheat-legume cropping systems to improve food security under changing climate in the drylands of West Asia and North Africa

The project was implemented in eight countries, including Turkey in the WANA region in 2012-2015. It was implemented in three different institutes, the Sanliurfa GAP Agricultural Research Institute (ARI), the Kahramanmaras ARI and the Eskisehir Transitional Zone ARI. The project disseminated new cropping systems technologies, especially to smallholder farmers, that would increase the income of small farmers. Seventy demonstration and on-farm trials and 20 field days were conducted in collaboration with farmers. In those trials more than 20 new legume (lentil and chickpea) and wheat cultivars were introduced to the farmers. The seed of the new chickpea and wheat cultivars were in high demand by the public and private sector seed producers.

HIGHLIGHTS OF ONGOING COLLABORATION

The Turkey/ICARDA collaborative research program covers cereal and legume crop production, natural resources management, capacity building for agricultural research, and integrated rural development initiatives.

Genetic Resources

Given the country's diverse agro-climatic conditions, ICARDA has established the second-largest collection of germplasm from a single country kept in the ICARDA GeneBank by collecting more than 12,000 germplasm accessions from Turkey. More than 3000 accessions collected from Turkey were repatriated to the Ankara genebank.

The GeneBanks are crucial to preserve the unique crop biodiversity which could otherwise be eroded by climate change or unsustainable agricultural practices. In addition, ICARDA shares germplasm from its collections with various agricultural research institutions in Turkey. Around 14,000 germplasm from ICARDA genebank have been kept under a "black box" arrangement in the Ankara genebank.

International Winter Wheat Improvement Program (IWWIP)

Wheat is a strategic staple crop in Turkey with around 7.9 million hectares producing 20 million tons annually. The numbers fluctuate each year, depending on precipitation, since much of the planted area is rainfed.

Wheat research started in Turkey in the mid-1920's right after the foundation of the Republic of Turkey. The International Winter Wheat Improvement Program (IWWIP) was established in the mid-1980s by the Government of Turkey and CIMMYT. ICARDA joined in 1991, integrating its experience from similar breeding programs implemented in Syria. The Government of Turkey, CIMMYT, and ICARDA continue to jointly oversee the program.

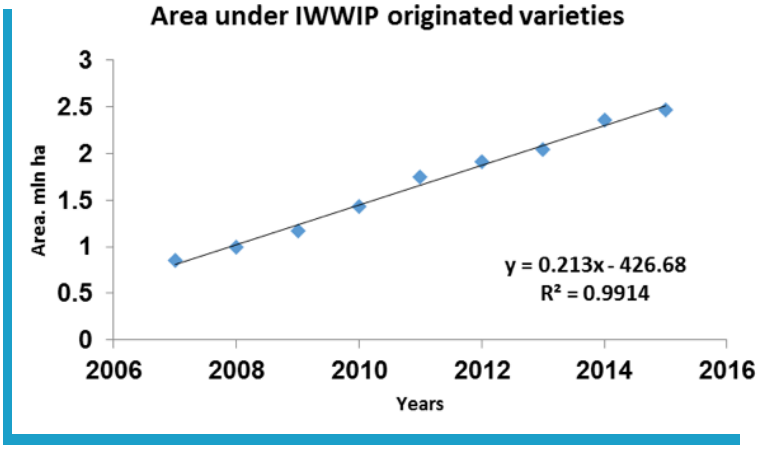
The main objective of the IWWIP is to develop and facilitate high yielding advanced winter wheat germplasm that is tolerant to major diseases and suitable for other regions, like Central and West Asia.

IWWIP provides advanced germplasm to the breeding programs in the region and facilitates the winter wheat germplasm exchange for the global breeding community.

The IWWIP germplasm development targets different agro-climates under irrigated and dryland conditions. The advanced breeding lines are annually distributed to more than 100 cooperators in approximately 50 countries.

