

2019 MN Kernza® Farmer and Researcher Meeting Summary of Future Research Questions - AGRONOMIC

This document summarizes the agronomic research questions that were brought up at the MN Kernza® Farmer and Researcher Meeting on March 11, 2019.

Note: Not surprisingly, many of the questions that came up have already been incorporated into past or ongoing research in our program. *Research questions that are not yet incorporated into our trials are marked in italics.*

Grain yield and yield persistence (general)

- Increase grain yield
- Maintain grain yield over time
 - Yield decline due to stand density or reproductive physiology as stand ages
- *Regional management recommendations*
- Effect of irrigation
- Effect of plant growth regulators (not allowed in organic)
- Management effects on grain quality
- *Maturation based on GDD or day length*

Establishment

- Seeding rate
 - Plant density required for good yield
- Seeding date
 - Possible to underseed in spring
- Planting depth
- Row spacing
- Appropriate seeders
- Seedbed prep
- *No-till options*

Fertility

- *Lodging cause N rate plateau*
 - *Agronomically optimal N rate change with new varieties*
- *When to top-dress liquid manure*
- *Injecting manure between rows*
 - *Help remove interrow plants and maintain row spacing*
- *Effect of potassium fertility on lodging*

Intercropping

- *Plant Kernza in wider rows to accommodate intercrop*
- *Intercrop with an annual legume that will die and then supply nitrogen (e.g. winter pea)*
- *Plant Kernza on top of a recently killed legume*

Grain harvest

- How to decide when to harvest
- Stubble height when windrowing
- *Cause of yield loss while drying in windrows*
- *How to dry grain*
- Potential to direct combine
- *Use of desiccant to enable direct combining (not allowed in organic)*

Dual-use for grain and forage

- Best management practices
- *How to determine whether a stand is strong enough to withstand a cutting*
- *Harvest forage from spring-seeded stand in establishment year*
- *Effect of N rate on biomass/forage production*
- *Northern limit on dual-use*
- Use of declining stand for forage
- *Yield and quality of “Kernza-lage” (ensiled Kernza biomass)*

Fitting into rotation with standard crops

- *Rotational schedules*
- *Ability to plant later or earlier to fit into rotation*
 - *Planting after maturity group 00.2 soybeans*
- *Interseeding options*
 - *“High-boy” type seeder (e.g., Avenger)*
 - *Aerial seeding/flying on*
 - *Rowbot (autonomous field robot)*

Weed control

- How to control weeds in Kernza
- Benefit of narrow row spacing in organic system
- Effects of intercrops
- *Effects of Kernza on weed seedbank and long-term weed pressure*

Pest issues

- *Ergot susceptibility and management*
- Management to reduce mycotoxin contamination
- *Potential for increased disease pressure in future*
- *Potential for increased insect pressure in future*

Soil health benefits

- Rotational effect on following crops
- Effects of root exudates on building soil OM

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Summary of Future Research Questions - BEYOND AGRONOMICS

The previous pages summarize the agronomic research questions. The discussion also highlighted research needs related to breeding, market development, and supply chains; these priorities (below) were also captured in our notes and other researchers will follow up on them.

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Ecosystem services

- Nitrogen/nitrate retention capacity
 - Change in capacity over time
 - Effectiveness compared to switchgrass, *cereal rye, miscanthus*, etc.
- *Use in buffer plantings* (only in unsaturated buffers, since it does not grow well in saturated soil)
- *Wildlife benefits (birds, insects, gophers, food plots, etc.)*
- Carbon sequestration potential

Economics

- *Impact on long-term profitability of a rotation due to improved soil health*
- *Capture economic benefits of nitrate remediation to support Kernza production*
- *Economics of dual-use*
- *Quantify non-cash benefits*
 - *Reduced input costs*
 - *Enhanced soil structure*
 - *Long-term weed seedbank reduction*
 - *Market potential for carbon, water, wildlife benefits*

Other

- *On-farm storage requirements*
- *Effects of residual herbicide in soil from previous crops*
- Identify additional uses, e.g., for the straw
- *Potential for plugging tile lines*