Soil erosion threatens to leave Earth hungry

Arable land is turning to desert or to salt at an ever-faster rate, lessening the hope that we can feed our booming population

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Borderline ... farmers in northern China struggle to eke out a living on the fringes of the Gobi desert. Photograph: Frederic J Brown/AFP/Getty Images

Within 40 years, there will be around 2 billion more people – another China plus India – on Earth. Food production will have to increase at least 40%, and most of that will have to be grown on the fertile soils that cover just 11% of the global land surface.

There is little new land that can be brought into production, and existing land is being lost and degraded. Annually, says the UN's food and agricultural organisation, 75bn tonnes of soil, the equivalent of nearly 10m hectares of arable land, is lost to erosion, waterlogging and salination; another 20m hectares is abandoned because its soil quality has been degraded.

The implications are terrifying. "The world is facing a serious threat of a major food shortage within the next 30 years. We are trying to grow more food on less land while facing increased costs for fertiliser, fuel and a short supply of water," says Professor Keith Goulding, head of sustainable soils at Rothamsted research station and president of the British society of soil science.

Lester Brown, president of the Worldwatch Institute in Washington, says it takes between 200 and 1,000 years to renew 2.5cm of soil. "The thin layer of topsoil that covers the planet's land surface is the foundation of civilisation. This soil, typically 6 inches [15cm] or so deep, was formed over long stretches of geological time as new soil formation exceeded the natural rate of erosion. But sometime within the last century, as human and livestock populations expanded, soil erosion began to exceed new soil formation over large areas."

Soil erosion is not a high priority among governments and farmers because it usually occurs so slowly that its cumulative effects take decades to become apparent, says David Pimentel, professor of agricultural sciences at Cornell University. "The removal of 1 millimetre of soil is so small that it goes undetected. But over a 25-year period the loss would be 25mm, which would take about 500 years to replace by natural processes."

Soil erosion also leads to lower crop productivity because of loss of water, organic matter and soil nutrients. A 50% reduction in soil organic matter has been found to reduce corn yields by 25%. Countries are losing soil at different rates. The US, which just avoided turning the Great Plains into a dust bowl in the 1930s, is still losing soil 18 times more rapidly than it is forming it.

China's desertification may be the worst in the world, Brown says. "Wang Tao, a leading desert scholar, reports that from 1950 to 1975 an average of 600 square miles [1,550 sq km] turned to desert each year. By century's end, nearly 1,400 square miles [3,600 sq km] were going to desert annually. Over the last half-century, some 24,000 villages in northern and western China have been entirely or partly abandoned as a result of being overrun by drifting sand."

The problem is highly visible in the grasslands of Africa, the Middle East and central Asia. In 1950, Africa was home to 227 million people and 273 million livestock. By 2007, there were 965 million people and 824 million livestock.

Countries are waking up to the problem. The African Union has launched the Green Wall Sahara Initiative to combat desertification across the Sahel. This plan, originally proposed by Olusegun Obasanjo when president of Nigeria, calls for planting 300m trees on 3m hectares in a long band stretching across Africa.

Senegal, which is currently losing 50,000 hectares of productive land each year, would anchor the green wall at the west. Modou Fada Diagne, Senegal's environment minister, says, "Instead of waiting for the desert to come to us, we need to attack it."

In July 2005, the Moroccan government, responding to severe drought, announced that it was allocating $778m to cancelling farmers' debts and converting cereal-planted areas into less vulnerable olive and fruit orchards.

China defends itself against the Gobi desert by planting a 4,480km, belt of trees from outer Beijing through Inner Mongolia. The goal was to plant trees on 10m hectares, but pressures to expand food production appear to have slowed the tree planting.

New farming practices are also being introduced. Instead of the traditional practices of ploughing land then harrowing it to prepare the seedbed, farmers drill seeds directly through crop residues into undisturbed soil, controlling weeds with herbicides. In the US, the no-till area went from 7m hectares in 1990 to 27m hectares in 2007. No-till farming has spread rapidly and now covers 26m hectares in Brazil, 20m hectares in Argentina, 13m in Canada and 12m in Australia.

The best hope may lie in the global climate change talks, which have recognised that nearly 30% of all carbon is released from deforestation, the conversion of peat lands and degradation of soils. If agreement can be reached to reward reforestation and conservation, there is some hope that the next 2 billion people may be fed.