The germplasm developed by the IWWIP has been utilized as parents for crosses and directly as varieties. More than 60 varieties originating from IWWIP have now been released in Afghanistan, Armenia, Azerbaijan, Georgia, Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkey, Turkmenistan and Uzbekistan. Plant varieties that have been produced through the breeding programs are winter wheat cultivars. Their area has increased since 2007, from less than one million hectares to the current area of about 2.5 million hectares (Fig. 1).

Figure 1 : The planting area of IWWIP originated cultivars in Central, West Asia and Caucasian Countries.



Twenty nine cultivars originating from IWWIP have been released in Turkey. The area of these IWWIP cultivars has grown from approximately 540,000 hectares to more than 1.6 million hectares in 2014.

The land covers about one-third of the winter wheat area that contributes to the livelihoods of Turkish farmers. This increase is mainly due to the private sector's demand for high yielding and disease resistant new cultivars.

Pulses

Pulses are leguminous crops that are harvested solely for the dry seed.

Dried beans, lentils and peas are the most commonly known and consumed types. Pulses in West Asia, mainly in Turkey, Syria, and Iran, are currently grown on 1.26 million ha. This represents 2% of the global pulse area with a production of 1.74 million tons and an average yield of 1,381 kilograms of pulses per hectare. Turkey is contributing 1.7% to the global pulse industry. Chickpea is the largest pulse crop, accounting for 40% of production of the cool-season food legume crops, followed by lentil (30%).

During the last five decades, pulses production in Turkey has more than doubled (110%), primarily due to a 41% increase in yield, which, by the 2011-2013 cropping seasons reached 1,448 kg ha-1. The area of pulses production also grew by 50% to 0.87 million ha in 2011-13.

More than 20 chickpea and around 10 lentil cultivars released in Turkey have been selected from ICARDA originated material. They cover a large percentage of Turkey's chickpea and lentil growing areas. For example, in the early 2000's, Gokce, a chickpea cultivar with high yield, disease and drought tolerance, covered around 80% of the chickpea area in the Central Anatolian Plateau of Turkey. Azkan, another cultivar, now covers more than 50% of the chickpea area in Turkey. The Azkan seed has also been exported to the neighboring countries Iran and Bulgaria. Azkan alone accounts for 38% of the total chickpea certified seed production in Turkey, which amounts to 6,000 tons in the last 3 years (2013-2015). Şakar is a lentil cultivar, selected from ICARDA originated material and released in 2005 by Dicle University in Turkey. Its 2,852 tons of production accounts for 53% of the total certified seed production in Turkey in the last 3 years (2013-2015).

Cereal Rust Research Center

Rust, especially Stripe Rust, is a devastating disease in cereals in the Central West Asia and North Africa (CWANA) region.

Symptoms are stunted and weakened plants, shriveled grains, fewer spikes, loss in number of grains per spike and grain weight. Losses can be as much as 50%, but in severe situations 100%. Rust is a wind-born disease that can be transmitted over long distances in a single season. It is therefore important to monitor the prevalence of rust - not only in one part of any given country, but also regionally where it may affect many countries.

CWANA did not have a dedicated regional rust center to serve the region until 2013, when the Government of Turkey and ICARDA decided to establish the Cereal Rust Research Center in Izmir, Turkey. The Center will monitor rust populations in the region and test national and international material. The tests will be done under strictly controlled conditions in a bio-containment facility. The Cereal Rust Research Center also develops rust resistant germplasm and makes it available to regional scientists and breeders. The office and lab construction was completed in 2015 and the bio-containment facility's construction began in 2016 and is expected to be completed by the end of the year.

Capacity Development

One of the key components of ICARDA's work is developing the capacity of national agricultural research institutions through training of scientists and supervision of post-graduate studies, short and long-term training courses, conferences, traveling workshops and scientific seminars.

Areas of training have included seed production and technology, crop improvement, cereal physiology, biotechnology, food legume entomology, DNA molecular marker techniques, experimental station operations management, experimental designs and field plot techniques, expert systems, GIS/RS, natural resources management, data analysis, and scientific writing.

