

# 2010 SARE Soil Health Project

## -Final Report-

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- Project Title: Soil Quality Project
- Project Number: YNC09-049
- Project Duration: April 1, 2010 – December 31, 2010
- Date of Report: December 28, 2010

### **Background**

I have always been very interested in agriculture and I know that healthy soil is important to increasing agricultural production. My Dad and I have heard over the past several years that the healthier the bugs in the soil are, the more productive the soil can be. We know some producers have tried to feed the soil micro-organisms by planting multi-specie cover crops. We were not aware of anyone in our immediate area that was trying some of these new ideas, so in 2007 I decided I wanted to start a six year project to find out a couple things; One, how many bugs are in my Grandpa's soil and are they balanced? Two, can cover crops be successfully grown where my Grandpa farms? Three, will cover crops increase and balance the numbers of beneficial micro-organisms in the soil over time? Four, can cover crops and healthier micro-organisms provide increased natural nutrients to crops?

### **Goals**

Some of my long term goals are figuring out how many bugs are in my Grandpa's soil and are they balanced? Can cover crops be successfully grown where my Grandpa farms? Will cover crops increase and balance the numbers of beneficial micro-organisms in the soil over time, and can cover crops and healthier micro-organisms provide increased nutrients to crops?

I plan to continue this project and use this information for the next four years for my high school science and FFA projects. I hope the information that I gather will be beneficial to my Grandpa and other Ag producers in my area.

### Process

To recap the first two years of my six year project (2008 and 2009), my Grandpa and I selected two fields for my project. The first thing we wanted to know was how many of which type of micro-organisms were in the project fields. We took a Soil Foodweb sample for each field and overnight mailed them to Oregon Soil Foodweb. These tests told me that our micro-organisms are at low levels and are not balanced very well. We also ran Soil Health Tests that included infiltration, temperatures, respiration, EC, and pH (See photo 1 and photo 2).



Photo 1



Photo 2

In 2008, to accomplish my second goal of determining if multi-specie cover crops will grow in my area, we purchased our seed from Pulse USA. We tried two mixes. Field #1 was seeded on August 4, 2008 to a warm season cover crop mix consisting of Millet, Oats, Turnips, Radishes,

Sunflowers, Soybeans, and Buckwheat. Field #2 was seeded on August 4, 2008 to a cool season mix consisting of Oats, Millet, Turnips, Radishes, Canola, Buckwheat, Peas and Lentils (See photo 3 and photo 4).



Photo 3



Photo 4

My grandpa has a JD 4450 tractor and a JD 750 single disk drill. He recently bought a drill fill to allow us to fill the seed faster and easier. (See photo 5 and photo 6)



Photo 5



Photo 6

My Grandpa and I were very surprised on how well the crops germinated. We started to notice growth within four days. (See photo 7 and photo 8)



Photo 7



Photo 8

In the spring of 2009 we seeded corn on Field One that had a cover crop on it during the fall of 2008. I wanted to see if one year of cover crop would provide enough nitrogen to grow corn for silage without having the additional cost of man-made fertilizer. I went to my local NRCS office and was able to get GPS coordinates that would split the field in half. The corn got planted the same way on the whole field, but only the South half got spread with bulk fertilizer. (See photo 9 and photo 10)

My corn fertilizer test on field one for 2009 showed me some very interesting results. The non-fertilized corn silage ran 10 ton/acre. The bulk fertilized corn silage (with broadcasted Urea) ran 11 ton/acre, but cost \$21.30/acre for the fertilizer. This showed me that the 2008 cover crop must have provided some natural nitrogen to the corn. The other benefit to not bulk fertilizing is that we did not add any additional salt to the soil, which is harmful to the micro-organisms we are trying to benefit.



Photo 9



Photo 10

After the 2009 corn was silaged and we planted 75# of winter triticale and 15# of Hairy Vetch/acre on field one on September 24<sup>th</sup>. In 2010 we hayed the winter triticale and vetch. As soon as the bales were stacked we went in on July 15 and planted a cover crop that consisted of Radish, Turnip, Sunflower, Cowpea, Sudan Grass, Millet, Vetch, and Soybeans. (See photo 11 and photo 12) In the spring of 2011 we will no-till another crop directly into the residue.



Photo 11



Photo 12

In the spring of 2009, I no-till seeded oats for hay on field two and only fertilized with a starter fertilizer at 50# of 28-26-0 for a fertilizer cost of \$12/acre. On August 8<sup>th</sup>, 2009, after the oats for hay was baled, I no-till seeded an eight-way cover crop mix consisting of Oats, Millet, Sudan Grass, Cow Peas, Lentils, Peas, Turnips and Radishes into the oat stubble. The cover crop had excellent germination but due to very warm weather in September, the overall growth was not as much as the 2008 cover crop. (See photo 13 and photo 14)



Photo 13



Photo 14

In 2010, I seeded corn for silage on field two. We fertilized 100 # of 4600/acre hoping the fall 2009 cover crop would help with nutrient availability.

