

# Evaluating Kernza: The First Perennial Grain



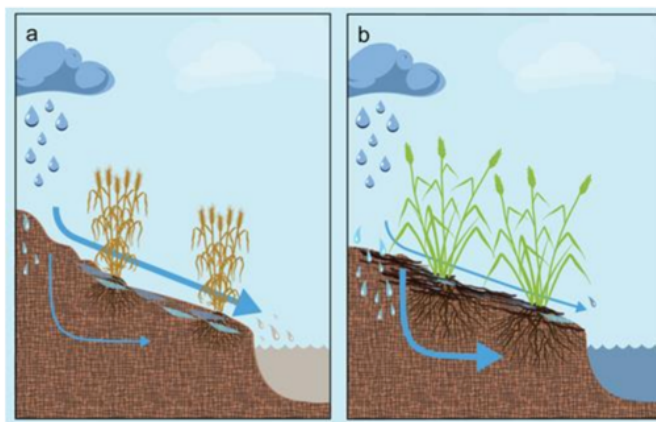
SUSTAINABLE CROPPING SYSTEMS LAB  
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Perennial grains are planted once and then harvested for multiple years, compared with annual grains that are replanted each year.

**Kernza®** is a domesticated perennial grain originating from a forage grass called intermediate wheatgrass (*Thinopyrum intermedium*).



Left: Compared with annual grains (a), Kernza (b) can increase water infiltration, reduce soil erosion, and protect water quality.

Modified from: Ryan, MR, TE Crews, SW Culman, LR DeHaan, RC Hayes, JM Jungers, and MG Bakker. 2018. Managing for multifunctionality in perennial grain crops. *BioScience*, 68:294-304.

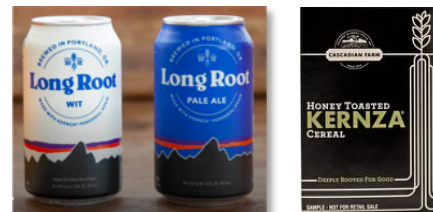
## Kernza origin

In the early 1980s, researcher Peggy Wagoner at the Rodale Institute evaluated nearly 100 perennial grass species for potential domestication, and selected intermediate wheatgrass based on vigor, seed size and flavor, and potential for mechanical harvest. Work with intermediate wheatgrass continued at the NRCS

Big Flats Plant Materials Center in Big Flats, New York. In 2001 the Land Institute, a non-profit research organization in Salina, Kansas, took on the crop breeding and domestication efforts. Kernza is being developed at the Land institute using traditional crop breeding methods.

## Kernza products

Kernza is the first perennial grain crop to be used in commercial products. Long Root Wit and Long Root Pale Ale are produced by Hopworks Urban Brewery in Portland, Oregon, in partnership with Patagonia Provisions. In 2019, Cascadian Farms (General Mills, Inc.) launched a limited edition breakfast cereal called Honey Toasted Kernza.



## Benefits

- Plant once, harvest for years
- Deeper roots
- Reduces soil erosion
- Improves soil health
- Year-round ground cover
- Wildlife habitat

## Drawbacks

- Slow establishment
- Lower grain yields than annual counterparts
- Combine harvest challenges
- Potential build up of pests
- Still under development

## Our research on Kernza

- Optimizing crop production
- Effects on soil health and erosion
- Legume intercropping
- Weed and disease management
- Farmer survey
- Consumer preference

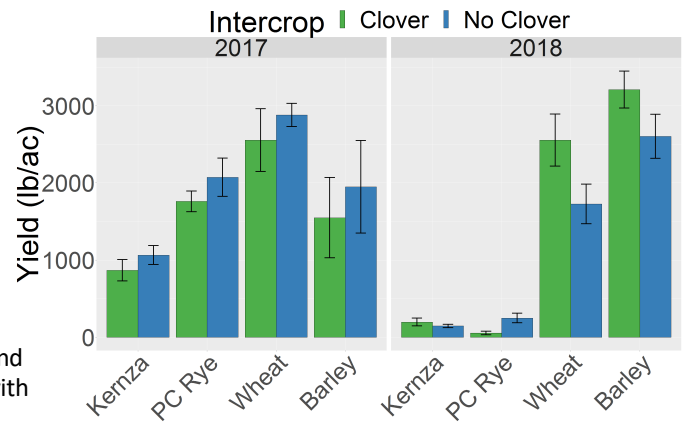


Left to right: Kernza after first winter; mature grain before harvest in August; spring growth in May after second winter.

## Intercropping red clover with Kernza

Intercropping Kernza with legumes can provide benefits including enhanced weed suppression, reduced nitrogen fertilizer requirements, and improved soil health. In 2016 at the Musgrave Research Farm, an intercropping experiment was established to test the effects of intercropping medium red clover (*Trifolium pratense*) on grain yield and other sustainability metrics.

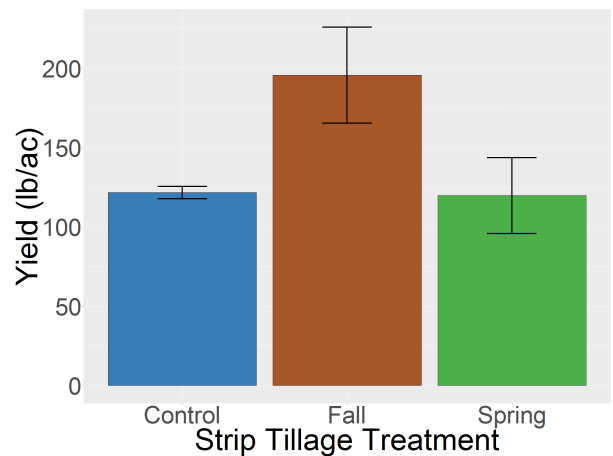
*Right:* Hand-harvested, dehulled grain yield of two perennial (Kernza and perennial cereal rye) and two annual grain crops (wheat and barley), with and without a red clover intercrop. Error bars indicate standard error.



## Maintaining Kernza grain yields with strip-tillage

Field trials of Kernza have consistently found that yield declines over time. Previous research suggests that grain yield is inversely related to stand density, which increases stand age. In an experiment examining the impact of soil disturbance, we found that post-harvest strip-tillage in the fall significantly increased grain yield in the subsequent harvest when compared to an undisturbed control.

*Right:* Hand-harvested, dehulled Kernza yields at the first harvest in July 2018 after strip-tillage treatments were applied. Fall strip tillage occurred in mid-October 2017 and spring strip tillage in mid-April 2018. Error bars indicate standard error.

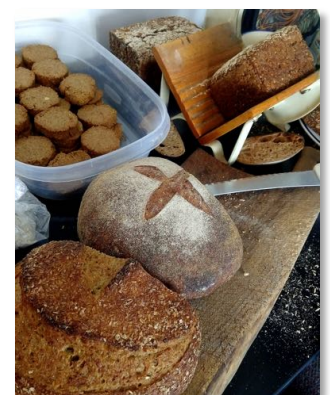


## Dual-purpose grain and forage production

In addition to grain, Kernza can be grazed or harvested for high-quality forage in the spring or fall. At grain harvest, leaves and stems remain green and can be harvested as a moderate-quality hay.

Results from a survey in the US and France showed that 47% of conventional farmers and 69% of organic farmers were interested in perennial grain crops that can be harvested for both grain and forage.

*Left to right:* Kernza plants in spring after second winter; dehulled Kernza grain that is ready to be milled; and bread and cookies made with Kernza flour by bakers at Wide Awake Bakery in Trumansburg, New York.



Visit our website: <https://blogs.cornell.edu/scslab/>

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