



Early Spring 2019

SOIL PORE SPACE IN STRIP TILLAGE

Some Hidden Secrets - Soils Air & Water Interchange

by: Mike Petersen, Soil Scientist/Agronomist for Orthman Manufacturing, Inc

When we truly look up close and personal at soils that have been Strip Tilled compared to Conventional farming practices or No-Till there are some notable differences, especially in row crop farming. Just employing the use of a 10 magnification hand lens we can see the number and size of pores do change in the two conservation tillage practices compared to conventional farming methods. A higher number of actual fine and medium sized pores are observable in Strip Till and No-Till. In the world of soil physics; pore size makes a great deal of difference to the transmission of water and atmosphere in and the downward fashion of the soil profile. True large pores, that 2 to 5mm in size or even larger, transmit water, oxygen, carbon dioxide, nitrous oxide, ammonia and more – not only down but up and out. Then the next smaller size pore, the medium size (1 to 2mm) pore are extremely important to holding water at the tension readily reachable by the plant root to absorb and utilize for plant functions. Most all terrestrial plants have so much “sucking power” we will call it. The soil tension water is held in a medium sized pore meets that functioning pull from the plant half way. With the smaller pore size (0.5 to 1mm) we scientists have measured water held more tightly, less water in the pores due to size (capacity) and plants have to exert more of their photosynthetic energy resources to ‘suck’ that water. During dry periods of the season that incurs stress.

We at Orthman have made countless measurements of pore space to determine what is the differences between the three major tillage systems [Strip Till—No-Till—Conventional Tillage] across the globe. In our years of experience we have discovered that Strip Till aids the plants leave behind many more roots that break down leaving the medium sized pores. Why? It so seems that with the lesser soil resistance after the pass of the Strip Till tool (both immediately and for up to 14-16 months following) roots can extend out and downward with less root push. As following crops grow, access to water, gases of oxygen, carbon dioxide, and more improves. An amazing additional benefit is that microbial life is enhanced on and around the root – making the root thrive all that much more. Should not this also be true in Conventional tillage systems? With full width tillage the soils are turned, tumbled, scraped, and bashed. Continuous pores are smashed, smeared and many times obliterated. Pores become miniature pockets sometimes then melt into a concrete-like material; water is held so tight inside those pores that roots do not have enough power to pull it into the root epidermis. When temperatures rise and the moisture is low, plants suffer acutely. When soil conditions are compacted and wet, with fewer pores and they are wet to being saturated – then crops suffer even more because they cannot breathe.

Below is a chart detailing a segment of a multiple year study Orthman did to account for this information and to observe why Strip Till has advantages differing from No-Till and Conventional Tillage. Please take a

look and you consider which system is working towards a sustainable soil physical condition that makes sense for better crop health and yes, Soil Health.

Pore Counts in Sandy Clay Loam Soil 10 to 20cm depth								
Strip Till System (late spring time)				Conventional Till (late spring time)				
Pore Size in 1 Decimeter				Pore Size in 1 Decimeter				
0.5- <0.5mm	1- 1mm	2- 2mm	5- 5mm	0.5- <0.5mm	1- 1mm	2- 1-2mm	5- 2-5mm	
194	147	21	12	82	67	4	1	
153	101	16	8	101	69	8	2	
219	196	17	5	114	74	5	2	
201	154	30	9	106	78	4	3	
188	102	27	5	124	79	5	4	
191	140	22.2	7.8	Averages	105.4	73.4	5.2	2.4

Pore Counts in Clay Loam Soil 10 to 20cm depth								
Strip Till System (late spring time)				Conventional Till (late spring time)				
Pore Size in 1 Decimeter				Pore Size in 1 Decimeter				
0.5- <0.5mm	1- 1mm	2- 2mm	5- 5mm	0.5- <0.5mm	1- 1mm	2- 1-2mm	5- 2-5mm	
155	127	18	7	128	62	8	3	
200	100	19	3	104	67	7	3	
194	97	18	5	99	61	8	2	
203	104	21	4	94	55	8	0	
158	74	16	5	89	48	4	0	
182	100.4	18.4	4.8	Averages	102.8	58.6	7	1.6

To Summarize:

Soils that are over-tilled may not have all the vital good soil physical characteristics that aid for water, nutrient, oxygen exchange to the growing plant which you as a farmer expect from your soils. At Orthman we have been studying Strip Tillage and soils to determine what are the differences for over 13 years and continue to do so. Talk to your Orthman representative, they are in the business to help you be as good as you want to be on your land.

We at Orthman are here to make it happen; we like to “Get to Work with You”.