CANADA
4-H Saskatchewan

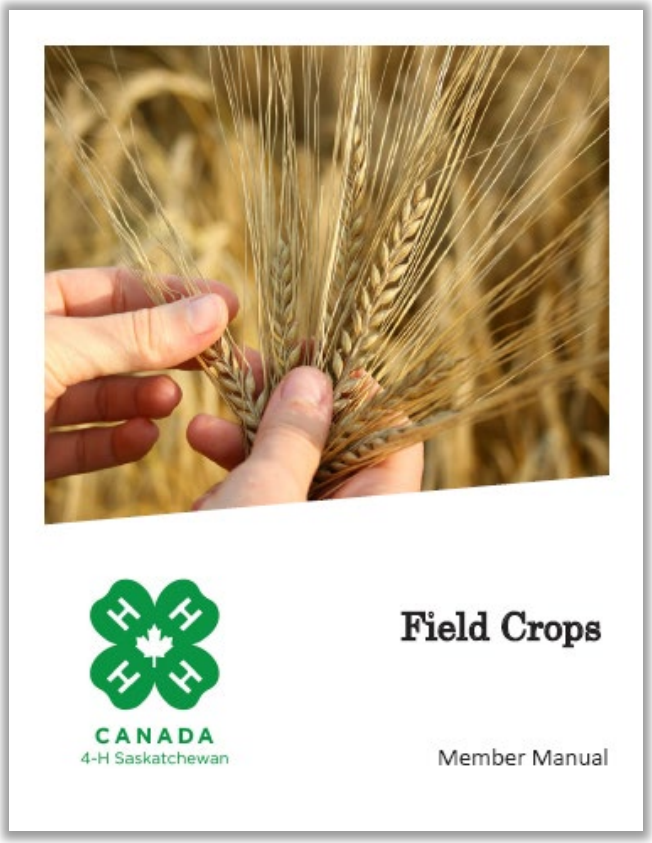
Exploring 4-H at Home

Sustainable Agriculture and Food Security

Pillar: **Sustainable Agriculture and Food Security**

Project: Field Crops

Activity: Checking Your Soil Health



Field Crops Activity: Soil Your Undies

1) Read the information about soil (after the activity instructions), taken from the Field Crops manual.

2) Take a shovel and go out to where you could be planting! This could be a field or your garden. Dig in the soil and…
   a) Take a picture of your soil.
   b) Look at your soil and observe the color and look for any insects or worms!
   c) Smell your soil.
      i. How does it smell?
   d) Feel your soil.
      i. Is it cold/warm?
      ii. Wet/dry?
      iii. Grainy/smooth?

3) Do the Soil your Undies project.
   a) Watch this video https://www.youtube.com/watch?v=akMT1ZZQ8PA
   b) Materials needed:
      i. Three (3) pair of Men's large 100% cotton white underwear.
      ii. A shovel
      iii. Flag or someway to help you find your undies again.
   c) After you field is seeded or garden planted, bury 3 pair of underwear. Pick three different spots in your plot. Maybe a high spot, low spot, near the edge, near the middle…
   d) Before harvesting, you will dig up your undies, and compare your 3 pairs to see if there is any difference.
   e) Ideally, you will bury your undies in May and plan to dig them up in August. Would be nice to leave them for 3 months for the best results.

Learning About Soil

Crops that we grow begin their life thanks to soil. Plant roots feed on food and water stored in soil. You might think of soil as the ground we walk on, or the dirt in the garden a few centimetres deeps, but it is so much more than that!

Have you ever thought of soil as a living, breathing thing? Soil is many metres thick. Soil is a storehouse of decaying vegetation, moisture and plant nutrients. It is home for insects and micro-organisms. Soil is made of four basic materials and each of these is required to sustain the life and development of soil. It is made up of minerals, organic matter, air and water.

Minerals

Minerals make up nearly one half the total volume of soil. These consist of sand, silt and clay, which are classified based on individual particle size. (The proportion of these particles determines whether a soil is a sand, loam or clay.) Sand particles can be seen very easily, but clay particles are visible to the naked eye and can only be seen with a microscope.

Organic Matter

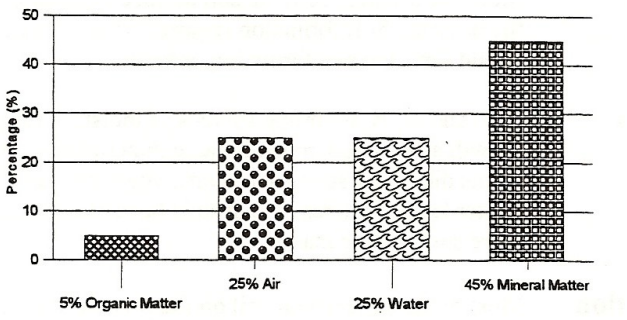
Organic Matter is anything that was once living but is now dead and rotting in the soil. You have probably noticed decaying plant material in your soil samples. There may also be plant roots, leaves, manure and dead animals that break down into organic matter in soil. Decaying organic material also requires worms, insects and very small microscopic bacteria and fungi, which are responsible for eating (decaying) the organic matter and breaking it down into tiny bits. When decay is complete, the dead plant has been changed into organic matter. Since soil organic matter is derived mainly from plant decay, it contains all of the essential plant nutrients, which are used as food by living plants.

Air

Air is found in spaces between the mineral particles and helps the plant roots to grow and breathe. Air is also important to bacteria and other microorganisms, which are responsible for decomposing organic material. Plants also require air to assist with nutrient and water absorption.

Water

Plants use water, and it dissolves salts and nutrients found in soil. Water is important for helping move food in soil to plant roots.



How is Soil Made?

