

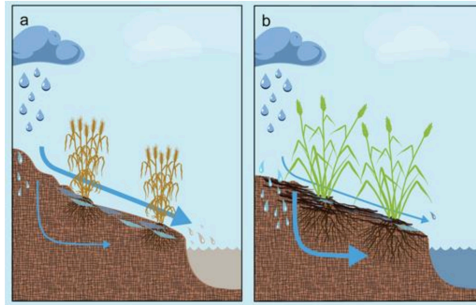


Evaluating Kernza: The First Perennial Grain

Musgrave Farm Field Day, July 11th, 2019

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Perennial grains are planted once and are harvested for multiple years, compared with annual grains that are replanted each year. We are working with the perennial grain intermediate wheatgrass (Kernza®, the trademark name for the Land Institute's domesticated wild perennial, *Thinopyrum intermedium*).



Left: Compared with annual grain crops (a), perennial grain crops (b) can reduce soil erosion and protect water quality when grown on sloped land MR Ryan, TE Crews, SW Culman, et al. 2018. Managing for Multifunctionality in Perennial Grain Crops, *BioScience*, Volume 68:4)

Kernza origination

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 seed size and flavor, vigorous perennial growth, 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 devoted to finding solutions to soil loss, then took on the breeding efforts. Kernza is bred using traditional methods of selection and not genetic engineering.

Kernza products

Kernza is the first perennial grain crop to be used in a commercially available product, Long Root Pale Ale, by Patagonia Provisions and Hopworks Brewery. This year, Cascadian Farms (General Mills, Inc.) launched a limited edition Kernza breakfast cereal.



Kernza photos, top left clockwise:
May forage cut, late-August grain harvest, at greenup after first winter, de-hulled grain, March after second winter, bread and cookies baked by Wide Awake Bakery.



Kernza Benefits

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

Kernza Drawbacks

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

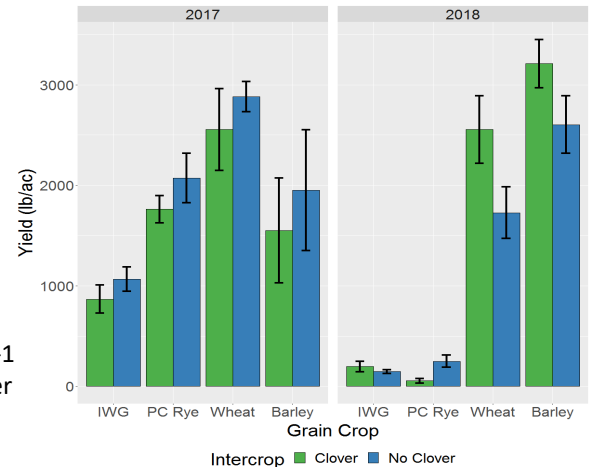
Our focus areas of Kernza research

- Optimizing crop production
- Effects on soil health and erosion
- Legume intercropping
- Farmer perceptions survey
- Disease incidence and weed competition
- Consumer preference for Kernza bread

Intercropping Medium Red Clover with Kernza

Intercropping small grain crops like Kernza with legumes can provide benefits including nitrogen fixation and weed suppression. At Musgrave Research Farm, medium red clover (*Trifolium pratense*) intercropping experiments are now in their third year, showing no impact of intercropping on grain yields for the first two Kernza harvests.

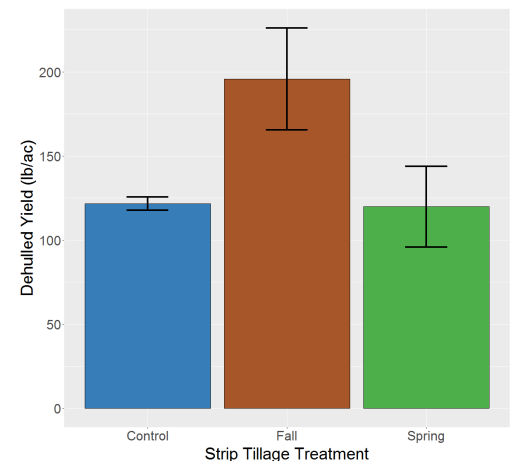
Right: Hand-harvested, dehulled grain yield of two perennial (Kernza and ACE-1 perennial cereal rye) and two annual grain crops, with and without a red clover intercrop. Error bars indicate standard error.



Maintaining Kernza Yields with Strip-tillage

Field trials of Kernza varieties have consistently found large declines in yield by the third grain harvest. Observations suggest that this decline is inversely related to Kernza stand density which increases over time through vegetative reproduction. In an experiment examining the impact of relatively low-disturbance strip-tillage we found that post-harvest strip-tillage in the fall significantly increased grain yield in the subsequent harvest when compared to an undisturbed control.

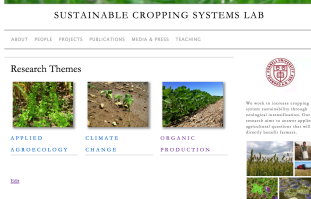
Right: Hand-harvested, dehulled Kernza yields at the first harvest after strip-tillage treatments were applied. Fall tillage occurred in mid-October and spring tillage in mid-April. Error bars indicate standard error.



Dual-purpose grain and forage production

Kernza can be grazed or harvested for high-quality forage in the spring or fall in addition to grain harvest. The straw at grain harvest also contains value for bedding. A survey we conducted of farmers in France

and the US found that 47% of conventional farmers and 69% of organic farmers agreed that they would be interested in perennial grain crops harvested for both grain and forage.



Learn more on our website: <https://blogs.cornell.edu/scslab/>

Questions? Feel free to contact us for more information about this experiment or to hear about our other research. Sustainable Cropping Systems Lab, Sandra Wayman sw783@cornell.edu, Eugene Law epl49@cornell.edu, Dr. Matt Ryan mrr232@cornell.edu. This work was supported by the Cornell University Agricultural Experiment Station (Hatch funds), NE-SARE grant LNE16-351, and NESARE grant GNE17-156.