



NutrientStar

Protocols for conducting production-scale field trials to evaluate nutrient use efficiency products and tools





Data required per trial:

- ★ Location (lat/long preferred)
- ★ Previous crop
- ★ Tillage
- ★ Rainfall (when/amount)
- ★ Tile drainage in plot area
- ★ Fertilizer applied (timing, rate, form, placement)
- ★ Soil (type, texture, organic matter, pH)
- ★ Temperature (when/ value)
- ★ Yield (from calibrated yield monitor)
- ★ Other events impacting plot results



General Protocols for Replicated Strip Trials to Evaluate Fertilizer Efficiency Products and Models

- Fields with long, straight rows are best for strip trials. A length of 1/4 to 1/2 mile is preferred, but shorter row lengths are acceptable. If possible, choose an area in the field with less soils and slope variability.
- The width of treatment strips should match the width of the combine or a multiple of the width of the combine. Harvest should be completed by making at least one pass through a strip without mixing grain from two treatment strips.
- To increase accuracy of the results, especially where the rows are shorter than 1/4 mile, the treatment strips should be two passes wide. The yield monitor should be set for loads or regions to identify the different strips.
- If a trial will be placed in a field for two years in a row, or every other year in a corn soybean rotation, the trial areas from the different years should not overlap.
- Fertilizer applicators should be calibrated before applying treatments.
- Yield monitors on combines should be calibrated before harvesting the strips.

Trials for Products to Increase Fertilizer Efficiency



Protocols to Evaluate Products to Increase Fertilizer Efficiency



The minimum requirement is two treatments applied in strips across the field. The fertilizer should be applied at the same time with the same placement and in the same form. Replicate 4 times across the field or 3 as a minimum. (See next slide #6).

- Treatment 1 should be 50 to 70% of the farmer's normal rate of fertilizer without use of the product being evaluated
- Treatment 2 should be the same rate of fertilizer as applied in Treatment 1 with use of the product being evaluated

A reduced rate of fertilizer is required to increase the probability of measuring a benefit from the fertilizer efficiency product.

Two additional treatments at a rate of fertilizer 30 to 50% of the farmer's normal rate with and without the fertilizer efficiency product would provide more complete information.



Two-Rate Trial for products

Plot with 2 treatments
(No VRT App Equip.)

Rep. 1		Rep. 2		Rep. 3		Rep. 4	
Farmer Normal Rate	Tool Recommendation	Tool Recommendation	Farmer Normal Rate	Farmer Normal Rate	Tool Recommendation	Farmer Normal Rate	Tool Recommendation
1	2	3	4	5	6	7	8

AREA OF SINGLE VARIETY



Trials for Computer Models that Predict Rate of Sidedress N for Corn





Protocol for RATE trials to Evaluate Computer Models that Predict Rate of N Sidedress for Corn

The minimum requirement is two rates of N applied in strips across the field (more complete information would be gained from 4 rates). The N should be applied at the same time with the same placement and in the same form. Replicate 4 times across the field or 3 as a minimum.

- For two-rate trials, one rate should be the farmer's typical rate of N and one the model recommended rate. There should be 25-50 lbs/acre difference between the rates to obtain the most useful information. (Slide 9)
- For four rate trials, two designs are often used:
 - One design is achieved by adding and subtracting 50 lbs N/acre from the farmer's normal rate. (Slide 10)
 - The other design has rates of 100, 150, 200 and 250 lbs N/acre or 0, 50, 100, and 150 lbs N/acre if a manured field. This design of trial is the one most commonly used by NutrientStar to evaluate models for improving N rate decisions. (Slide11)



Two-Rate Trial

Plot with 2 treatments
(No VRT App Equip.)

Rep. 1		Rep. 2		Rep. 3		Rep. 4	
1	Farmer Normal Rate	2	Tool Recommendation	3	Tool Recommendation	4	Farmer Normal Rate
5	Farmer Normal Rate	6	Tool Recommendation	7	Farmer Normal Rate	8	Tool Recommendation

AREA OF SINGLE VARIETY





Four-Rate Trial – Plus/Minus 50 pounds of N/acre

Plot with 4 treatments
(No VRT App Equip.)

