

# Improving wheat by conserving wild 'goat grass'

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## Highlights

- The availability of synthetic hexaploid wheat (SHW) widens the genetic base for bread wheat improvement.
- ICARDA and CIMMYT hold 1,570 accessions of goat grass (*Aegilops tauschii*). More than 600 accessions were used to develop 1,577 SHW since 1986.
- Over 10,000 samples of SHW were distributed to 110 institutions in 40 countries since 2000, representing 21% of the total germplasm distributed externally by CIMMYT genebank.
- Survey findings indicate that wheat varieties derived from SHW are currently grown on 10% and 34% of the wheat area in India and southwest China, respectively.

## Seeking rugged resilience

This study traces the use of goat grass accessions conserved in the genebank through the stages of wheat improvement to varieties grown in the fields of farmers.

While there is mounting research interest in using crop wild relatives as a source of important traits for adaptation to environmental and social change, there is scant information regarding their contribution to varieties that have been introduced to farmers.

## Data and methods

We traced the origins of goat grass accessions conserved in the genebank using passport data. This allowed us to assess the use and contribution of goat grass in the development of SHW and improved wheat varieties.

We also examined the incorporation of over 800 SHW-derived lines in 7 international nurseries between 1996 and 2018. The list of varieties released with SHW parentage were identified from online wheat databases, literature review, and wheat survey data from CIMMYT. Temporal patterns in the distribution of SHW by the CIMMYT genebank were analysed as an indication of the demand for this intermediate germplasm.

In the last stage, we explored the potential for impact on farm production through a survey of users and breeders from China, India, Argentina, Pakistan, Turkey, Kazakhstan and Bolivia. The survey generated estimates of the share of wheat area planted to varieties with SHW parentage and the economically important traits associated with their use.

## From genebanks to nurseries to farmers

Our survey revealed that 57% of improved wheat varieties reached NARS through the international nurseries and at least 85 wheat varieties with SHW in their genetic background have been released to farmers in 21 countries.

Respondents confirm that farmers are adopting the improved wheat varieties because they are resistant to pests and tolerant to drought and heat. SHW also contributed to zinc-enriched, biofortified varieties that have now been introduced to farmers – such as Zinc Sakhti in India and INIAF Yesera in Bolivia.

## Why we need the wheat genebanks



Together, CIMMYT and ICARDA genebanks hold 50% of the wheat accessions reported in Genesys. Conserving more than 150,000 wheat accessions, CIMMYT is the largest genebank for a single crop. The ICARDA genebank has high proportions of landraces and wild relatives, representing 56% and 13% of the wheat collection, respectively. The germplasm conserved at CIMMYT and ICARDA is available for distribution through the multilateral system under the terms of the Plant Treaty.

The genebanks play a vital role in crop improvement because they conserve, maintain, and make available both raw and pre-bred germplasm for the development of wheat varieties containing economically valuable traits that are needed to confront emerging challenges, such as climate variability and micronutrient deficiency.

Goat grass, one of the wild ancestors of modern bread wheat, has been re-incorporated into new varieties via intermediate germplasm.

*The story of goat grass and synthetic hexaploid wheat illustrates the process of transferring desirable traits from wild relatives to improved wheat varieties.*

Figure 1. Geographic distribution of geolocalised *Aegilops tauschii* accessions used for the development of SHW by CIMMYT

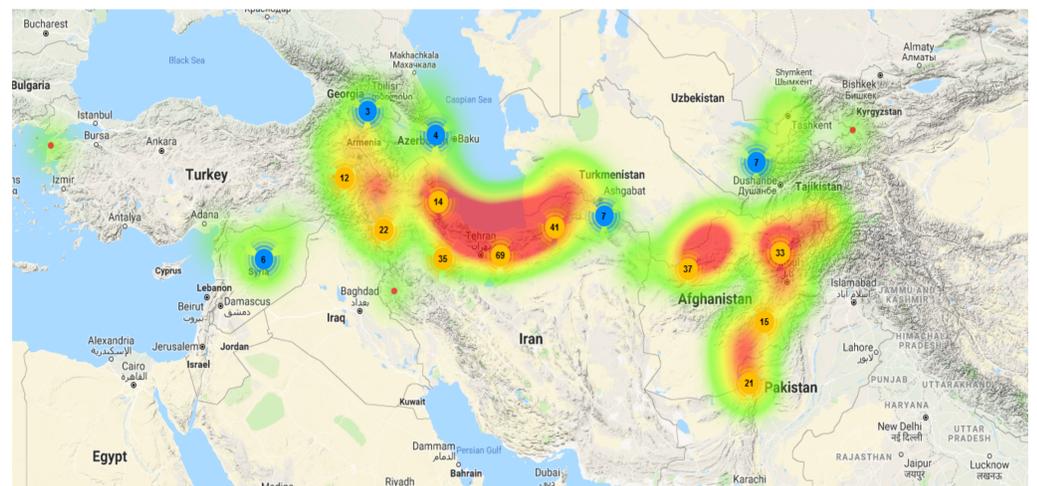


Figure 2. Countries receiving SHW germplasm from CIMMYT genebank since 2000

