INNOVATION GRANT PROGRESS REPORT

PROJECT TITLE: Comparing "Living Carbon" fertility program to my commercial fertilizer program
REPORTING PERIOD: 12-31-22
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1.) PROJECT ACTIVITIES COMPLETED DURING THE REPORTING PERIOD. Year 2 for comparing a composted fertility amendment product (Living Carbon) to my commercial fertilizer program. Looking at yield comparisons in corn and soybeans, soil test results in treated zones vs untreated, economic bottom line, environmental advantages.

2.) IDENTIFY ANY SIGNIFICANT FINDINGS AND RESULTS OF THE PROJECT TO DATE. This was year one for corn in the south trial zone following soybeans in 2021. GDU growing conditions in 2022 were similar to 2021. Soil root zone moisture was recharged with 8" of moisture during March and April. Limited rainfall events during May and June created very dry topsoil conditions similar to 2021. Limited but timely rainfall events occurred in July and August. Growing season total rainfall from planting through August was about 12". Significant surface compaction created by a very heavy rainfall event on April 27 delayed planting by 10 days and created variable planting and emergence conditions in the corn zones. This resulted in challenges creating more localized yield variability for the corn crop within the trialing area.

Living Carbon (LC) was applied in late December at 500 lbs./acre along with 1000 lbs. of beet lime/acre. One pass with a standard field cultivator was done just prior to the April 27 heavy rainfall event. 102, & 108 day RM Syngenta hybrids were planted in the trialing area at 35,000 ppa on May 8. Herbicide program was Acuron pre fb Acuron post + Syngenta fungicide at V4-V5. A second application of a Syngenta fungicide was applied at late R1-early R2.

Because the Nitrogen plan was switched from spring UAN to fall anhydrous + N Serve we were unable to easily yield check several different N rates for 2022. However, based on 2021 N trial results, a decision to cut the total commercial N rate back from 160 lbs./acre to 100 lbs./acre and supplement additional N using variable rate technology in conjunction with pre-side dress soil testing done in mid-June. Three Y-drop management zone rates were established at 10, 15 & 20 gal. rates. The average rate applied was 15 gal./acre giving a N field average of 145 lbs./acre applied. We are still working to overlay yield data with the Y-drop zones in an attempt to validated additional N rates. One yield check was completed where an additional 25

lbs. of UAN was applied at planting had no additional yield resulting in a negative ROI. No standability or harvestability differences were noted across the different N management zones.

Only one Living Carbon side by side yield trial is listed, due to the April 27 rainfall affecting soils and emergence variability within the trialing zone. Row length was 865'.

Commercial fertilizer check 246.9 bu.
LC check 249.5 bu.

Additional trials conducted within the corn LC trialing zone;
LC + 2 gal. starter check 246.9 bu.
LC + 2 gal. starter + biological 249.5 bu.

Acuron fb HalexGT 229.6 bu.
Acuron fb Acuron 235.6 bu.

V5 fungicide 231.4 bu.
No V5 fungicide 224.9 bu.

This was year one for soybeans in the north trialing area and year 2 for the Living Carbon (LC) treated area vs untreated areas on each side of the treated zone. 750 lbs./acre Living Carbon (LC) applied late December 2021. Fall chisel plow fb spring disc tillage.
Soybean planting was slightly delayed. Stand uniformity and yield uniformity were very good within the trialing area and field in general. Overall yield for the soybean trialing area was slightly better than 2020 & 2021 bean crop. A new 1.4 RM XtendFlex Syngenta variety was planted in 30" rows at 140,000 ppa on May 16th. Metolachlor pre, fb Glufosinate + Metolachlor @ 35 dap, fb Glyphosate rescue for lambsquarter escapes 55 dap fb Syngenta fungicide + custom made hormone biological package + aphid insecticide applied 75 dap.

Of significant interest within the soybean trialing block the average yield checks for the Living Carbon (LC) fertility program vs no Living Carbon applied were all lower yielding. I attribute this to increased lodging which incurred during the August grain fill period. Soil test levels for P are significantly higher within the 2nd yr. Living Carbon (LC) block vs outside the zone of application. In addition, elevated Sulfur levels along with extra available nitrogen probably exacerbated the lodging & higher disease pressure issue which slightly depressed yield. The topic of how much is too much N,P&S fertility for soybeans is under discussion with my LC supplier/sales agronomist.

Check area #1 (row length was 420')
Commercial fertilizer + 2 gal. starter 69.3 bu.
LC with 2 gal. starter + bio product 67.7 bu.
LC no starter 64.1

Check area #2 (row length was 420')
LC with + 2 gal. starter + bio product 62.3 bu.
Commercial fertilizer ck + 2 gal. starter + bio product 66.3 bu.

A second starter fertilizer trial area with zones of high pH (8-8.2) medium to high fertility area of the field with little or no previous manure history - the first year LC application in Dec. 2021 - adjacent to the yr. 2 trialing block area with a row length of 870' - had the following results;

No starter ck	65.7 bu.
2 gal. starter + a bio product	67.1 bu.
4 gal. starter + a bio product	67.4 bu.
2 gal. starter	66.1 bu.
No starter ck	64.8 bu.

Of particular interest in this trialing area was noticeable yield stability within the high pH zones.

Comparing soil fertility & soil health metrics for the past two years are showing;
Generally speaking, we are seeing improvement in both water soluble and mineralized macro nutrients in the LC zones. P & K fertility in general, is improving in both very high fertility and medium fertility zones. Ca/Mg ratios are improving as well.

Economic advantage goes to the Living Carbon acre. Current price comparisons have the LC acre running about 40% less cost the standard nutrient crop replacement dry fertilized acre. Additionally, 10% reduction in applied Nitrogen also adds to the bottom line with the LC acre.

Environmental impact advantage also goes to the Living Carbon acre. Less applied commercial nitrogen creates less GHG contribution as well as the potential for less N losses through tile drainage. Establishing the optimum nitrogen rate is under discussion with the LC sales agronomist. Elevated P levels could potentially elevate P loss risk through surface and subsurface run-off.

3.) CHALLENGES ENCOUNTERED. Validating the spread zones vs untreated zone for accurate yield comparisons – Actual spreading was done when I was not present so I had to rely on the applicator understanding of the map and flags with the field.
The Living Carbon program recommends incorporating the soil amendment shortly after application to minimize microbial solar radiation mortality and this is impossible with late December application.
Will results from a wetter than normal cropping season be different from the past two drier than normal years?

4.) EDUCATION AND OUTREACH ACTIVITES. *Local one on ones with neighbors*

5.) HOW CAN WE HELP?