

The Effects of TerraNu® Fertilizers on Wheat and Barley Production in Northwestern, ND

Compiled February 1, 2024

Trial Design

In 2023, the impact of TerraNu HiP and TerraNu Ignite fertilizer application rate was assessed on multiple fields of Wheat and Barley located in Northwestern, North Dakota.

The first trial was located in Adams County, ND. TerraNu HiP was applied on a hard red spring wheat (WB 9606 and WB 9719 varieties). During application, TerraNu Ignite was variable rate applied with the air drill at an average application rate of 21 pounds per acre and applied on April, 24, 2023. An omission strip, located across the southern portion of the field was used as the control (Image 1).

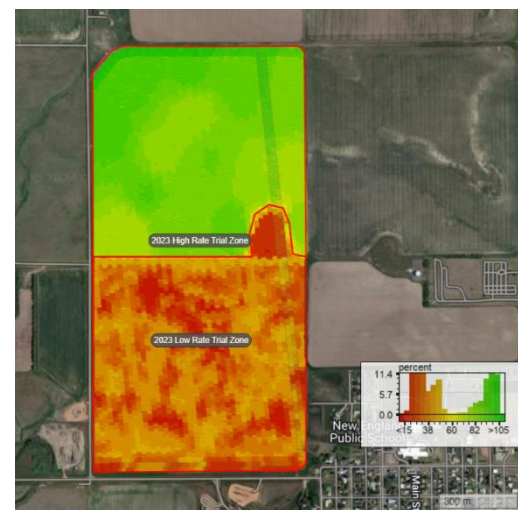
The second trial was located in Hettinger County, ND. TerraNu Ignite was applied at both low and high rates on a Hard Red Spring Wheat (WB 9719 variety), which was planted on May 21, 2023. The target application rate for TerraNu Ignite was 50 pounds per acre in the high treatment zone and 25 pounds per acre in the low treatment zone. TerraNu Ignite was applied as a 50/50 blend with MAP for a total of 100 pounds per acre in the high treatment and 50 pounds per acre in the low treatment (Image 2).

The third trial, also located in Hettinger County, ND, was TerraNu Ignite rate trial on Barley (Carginal Variety). TerraNu Ignite was variable rate applied and data was collected from high and low rates of

Image 1: Control and treatment fertilizer applications and rates for TerraNu HiP trial in Adams County, ND.



Image 2: Aerial image of low and high treatment zones for the TerraNu Ignite trial in Hettinger County, ND.



application (Image 3). The average target application rate for TerraNu Ignite was 24.46 pounds per acre. In the high treatment zone, TerraNu Ignite was applied at approximately 38 pounds per acre. In the low treatment zone, TerraNu Ignite was applied at 18-19 pounds per acre.

Soil and plant tissue samples were collected on June 17, 2023, from all treatment zones and analyzed by Midwest Laboratories. Data was collected from the following soil types: Grail silty clay loam, Wylola silty clay loam, Regent-Wyola silty clay loam, Chama-Cabba-Sen silt loam, and an Amor-shambo loam. Yield data was provided by the producer.

Results

Trial 1 – Hard Red Spring Wheat (Adams County, ND)

Soil (treatment versus control)

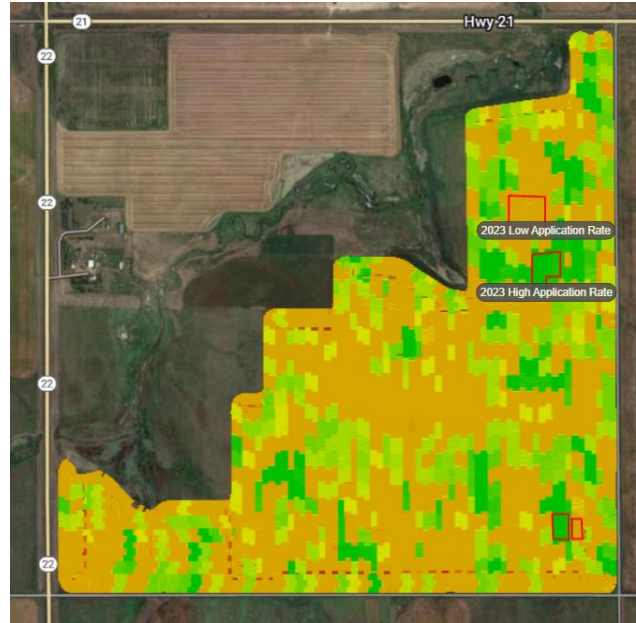
Neutral Ammonium Acetate Extraction

- Organic matter increased 2%
- P1 phosphorus increased 31% (5.4 ppm)
- P2 phosphorus increased 25% (11.4 ppm)
- Potassium increased 10% (35 ppm)
- Sodium decreased 8%
- Zinc increased 27%
- Iron increased 17%

