2009 SARE Soil Health Project
-Final Report-

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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? 2009 was the 2nd year of my six year project.

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.

Specifically in 2009, my goal was to decrease man made fertilizer inputs without reducing yields by seeding corn and oats into cover crop residue from the fall of 2008 and to continue experimenting with seeding numerous types of cover crops in 2009.

Process

To recap the first year of my six year project (2008), 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. It took us a while to figure out what we should set the drill depth to, after some trial and error we saw that we didn't have it deep enough and we took time to reset it. All in all everything went without a breakdown. (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)

Photo 9

Photo 10

On September 24th, 2009 we planted 75# of winter triticale and 15# of Hairy Vetch/acre on field one, after the corn was silaged. My hope for 2010 is to hay the winter triticale and hairy vetch and allow the vetch to green back up for fall grazing. In the spring of 2011 we will chemically kill the vetch and no-till oats for hay directly into the residue, while not adding any additional man-made fertilizer.

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 8th, 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 11 and photo 12)

Photo 11

Photo 12

In 2010 I will no-till wheat into Field two and not apply any bulk man-made fertilizer and hope that two years of cover crops can provide enough natural fertilizer to produce an adequate crop with very limited man-made fertilizer inputs.

In 2009, I continued the Soil Quality testing on both Fields one and two. Soil Food Web testing was completed on August 18, 2009, to determine if cover crops are benefiting soil micro-organisms in Field One and Two. 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 13 and photo 14). 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 13

Photo 14

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.

Results

Throughout 2008, I took 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 that year because of all the different kinds of live roots they had to interact with. The Turnips and Radishes stayed green until late November.

We learned another benefit of cover crops was fall grazing of livestock. My Grandpa's cattle loved to eat all of the species of cover crops. The cattle were allowed to graze field 1 but not field 2. Field 2 stayed partially green until late November. Another positive benefit of cover crops was food and cover for deer and pheasants in our area. (See photo 15 and photo 16)

Photo 15

Photo 16

Some of the Turnips and Radishes showed tremendous growth. The taproots of these two crops transported deep nitrogen to the soil surface for my Grandpa's 2009 crops (See photo 17 and photo 18).

Photo 17

Photo 18

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.

In 2009 on field two, I believe the excellent stand of cover crop from the fall of 2008 provided additional nitrogen needed to grow the large amount of oats. We harvested five 1,200# oat bales/acre for a total of 6,000# of oats/acre (See photo 19 and photo 20).

Photo 19

Photo 20

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 2009 goal of reducing man-made fertilizer, I was able to not only save my Grandpa money on both his corn for silage and oats 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.