DEPLOYMENT OF LANDRACE CULTIVARS IN WHEAT BREEDING

DSW
DELIVERING SUSTAINABLE WHEAT

THE CHALLENGE

The world population is projected to increase by 2 billion people over the next 30 years, placing greater demands on wheat which currently provides 20% of global human caloric intake.

Historically, farmers relied on locally adapted crop cultivars known as landraces. Although wheat landraces are generally considered lower yielding compared with modern varieties, they often harbour a rich and underutilized source of diversity.

Yield gains in wheat have slowed, in part due to the narrowing genetic diversity of modern varieties. There is great potential to enhance agronomic traits in modern wheat by cross-pollinating with landraces, aiming for superior progeny.

By 2050, the world population is projected to reach

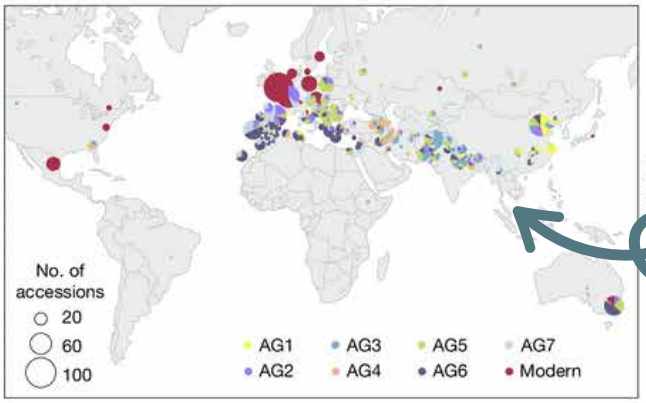
9.7 billion people

OUR RESEARCH

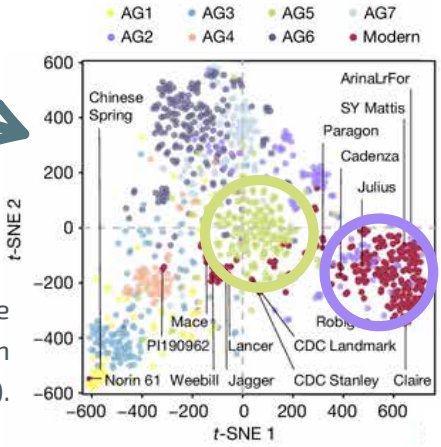
SCAN FOR MORE INFO

We have examined the genetic and phenotypic diversity of the A. E. Watkins landrace collection of wheat (*Triticum aestivum*) by whole-genome re-sequencing and field evaluation. Our research found seven ancestral groups of wheat and modern varieties are derived from only two of these. The remaining five ancestral groups represent untapped genetic sources, providing access to landrace-specific diversity for breeding.

Furthermore by combining genomic data, with extensive field experimentation and in-depth phenotyping, we confirmed that much of the genetic diversity that is not found in modern varieties have beneficial effects on yield potential, adaptation, human nutrition and disease resistance. To help the wheat community make use of this novel genetic diversity, resources, including the germplasm, genomic and phenotypic data, have been made publicly available through the Grassroots data repository.



This map shows the geographical distribution of all cultivars, including the A. E. Watkins landrace collection and modern wheat varieties, sequenced in the study. The seven ancestral groups (AG1–AG7) and modern wheat are colour-coded.



This plot shows the relative similarities between cultivars from the seven ancestral groups. Modern wheat varieties (in red) clusters with ancestral group 2 (in lilac) and ancestral group 5 (in green).

Image credit: Cheng et al., Nature 632, 823–831 (2024)

A. E. Watkins first described the wheat landrace collection used in this study in a 1930 publication "*The Wheat Species: A Critique*". Although nearly a century has passed, we can now use genomics to fully realize the potential of these invaluable genetic resources.

Biotechnology and Biological Sciences Research Council

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The Delivering Sustainable Wheat research programme aims to address critical challenges in wheat health, yield, and production in order to safeguard the future of this vital crop.

It is a collaboration between the John Innes Centre, Rothamsted Research, Quadram Institute, and Earlham Institute, with the universities of Bristol, Lancaster, Leeds, Imperial College London, and Nottingham, NIAB, and NISD-UEA.

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