

## Climate-Smart Durum Wheat for Drylands

A pioneering research-for-development initiative of ICARDA

### The Challenge of Drylands

41% of the world's land area is dry but also home to one-third of the global population. About 16% of dryland communities live in chronic poverty, particularly in marginal rainfed regions. Interrelated challenges such as the depletion of already scarce natural resources, frequent droughts, high climatic variability, land degradation and desertification, and rapid population growth jeopardize food and nutrition security in the drylands. Under CGIAR, the world's largest global agricultural innovation network, ICARDA's durum program targets these challenges to deliver climate-smart germplasm resilient to deteriorating conditions.

### History of ICARDA's Durum Wheat Program

In partnership with CIMMYT, a sister CGIAR center, ICARDA's durum wheat program was launched in Tel Hadya, Syria, in 1977 as part of ICARDA's core research portfolio to address food insecurity and poverty challenges that developing world dryland communities face. Since its launch, the partnership has significantly contributed to durum wheat research and improvement.

ICARDA's durum wheat program offers a wide range of genetic diversity due to its location in the Fertile Crescent at the epicenter of durum wheat genesis. In 1983, ICARDA's partners released in Algeria <Om Rabi>, the first variety originated by hybridizing an elite by a landrace, which was later released by over 20 developing countries. Because of the program's offering of extensive genetic diversity, the durum wheat germplasm developed in Syria continues to serve as a source of resistance to most durum wheat diseases and pests today.



**Moroccan farmers suggesting the best ICARDA entries to be released**

### Targeting the Market

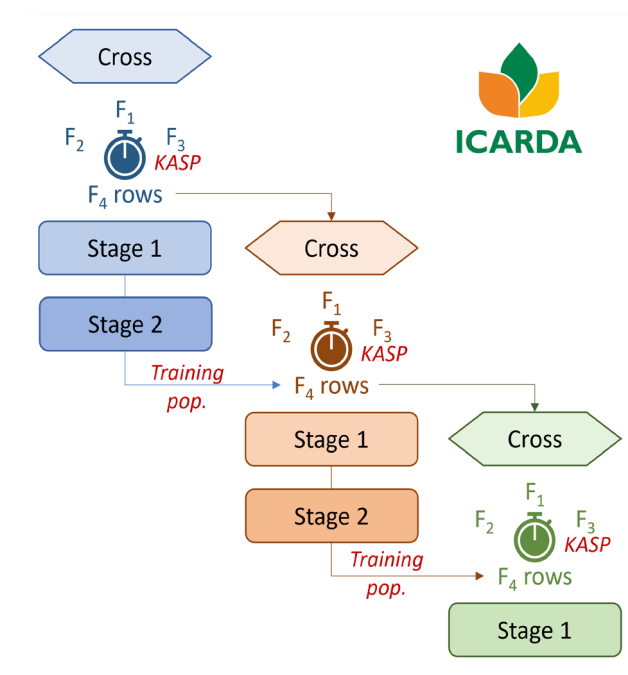
Under the new CGIAR Research Portfolio umbrella, ICARDA has identified six target pipelines for delivering germplasm to an estimated 8.5 million hectares of cultivation, impacting the lives of around 1.3 billion rural people. With an annual investment of 1 million USD, mainly through bilateral projects, and a re-focused approach to its pre-breeding needs, ICARDA aims to generate a faster, unprecedented impact rate in people's lives.

