Food and Agriculture Organization of the United Nations


©FAO/Johan Spanner

Healthy soils are the basis for healthy food production

2015 International Year of Soils

The most widely recognized function of soil is its support for food production. It is the foundation for agriculture and the medium in which nearly all food-producing plants grow. In fact, it is estimated that 95% of our food is directly or indirectly produced on our soils. Healthy soils supply the essential nutrients, water, oxygen and root support that our food-producing plants need to grow and flourish. Soils also serve as a buffer to protect delicate plant roots from drastic fluctuations in temperature.

WHAT IS A HEALTHY SOIL?

Soil health has been defined as the capacity of soil to function as a living system. Healthy soils maintain a diverse community of soil organisms that help to control plant disease, insect and weed pests, form beneficial symbiotic associations with plant roots, recycle essential plant nutrients, improve soil structure with positive effects for soil water and nutrient holding capacity, and ultimately improve crop production. A healthy soil also contributes to mitigating climate change by maintaining or increasing its carbon content.


©FAO/Giulio Napolitano

SOILS AND FOOD SECURITY

Food availability relies on soils: nutritious and good quality food and animal fodder can only be produced if our soils are healthy. A healthy living soil is therefore a crucial ally to food security and nutrition.

In the past 50 years, advances in agricultural technology led to a quantum leap in food production and bolstered world food security. However, in many countries this intensive crop production has depleted the soil, jeopardizing our ability to maintain production in these areas in the future. With a global population that is projected to exceed 9 billion by 2050, compounded by competition for land and water resources and the impact of climate change, our current and future food security hinges on our ability to increase yields and food quality using the soils that are already under production today.

Numerous and diverse farming approaches promote the sustainable management of soils with the goal of improving productivity, for instance: agroecology, conservation agriculture, organic farming, zero tillage farming and agroforestry.

- **Agroecology** uses ecological theory to study and manage agricultural systems in order to make them both more productive and better at conserving natural resources. This whole systems approach to agriculture and food systems development is based on a wide variety of technologies, practices and innovations, including local and traditional knowledge as well as modern science. By understanding and working with the interactions between plants, animals, humans and the environment within agricultural systems, agroecology encompasses multiple dimensions of the food system, including ecological, economic and social.

- **Organic farming** is agricultural production without the use of synthetic chemicals or genetically modified organisms, growth regulators, and livestock feed additives. It also emphasises a holistic farm management approach, where rotations and animals play an integral role to the system. Soil fertility is the cornerstone of organic management. Because organic farmers do not use synthetic nutrients to restore degraded soil, they must concentrate on building and maintaining soil fertility primarily through their basic farming practices.

- **Conservation agriculture** practices have significantly improved soil conditions, reduced land degradation and boosted yields in many parts of the world by following three principles: minimal soil disturbance, permanent soil cover and crop rotations. To be sustainable in the long term, the loss of organic matter in any agricultural system must never exceed the rate of soil formation. In most agro-ecosystems, that is not possible if the soil is mechanically disturbed. Therefore, one of the tenets of conservation agriculture is limiting the use of mechanical soil disturbance, or tilling, in the farming process.

- **Zero tillage** is one of a set of techniques used in conservation agriculture Essentially, it maintains a permanent or semi-permanent organic soil cover (e.g. a growing crop or dead mulch) that protects the soil from sun, rain and wind and allows soil micro-organisms and fauna to take on the task of "tilling" and soil nutrient balancing - natural processes that are disturbed by mechanical tillage.

- **Agroforestry** systems include both traditional and modern land-use systems where trees are managed together with crops and/or animal production systems in agricultural settings. The combination of trees, crops and livestock mitigates environmental risk, creates a permanent soil cover against erosion, minimizes damage from flooding and acts as water storage, benefitting crops and pastures.


©FAO/Giulio Napolitano


©FAO/Gianluigi Guercia

Conservation agriculture in Lesotho

In response to the 2012 food insecurity crisis in Lesotho, FAO and the Ministry of Agriculture and Food Security (MAFS) designed a three-year cycle programme to assist 18 500 households with agricultural inputs and know-how on agricultural technologies helping communities to adapt to climate change, building their resilience to better withstand future shocks. The programme promotes conservation agriculture and improved home gardening and nutrition in all ten districts of Lesotho. Soil erosion is a major problem in Lesotho affecting both the quality and quantity of harvests. By adopting conservation agriculture, farmers not only ensure better harvests but also contribute to the improvement of soil quality and its preservation.

"Soil anaemia also breeds human anaemia. Micronutrient deficiency in the soil results in micronutrient malnutrition in people, since crops grown on such soils tend to be deficient in the nutrients needed to fight hidden hunger."

M.S. Swaminathan

Strengthening capacity for sustainable organic farming in Palau

The major constraint to increasing agriculture production in Palau is lack of appropriate sustainable technologies to improve the quality of soil for crop production. Palau's soils are highly weathered, acidic and clayey and there is a limited amount of land area that is suitable for agricultural production without substantial inputs and soil amendments. FAO is assisting the Bureau of Agriculture (BOA) in strengthening the Palau Organic Growers Association (POGA) to increase domestic agricultural production through adoption of new sustainable technologies and methods for soil improvements. FAO is facilitating training for POGA farmers and BOA extension staff on key aspects of soil biology, soil testing, fertility improvement strategies, demonstration trials and other sustainable organic production technologies and crop management. FAO is also supporting on farm demonstrations with selected farmers to adapt technologies to local conditions and major crops.


©FAO/Daniel Hayduk

2015 International Year of Soils

FAO IN ACTION


©FAO /Mary Jane dela Cruz

KEY FACTS

- 95 percent of our food is directly or indirectly produced on our soils.
- A shortage of any one of the 15 nutrients required for plant growth can limit crop yield.
- By 2050, agricultural production must increase by 60 percent globally – and by almost 100 percent in developing countries – in order to meet food demand alone.
- It can take up to 1 000 years to form one centimetre of soil.
- Sustainable soil management could produce up to 58 percent more food.

Growing poplars for food security in China

Poplar-based smallholder agroforestry has transformed the flood plains of Siyang County into a mosaic of green activity on the landscape, thanks to assistance from FAO forestry and FAO's International Poplar Commission. Large swaths of planted poplar trees now protect fields once ravaged by floods, wind, sandstorms and soil erosion, giving boost to agricultural activities. Faster leaf decomposition and biomass growth have created a much more fertile soil on once sandy land, which was not always suitable for cultivation. Because of poplars' compatibility with many crops, farmers can now grow wheat and maize and an abundance of horticulture crops. Smallholder farmers can also use the cut stems of poplar for cultivating mushrooms in their greenhouses.


©FAO/Ishara Kodikara

Food and Agriculture Organization of the United Nations

Viale delle Terme di Caracalla
00153 Rome, Italy
Tel:(+39) 06 57051
Fax:(+39) 06 570 53152
e-mail: soils-2015@fao.org
web: www.fao.org

#IYS2015

fao.org/soils-2015

I4405E/1/02.15