APPROXIMATELY **800 SCIENTISTS** FROM TURKEY PARTICIPATED IN TRAINING ACTIVITIES CONDUCTED BY ICARDA FROM **1978 TO 2015**

POTENTIAL FOR FUTURE COLLABORATION

Turkey and ICARDA collaborate through the General Directorate of Agricultural Research and Policies (GDAR) of the Ministry of Food, Agriculture and Livestock. Fifteen institutes under GDAR have been involved in this collaboration.

The ICARDA-Turkey partnership is important not only for the region but also for global food security. There are several areas of common interest which provide a strong base for collaboration. Many joint partnerships have been initiated and are making good progress, with promising avenues for further enhancement.

The International Winter Wheat Improvement Program (IWWIP), which is an ongoing joint enterprise between the Government of Turkey, CIMMYT and ICARDA, has been pioneering in germplasm development in irrigated and dryland conditions. It has distributed germplasm globally and continues to facilitate winter wheat germplasm exchange for the breeding community in the region of Central, West Asia and North Africa.

The Cereal Regional Rust Research Center, which is currently under construction and estimated to be operational by the end of 2016, will provide ICARDA's scientific expertise to Turkey and other countries in the Central Asia, West Asia and North Africa (CAWANA) region to identify and track rust diseases. Close cooperation on rust monitoring will help the countries to take timely measures before any outbreak strikes.

The Winter Barley Partnership is an initiative on which Turkey and ICARDA have been collaborating to provide high yielding, drought tolerant and winter hardy advanced germplasm to the breeding programs. Since barley is one of the most drought tolerant crops and is grown in large scales in Central Asia and the Caucasus (CAC) region, including Turkey and Iran, this is a promising initiative with great potential of improving farmers' income by increasing their yields.

All these collaborative partnerships will give excellent opportunities to young Turkish scientists to be trained and integrated into the international research system and also promote junior scientists from the region, thus building on the human potential.

CONCLUSION

The long and productive relationship between the Government of Turkey and ICARDA will continue to develop research programs that benefit not only the country, but the entire region. The collaborative aim is to make Turkey and the region more food secure, promote the sustainable use of natural resources, enhance and diversify rural livelihoods, raise people's income level and contribute to development targets, such as social stability and economic growth by enhancing the productive and employment generation capacity of the rural sector.

LIST OF COLLABORATING/PARTNER NATIONAL INSTITUTIONS IN TURKEY

- Centro Internacional de Mejoramiento de Maïz y Trigo (CIMMYT), MEXICO
- Dicle University, TURKEY
- Southeastern Anatolia Project (GAP), TURKEY
- University of Cukurova, TURKEY
- Fifteen Research Institutes under the General Directorate of Agricultural Research and Policies (GDAR) of Ministry of Food, Agriculture and Livestock of Turkey

  - Field Crops Central Research Institute, ANKARA
  - Plant Health Central Research Institute, ANKARA
  - Soil, Fertilizer and Water Resources Central Research Institute, ANKARA
  - GAP International Agricultural Research and Training Center, DIYARBAKIR
  - International Agricultural Research and Training Center, IZMIR
  - East Mediterranean Agricultural Research Institute, ADANA
  - West Mediterranean Agricultural Research Institute, ANTALYA
  - Thrace Agricultural Research Institute, EDIRNE
  - East Anatolian Agricultural Research Institute, ERZURUM
  - Transitional Zone Agricultural Research Institute, ESKIŞEHIR
  - Aegean Agricultural Research Institute, Menemen, IZMIR
  - Black Sea Agricultural Research Institute, SAMSUN
  - GAP Agricultural Research Institute, SANLIURFA
  - Bahri Dagdas International Agricultural Research Institute, KONYA
  - Maize Research Station, SAKARYA
  - East Mediterranean Transitional Zone Agricultural Research of Institute, K.MARAŞ

Turkish Citizens who Served as ICARDA's BoT Members

Prof. Dr. Fahrettin Tosun	1978-1983
Dr. Nazmi Demir	1986-1992
Prof. Dr. Ersin İstanbulluoğlu	1993-1998
Assoc.Prof. Dr. Masum Burak	2009- today

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