How can we save our soil, and how can the soil save us?

By **David W. Smith** - October 14, 2015

The world's soils have been degrading for decades, releasing CO2 into the atmosphere, but regenerative farming techniques can draw the carbon back into the soil. By David W. Smith.

No one alive knows more about soil than Professor Rattan Lal at Ohio State University. But t Indian-born academic is aware that the acclaim of his university peers will make little impac global agriculture. To wield true influence, he has to burst out of his academic bubble and re the political decision-makers. This year, he was stunned to be presented with a perfect opportunity out of the blue. The French Minister of Agriculture, Stéphane Le Foll, called him unexpectedly to ask if he could cross the Atlantic to visit his lab. Professor Lal was elated.

Professor Lal's studies have revealed how the carbon content of soil has been diminishing fo decades with fearful consequences for global warming and our capacity to feed the poor. Wh soil degrades, carbon is released into the atmosphere in vast quantities and the soil become much less productive. But few politicians show an awareness of the issues, which are ignore UN climate talks. Ignorance of carbon science among the powerful is a frustration for Profes Lal and Stéphane Le Foll's arrival in his Ohio laboratory at the start of July, bringing in his wa his entire cabinet and a team of photographers, was a wonderful moment in his long career.

"I told him we need more people like him and he'd made me more optimistic than I'd felt for long time," says Professor Lal. "He's a forward-thinking individual and I was impressed he'd travelled thousands of miles to see me. He's passionate about the environment and is chairi the COP21 Paris Climate Conference this year.

"Although sequestering more carbon in the soils using regenerative farming techniques isn't panacea and our over- dependence on fossil fuels remains an even bigger issue, it will make significant dent in the problem."

Minister Le Foll wanted to understand Professor Lal's methods for sequestering carbon, inclu conservation agriculture, planting the right crops and recycling biomass. "We toured local fa doing these things. They don't need pesticides as the rich soil acts as a disease-suppressant minister hadn't seen such good soil in 40 years," says Professor Lal.

Few people are in a position to influence more people in the agricultural world than Stéphan Foll. France is the world's sixth-largest agricultural producer and contains about a third of th EU's agricultural land. "My dream is that his influence radiates outwards. If the French and Germans take the ideas to the European Parliament, we could get the whole EU on board. A Francophone Africa is vast. It includes Niger, Democratic Republic of the Congo, Cameroon, Burkina Faso, Senegal, Ivory Coast, Algeria, Tunisia and Morocco," Professor Lal says.

Minister Le Foll was aiming to increase the carbon content of French soils by 0.4 per cent pe year up to 2050, but Professor Lal has tempered his enthusiasm. "I was the one putting the brakes on. I felt 0.2 per cent was a more attainable target. If the whole world achieved that soil would increase greatly its capacity as a carbon sink. Global emissions are 11 Gigatons p year, but a 0.2 per cent greater concentration of carbon would reduce that by a third."

Ground-up solutions

Professor Lal is not the sole scientist to promote the critical importance of our soils. Dr Jame Hansen, America's top climate scientist and the former director of NASA's Goddard Institute Space Studies proposed an agricultural solution to global warming in an editorial in 2009. "W need to cut off the largest source of emissions – coal – and allow CO2 to drop back to the sa level of 350 parts per million (ppm) through agricultural and forestry practices that increase carbon storage in trees and soil," he wrote. Hansen calculated that a 50 ppm drawdown via forestry and agricultural practices was plausible.

Dr Hansen's powerful ideas were a revelation for the writer Courtney White when he read th editorial at his home in New Mexico in 2009. He saw them as "operating instructions for the

century" and was inspired to become a writer about climate change, soil and agricultural practices in the rural Southwest.

Former grass-fed cattle rancher White says: "My heroes became micro-biologists who try to understand the universe in the soil," he says. "There's a huge amount of life underground if allow it to express itself. But if we pour chemicals on the way industrial agriculture does, it k most of it. If we manage it biologically for life, all kinds of good things happen. The key is ca which is the essential element of life. It's the soil beneath our feet, the plants, the land, the wildlife we watch, our livestock and food, the energy we use, and the air we breathe."

The miraculous process that reverses climate change is photosynthesis. Plants naturally pull out of the air and convert it into soil carbon, where it is safely stored in the ground. The pro has been going on for billions of years, and requires only sunlight, green plants, water, nutri and soil microbes. It creates a simple equation: More plants and deeper roots means less C(the atmosphere. When degraded land is restored to a healthy condition, it pulls a high amou carbon out of the atmosphere and stores it in the soil, which contains three times the carbor stored in vegetation and twice the amount in the atmosphere.

Since two thirds of the earth's land mass is grassland, additional CO2 storage in the soil has huge impact. Fortunately, an exciting toolbox of low-tech innovative ideas has emerged over past 30 years to encourage photosynthesis.

Carbon Ranch

In the summer of 2009, White came up with the idea of a Carbon Ranch, which he develope his 2014 book 'Grass, Soil, Hope' and his forthcoming 'Two Percent Solutions for the Planet'. the arid rangelands of Southwestern US, he promoted six strategies to create a Carbon Ranc These are:

1. Planned grazing systems, especially on degraded soils, including deepening plant roots.

2. The restoration of riparian, riverine and wetland zones, degraded by overuse.

3. The removal of woody vegetation so grass may grow in its stead. Not only can soils store CO2 than trees, they are also relatively permanent.

4. The conservation of open space so there is no further loss of carbon-storing soils. Forests peatlands are important sinks for CO2 and their destruction releases carbon.

5. The implementation of no-till farming practices: Ploughing exposes stored soil carbon to t elements, including the erosive power of wind and rain.

6. The management of land for long-term resilience: This involves the cooperation of biologi conservationists, ranchers, and policy-makers to improve land health.

"One of the most surprising discoveries was the importance of no-till," White says. "If we co do one thing for the planet it would be to ditch the plough. When we turn over soil, the air a sun wreak havoc on the microbes, which is why we need chemicals to bring the fertility back till creates thin furrows in the soil and drops seeds in. It's difficult to convince the food giant the importance of these methods, but a lot of US ranchers realise we either pay more now t produce crops, or we pay later. If the latter, we will have degraded and sterilised the land an agricultural system will be in crisis."

On a global level, Professor Lal says one solution would be to compensate small farmers in t developing world for sequestering carbon. "The farmers should be paid the social cost of car which is US$220 dollars a tonne, rather than the market value of US$35 a tonne," he says. "Farmers would be paid for sequestering carbon on their lands. The compensation could com from the UN, or the large-scale industrial farmers, such as Monsanto, who are damaging soi chemicals."

When it comes to political influence, Professor Lal's new friend Stéphane Le Foll represents a good start. After his visit to the US, the Frenchman invited Professor Lal to Paris in mid- July more discussions. "Even if one person like him starts to spread the word, it can make a huge difference in raising awareness," says Professor Lal.

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