### The new breeding pipelines of the ICARDA's program

Pipeline	Area	Production	Rural population
	Ha	MT	N
West/Central Asia drylands - rainfed	4,360,000	8,544,000	109,439,692
North Africa drylands - rainfed	2,500,000	5,000,00	26,763,737
High-cold drylands - rainfed	700,000	2,200,00	27,711,223
South Asia drylands - limited irrigation	600,000	2,100,000	1,020,455,478
East Africa drylands - rainfed	220,000	550,000	96,670,257
West Africa savannas - irrigated	110,000	1,500,000	40,369,022
<b>Total</b>	<b>8,490,000</b>	<b>19,894,000</b>	<b>1,321,409,409</b>

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**The Accelerated breeding scheme of ICARDA using speed breeding and genomic predictions**

### Setting the Standard for the Next Decade

In 2012, the main program activities were relocated to Morocco and Lebanon under the guidance of Dr. Filippo Bassi to incorporate novel genomic approaches. Each year, via its international nurseries system, the program delivers free germplasm to around 52 partners from 32 countries. As of 2022, the program, through its national partners, has contributed to the release of around 150 varieties across 23 developing countries, of which more than 40% were obtained from wild relatives, primitives, or landraces collected by ICARDA.

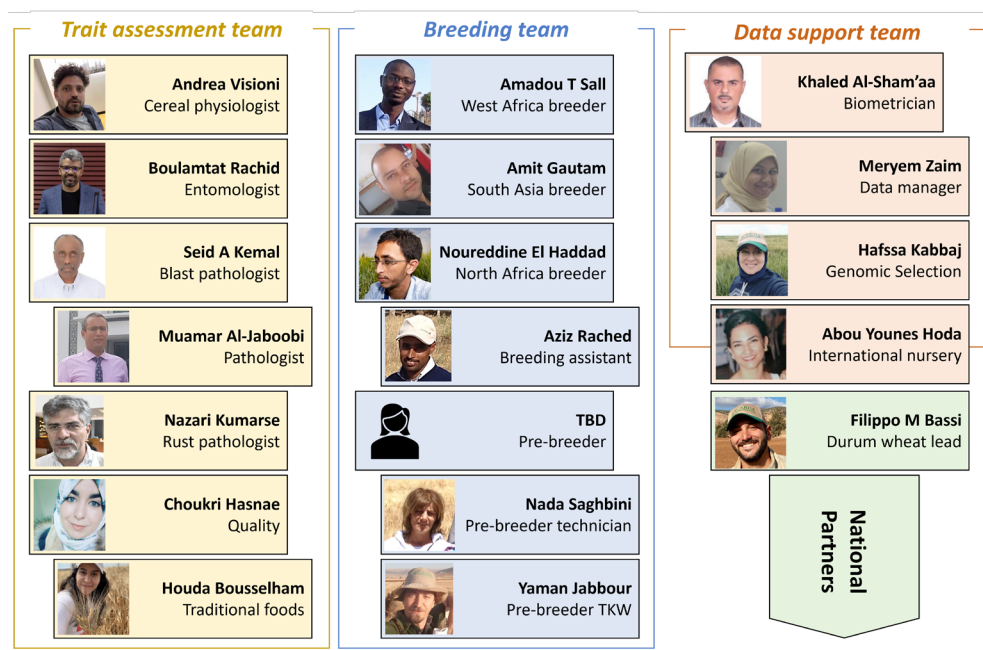
An ICARDA-led assessment shows that in the past 35 years until 2012, ICARDA's Durum Program achieved an average annual rate of genetic gain for grain yield of +0.7%. A preliminary assessment for 2012-2022 shows a further increase, reaching +1.5% annually for the next decade, doubling its historical trend.

The program has devised a new scheme that integrates the speed-breeding principle to reduce the progression to inbreeding by one year, simultaneously utilizing genomic predictions to recombine germplasm early, further reducing by two years the time to recycling.

Through close collaboration with national partners, another radical transformation will be the relocation of later yield trials from ICARDA's main research station to the target environment in partners' fields, delivering better germplasm and faster.

### ICARDA's Durum Wheat Team

Dr. Filippo M. Bassi leads seven scientists specializing in traits assessments, three breeders, three pre-breeders, four data experts, and five technicians to deliver first-rate durum wheat germplasm to our partners.



**The research team of ICARDA durum wheat**