Plant Tissue (treatment versus control)

- Phosphorus increased 6%
- Magnesium increased 5%
- Sulfur increased 5%
- Manganese increased 30%
- Boron increased 14%
- Zinc increased 5%

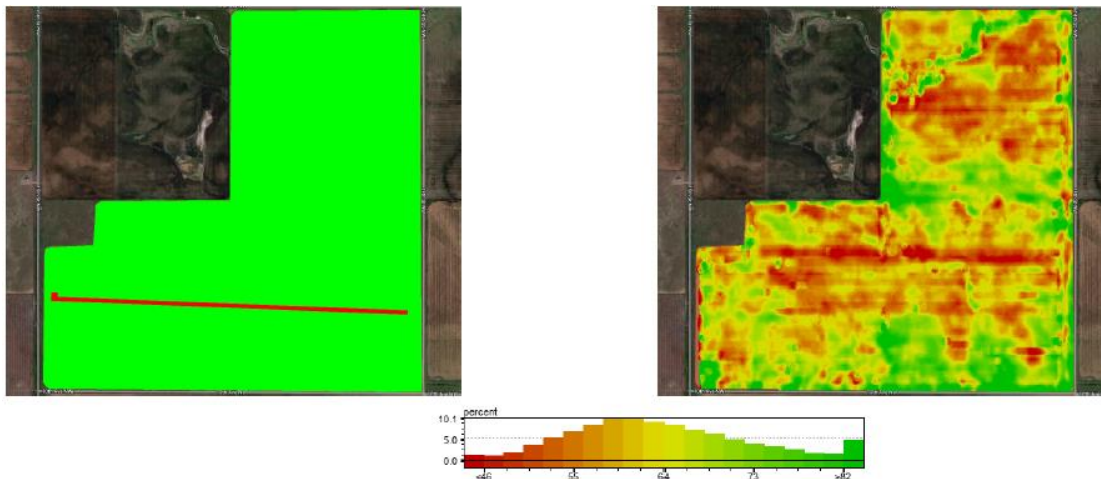
Image 3: Aerial image of TerraNu Ignite application rate map and treatment zones for Barley trial in Hettinger County, ND.



Yield (treatment versus control)

- The average yield in the treatment zone was 63.83 bushels per acre. Yields dropped 4.91 bushels per acre in the control zone to 58.92 bushels per acre (Image 4).

Image 4: Hard red spring wheat trial yield map, Adams County, ND 2023. Zone 1 indicates omission zone where TerraNu HiP was not applied. TerraNu HiP was applied in zone 2 at an average application rate of 21 pounds per acre.



Total Harvested Acres: 451.48
 Whole Field Yield Average: 63.76

Zone No.	Mgmt Zone Name	Range	Zone Name	Data	Avg Moisture%	Avg Yield	HarvestAcres	Area
Zone 1	Yield Comparison	Min - Max	1	None	10.65	58.92 bu/ac	6.57	6.57
Zone 2	Yield Comparison	Min - Max	2	None	11.58	63.83 bu/ac	444.85	446.53

Trial 2 – Hard Red Spring Wheat (Hettinger County, ND)

Soil (high treatment versus low treatment)

Neutral Ammonium Acetate Extraction

- P1 phosphorus increased 51% (13.5 ppm)
- P2 phosphorus increased 93% (55.5 ppm)
- Potassium increased 20%
- Sulfur increased 8%
- Copper increased 21%
- Boron increased 150%

Saturated Paste Extraction

- Nitrate nitrogen increased 117%
- Phosphorus increased 53%
- Potassium increased 20%
- Calcium increased 71%
- Magnesium increased 45%
- pH increased 12% (5.57 to 6.22)

Plant Tissue (high treatment versus low treatment)

- Nitrogen increased 13%
- Phosphorus increased 10%
- Magnesium increased 27%
- Calcium increased 11%
- Sulfur increased 9%
- Iron increased 11%
- Boron increased 140%
- Copper increased 17%
- Zinc increased 13%

Yield (high treatment versus low treatment)

- Average yield increased 33% between the high and low treatment zones.
 Wheat yields increased 20.15 bushels per acre (Image 5).
 Average yield in the high treatment zone was 130.90 bushels per acre.

