

Seeking understanding in aspects of soil health

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Recently I took a look at how soil microbe populations, forage crops, and grazing cattle on our irrigated field of corn have influenced our fertilizer management on this field.

There definitely seems to be a correlation between improving soil health with forage crops following winter wheat and grazing cattle on these crops prior to planting our irrigated corn and nitrogen fertilizer requirements.

We have lowered our nitrogen fertilizer in this field by 60 pounds per acre and feel our corn has the potential for a yield of 200 plus bushels per acre.

We'll know more once the corn is actually harvested, but the crop looks good right now and if the corn finishes out the growing season in good shape I think it will be a very high yielding crop for us.

So far we have irrigated just a little over nine inches of groundwater pumping on this field so we are happy with the residues we left in the field following the grazing of cattle to lower our soil moisture evaporation rates.

We also conducted a dry land corn trial where we applied varying rates of nitrogen in the field.

The history on this field is long term no-till of over 20 years, most recently in a winter wheat, corn, field pea rotation for the past seven years.

We haven't grown any forage crops for cattle grazing on this field.

We tested the field for soil microbes and found this field had considerably higher soil microbe levels than a neighbor's conventional winter wheat/summer fallow rotation.

The soil microbe numbers were about one half of our irrigated field where we had raised the forages and grazed the cattle.

This dry land field's soil microbe numbers are only about 20 percent of the soil microbe numbers found in producers soils from North Dakota where they have done extensive soil health improvement with forages and cattle grazing for several years.

These producers had soil microbe samples for their dry land fields that were over three times higher than our irrigated field where we raised the forages and grazed cattle last summer.

From what I have learned from our trial on our irrigated corn I think these high soil microbe numbers and improved soil health on these North Dakota farms explains why they can produce high yielding crops with little to no fertilizer applications.

On our dry land corn field we also ran the Haney test which showed we needed 22 pounds of nitrogen to produce a 80 bushel per acre corn crop. The Haney test looks at soil microbes and their ability to mineralize soil organic matter nutrients to supply nitrogen to the corn crop.

We fertilized the majority of the field with 50 pounds of nitrogen using the recommendations from our standard soil fertility test.

We had test strips where we applied no nitrogen fertilizer and 30 pounds of nitrogen fertilizer.

Visual observation didn't show much difference in the varying fertilizer rates until the corn reached about the V-6 growth stage.

For a few weeks there was a visual difference in the test strip where we applied no fertilizer, and no difference in the 30 pound and 50 pound nitrogen rates.

The visual difference began to disappear by the time the corn crop reached tasseling and there is a slight difference in appearance in the field now.

We tissue sampled the dry land corn crop twice, once at V-6 and again at tasseling. The initial tests showed the zero nitrogen fertilizer corn to have a 2.92 percent nitrogen dry basis, the 30 pound rate of nitrogen had 3.29 percent nitrogen, and the full fertilizer rate of nitrogen at 50 pounds had a 3.55 percent nitrogen dry basis test.

At the tasseling stage of crop development, the rates were 2.27 percent in the zero fertilizer, 2.49 percent in the 30 pound rate, and 2.54 percent in the full rate of nitrogen fertilizer.

The rates of nitrogen on a dry matter basis are still in line with the amount of fertilizer applied, but the difference in percentages has narrowed.

At this point in trying to analyze the different soil microbe tests and fertility rates we have applied along with our irrigated corn tests I'm not quite sure what to think.

I feel the improvement in soil health by incorporating forages and grazing cattle has some real benefits in crop production. I'm sure if we did more to improve our overall soil health these benefits would increase.

I think we are a long way from really understanding the relationship between soil health, microbial populations, and how we can incorporate these aspects of soil health into our crop production practices. I'm also sure we will learn much more about these cropping systems in the years to come.