

Langdon Research Extension Center - Soil Health Update

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Soil Erosion + Cover Crops = A Healthier Soil

There are many risks to soil health including low organic matter, low fertility, high groundwater, poor drainage, soil erosion, very high pH, excessive salt/sodium levels and capillary rise of groundwater due to excessive evaporation at the soil surface, which can greatly reduce the ability of our soils to sustainably produce profitable yields. Out of all of these risks, soil erosion can have a very rapid and devastating effect due to our rolling landscape, recent wet weather cycle and gusting winds. It takes several hundred to thousands of years to develop one inch of top soil, however, it takes a great deal less time to lose that nutrient rich, high in organic matter top soil during the erosion.

Soil erosion is the loss of top soil from one spot and accumulation of it at another spot. One of the major ways to reduce the impact of different types of soil erosions and to start the rehabilitation process is by having a suitable soil cover.

Soil Erosion Types

Traditionally wind and water erosion have been cited as the main agents for causing soil erosion, however, just recently tillage erosion has also been recognized as a major form of soil erosion. It not only causes erosion itself, but also speeds up the effects of wind and water erosion. Studies conducted across North America and Europe concluded tillage erosion as being the major cause of severe top soil loss and subsequently crop yield losses observed on hilltops (Soil Management Guide, Manitoba Agriculture,

Food and Rural Initiatives, 2008).

Wind Erosion

Wind erosion is the detachment, movement and removal of soil from the land surface by wind and that generally happens when the soil is dry. Very coarse sandy soils with loose or single-grained structure will be very susceptible to wind erosion. The most vulnerable time is early spring under drier conditions combined with gusty winds and after fall tillage. Like any other form of soil erosion the best way to counter wind erosion would be to provide the top soil with a cover by planting cover crops. If we can't plant cover crops for any reason then we should not work the fields and should leave the previous plant residues. Standing stubble has found to be 1.6 times more effective at preventing wind erosion than flat stubble (Soil Management Guide, Manitoba Agriculture, Food and Rural Initiatives, 2008). Annual barriers of corn and sunflower perpendicular to the wind can also reduce the wind speed. Planting of shelterbelts perpendicular to the wind will reduce the wind speed. Shelterbelts reduce wind velocity in the area behind them for a distance up to 30 times the height of the trees (Soil Management Guide, Manitoba Agriculture, Food and Rural Initiatives, 2008). Apart from that addition of cereal straw (on highly erodible soils) and solid or liquid manure application will also improve soil structure, add organic material and will resist all kinds of erosions.

Water Erosion

Water erosion is the detachment, movement and removal of soil from the land surface by rainwater as runoff. Rainfall quantity, intensity, duration, soil texture, structure, drainage, organic matter content, landscape type and lack of soil cover influences the extent of water erosion. Intense rainstorms of more than 1 inch exceed most soil's capacity to absorb water, creating run-

off conditions (Soil Management Guide, Manitoba Agriculture, Food and Rural Initiatives, 2008). A heavy clay soil will be more susceptible to water erosion due to the slower soil water infiltration. Most susceptible times are during the spring snow-melt and during the months of May and June (after seeding but before an established plant canopy). Again unnecessary or excessive tillage can maximize the effects of both wind and water erosion. In terms of management having a vegetative soil cover is very important to minimize the intensity of water erosion. Unlike wind erosion, flat stubble is more effective at reducing the impact of water erosion than standing stubble. Forages are most effective at controlling water erosion followed by cereals and then row crops. Reducing unnecessary tillage which would leave about 30 percent of the last year's residues will help too. Planting of buffer strips and considering forage or pasture production in sensitive areas is again helpful (Soil Management Guide, Manitoba Agriculture, Food and Rural Initiatives, 2008).

Tillage Erosion

Tillage erosion relates to the progressive movement of top soil from higher grounds and midslopes into the depressions or low grounds. Tillage operations can also greatly increase the effects of wind and water erosion as top soil would be more vulnerable due to tillage. All field operations including seeding, row crop cultivation, root crop harvesting and manure injection cause some sort of tillage erosion. Hilltops, soils without a cover, loose structure and poor particle aggregation due to low soil organic matter are most susceptible to tillage erosion.

Best way to manage tillage erosion is to reduce the tillage frequency by eliminating any unnecessary operations. Performing tillage under suitable soil conditions will also

prevent any correctional tillage. Tillage implements should also be operated at minimum recommended speeds and depths to reduce the intensity. If possible, tillage should be performed along the contours. Very long or wide equipment should also be avoided on highly susceptible lands along with maintaining a constant speed and depth. Also, some tillage operations move the top soil from high grounds to low grounds. By performing tillage up the slope we can move some of the top soil back from depressions to the hilltops (Soil Management Guide, Manitoba Agriculture, Food and Rural Initiatives, 2008).

Role of Cover Crops

Even though it is bit difficult to assess the soil health benefits of cover crops on a short-term basis, there are some specific and long-term benefits. By planting cover crops, soils will get the much needed plant cover which will not only reduce the intensity of wind, water and tillage erosion, but will also add organic material to the soil by providing above-the-ground and below-the-ground biomass. Cover crops will also lower down the soil water-table levels by using up the excessive soil moisture, increase soil water holding capacity by adding organic matter and will reduce soil moisture evaporation, minimize capillary rise of soil water along with improving soil water infiltration and drainage.

Considering a high number of prevent plant acres it becomes evi-

dently important to plant a cover crop suited to the specific needs. Selection of cover crops depends upon our objectives. Cover crops can be planted to use up the excessive soil moisture, especially on the hilltops, midslopes, along the sloughs, ditches or depressions so that the excessive soil water should not get dumped in the low grounds. Planting legumes will fix nitrogen for the subsequent crops. Cover crops can also be used for grazing or haying until the USDA specified date of November 1st. Generally it can be a cocktail mix which may include a warm-season crop such as forage sorghum or millet for dry matter production, radish or turnip to improve soil water infiltration and a legume crop like field peas to fix nitrogen.

There are different cover crop options we can plant in July and August. Some of them are Buckwheat, millet, sorghum sudangrass, flax, winter cereal ryegrass, oats, winter barley, cow peas, field peas, alfalfa, berseem clover, forage turnips and radish.

For detailed cover crop planting options please check the following link: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1142714.pdf.

For the "Locally Approved Covers or Practices for DCP Base Acreage", check the "1-DCP (Rev. 3) ND Amend. 1" or visit your local FSA office.

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