No-Till Notes:
What Is Soil Quality?
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This week's column is written by Kathy Buttle, Resources Conservationist specializing in soils. Kathy is based out of the USDA-Natural Resources Conservation Service (NRCS) office in Scottsbluff.

As a conservationist with the Natural Resources Conservation Service (NRCS), I advocate Continuous No Till Cropping Systems. My responsibility is to assist private landowners in conserving all of our resources. We use an acronym "SWAPA" to identify those resources; soil, water, air, plants, and animal. There is a reason soil comes first. If we take care of our soil, it will take care of the other four resources.

Tillage is not a natural occurrence. By using a no till system with a diverse crop rotation, we will improve the quality of the soil.

What is soil quality? Soil quality is the capacity of the soil to function, to sustain plant and animal productivity, to maintain or enhance water and air quality, and support human health and habitation. Soil grows our food, filters our water, cycles our nutrients, and supports the structures that shelter us.

Soils vary in their capacity to function. Quality is specific to each type of soil. We need to understand there are inherent soil properties that we can not change. Factors like climate, topography and parent material we have little or no control of. We refer to this concept as soil capability.

The dynamic factors that we do have control of are tillage and management practices and diverse crop rotations. The dynamic quality is what we refer to as soil quality.

There are three indicators of soil quality; physical, chemical, and biological. Physical indicators are infiltration rates, soil structure, aggregate stability and bulk density. Examples of chemical indicators are organic matter, pH, electrical conductivity (salt content), and cation exchange capacity. An interesting indicator is the biological or the measure of living organisms and their activity.

While we can't measure soil quality, we can assess it or compare it to other management systems and monitor it over time. If you would like to test the quality of your soil, contact your local NRCS office and ask to have a conservationist come to your farm. We have soil quality test kits that we can use to evaluate your soil.

While working with ag producers who are transitioning to no till farming practices, I have noticed that soil quality is not something that they are concerned with at the start. However, as they see what soil quality can do for them, it seems to become a major

consideration for them after a few years. As producers, we contemplate what crop to plant, what form of fertilizer and how in what quantity to use, what pests we need to deal with, our equipment. Soil should be our first concern. The soil supports the plant, feeds and waters our crops, and with help from diverse crop rotations, manages pests.

For questions regarding soil quality or conservation of any natural resource, contact your local Natural Resources Conservation Service.

Soil Quality Indicators

Soil quality is the capacity of the soil to function, or in other words, do what you want it to do. This article will deal with the capacity of the soil to sustain or enhance agriculture productivity, maximize profit, and maintain the soil resource for future generations.

There are three indicators of soil quality; chemical, physical and biological. These often have an influence on one or both of the other indicators. At the Natural Resources Conservation Service, we have a soil quality test kit that can help assess the soil quality on your farm.

The chemical factor of soil quality includes organic matter, pH, electrical conductivity or salt content, and cation exchange capacity. The most important of these is organic matter. Tillage speeds the decomposition and loss of organic matter. Increases in organic matter means increases in nutrients in your soil and higher water holding capacity. No till systems increase fungi in the soil. The fungi will keep the pH levels lower. As soil quality levels increase, the cation exchange capacity also increases. CEC levels are listed on soil tests results. CEC is the amount of negative charges available on clay and humus to hold positively charged ions. In other words, the cation exchange capacity is the ability of the soil to hold nutrients for plant use. When the wind blows, and we see dirt in the air, we are seeing the clay particles that are holding onto the nutrients we need to grow our crops.

Water is our limiting factor in this area for growing crops. The soil structure or the physical indicator is essential to using what precipitation we do get to our best advantage. Soil structure or the crumbly particles we see in the top few inches of native rangeland or in long term no till fields let the rain we get infiltrate into the soil. The crumbly makeup is soil particles held together by glue produced by the soil organisms. A mistaken concept is that we need to till the soil to let the rain soak in. When we till we destroy the structure which decreases the aggregate stability. Aggregate stability is the ability of the soil to resist degradation. A rain drop can break apart the soil particles, making them more susceptible to wind and water erosion. The clay and silt particles will seal the pores, blocking rain from entering the soil. Good soil structure will also help

alleviate compaction. The Rainfall Simulator demonstration that has been shown at many of the no till events is a very good illustration of this.

The third indicator, biological, is perhaps the least understood and the most interesting. According to Kris Nichols, microbiologist with the Agriculture Research Service, there are more living organisms in a spoonful of soil than there are people on earth. As stated before, those organisms can affect the pH of the soil and bind soil particles together into stable aggregates. Soil organisms get water and nutrients into the crop roots, convert organic matter into plant available, and create pores for water to enter soil profile.

Soil quality indicators are important. They help us focus on conservation efforts that maintain and improve the condition of the soil, evaluate our management practices and guide land management decisions.