EFAO
ECOLOGICAL FARMERS ASSOCIATION OF ONTARIO

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Efficacy of Advancing Eco Agriculture (AEA) products as an alternative fertilizer source for field corn

FARMER-RESEARCHER

Larry Dyck, Campden Grain

FUNDING

The McLean Foundation

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IN A NUTSHELL

Larry combined alternative fertilizers with synthetic nitrogen sources for field corn production in order to determine the yield and economics, relative to synthetic fertilizers alone.

- Larry's results showed that yields decreased when he used the mix of alternative and synthetic fertilizers.
- Although there was some cost savings with the treatment protocols, the cost savings per acre could not justify the yield decrease compared to synthetic fertilizers alone.
- Overall, Larry's trial demonstrates the power of farmer-led research for testing products for your own farm.

MOTIVATION

When Larry learned from a researcher during a talk that only approximately 40% of nitrogen (N) is taken up by plants with the rest lost due to volatilization and runoff, he was very motivated to look into ways to increase N efficiency on his farm. After referencing podcasts by John Kempf about reducing N and Nicole Masters' book *For the Love of Soil*, he decided to trial the use of biologicals and alternative fertilizers for his grain crops. In 2023, he used Johnson Su biologicals and observed good results, which led him to want to trial the efficacy of Advancing Eco Agriculture (AEA) products as alternative fertilizers.

Photo 1. Planting into established cover crop mix

METHODS

On May 20th, Larry planted Pride A6572G2 field corn in a randomized block design with three treatments and six replicates each, for a total of 18 plots. There was one long section of the farm that was wide enough to support the trial, but it had a long taper, meaning the plot sizes were not equal and ranged in size from 1.5 to 2.21 acres and totaled 35.14 acres.

With a 16-row planter, he planted into a dense stand of overwintered cover crop mix that included crimson clover, hairy vetch, Vivant turnips and some overwintered Austrian winter peas, and used GPS-guided machinery to define and maintain the strips.

Each block contained three treatments, as outlined in **Table 1.**

Table 1. Fertilizer treatments applied to each block

STANDARD RATE OF N FERTILIZER	30% REDUCTION OF N FERTILIZER WITH ALTERNATIVE SOURCES	50% REDUCTION OF N FERTILIZER WITH ALTERNATIVE SOURCES
• 45 gallon/ac Urea • Ammonium Nitrate (UAN) • 10% of total solution of • Ammonium Thiosulfate (ATS)	• HumaCarb 3% of total solution • Rebound Molybdenum, 500 ml/ac • ATS 10% of total solution • Balance 28% UAN • Total solution applied, 31 gal/ac	• Huma Carb 3% of total solution • Rebound Molybdenum, 500 ml/ac • Rejuvenate 3% of total solution • ATS 10% of total solution • Balance 28% UAN • Total solution applied 23 gal/a

When Larry interseeds into covers, like in this trial, his standard N program is 50 lbs N at planting time and another 90 lbs at side-dressing time. For this reason, Larry fertilized all plots with 50 lbs of N at planting and the supplemental fertilizer mixes for the treatment plots. The rate adjustments with their second application of the supplemental alternative fertilizer mixes, occurred during side-dressing at the 4-6 leaf stage. Larry also interseeded cover crop at this stage.

AEA recommended he replace 10% of N with ATS, which he adopted across the treatments. Larry accomplished this by preloading the nurse truck with 10% ATS and then filling the remainder of the tank with UAN. The standard N treatment also included Excellis Max, an N stabilizer.

All three treatments received AEA's dry seed inoculant, Biocoat Gold. In hindsight, Larry noted they could have skipped applying BioCoat in the standard treatment. He also noted at planting that the HumaCarb product needed pre-filtering in order to flow through the planter more effectively.

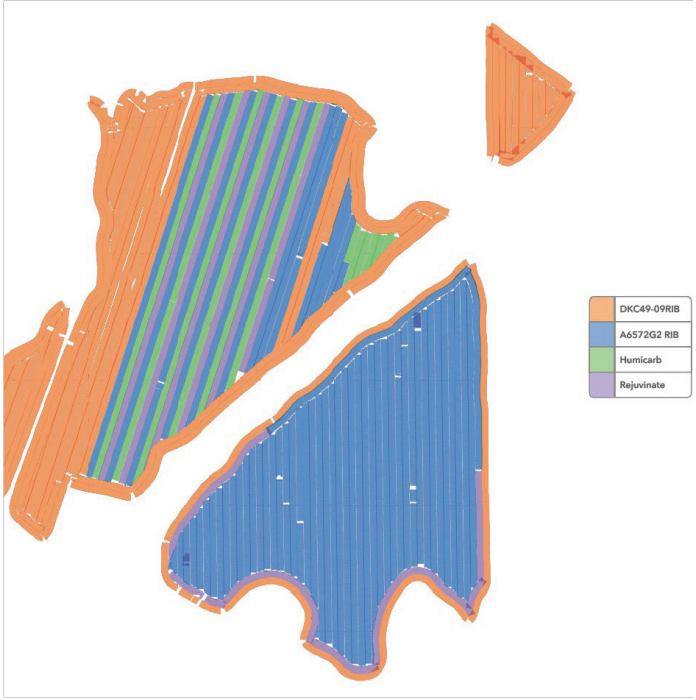


Figure 1. Map of Larry's planting.
Blue: standard treatment.
Green: 30% reduction in N with alternative fertilizers.
Purple 50% reduction in N rate with alternative fertilizers.

