

Soil Isn't Just Dirt



“Improving soil quality is a long term issue. But if we don't start working now, there won't be any good soil left in the future. And where will our food come from then?” asks IAEA/FAO Soil Scientist Gerd Dercon.

40% of the world's land is used for agriculture. That land is increasingly threatened by desertification, salinity, and loss of nutritional content. Soil in many African and Asian countries is so damaged, farmers must struggle to eke out a living.

Soil loss and damage threatens the food security of tens of millions of people.

Conservation agriculture and nuclear science are two of the tools being used to address this problem: improving food security by making soil more fertile.

Conservation Agriculture and Soil Fertility

“There are a number of things you can do to make soil more fertile,” says IAEA Soil Scientist Gerd Dercon. “The first thing is to significantly reduce how much farmers till the soil while sowing, because digging it up and turning it over makes the soil drier.

“Also, crop rotation, usually between cereals and legumes, is encouraged. This ensures that the soil isn't depleted of any one type of nutrient because the same crop is farmed over and over. And finally, using crop residues—stalks and leaves that would otherwise have been discarded—as ground cover.

“This serves two purposes. It provides a layer of protection for the soil so moisture doesn't

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(Christian Resch/IAEA)

escape easily. And when these residues decay completely, they'll become part of the soil's organic matter, matter that is essential for healthy, vibrant plant growth," explains Dercon, who works in the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture in Vienna, Austria.

While these conservation agriculture practices are being promoted by numerous organisations around the world, the Joint Division is conducting experiments to understand just how carbon moves from the atmosphere, into plants, then the soil.

Their ultimate goal is to improve soil quality so farmers can produce better, more nutritious food.

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What does the movement of carbon have to do with better quality food?

Rich, fertile, soil has a lot of carbon. And food quality is determined by soil quality. "If you have poor soil, you won't be able to produce as much food, or food that's as nutritious as it could be," says Dercon.

The Joint Division is tracking carbon through the plant cycle to see which plants retain the most carbon from the atmosphere.

"If smallholder farmers in particular can plant these crops, while practicing conservation

agriculture—no tillage, crop rotation and using crop residues—then globally we can become infinitely more optimistic about our prospects for continued food security," says Dercon.

Planting crops that absorb more carbon from the atmosphere can significantly contribute to the reduction of greenhouse gases like carbon dioxide, lessening the impact of climate change, a process that's driven by the release of these gases.

The Nitty Gritty of Soil

Soil is made up of minerals and organic matter, as well as living organisms. Organic matter binds nutrients to the soil, improving the likelihood that crops will grow, using more and more carbon from the atmosphere, creating a cycle that is beneficial to the atmosphere and plant agriculture.

Organic matter maintains soil structure, which improves the soil's ability to absorb and hold water. In addition, it speeds up the breakdown of pollutants and can bind these harmful substances to its particles, reducing the risk of run-off into rivers and streams where people could be affected.

Soil organic matter is essentially carbon. It's made up of dead plants, insects and animal remains that have decayed to the point of being unrecognizable. The bacteria, worms and insects that live in organic matter help in the decay process, thereby releasing nutrients that can be taken up by crops.

Sasha Henriques, Division of Public Information.
E-mail: S.Henriques@iaea.org

Good Soil = Strong Agricultural Sector = Economic Development

"Roughly 2.5 billion people derive their livelihoods from agriculture. For many economies, especially those of developing countries, agriculture can be an engine of economic growth.

In many developing countries the agricultural sector contributes as much as 30% to the Gross Domestic Product (GDP) and is a source of employment for two-thirds of the labour force.

According to the World Bank, growth in the agricultural sector can be up to 3.2 times more effective at reducing US\$1/day poverty than growth in other sectors.

Importantly, agriculture can provide a haven of resilience against global economic and financial turmoil, often more effectively than other sectors."

Food and Agriculture Organization of the United Nations Statistical Yearbook 2012
www.fao.org/docrep/015/i2490e/i2490e00.htm