In 2010, I continued the Soil Quality testing on both Fields one and two. Soil Food Web testing was completed in August, to determine if cover crops are benefiting soil micro-organisms. My hope is to collect Soil Quality and Soil Food Web Test Data for six years to see if any positive or negative patterns developed.

### People

To implement this project, I asked numerous people to assist in taking the Soil Foodweb samples and running the Soil Health Tests. The local NRCS and local Soil Conservation District Office is using information from my fields to educate other area producers. Some individual producers have spoke to my Grandpa about the plots. Some of our cover crops were dug up and displayed at producer workshops to show that cover crops can be grown in our area (See photo 15 and photo 16). I will utilize information from this project to develop my bi-annual science projects and I have spoke with my FFA Advisor about developing a FFA project that will educate our area producers about what Soil Health can do for them.



Photo 15



Photo 16

My dad and grandpa help me with all of the questions I have and teach me how to use all the equipment needed. I was able to get Oregon

Soil Foodweb to give me 50% off all future soil Foodweb testing. This is worth about \$250 per year for my project. I will continue to apply for youth SARE grants to fund the rest of my testing costs and cover crop seed costs.

In September of 2010, the NRCS and Soil Conservation District held a field day for the local farmers in my area. It consisted of several area farmers who had multiple kinds of Cover Crops growing in their fields. There were 30 people who attended. We started out on my field where my dad and his staff shared about how cover crops benefit the fields. I shared what my project was about and what I have been testing and experimenting with on my test fields. John Stika, a Soil Scientist from the Dickinson NRCS Area Office explained about how the bugs functioned in the soil. He had a few water demonstrations that showed how the soil of a heavily worked field would dissolve into nothing compared to the soil from a no-tilled field with good root systems held together. With the help of the staff of the NRCS, I submitted a review of my Soil Health Project in the 2010 fall newsletter.

### **Results**

I take pictures on a weekly basis to show how the cover crops progressed during the fall. The cover crops were very successful and I believe that the micro-organisms were benefitted because of all the different kinds of live roots they had to interact with.

Some of the Turnips and Radishes showed tremendous growth. The taproots of these two crops transported deep nitrogen to the soil surface for next year's crops. (See photo 17 and photo 18).

In field 1 the Winter Triticale and Vetch ran about two bales to the acre. On field 2 the silage ran 10 ton/acre.



Photo 17



Photo 18

### **Discussion**

This has been a very interesting year and I have learned a lot about Soil Health and soil microorganisms of the Soil Foodweb. Looking at my ultimate goal of reducing man-made fertilizer, I was able to not only save my Grandpa money on both his corn for silage and Winter Triticale/Vetch for hay acres, but also help the micro-organisms in the soil by not adding more harmful salt to the soil. I hope the information I get from this project can not only help my future career options, but also help farmers and ranchers in my area. I would like to thank the SARE program for assisting me in paying for part of the Soil Foodweb testing costs and cover crop seed costs. I would especially like to thank my Grandpa for donating his land, equipment, time, and advice. I could not do this project without everyone's help.



## 2010 Fall Newsletter Article

My Name is Kalen Hartel and I am a sophomore at Watford City High School. I have been doing a Soil Health Project on my Grandpas farm since I started seventh grade. This is a six year project throughout my high school career. I wanted to update everybody on how things have been going. A cover crop mix of Radish, Turnip, Sunflower, Cowpea, Sudan Grass, Millet, Vetch, and Soybean were Planted on July 15, 2010. This Cover crop mix was no-tilled into Winter Triticale and Hairy Vetch stubble that was hayed several days prior. All of the cover crop grew tremendously well and was very thick. We got a few cold days later on in September which killed the warm season plants. The turnips and radishes, being a cool season crop, are still green at the middle of November. Any green plants have root systems that are continuing to provide a way for the bugs in the soil to make natural nitrogen for next year's crops. We had to put up an electric fence around the field to keep my grandpas cows from grazing it. We want all of the above ground forage production to remain on the field to increase Organic Matter (OM) levels next year. The Cover Crop mixes are great for replenishing nutrients in the soil that your annual crops take away, along with catching of snow fall. The NRCS office put on a field day this fall that consisted of several local farms with cover crops planted. We started on my field and I talked to the farmers about my project and my goals and future plans for the project. John Stika, a Soil Scientist from the Dickinson Area NRCS office explained about how the bugs function in the soil. This spring we will come back with an annual cash crop and no-till right into the cover crop with a disc drill. No man made fertilizer will be applied with the hope that the cover crop and bugs supply natural nutrients to the crop.