DATA ANALYSIS

To evaluate the effect of 30% and 50% N reduction with additional supplemental fertilizers on field corn yield, we used a statistical model called analysis of variance (ANOVA) with a 95% confidence level to calculate the least significant difference (LSD). When the difference between two treatment means is greater than the LSD, we can conclude that there's a consistent difference between two treatments 95% of the time. We could make these statistical calculations because Larry's experimental design involved replication of treatments with six blocks.

FINDINGS

Larry's trial measured the weight of yield for each strip separately and, from each strip, took a sample for test weight. He also evaluated crop profitability of the plots by determining the cost to fertilize and the gross return.

The plots with the standard rate of synthetic N fertilizer applied had significantly greater yield than the treatment plots with reduced N plus alternative fertilizer treatments, both in terms yield (bu/acre) and total test weight (g/0.5L).

YIELD

- Fertilization at the standard rate yielded the highest with high statistical confidence (P=0.00002).
- Fertilizing at 50% reduction with AEA yielded the lowest, but was statistically indistinguishable from the 30% reduction treatment (**Figure 1**).

TEST WEIGHT

- Test weight was high across all plots.
- Test weight with standard fertilization was significantly higher than the 50% reduction but indistinguishable from the 30% reduction treatment (P<0.005), see **Figure 2**.

Photo 2. Field corn at side-dressing time.

Figure 1. Yield (bu/acre) by treatment

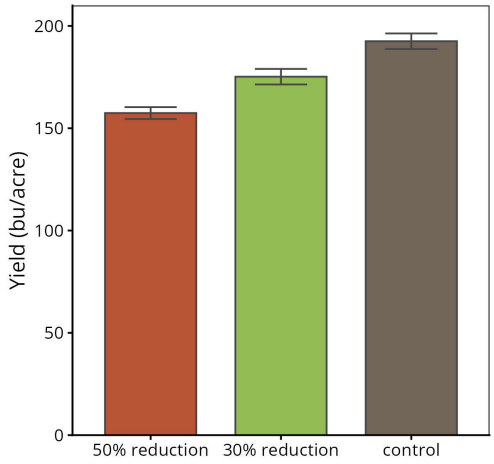
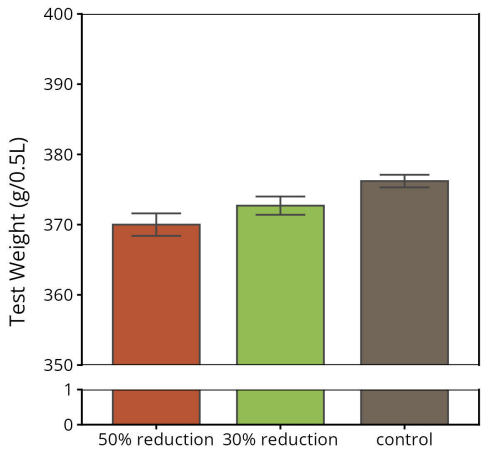


Figure 2. Test weigh (g/0.5 L)) by treatment



PARTIAL PROFITABILITY ANALYSIS

Larry sold his corn for $6.27/bu on November 28, 2024.

- The standard N rate cost $115.72 per acre.
- The 30% and 50% N reduction treatments cost were $107.70 and $106.31 per acre, respectively.
- AEA treatments resulted in approximately $10 per acre in savings over his standard N program, but this was not enough savings to make up for the loss in yield.

Table 2. Crop profitability of corn plots

TREATMENT	AVERAGE YIELD (BU/ACRE)	AVERAGE GROSS REVENUE @ $6.27/BU (PER ACRE)
Control	192	$1203
30% Reduction + AEA	175	$1097
50% Reduction + AEA	157	$984

NEXT STEPS

Larry is still dedicated to finding solutions to improving N efficiency at Campden Grain. In 2025, he participated in EFAO's EFAO's Adaptive Nitrogen Trials. He is intrigued by the broader conversation of farms growing their own N, but consistency is an on-going challenge.

TAKE HOME MESSAGE

Larry had high hopes this trial would contribute positive data about these products, and felt disappointed with the product's lackluster performance. AEA products don't appear to work for Larry's farm, and the reason for this remains unclear.

When he consulted with AEA, the company theorized that the farm's clay soil may "not have the present biological capacity to facilitate the conversion of nitrogen fertilizer to organic nitrogen at a significant enough level to make up for the reduced fertilizer rates" and suggested that wet years, like 2024, could exacerbate this effect. However, they confirmed that few people had tested their products in rigorous trials and had no test data to share about the interactions of soil type—or the product's efficacy in general.

Campden Grain utilizes soil health practices like cover cropping and reduced tillage, which Larry believes supports the conditions for good soil biology on their farm. Another reason for negative response, therefore, may be the fields need more time for microbial communities to adapt to alternative fertilizers. However, testing an potential lag period is more suitable on a research farm where maintaining crop profitability is not at play.

Overall, Larry's trial demonstrates the power of farmer-led research for testing products for your own farm "so you know what you know"—as Dick Thompson, farmer-researcher and co-founder of Practical Farmers of Iowa, would say.

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