

# “Soil Your Undies” Project Results and Conclustions

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In the fall 2020 Newsletter there was an article called “Soil Your Undies” which was a trial the LaMoure NRCS and SCD employees tried in LaMoure County. In this trial, three different field locations were chosen, and pairs of underwear were buried in hopes of demonstrating different levels of soil biological activity based on visual observations of the underwear after **61 days** buried underground. The theory is that the 100% cotton underwear are high in carbon and they would be “eaten” in healthy soils teaming with the microbial life underground.

Our conclusions and observations to this trial are as follows:

## Site 1 - Barnes- Gardena Loam Soil Type.

No-till system for ten years- soybeans in 2019, nine-way Cover Crop Grazing Mix in 2020.



DAY 1- SITE 1 START: 7/24/2020



DAY 61- SITE 1 End: 9/22/2020

### Half-Eaten Undies (2<sup>nd</sup> place)

Conclusion/Ideas: We gave these undies a rating of 2<sup>nd</sup> place based on our visual observations of how “eaten” they were by the soil microbes and other chemical reactions.



Our thoughts from visual observation and a soil analysis:

- \* **Organic Matter (OM)** is at 5.5%, which is good! If the OM has risen in the last 4 years, then there may be too much Carbon in the system.
- \* **What is the Carbon to Nitrogen Ratio (C:N)?** We suspect maybe higher carbon in the soil, so this ground may need different diversity (maybe adjust the crop rotation).
- \* **pH** is at 5.9 (pH scale 0-14, 7 is Neutral). pH on this site is slightly/moderately acidic. Low or High pH soils can tie-up nutrients, many sources say to aim for your soil pH to be in the 6.3 to 7.3 range.



## Site 1 - Continued...

Maybe the soil pH is affecting the microbes in the soil?

- \* **Phosphorus (P) and Potassium (K)** are reported in parts per million (ppm).

At this site P was 46 ppm. NDSU says the optimum level ranges from 15 to 50 ppm but the amount required varies among soil types.

At this site K was 675 ppm, per the soil test there seems to be an excess of Potassium. NDSU says the optimum level ranges from 200 to 300 ppm but the amount required varies among soil types.

- \* On 9/22/20 when digging up the undies, it was noticed that the soils at this site were semi-dry (not wet but not dry). Crops and Cover Crops use some moisture but not as much as perennials (in Site 2).

## Site 2 - Barnes- Svea Loam Soil Type. 2 Years in Pasture

Site was seeded back to grass in the spring of 2018 with a mix consisting of Big Bluestem, Little Bluestem, Green Needlegrass, Blue Grama, Sideoats Grama, Western Wheatgrass, and Indian Grass. Prior to seeding it to grass it was cropped and in the early fall of 2018 it was seeded to a grazing cover crop mix of peas, oats, turnips, and radishes and then grazed.



Day 1 - SITE 2 START: 7/24/2020



DAY 61- SITE 2 END: 9/22/2020

### Barely Eaten Undies (3<sup>rd</sup> place)

Conclusion/Ideas: We gave these undies a rating of 3<sup>rd</sup> place as they had not really changed.



Our thoughts from visual observation and a soil analysis:

- \* **Organic Matter (OM)** is at 3.5%. This seems a bit low for pasture and is the lowest of the three sites. Will have to watch it over the next few years, it should increase overtime.
- \* **What is the Carbon to Nitrogen Ratio (C:N)?** We suspect this spot may be high in Carbon. This field is cycling carbon from the top vegetation as well as the roots. Soil organisms and the soil are still probably adjusting to the management change.



## Site 2 - Continued...

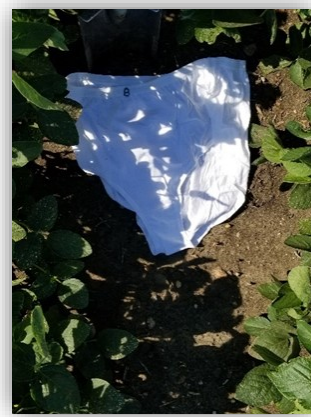


- \* **pH** is at 6.8, so close to neutral (pH scale 0-14, 7 is Neutral). Most plant nutrients are optimally available to plants within the 6.5 to 7.5 pH range, plus this range of pH is generally very compatible to plant root growth (Jensen, Dr. Thomas L., "Soil pH and the available of Plant Nutrients- Plant Nutrition Today", Fall 2010, No. 2"). Should see more plant diversity in the next few years.
- \* **Phosphorus (P) and Potassium (K)** are reported in parts per million (ppm). At this site P was 36 ppm, a really good level to be at. NDSU says the optimum level ranges from 15 to 50 ppm but the amount required varies among soil types. At this site K was 440 ppm. NDSU says the optimum level ranges from 200 to 300 ppm but the amount required varies among soil types.
- \* On 9/22/20 when digging up the undies, it was noticed that **the soils at this site were dry**. Our thoughts were because this is perennial vegetation it used up the moisture quicker and because this site is dry at this time it affected the soil microbe population as well, which leads to 3<sup>rd</sup> place undies.
- \* **Still newly established**, only two years as pasture, the soil may still be making changes to itself and microbes are getting accustomed...just needs more time to flourish.

