

## Nutrient Management

The Iowa Soybean Association (ISA) On-Farm Network® (OFN) nutrient management research ranged from inoculant and non-traditional amendment studies in soybeans to variable rate nitrogen (VRN) studies in corn. The purpose of this research is to understand practical ways farmers can contribute to the Iowa Nutrient Reduction Strategy, increase yields or reduce unnecessary input costs.

### Novel Soybean Inoculants

Co-inoculation in soybeans is a phenomenon reported in scientific literature. Rhizobia are stimulated to increase nodule number and size by the presence of another nitrogen fixing bacteria called azospirillum. The product “New Tech SI IF” contains azospirillum and a unique formulation and strain of rhizobia inoculant. This product was applied in-furrow to soybeans in replicated strip trials in 2018.

The yield response to co-inoculation ranged from 1.6 to 4.1 bu/acre with an average response of 2 bu/acre (Table 1). At a product cost of \$4.00/acre, New Tech SI IF represents an opportunity for a positive return on investment, but more testing is necessary. The complication with New Tech SI IF is that it must be applied in-furrow in contact with the seed, but seed treatment formulations are available.

**Table 1. Soybean response to co-inoculation using the product New Tech SI IF.**

| Location | New Tech SI In-Furrow     | Untreated Check | Difference | Pr>t |
|----------|---------------------------|-----------------|------------|------|
|          | -----yield (bu/acre)----- |                 |            |      |
| 101      | 69.1                      | 65.0            | 4.1        | 0.03 |
| 102      | 70.3                      | 67.9            | 2.4        | 0.06 |
| 113      | 65.2                      | 63.7            | 1.6        | 0.16 |
| Average  | 67.6                      | 65.6            | 1.9        | 0.02 |

### Nitrogen in Corn Studies

One of the popular protocols with OFN participants is the five-rate nitrogen study. The purposes of this study are to help farmers refine their nitrogen rates based on local data generated from similar soils and conditions to their farms as well as to understand best practices when creating management zones for variable rate nitrogen (VRN). In 2018, there were 12 locations of this study across the major land form regions of Iowa.

Figure 1 illustrates examples of the different rate responses in the 2018 trials. Note the optimum rate for corn following soybeans at a northwest Iowa location was 170 lbs nitrogen/acre, while the optimum rate for corn after corn at a central Iowa location was near 220 lbs nitrogen/acre. This data is available to help farmers fine tune their nitrogen rates on a more local level. Summaries of yield responses to nitrogen rates can be found at on the [ISA website](#).

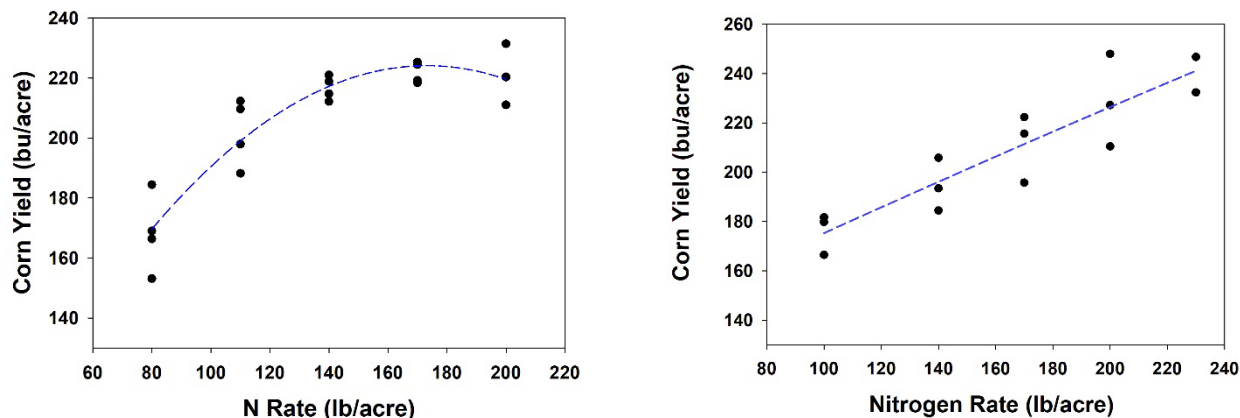


Figure 1. Examples of nitrogen response by location and crop rotation. Left: Rate response in northwest Iowa for corn following soybeans. Right: Rate response to nitrogen for corn following corn in central Iowa.

From the OFN studies, there is significant potential for variable rate nitrogen applications on farms where there is large variation in soil types and yield levels. The biggest problems with VRN application the OFN team noticed were that farmers may not know how to create nitrogen response zones on their farms and what rates to place in which nitrogen response zone. To solve these problems, the Climate Corporation has developed a decision aid for farmers in creating management zones along with nitrogen rate recommendations for the individual zones. In this research, the OFN tested the Climate Corp. approach to VRN nitrogen versus standard, single-rate applications at eight locations in 2018.

At four of eight study sites, there was a significant profit and yield advantage for the Climate Corp. nitrogen tool (Table 2). At one of the eight sites there was a large profit disadvantage for the Climate Corp. tool. At this location, the farmer’s standard rate was considerably greater than the rate recommended by the Climate Corp. model. Data from this site will be used by Climate Corp. to tweak and improve their model. The other sites realizing a negative profit advantage were farms with more uniform soils where the costs savings from VRN were not enough to overcome the costs of the prescription.

Generally, OFN is optimistic about the potential of the Climate Corp. VRN tool on farms with non-uniform soils and yield levels. We plan to continue this research in 2019.

Table 2. Responses to Climate Corporation VRN tool at eight Iowa locations in 2018.

| Location      | Climate VRN               | No-VRN | Difference | pr>F  | Profit (\$/A) |
|---------------|---------------------------|--------|------------|-------|---------------|
|               | -----Yield (bu/acre)----- |        |            |       |               |
| ST2018IA0097A | 195.5                     | 192.8  | 2.7        | 0.92  | -1.9          |
| ST2018IA0097B | 200.0                     | 195.3  | 4.7        | 0.36  | 5.6           |
| ST2018IA0098  | 200.2                     | 195.9  | 4.3        | 0.57  | 18.8          |
| ST2018IA0149  | 170.1                     | 169.0  | 1.1        | 0.4   | 1.7           |
| ST2018IA0150  | 149.5                     | 141.0  | 8.5        | 0.006 | 9.0           |
| ST2018IA0195  | 153.6                     | 149.6  | 4.0        | 0.03  | 26.0          |
| ST2018IA0196  | 224.7                     | 237.3  | -12.6      | 0.12  | -46.0         |
| ST2018IA0227  | 196.4                     | 193.9  | 2.5        | 0.92  | -5.8          |
| Average       | 186.1                     | 184.4  | 1.9        | 0.0   | 0.9           |