

By Mark Watson

Panhandle No Till Educator ☐☐

In the past several articles I have talked about diverse mixtures of forage crops and grain crops. We know diverse crop rotations have the benefit of breaking up persistent weed and disease cycles.

I've also talked about how diverse forage crops seem to improve overall forage, and the possibility that even diverse mixtures in our grain crops may increase the yield of these crops.

By using no till crop production systems, we are improving the organic matter of the soil.

When we add to the no till system more diversity, we are also improving the soil micro organism population.

With a combination of diverse crop rotations and improved organic matter we are improving our soil food web. This is very important when considering the overall health of the soil we work with.

I'm beginning to understand some of the workings of this complex system known as the soil food web.

The soil food web is the community of soil organisms living all or part of their lives in the soil.

I gained a better understanding of this soil food web when we attended the forage workshop in Burleigh County, North Dakota.

The NRCS staff and local producers in Burleigh County are concentrating on improving the soil food web in their soils and are seeing some dramatic results.

A booklet entitled "Soil Biology Primer" is an introductory book to the soil food web.

This booklet was published by the Soil and Water Conservation Society in cooperation with the USDA Natural Resources Conservation Service and is available at the NRCS office. It can also be found online at <http://soils.usda.gov/sqi/> and click on soil biology.

What is soil food web

The soil food web is a complex system of soil organisms that are a key element in determining the overall health of the soil we work with and how this soil will perform for us in production agriculture.

The soil food web is an integral part of how our soils perform as far as nutrient cycling, soil aggregation, water infiltration, water holding capacity, the breakdown of pesticides, storing of nutrients, fixing nitrogen from the atmosphere, and controlling some crop pests.

The soil food web is the livelihood of our soil, yet we don't understand or pay much attention to this important part of our soil in production agriculture.

The overall health of the soil food web is dependent upon our soil management practices. With no till and diverse cropping rotations we can improve the soil food web in our soil.

My simple farmer's version of the soil food web is organic matter, plant roots, and crop residue feed these soil organisms.

The soil organisms decompose the organic matter and crop residue and release nutrients available to the plants we grow.

Primarily the bacteria and fungi are the decomposers of organic matter.

The bacteria and fungi are also an important food source for protozoa and nematodes. The protozoa and nematodes are predators in the soil food web.

The bacteria and fungi are higher in nitrogen than the protozoa and nematodes, so protozoa and nematodes excrete excess nitrogen during the digestive process and this excess nitrogen becomes available to the plants we grow.

The more bacteria and fungi we can produce through our soil management practices, the

more the protozoa and nematodes will eat, and the more nutrients that will be available for crop production.

As we improve our soil management practices by incorporating no till systems into our crop production practices and diversify our cropping rotations, we can influence the overall soil food web in our soils.

As the food web improves, our overall soil health and the performance of our soil in crop production will also improve.

How to improve the soil food web

What are the practical applications for improving the soil food web and overall soil health in production agriculture?

I want to try and answer this question by sharing some results a producer in Burleigh County, North Dakota shared with me on his farm.

Gabe Brown has been an integral part of the team of producers and NRCS staff who have been exploring the possibilities of improved soil health in production agriculture.

Brown had a field on his farm that had grown two years of forage crops for cattle grazing. Prior to this the field had produced winter triticale.

Brown has been improving the soils on his farm over the past 10 years by growing forages along with grain crops in a no till production system.

During this time he has had diverse mixtures of forages and has also improved the organic matter of his soil.

On this particular field, Brown had soil tests taken prior to planting the corn crop he intended to grow. The soil test showed he had 14 lbs. of total N in a 3 foot sample. He had also sent a soil sample to have his soil food web analyzed.

The soil food web assay analyzes the total amount of bacteria, fungi, and protozoa and nematodes in the soil along with other soil health indicators.

The food web analysis indicated he would have 200+ lbs./acre potential supply of available nitrogen. This supply of nitrogen would in part be the mineralization of nitrogen which is available through the soil food web.

The nitrogen would be a slow release of nitrogen during the growing season.

The benefit of this type of nitrogen release is this nitrogen isn't readily available for leaching in its current state in the soil.

His goal was to produce 100 bushels of dry land corn. The soil sample recommended 100 lbs. of nitrogen be applied for this yield goal.

Yield experiment

He decided to conduct an experiment and fertilized half the field and applied no fertilizer to the other half of the field. He combined and weighed each half of the field and found the yields to be identical.

His soil food web analysis indicated he had plenty of available nitrogen to produce the corn crop and he saw no response from fertilizing the other half of the field.

By improving the soil health along with the soil food web in his soil Brown feels he will require little if any fertilizer to produce crops on his farm.

Imagine the economic return if we could reduce the amount of fertilizer we require to produce crops here in Western Nebraska.

I feel we need to look more closely at our soil management practices and see what we can do to improve the overall soil health with the soils we work with.

Improving the soil food web in our soil will result in healthier soils and an improved bottom

line.