The Effect of Cover Crops on Soil Erosion

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Abstract

Previous studies have shown that cover crops can have a positive effect on farmland such as fixing nitrogen to the soil and reducing soil erosion. (REF) The objective of this study was to see what would happen to a field with cover vs a field with no cover crop under 7 inches of rain water. My hypothesis is if soil with cover crops is exposed to water runoff it will reduce the mass of eroded soil because of the cover the leaves the plants will provide and the soil structure they provide. This was researched by growing a tub full of soil and growing cover crops in it and using a homemade drip line to pour water over it. The data suggests that cover crops will reduce soil erosion from rain.

Introduction

Fruit and vegetables are a great part of a healthy diet. Now imagine not being able to eat those and now you live in a desert and all the water you drink is polluted. All of this is caused by soil lesions. Lucky for us, cover crops can help prevent all. Cover crop has numerous uses including, adding nutrients back to the soil, adding organic matter to the soil, helping soil compaction, but most importantly cover crop helps prevent soil erosion.

Cover crop is a mixture of plants that are planted in fields not to be harvested but to primarily benefit the soil for future crops planted in that field such as corn (USDA,2023). Cover crops will help manage the field soil erosion, soil compassion, diseases, pests, biodiversity and more (USDA,2023). Cover crop is also used to crowd out harmful weeds which shade the soil surface. Cover crops are a mixture of plants that can be grouped upped into 4 main classes of cover crop, grasses (such as rye/ryegrasses or barley) witch can help fix nitrogen into the ground, legumes (such as alfalfa or clover or Hairy vetch) witch can also fix nitrogen to the ground, brassicas (such as mustards, kale, oilseed, radish, and turnips) (witch can reduce soil compaction because of their taproots and reduce weeds, and and non-legume broadleaves (such as spinach or flax) (Mosaic,2023) . All of these groups also do much of the same including adding biomass, fixing nitrogen and reducing erosion. Usually Cover crops are planted in the fall by the farmer and will grow until and they are usually grown into spring until the main crop is planted, But cover crops can be planted anytime of the year in certain areas (Hudson Valley Seed Company, 2023).

Soil erosion is where soil is exposed to certented factors and moved from its place of origin. These factors included wind, heavy rain, running water, low organic matter, and human activities, like farming and land clearing that leaves soil exposed and vulnerable. Soil erosion is a major problem because we can lose fertile land, increase pollution in rivers, clog waterways, kill fish and animals that live in areas with soil erosion, and degrade areas of land to the point that it can hold less water causing flooding. It can take up to a century for soil to recover from erosion without proper management which is why it is important to stop it from happening in more areas to prevent the problems that it causes stated before. One of the best ways to prevent soil erosion is by using much and planting perennial plants. But farmers who plant corn and soybeans every year can't do this as they are constantly harvesting the field every fall which is where fast growing cover crops are used.

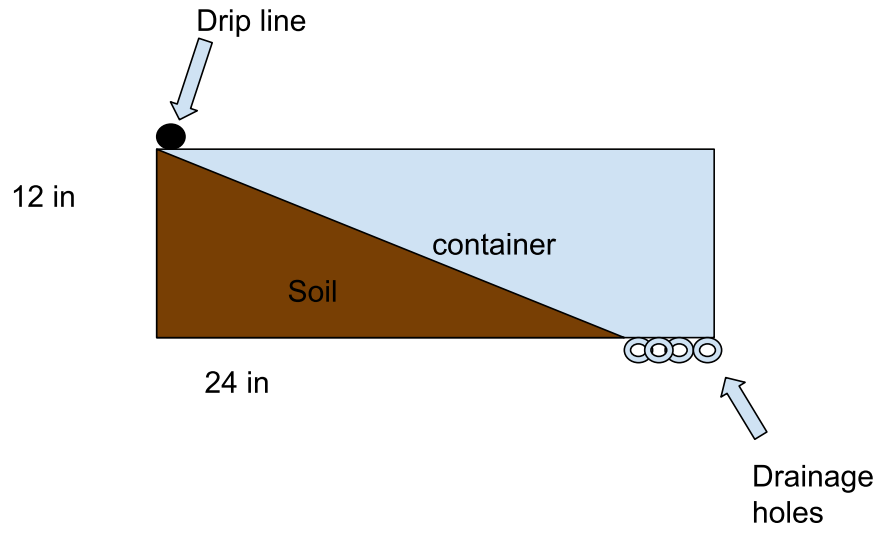
Cover crops can decrease soil erosion or sometimes completely eliminate soil erosion in many ways. Cover Crops provide coverage from the soil surface which helps protect it from wind and rain. The roots of the plants help provide soil structure too. The soil structure helps create pores in the soil with it to accommodate more water. This is good because that water will reduce runoff water that causes soil erosion. All of this leads me to my Hypothesis

Hypothesis: If Soil planted with cover crops then they will have significantly less erosion than bare soil because root mass will provide soil structure and leaves provide soil protection from rainfall.