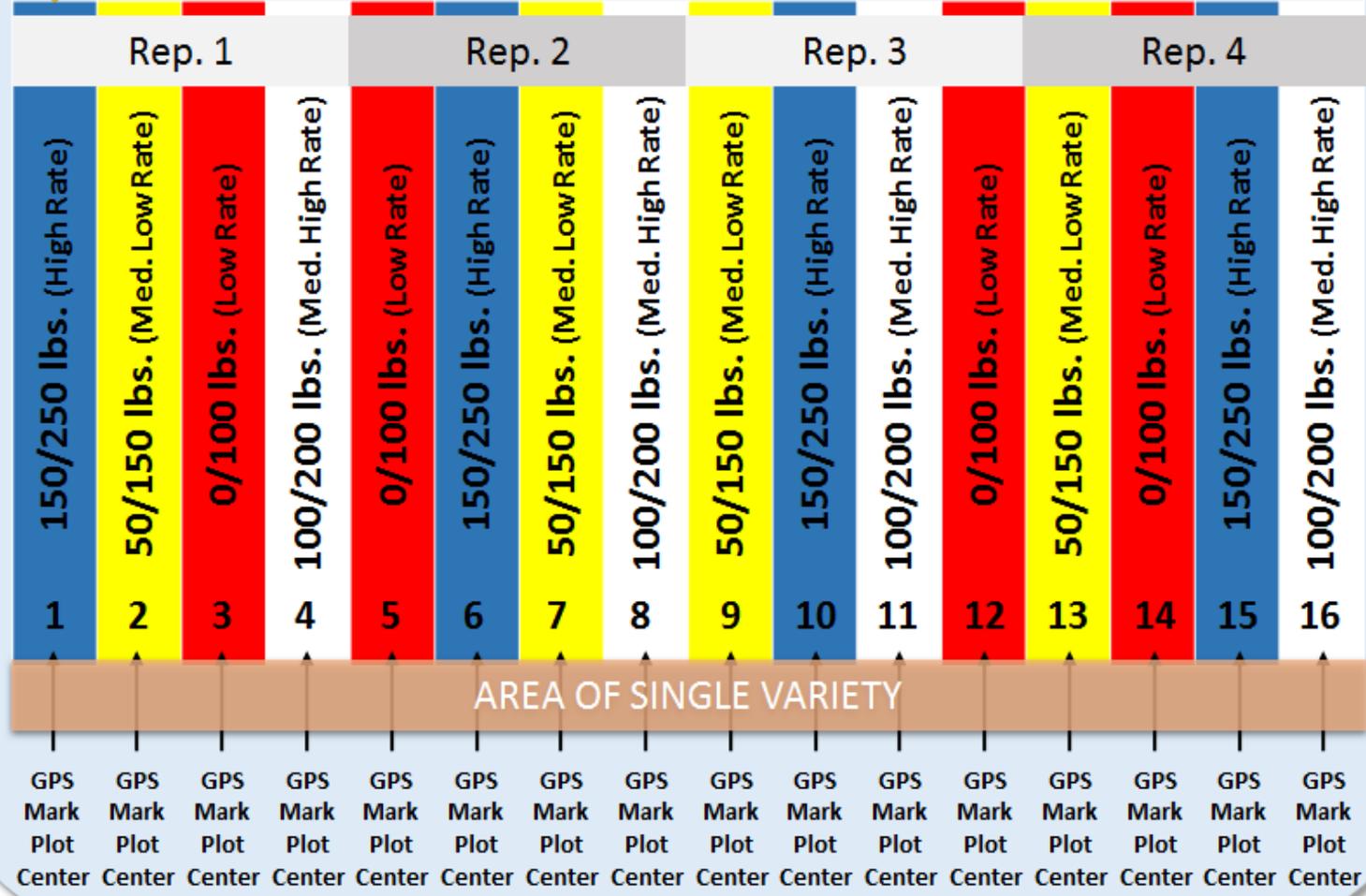
Rep. 1				Rep. 2				Rep. 3				Rep. 4																			
1	Farmer Normal Rate +50	2	Farmer Normal Rate	3	Tool recommendation	4	Farmer Normal Rate -50	5	Tool recommendation	6	Farmer Normal Rate +50	7	Farmer Normal Rate	8	Farmer Normal Rate -50	9	Farmer Normal Rate	10	Farmer Normal Rate +50	11	Farmer Normal Rate -50	12	Tool recommendation	13	Farmer Normal Rate	14	Tool recommendation	15	Farmer Normal Rate +50	16	Farmer Normal Rate -50

AREA OF SINGLE VARIETY



4 Rate Design- 100, 150, 200, 250 lbs N/acre Or 0, 50, 100, 150 lbs N/acre if manured field

Harvest
2 Pass Min.
Applicator





Advantages and disadvantages of 4 N rate trials from 100 to 250 or 0 to 150 pounds of N/acre in 50 pound steps

Advantages

1. Provides information to separate trials into 3 categories of responsiveness to N, which cannot be done with trials not having a large separation in N rates
2. Category 1 = no yield response when N rate greater than 100 lbs/acre
3. Category 2 = yield response between 100 and 250 lbs N/acre
4. Category 3 = yield response greater than 250 lbs N/acre
5. Enables calculation of economic optimal N rates for trials in Category 2.

