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Historic wheat–yield trendlines in the southern Great Plains

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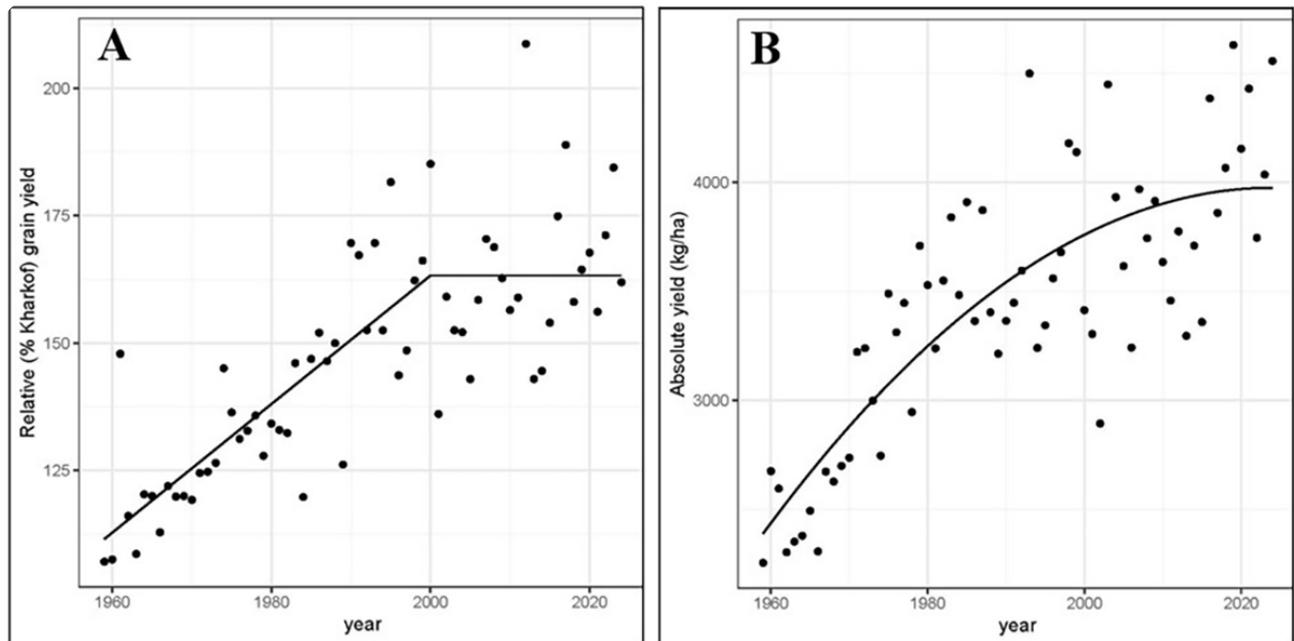


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Hard red winter wheat grown in the Great Plains accounts for ~40% of total U.S. wheat production, primarily used to make bread wheat flour. Because U.S. wheat is a principal human food grain and a major export product, increasing wheat yields has remained a priority to benefit U.S. farmers and to protect global food security.

Since the 1950s, USDA scientists in Lincoln, NE, have coordinated the Hard Winter Wheat Regional Performance Nurseries (HWWRPN) to foster wheat yield improvement on behalf of public and private organizations located throughout the Great Plains. Using HWWRPN yield data collected from 1959 to 2024 in the southern Great Plains, trendlines for wheat improvement indicated that yields significantly increased by ~1.0% per year compared with the historic check variety "Kharkof." On-farm gains were estimated at ~25 kg/ha/yr.

Notwithstanding, non-linear models provided the best overall fit to the 64-year datasets, revealing an upper plateau for relative grain yield starting in 2000 (**Fig. 1A**) and a more gradual levelling-off of on-farm yield best fit by a quadratic curve (**Fig. 1B**). It remains to be seen if new technological drivers in agricultural management paired with wheat-breeding gains will continue to maximize yields, especially in favorable environments, so that wheat yield improvement continues.



Non-linear regression of relative (% Kharkof/yr) and on-farm (kg/ha/yr) wheat grain yield, respectively, for elite breeding entries comprising the Southern Regional Performance Nursery (SRPN) from 1959–2024. Yield–plateau models provided the most parsimonious fit of the relative (% Kharkof) yield dataset, revealing the year 2000 to be the start of an upper-yield plateau (A). Alternatively, quadratic models provided the best overall fit for the on-farm wheat grain yield dataset, indicating a more gradual levelling off of on-farm yield that was best explained by a quadratic curve (B). Figure courtesy of Jeffrey D. Boehm Jr., USDA-ARS.

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Boehm, J. D., Palmer, N., Cai, X., & Miguez, F. (2025). Yield trends for genetic improvement of winter wheat (*Triticum aestivum* L.) grain yield in the southern Great Plains of North America, 1959–2024. *Crop Science*, 65, e70135.

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