



# Soils Support Agriculture

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## Importance of Soil to Agriculture

Agriculture is one of the most important components of our society. Farmers and ranchers produce the food and fiber we use every day. Soil is a critical part of successful agriculture and is the original source of the nutrients that we use to grow crops. The nutrients move from the soil into plants that we eat like tomatoes. Nutrients are also a part of the food animals (like cows) eat. In the end, we benefit from healthy soil. The healthiest soils produce the healthiest and most abundant food supplies.

Since the healthiest soils produce the most food, they have also been at the center of the best communities in history. Ancient Egyptians had fresh nutrients delivered to their fields every year by the flooding of the Nile River. This allowed farmers to use the same soils for a very long time. Some other ancient civilizations had soil that was nutrient poor or didn't hold much water. The health of these soils declined over time, and people had to move away to farm new ground. Soils in dry climates are more likely to see a decline in nutrients, especially if irrigated. The small amounts of salts and other chemicals found in water can build up in the soil over time if not carefully managed. This process is called **salinization**. Much like freshwater fish are not able to live in the saline ocean, many land plants, including most crops, are not able to grow in saline soil. The most successful civilizations in history have lived on healthy soils and taken good care of the soil so that food production was sustainable.

Adding fertilizer is one important way to keep agricultural production systems sustainable. In nature, plants use soil nutrients, and then they die and are decomposed by microorganisms. This returns the nutrients to the soil. In an agricultural setting, the crops take up nutrients, but then are removed from the field so people and livestock can eat them and in turn get the nutrients. This removes nutrients from the field. In order to maintain nutrient levels in soil, it is important to apply fertilizer, whether from natural sources, such as manure, or human-made sources, such as ammonium.



L to R: Nutrients move from soil into plants we eat. A corn plant growing in rich top soil. The most successful civilizations have lived on health soils and taken good care of them.

**Arable land** is the term applied to soils that are suitable for agriculture. The soils considered best for agriculture have many of the following properties. They:

- allow both water and air to move through and get to roots,
- have a diverse population of microorganisms,
- are dark in color because they contain a lot of organic matter (dead plants and animals), and
- they contain an abundance of readily available nutrients.

The amount of arable land is not increasing. Some is being lost to soil degradation caused by salt build-up, desertification, erosion, chemical spills, and so on. Other lands are being covered up by buildings and roads. As Earth's population increases, it is important to maintain as much land as possible to produce more food. Understanding and conserving soil are critical to this effort.

## Managing Soil in Agricultural Settings

As the first land users, farmers were also the first land stewards. Farmers use many practices to make sure they are taking good care of the soil and the surrounding environment. These include:

- monitoring levels of nutrients in the soil,
- using precision agriculture practices to apply nutrients and water only where they are needed,
- using precision agriculture to grow more crops on the best soil and allow more rest for the weaker soil,
- rotating crops to improve diversity,
- not driving in fields when the soil is too wet,
- not disturbing the soil too much (disturbance makes erosion easier and increases the rate at which microorganism lose their food supply),
- keeping the surface covered to reduce erosion, and
- monitoring watering so that salts do not accumulate.

There is a lot of technology used to make modern agriculture more efficient. Examples include global positioning systems (GPS) and large computerized harvesters. **Precision agriculture**, the study of management practices to maximize food production and minimize environmental impact, is one of many modern farming practices that make production more efficient. With precision agriculture, farmers and soils work better, not harder. One example of a precision agriculture practice is to understand how soils differ within a field and manage the different areas differently. If the soil in one area holds water better, then crops can be planted more densely and irrigation can be used more sparingly in these places than on the soils that don't hold water as well. If the soil that holds water better was used in animal production, then the pasture grasses would probably be thicker and more diverse in that area, allowing a greater number of cattle to graze than a similar area of poorer quality soil.

## Recap

Healthy soil results in a more stable food supply, which results in a strong community. Farmers use many practices and technologies, including precise applications of fertilizer and irrigation, to ensure that soil is conserved for sustainable food production.



Precision agriculture applies nutrients only where they are needed. Photo: Jason Ellsworth



Keeping the soil covered reduces erosion.