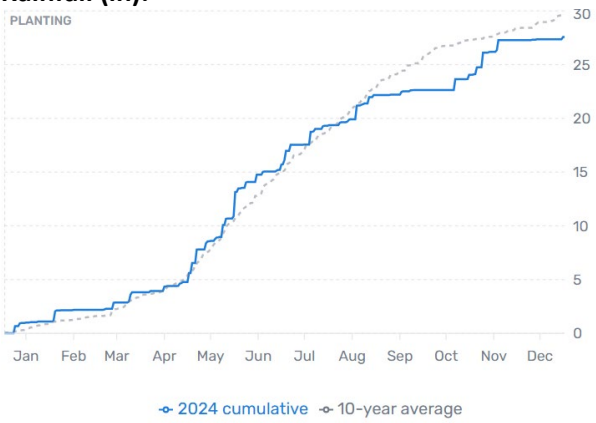
Increasing Organic Matter in Non-Irrigated Cropping Systems

Study ID: 0720129202401
County: Nuckolls
Soil Type: Hastings silt loam 0-1% slope
Planting Date: /25/23
Harvest Date: 7/12/24
Seeding Rate: 90 lbs/ac
Row Spacing (in): 7.5”
Variety: WestBred® 4422
Reps: 4
Previous Crop: Corn silage
Tillage: No-till
Herbicides: ***Pre:*** Ally® XP
Foliar Fungicides: Trivapro®
Fertilizer: 85 lbs/ac N spring applied

Irrigation: None
Rainfall (in):



Introduction: The goal of this family farm is to increase organic matter on this non-irrigated field. This is Year 1 of a long-term study to determine the impacts of using biological products with and without the use of cover crops. Two other on-farm research studies (early season interseeded cover crops) showed an increase in organic matter with the use of a biological product with cover crops. This study seeks to test if the results can be repeated on this farm.

Four products were tested:

- Untreated Control
- H-Pro 20 at 2 qt/ac (H-Pro 20 is an organic acid containing humic and fulvic acids)
- WC814F bio stimulant at 8 oz/ac (WC814F is an experimental bio stimulant)
- PrairieFood™ at 15 gal/ac (PrairieFood™ is a soil amendment to feed soil microbes)

Winter wheat WestBred® 4422 was planted Sept. 25, 2023, at 90 lb/ac. Prior to top-dressing the wheat with fertilizer, the bio stimulant products were added to the plot at Feekes 5 on April 12, 2024. Haney and PLFA soil tests were compiled from the 4 reps of each treatment on April 17, 2024. Data is shown in Table 1. After wheat harvest, a multi-species cover crop was drilled into half of the plots at 43 lb/ac on July 22, 2024. The cover crop consisted of 23.16% BMR Sorghum Sudan, 14.01% Pearl Millet, 45.88% Cow Pea, and 14.91% Radish by weight. For the purposes of the yield results, the cover crop was not implemented until after wheat harvest and is not a factor in the yields.

Photos: (Left photo): Winter wheat on Oct. 23, 2023, and April 29, 2024 (Right photo).

Table 1. Haney (H20 and H3A Extracts) and Phospholipid Fatty Acid (PLFA) collected April 17, 2024 (0-6").

	pH	Buffer pH	OM LOI %	Nitrate-N ppm N	*Soil Resp. CO2-C ppm	*WEOC ppm	*%MAC	*WEON ppm	*SHC	Avail. N (lb/ac)	Avail. P (lb/ac)	Total Microbe Biomass ng/g	Total Bacterial Biomass ng/g	Total Fungal Biomass ng/g	Diversity Index
Check NC	5.7	6.2	2.8	4.3	116.7	197	59.1	12.7	14.95	37.2	53.5	1808.8	821.8	62.8	1.18
H-Pro 20 NC	5.7	6.3	3.0	4.3	104.8	178	59.0	12.3	13.52	36.2	46.3	1978.8	1064.5	102.8	1.26
WC814F NC	5.6	6.2	2.9	5.1	97.8	196	49.8	12.7	14.98	38.9	60.3	2191.7	1146.9	43.5	1.05
Prairie Food NC	5.6	6.2	2.9	3.8	107.8	192	56.0	12.4	14.07	35.4	47.7	2268.0	946.8	181.7	1.36
Check CC	5.6	6.2	2.7	5.5	109.4	203	53.8	13.0	14.48	43.0	67.0	1466.8	721.1	108.9	1.33
H-Pro 20 CC	5.6	6.3	3.0	4.8	109.0	172	63.3	11.4	13.66	39.4	57.0	3010.0	1442.1	219.3	1.34
WC814F CC	5.7	6.3	3.0	5.1	100.7	208	48.5	13.3	13.87	39.4	78.7	4631.9	2198.9	565.1	1.47
Prairie Food CC	5.7	6.3	2.7	4.9	91.6	210	43.6	13.3	14.70	40.1	65.1	1391.3	672.1	63.9	1.22

Terms from Regen AgLab:
*Soil Respiration is a measure of C02-C a soil can produce over a 24-hour incubation period following a significant drying and rewetting event. 71-100 is Above Average; 101-200 is High.
*WEOC (Water Extractable Organic Carbon) is a measure of the organic carbon or food most readily available to microbes.
*%MAC (Microbially active carbon) is how much of the WEOC pool was acted upon by the microbes measured as soil respiration. Ideal range between 50-75%.
*WEON (Water Extractable Organic Nitrogen) represents the pool of organic N that is available to the microbes. Often between 10-30 ppm.
*SHC is the soil health score, which is a summary of the soil respiration, WEOC and WEON measured by the Haney Test and represents the current health level of the soil based on these indicators. Would like to see this above 7 and rarely see this above 30.

Results: The results show the four treatments used in 2024. Cover crops were planted after this wheat study was harvested and were not a factor in these yield results.

	Moisture (%)	(bu/ac)†	Marginal Net Return‡ ($/ac)
Untreated Check	10.4 A	98 A	644 AB
H-Pro 20	10.1 A	10 A	663 A
WC814 experimental	10.1 A	100 A	654 A
PrairieFood™	10.0 A	99 A	603 B
P-Value:	0.27	0.69	0.02

*Values with the same letter are not significantly different at a 90% confidence level.
†Bushels per acre corrected to 13.5% moisture.
‡Marginal net return based on $6.60/bu wheat, $48.75/ac Prairie Food, $6.00/ac H-Pro 20, $2/ac experimental (WC814).

Summary:

- There were no significant differences in moisture or yield between the treatments.
- There were significant differences in marginal net return, with 3 treatments having significantly higher net return than Prairie Food™, including the untreated check ($644/ac), H-Pro 20 ($663/ac) and WC814 experimental ($654/ac).
- The benefits of focusing on increasing organic matter and the usage of cover crops should be viewed as a long-term investment in the field.