Methods:

I Took two 12W x 12H x 24L storage containers and each one with soil that is placed at an angle. In one container I will plant a mixture of cover crops. I attached a drip irrigation line to the top of the container and I drip a gallon of water a day for one week, this will act as run off water. I will not cover the last four inches of each container so I can drill holes for drainage. In one

container I planted a cover crop mixture for 2 weeks to let it grow. In the other I will plant nothing. I place a metal rod in the middle of each container with measurements on it to see how much soil has eroded. Every day I took measurements to see how much soil has eroded.



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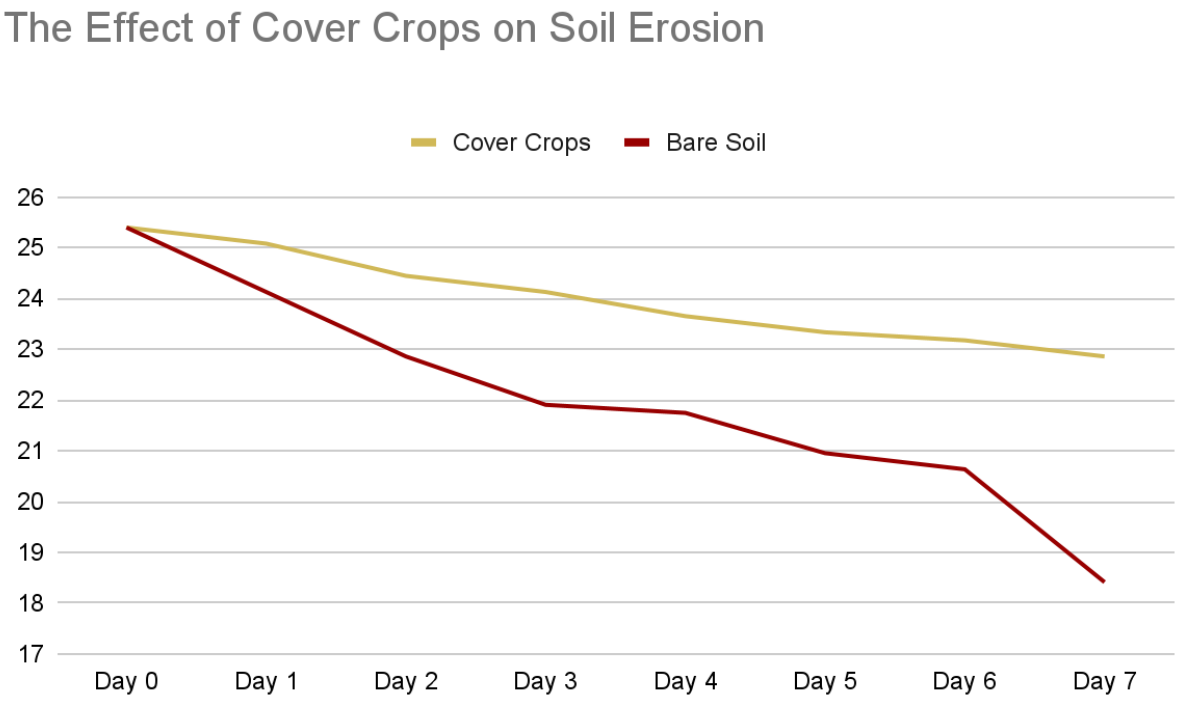
Days	0	1	2	3	4	5	6	7
Inches with just soil	25.4	24.13	22.86	21.9075	21.7488	20.955	20.6375	18.415
Inches with cover crop	25.4	25.0825	24.4475	24.13	23.6537	23.3362	23.1775	22.86



The Bare soil Started to drop off more rapidly than soil with cover crops. It also declined in centimeters at a much more rapid rate

Results

This graph shows the effect that the Cover crop had on soil erosion. The plain soil was 4.445 Cm lower than the cover crop soil.

Discussion:

As you can see my Data shows that the container with cover crop had 4.445 Cm of soil more than the bare soil by itself. This shows that cover crops does have an effect on soil erosion. The cause of this is probably the long and fibrous roots from the grasses and legumes that grew in the soil. The plant cover could have also slowed down the speed of the water as it flowed down into the bucket which could make the water take away more soil. There was a lot more erosion in the bare soil. The water

stripped away the first layer of soil and started to flow down its own paths causing more erosion in those areas. Also the water that we collected from the bare soil was much darker and had much more soil that settled at the bottom compared to the water that was poured over the Soil with cover crops planted in it. Both the Bare soil and cover crops Height in Centimeters started to drop off faster the 7th day, this could have happened because as water ran over each group the angle that they were at became much steeper increasing the speed of water. Overall the Bear was much less attached and eroded much more than the soil cover crops.

Limitations:

For this experiment I had very few limitations. One of them is that I couldn't find the proper sized storage bins for the soil. Instead I took storage bins to the closest size I could find in my methods and adjusted the amount of water I put into them. Another Limiting factor was I didn't have any drip line to use so instead I made my own using syringes and PVC pipe.

Future studies:

The next step I could take is to see if different arrangements of cover crops could have a greater effect on preventing soil erosion, or worse. For example instead of planting the cover crops randomly i could plant them in a pacific pattern.

I could also run the same experiment I did but also plant row crops with the cover crop.

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