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## RAY THE SOILS GUY ON SOIL HEALTH

I had an opportunity this past week to listen to Ray Archuleta, a nationally recognized speaker on soil health principals at Albion, Nebraska. He is retired from the NRCS but is active in promoting soil health principals in farming.

He blames western reductionist science as a main reason for the farming and ranching occupation in 2016 as having the highest suicide rate. Too often we are increasing insecticide and fungicide use and are involved in systems that are “leaky” with nitrogen. By increasing soil health or farming practices that increase soil aggregates, water infiltration, biotic glues, mycorrhizae fungi that exchange nutrients, and other beneficial changes to soils, we can begin to remove ourselves from reductionist science according to Ray.

One of the soil properties in long term no-till conditions is the soil switches over from a bacterial condition to more fungi. Fungi provide access and transport of nutrients to crop roots, extend root volume and depth, exudates enhance soil carbon status, increase water and nutrient retention and increase drought resistance. Plant growth is highest when there is a higher fungal to bacteria ratio in your soil.

The most powerful thing for your soils are plant life 24/7. As an example Archuleta says look at the Chernobyl nuclear accident in Russia in 1986. The region today is widely known as one of the world's most unique wildlife sanctuaries. Thriving populations of wolves, deer, lynx, beaver, eagles, boar, elk, bears and other animals have been documented in the dense woodlands that now surround the silent plant. Only a handful of radiation effects, such as stunted trees growing in the zone of highest radiation and animals with high levels of cesium-137 in their bodies, are known to occur. Once again the power of plants and nature.

The new buzz word in agriculture is biomimicry or design innovation inspired by nature. There are so many inventions that have come from nature; Velcro for example was inspired by the cocklebur seed. Cell phone antennas were inspired by nature and fractals. Without the self-similar, fractal shape itself found in natural systems, the most complex smart phones that operate like a computer would not have been possible. Termite mound designs are inspiring new building designs that are 90% more efficient in cooling. There is a Ted talk from Janine Benus that talks about how in natural systems we have 3.8 billion years of research and development and 10-30 million species with well adapted solutions.

Gabe Brown in North Dakota said before he started continuous no-tilling, diverse rotations and cover crops, he used to wake up in the morning and spend money seeing what I needed to kill that day (insects, diseases and weeds, etc.). Now, with all the benefits that he is seeing in his farming operation, he wakes up thinking what can I help bring to life? Plants leak exudates into the soil system called “liquid sun”. The longer you have living plant roots working for you, the better. The best way to regulate temperature of soil in the summer is living plants and residue on the soil surface.



A high soil health score leads to numerous benefits including better water infiltration and less agricultural runoff of sediment and nutrients. Enhanced soil microbe interactions are of key interest to scientists devising new strategies to enhance crop production with less water and chemical fertilizers. Ray's final advice when taking the next step and utilizing no-till farming and cover crops and adding diversity in your farming system is 1) be committed; 2) be patient, never go cold turkey; 3) expect failure and 4) give it 3-5 years for the new diversity to repair your soil.

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