

Safety Security : Food Water

Agriculture and Climate: Saving the Soil

Agriculture is severely threatened by global warming, yet it is also a major contributor to the problem. More sustainable farming and a new type of soil could spare farmers some of the expected ravages of climate change.



Tread Softly

The health of the soil in our fields is vital for future food security. We need to treat it with care (Photo: Reuters)

Rolling fields and grazing cattle do not look like major climate change culprits, but taken together farming and deforestation – mainly for farming – are responsible for about a third of man-made emissions. Reducing these emissions is a critical challenge in the battle against climate change, but for many the more immediate concern is to feed the world.

"If [environmentalists] lived for just one month among the misery of the developing world they'd be crying out for tractors and fertilizer and irrigation canals," said Norman Borlaug, one of the founding fathers of the Green Revolution.

That revolution - mainly improved seeds, irrigation, and fertilizers - greatly enhanced crop yields in Asia. But it also spread water-intensive farming methods dependent on fertilizers and chemicals that are degrading the world's soils.

Relentless plowing both releases carbon dioxide and enfeebles the soil, reducing its capacity to fix CO₂ and nitrogen, absorb nutrients, or to hold water. Unrestricted use of fertilizers, meanwhile, releases climate changing nitrous oxides into the air.

Agriculture is not only a cause of global warming, but it will also be among the first victims of a changing climate. Glacial melting in the Himalayas, for example, could drastically reduce the water available for Chinese and Indian farmers.

Saving the Soil

Conservation agriculture aims to restore the health of the soil and its ability to sequester carbon. Its basic principles are radically reduced plowing ('no-till' farming), minimum agrochemical inputs, and soil protection from rain, sun, and wind.

Rotating different crops on the same farmland, for example, provides new plant matter and helps create soil that better retains water and nutrients without the use of chemical fertilizers.

Conservation agriculture is “a truly sustainable production system” says the Food and Agriculture Organization of the United Nations (FAO), Conservation farmers, FAO reports, use 30 to 40 percent less energy than conventional farmers.



Picture Gallery (click on the image to start)

Feeding an expanding world population takes a heavy toll on the planet. Click on the image to learn about sustainable ways to farm (Photo: Reuters)

Preserving water will also be critical. There is enough unused irrigable land around the world, but in South Asia, the Near East and North Africa water is scarce. Conservation measures like rainwater harvesting and drip-feed irrigation could help. “Agriculture must meet future demand through water productivity improvements,” says the World Bank in its World Development Report 2008.

Conservation agriculture often uses simple, traditional techniques. In the North African Sahel, farmers have reclaimed thousands of hectares of land lost to the desert by planting barricades of trees to stop winds blowing away the topsoil. Stones placed around field help capture rainwater and avoid soil erosion. Silt and seeds are trapped as well, and over time shrubs and small trees grow around the field edges, enriching the soil further with their falling leaves.

Another simple solution is the ‘Zai’ technique adopted in Burkina Faso. Farmers dig small pits (Zai) in their fields and fill them with manure. This attracts termites that digest the manure and effectively fertilize the crops. The termites also dig channels in the soil that water can run through.

Trees are planted in the Zai in a form of ‘agroforestry’ that benefits the crops by providing shelter from sun, wind and rain, benefits the soil by binding it with tree roots and providing dead leaves, and benefits the atmosphere by sucking up carbon.

A Black Revolution

One of the most promising technologies comes from the [Amazon region](#), where soils are notoriously poor. Yet the Amazon is also home to some of the richest soil on the planet, the “black Indian earth” or “terra preta”. These ancient man-made soils could help feed the world and restore the carbon balance at the same time.

Terra preta is full of minerals and incredibly fertile. It contains large amounts of charcoal, added to the soil in pre-colonial times by indigenous people employing “slash-and-char” soil management

techniques. Terra preta gathers up nutrients and water very efficiently, creating a soil that contains three times as much phosphorus and nitrogen than nearby soils. It also retains much more carbon.

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Making terra preta could have the potential to sequester vast amounts of carbon and would be more effective and quicker than planting trees. Johannes Lehmann of Cornell University estimates that by the end of this century terra preta schemes, together with biofuel programs, could store up to 9.5 billion tons of carbon a year - more than is emitted by all today's fossil-fuel use.

Terra preta enthusiasts like Lehmann predict a "black revolution" in poor countries with weak soils. With climate scientists forecasting that global warming will make arable land in many developing countries less productive or unusable, this revolution could help rebalance agriculture and climate.

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