Image 5: Hard red spring wheat trial yield map, Hettinger County, ND 2023. TerraNu Ignite and MAP was applied in Zone 1 as a 50/50 blend at an average application rate of 50 pounds per acre. TerraNu Ignite and MAP was applied in Zone 2 as a 50/50 blend at an average application rate of 100 pounds per acre.



Total Harvested Acres: 308.98
 Whole Field Yield Average: 113.81

Zone No.	Mgmt Zone Name	Range	Zone Name	Data	Avg Moisture%	Avg Yield	HarvestAcres	Area
Zone 1	2023 Trial Zone 2 of 2	Min - Max	1	None	11.47	98.53 bu/ac	163.08	162.99
Zone 2	2023 Trial Zone 2 of 2	Min - Max	2	None	12.81	130.90 bu/ac	145.83	146.00

Trial 3 – Barley (Hettinger County, ND)

Soil (high treatment versus low treatment)

Neutral Ammonium Acetate Extraction

- P2 phosphorus increased 46%
- Bicarbonate phosphorus increased 54%
- Manganese increased 50%
- Iron increased 23%
- Copper increased 50%

Saturated Paste Extraction

- pH decreased 6% (7.35 to 6.92)
- Sulfur increased 40%
- Calcium increased 6%
- Boron increased 15%

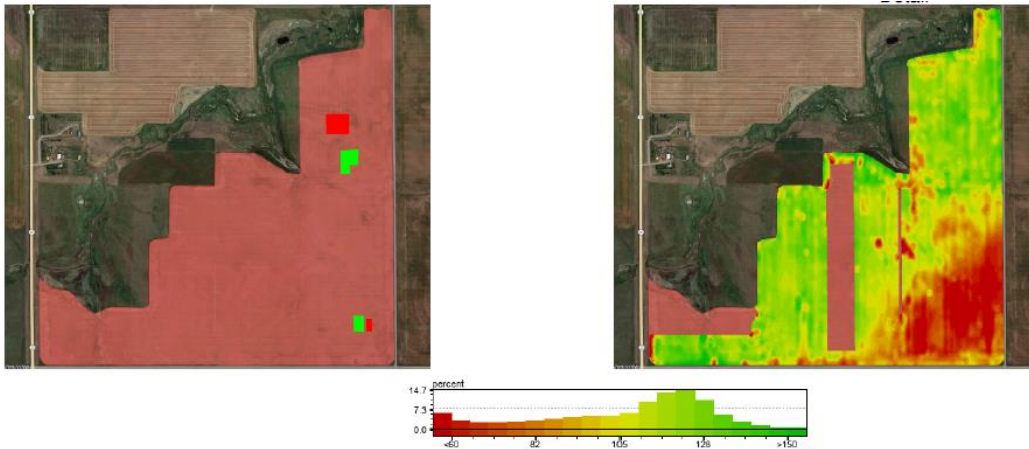
Plant Tissue

- Calcium increased 3%
- Nitrogen decreased 15%
- Phosphorus decreased 13%
- Potassium decreased 11%

Yield

- Average yield in the low treatment zone was 119.17 bushels per acre. Yields decreased 18.93 bushels per acre in the high treatment zone to 100.24 bushels per acre (Image 6).
 - While a yield reduction is not a favorable outcome, it does highlight the importance of the right rate based on crop variety and soil conditions. When utilizing high efficiency fertilizer, less can be more.

Image 6: Barley trial yield map, Hettinger County, ND 2023. TerraNu Ignite was applied in Zone 1 at an average application rate of 18-19 pounds per acre. TerraNu Ignite was applied in Zone 2 at an average application rate of 38 pounds per acre.



Total Harvested Acres: 273.56
 Whole Field Yield Average: 106.49

Zone No.	Mgmt Zone Name	Range	Zone Name	Data	Avg Moisture%	Avg Yield	HarvestAcres	Area
Zone 1	Yield Comparisson	Min - Max	1	None	11.84	119.17 bu/ac	2.55	2.57
Zone 2	Yield Comparisson	Min - Max	2	None	11.62	100.24 bu/ac	2.41	2.46