Disadvantages

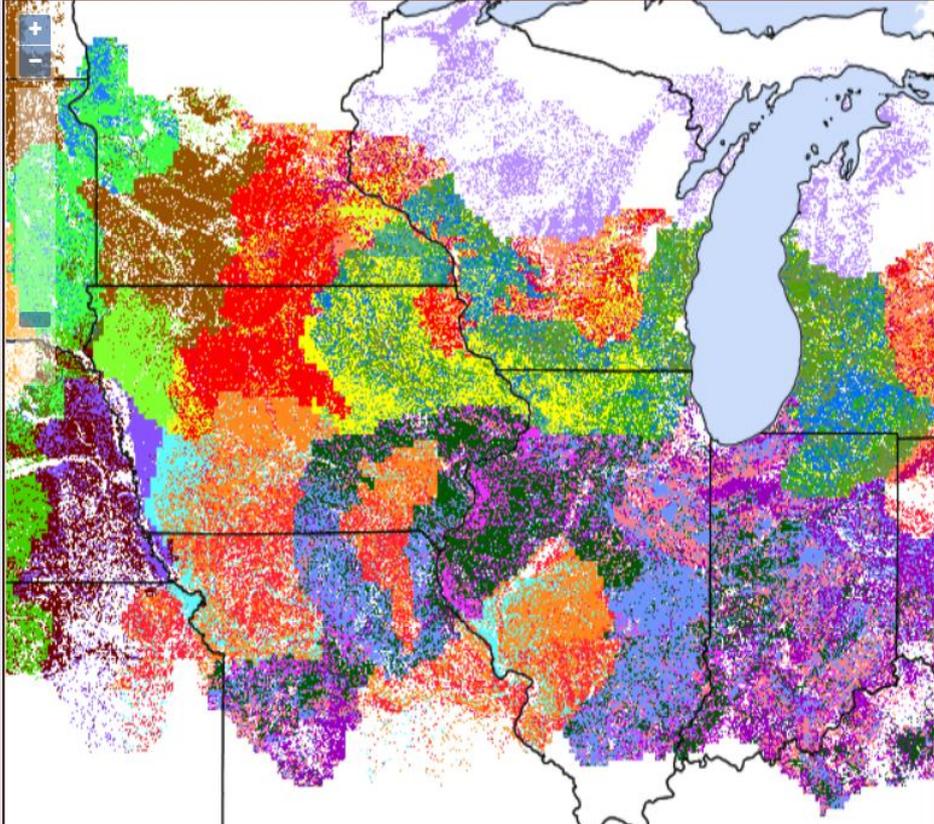
1. More difficult to run and to analyze compared with a two-rate trial
2. Does not allow a direct comparison of farmer rate to model rate; comparison is made using relationship between yield and N rates
3. In some years up to 50% of trials can be in categories 1 and 3, which makes comparisons of benefits from model rate with farmer rate limited; however, much useful information about N response in fields is still obtained.

Use TED geospatial framework as a guide to site trials:



<http://nutrientstar.org/about-teds/>

Selected TEDs cover 70.3% (60709456 acres) of corn area in central/easte..



Select TEDs with corn area

Select TEDs by:

Target corn area:

Corn mask : Apply corn mask

Additional selection by TED climate-soil attributes:

Soil water storage ⓘ :

Growing degree days ⓘ :

Selected TEDs:		Corn area	TEDs description
<input type="checkbox"/>	TED	Corn area (ac.)	% of corn area
<input checked="" type="checkbox"/>	504803	5340078	6.2%
<input checked="" type="checkbox"/>	604803	5143672	6.0%
<input checked="" type="checkbox"/>	603603	4212234	4.9%
<input checked="" type="checkbox"/>	604603	3672984	4.3%
<input checked="" type="checkbox"/>	603703	3076609	3.6%



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