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## Dust to dust: a man-made Malthusian crisis

by Ambrose Evans-Pritchard | 2 Dec 2013 United States | food crisis | seeds & biodiversity | Blog



Genetically modified maize in Shropshire Photo: ALAMY

American scientists have made an unsettling discovery. Crop farming across the Prairies since the late 19th Century has caused a collapse of the soil microbia that holds the ecosystem together.

They do not know exactly what role is played by the bacteria. It is a new research field. Nor do they know where the tipping point lies, or how easily this can be reversed. Nobody yet knows whether this is happening in other parts of the world.

A team at the University of Colorado under Noah Fierer used DNA gene technology to test the 'verrucomicrobia' in Prairie soil, contrasting tilled land with the rare pockets of ancient tallgrass found in cemeteries and reservations. The paper published in the US journal Science found that crop agriculture has "drastically altered" the biology of the land. "The soils currently found throughout the region bear little resemblance to their pre-agricultural state," it concluded.

You might say we already knew this. In fact we did not. There has never before been a metagenomic analysis of this kind and on this scale. Professor Fierer said mankind needs to watch its step. "We really know very little about one of the most productive soils on the planet, but we do know that soil microbes play a key role and we can't just keep adding fertilizers," he said.

The Colorado study has caused a stir in the soil world. It was accompanied by a sobering analysis in Science by academics from South Africa's Witwatersrand University. They fear

that we are repeating the mistakes of past civilisations, over-exploiting the land until it goes beyond the point of no return, and leads to a vicious circle of famine, and then social disintegration.

Entitled "Dust to Dust", the paper argues that the erosion of soil fertility has been masked by a "soup of nutrients" poured over crop lands, giving us a false sense of security. It said 1pc of global land is being degraded each year, defined as a 70pc loss of the top soil.

Once the top soil crosses a crucial threshold, the recovery rate plunges. Chemicals can keep crop yields high for a while but the complex ecology beneath is being abused further. Yields have already fallen 8pc across Africa as a whole. The paper calls for a complete change of course as the "only viable route to feeding the world and keeping it habitable."

This degradation is courting fate given that the world's population will grow by over a quarter to nine billion before peaking in the middle of the century. It comes as China and emerging Asia switch to an animal protein diet, replicating the pattern seen in Japan and Korea as they became rich. As a rule of thumb it takes 4kg-8kg of grains in animal feed to produce 1kg of meat.



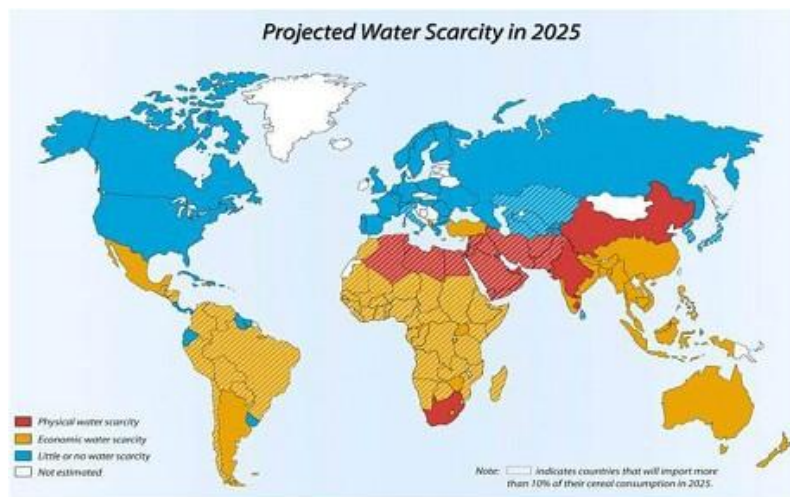
Professor Robert Scholes, one of the authors, said there comes a point when terrified governments make a Faustian pact, sacrificing their future to stop their people starving today. "We're seeing a massive arc of deforestation in Africa," he said.

Cautionary stories abound. The East side of Madagascar has been destroyed by slash and burn deforestation, perhaps irreversibly in any human time horizon. Iceland's Norse settlers

turned their green and partly forested island into a Nordic desert in the 10th Century. They have yet to restore the fragile soil a thousand years later, despite careful husbandry.