Soil is composed of ground-up granite rock, shale, limestone and other kinds of rock. These are called the mineral portion of soil and are formed by the breaking down of rocks.

The glaciers that shaped our prairies over 10,000 years ago were sheets of ice almost one kilometer thick. Rocks and gravel picked up by these moving sheets of ice were broken up and crushed. These smaller rocks were worked down even more by the action of wind, water, heat and cold.

This action is called weathering and happens slowly. The worked down rock forms the mineral matter that makes up nearly half the total volume of soil. It takes hundreds of years for freezing, thawing, air and sunshine to break down rock and turn it into soil particles.

What affects the Formation of Soil?

Not all soil is the same. Soils formed under different conditions develop unique characteristics. Four conditions that affect soil development in Saskatchewan are:

1. Climate – The climate of an area will help determine many of the soils qualities. Some soils are formed where there is a lot of rain and generally cool temperatures. Others are formed where there is no rain and very hot temperatures. Climate influences the rate and type of soil that is formed. Climate includes Temperature, Wind, Evaporation and Precipitation.
    - Temperature: Affects which plants can be grown and the rate of plant matter decay. Extreme temperatures, both hot and cold, limit the soil formation process.
    - Wind: Will limit soil formation and plant growth. Brisk winds blow bare soil away, destroying many years of soil development.
    - Evaporation: Moisture is taken from the soil surface through evaporation from the hot sun. Soil formation requires water so an extreme loss of moisture would limit the soil formation process.
    - Precipitation: Rain and snow are prime sources of moisture for plant growth. Plant growth affects how much organic material is returned to the soil when the plants die. (Dry soils have sparse vegetation and therefore low organic matter levels, whereas moist soils have more vegetation and therefore more soil organic matter.)

2. Vegetation – Most of the agricultural soil on the prairies was formed under grass. Grass produces many small rootlets that die and decay. Soil formed under grass is very black, full of organic matter, fertile and with good texture. Some of the soil is formed under trees. This soil does not contain as many roots and any organic matter is from decaying leaves and needles that tend to remain in a separate layer on top of the soil.

3. Parent Material – Parent material is the name given to the loose mineral and organic material above the bedrock from which soils develop. It largely determines the soil texture and the supply of natural plant nutrients. Soil conditions such as acidity, alkalinity and salinity are due to properties of the parent material.

4. The Shape of the Land – The shape of the land is called relief. It controls the drainage of an area and this affects the soil type.

Soils of Saskatchewan

The soils of Saskatchewan are divided into colour types based on the amount of organic matter they contain. They are brown, dark brown, black and gray. Each type has its own special characteristics and they are all different because they are all formed under different conditions.

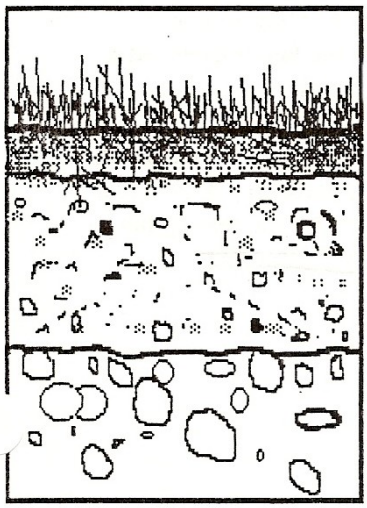
- Brown Soil Zone: The brown soil zone in south central Saskatchewan covers about 15 million acres. Soil in this zone was formed under short grass vegetation. About 70% of this soil zone is cultivated. Hot summer weather, frequent wind, low rainfall and lower organic matter in this region limit crops mostly to cereals and grass for livestock.
- Dark Brown Soil Zone: The dark brown soil zone covers 17 million acres in a band mostly north and east of the brown soil zone. Soil in this zone was formed under mostly grassland vegetation. About 82% of this zone is cultivated. Crops are more diversified in this zone due to improved moisture and cooler temperatures.

- Black Soil: The black soil zone lies north and east of the dark brown soil zone. About 70% of the 17 million acres is cultivated. Soil was formed under tall grass and aspen trees, resulting in a higher organic matter. The growing period in the black soil zone is somewhat shorter, temperatures average lower but moisture is usually better than the other soil zones.
- Gray Soil Zone: This soil zone is the most northern and covers 10 million acres. The Gray, Dark Gray and Gray wooded soils have a short growing season with high moisture but productivity is limited by the fertility of the soil. A considerable amount of land in this zone is used for livestock production.

Soil Profile

Tells a Story

Soil develops a number of different layers as it is formed. If you were to dig a pit in your field, you would be able to see layers. These layers all together are called the soil profile. Each soil profile tells a special story of the life of that soil.



The thin, dark, top layer is called the TOPSOIL. This is the most productive soil. This is because it contains the most food for plants, can hold more moisture and can be cultivated easily. This is where most of the organic matter is found and the colour of topsoil may be black, brown or gray.

The middle layer (SUBSOIL) is just beneath the topsoil. It is not a productive soil. It absorbs water poorly and is often difficult to work.

The PARENT MATERIAL is the unaltered, loose, mineral layer found underneath the topsoil and subsoil layers. It is called the parent material because it is what most of the soil was originally made from.

Soil takes many years to form from organic matter, mineral matter and parent matter.

Soil Facts

- Soil makes up the outermost layer of our planet.
- Natural processes can take 300 years to form one inch of topsoil.
- Fungi and bacteria help break down organic matter in soil.
- Roots loosen soil and allow oxygen to penetrate. This is beneficial to animals living in the soil.
- 5-10 tons of animal life can live in an acre of soil.
- Soil is made of different sized mineral particles that are sand, silt and clay.
- 5 tons of topsoil spread over an acre is as thick as a dime.