### Site 3 - Barnes- Svea Loam Soil Type.

#### No till system for 5 or more years- Corn and Soybean rotation.

Soybeans in 2019 and 2020, as well as some Preventive Plant (PP) areas in this field also.



#### Mostly Eaten Undies (1<sup>st</sup> place)

Conclusion/Ideas: We gave these undies a rating of 1<sup>st</sup> place as there was very little left of these undies.



#### Our thoughts from visual observation and a soil analysis:

- \* **Organic Matter (OM)** is at 4.9%, which is really good! This spot may have high organic matter due to the soil types. Svea has high amounts of OM, it is deep dark black to a depth of 16 inches. Barnes is similar to Svea but has thinner topsoil and still has a lot of OM.

- \* **What is the Carbon to Nitrogen Ratio (C:N)?** We suspect it is very high in Nitrogen. We added Carbon to the system by adding 100% cotton undies and the microbes attacked it (microbe frenzy), hence why the undies are gone and why this site comes in at #1.



SITE 3- NO-TILL END: 9/22/2020

## Site 3 - Continued...



- \* **pH** is at 7.7, this soil is mildly alkaline (pH scale 0-14, 7 is Neutral). Most plant nutrients are optimally available to plants within the 6.5 to 7.5 pH range, plus this range of pH is generally very compatible to plant root growth (Jensen, Dr. Thomas L., "Soil pH and the available of Plant Nutrients- Plant Nutrition Today", Fall 2010, No. 2"). At alkaline pH values, greater than pH of 7.5, like this one, phosphate ions tend to react quickly with Calcium (Ca) and Magnesium (mg) to form less soluble compounds. Most other nutrients (micronutrients especially) tend to be less available when soil pH is above 7.5. The exceptions is Molybdenum (Mo), which appears to be less available under acidic pH and more available at moderately alkaline pH values (Jensen, Dr. Thomas L., "Soil pH and the available of Plant Nutrients- Plant Nutrition Today", Fall 2010, No. 2").
- \* **Phosphorus (P) and Potassium (K)** are reported in parts per million (ppm). At this site P was 125 ppm, P is very high in this exact location of where the soil was tested (P is not necessarily this high in the whole field). NDSU says the optimum level ranges from 15 to 50 ppm but the amount required varies among soil types. At this site K was 2,000 ppm, K is extremely high in this exact location of where the soil was tested (K is not necessarily this high in the whole field). NDSU says the optimum level ranges from 200 to 300 ppm but the amount required varies among soil types. This high of P & K tells us that amendments are being applied each year but that the plants are not using it all. So, fertilizer was applied but there was minimal plant growth in that area to use it.



If you have areas in your field that are usually wet/drown out, then check with your agronomist if you need to put fertilizer in those spots. It may be a way you can save some money because those areas can add up.

On 9/22/20 when digging up the undies, it was noticed that the soils at this site were wet. WHY? Odds are there was extra moisture in that spot. Soybeans use less water, than say corn, and especially in September when the growing season is slowing down.

### Did this experiment go as we thought it would?

**NO**, we thought it would go like this:

**1st place** (undies all eaten by micro-organisms): Site 2- Pasture. Why- higher diversity of plants (9 or more), which start growing earlier and continue later than some crops.

**2nd place** (half eaten undies, half not): Site 1- Cover Crops & No-Till. Why- Mix of cover crops means more diversity, so more soil biology.

**3rd place** (barely eaten undies): Site 3- No-Till. Why- less diverse crop and cover crop rotation and saline/wet areas in the field.

This experiment is more visual than scientific and poses so many more questions in our minds as to why and how these undies were soiled the way they were. It has really made us think more about what is happening underground and how it relates to soil health.

We look forward to trying this experiment again this spring. Let us know if you would like undies planted in your soil this spring!

The original article was published in last fall's newsletter and can be found on the LaMoure Soil Conservation website at [LaMoureSCD.org](http://LaMoureSCD.org) under the "Projects" tab.