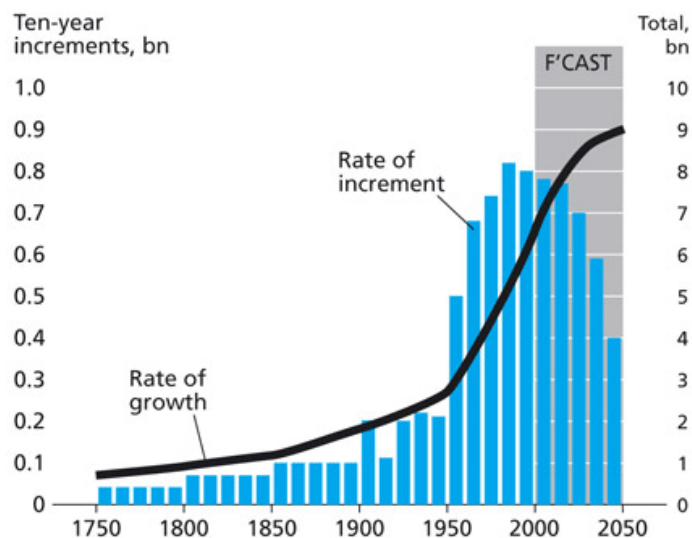
"We're running out of new agricultural frontiers and we don't have the freedom to make errors any more. We are using up our nutrient capital and face a looming food crisis over the next 30 to 40 years. There is a risk that we are going to paint ourselves into a corner. Famine is a very real possibility," he said.

The Sumerian civilisation that first pioneered cereal farming in the Tigris and Euphrates was almost certainly destroyed by soil erosion and over-cultivation. The Gilgamesh epic describes tracts of cedar forest in Iraq before it was cut down for the timber trade around 2,600 BC.



The story is usually the same, whether for the lowland Maya central America, or the Khmer Empire of Angkor, or Easter Island, recounted by Jared Diamond in "Collapse". Once the hillside trees are cut down, water flows are disturbed. It then becomes harder to feed saturated settlements. Societies take short-cuts to survive, leaving less land fallow. The spiral accelerates. It seems that a climate shock is often the coup de grace, pushing them over the edge.

The UN Convention to Combat Desertification (UNCCD) says the world food demand will 50pc by 2030, requiring up to 170m- 220m hectares of fresh land. Yet it also expects land degradation to cut output by 12pc over the next 25 years.



Expected growth in the world population. Source: UN

The UNCCD is aiming for a global deal to achieve "zero net land degradation" from 2015, mostly by replanting forests. The body's environment chief Veerle Vanderweerde says it is not going well. "We know what to do to restore degraded land. It's not impossible but it takes time, money, dedication, and political will, and there is not a lot political will."

There have been heart-warming episodes. Yacouba Sawadogo, "the man who stopped the desert", began to revive the ancient zai technique thirty years to stop soil erosion on his little farm in Burkina Faso. It involved digging small holes and filling them with compost and tree seeds to catch the seasonal rains, recreating a woodland of 20 hectares in the arid Sahel. Sadly, local officials then expropriated the land.

Mrs Vanderweerde said global agro-industrial companies are moving into new frontiers, stripping and degrading land for quick profit, more akin to mining than farm stewardship. "They can't just come in, take the resources, and then walk away. The big companies need to change their behaviour and they won't do it unless they are made to," she said.

A new Land Matrix Global Observatory put together by five research centres says the world land rush by investors is not quite as bad as feared. An Agri-SA investment in the Congo proved to be just 80,000 hectares, not 10m as alleged.

The observatory has tracked deals equal to 48m hectares -- completed or in the pipeline -- an area the size of Spain. This may understate the figure since foreign firms have learned to tread carefully after a populist backlash in Africa and Latin America. They work through local ventures.

The registry found that the top investors came from the US, followed by Malaysia, the Arab Emirates, and the UK (mostly global funds in London). China was lower, though this may change after it struck a deal in September to lease 5pc of Ukraine's land surface for fifty years, on paper a 3m hectare prize as large as Belgium.

The top target is Papua New Guinea, home to one of the last great rain forests, now a third owned by foreign firms. It is followed closely by Indonesia, Sudan, the Congo, and Mozambique. Nobody is really policing this.

Famine worries have abated since the Malthusian scare of 2008 when corn and wheat prices tripled in three years and then stayed high, triggering the food riots that led to the Arab Spring. The UN says bumper crops in the US, Canada, and Ukraine have boosted world cereal output by 8pc this year: consumption has risen 3.5pc.

Global grain stocks have jumped 13pc to a slightly safer level, yet still cover just 69 days of global consumption. Stocks averaged 107 days in the 1980s and 1990s. We are operating on a very thin margin. Nor have food prices returned to earlier levels. The UN's food price index is up by 105pc over the last decade.

We are becoming complacent again. The blunt truth is that the world cannot afford to lose one hectare of land a year, let alone 12m hectares. The added discovery that we doing even more damage than feared to the soil microbia should bring us to our senses. We argue too much about global warming, which may or may not be caused by man's actions, and may or may catch us this century.

The global land crisis is almost entirely our own doing. It is closing in on us right now. It can be reversed if world leaders choose to reverse it.