Charcoal

how to capture carbon dioxide

THERE IS TOO much carbon dioxide in the atmosphere. We must reduce it. But how?

It's easy. Plants, through photosynthesis, capture it all the time, but they release carbon dioxide when they decompose. Cut the plants – any plants can be used, not just wood – turn them into charcoal before they rot and bury the charcoal. It's like coal mining in reverse.

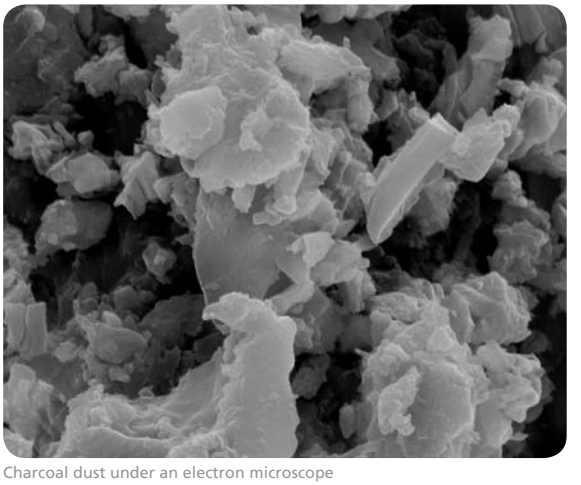
To have any effect on the amount of carbon dioxide in the atmosphere this process would need so much land that it could reduce food supply at a time when global stocks of many staples have never been lower. So is it possible that farmers might have an incentive to bury charcoal as normal farming practice without reducing the amount of food they produce?

Ravi Kumar, an innovator in south India, has developed a small stove on which rural families can cook a meal and produce charcoal while doing so. The family collects waste plant material, dries it and puts it into the unit's circular casing, which is then sealed to prevent oxygen getting in. To start with, a few sticks are burned in the central void. When the surrounding plants heat up they emit gases through small holes into this void. The gases ignite so that no methane is emitted and continue to burn for over an hour, long enough to cook a meal. Finally the plant material, which is now charcoal, is raked out.

Charcoal, even charcoal dust, retains the microscopic skeletal carbon-structure of plants after other compounds have left, this is why it is so light in weight. The carbon from carbon dioxide is captured and the oxygen released. The voids of the skeleton attract nutrients and water, and provide acres of surface for fungi and microbes. Once 'charged' with compost and manure then buried, the charcoal increases the soil's fertility and its ability to retain moisture. These amazing properties of charcoal allow it to capture carbon dioxide while enabling farmers to increase their yield.

Most nutrients that pass through our bodies are excreted in urine and it is important to get these back into the soil rather than flushing them out to sea. Toilets that separate faeces and urine are beginning to be used in India. The urine collected from this sanitation system can be added to charcoal in order to make use of the nutrients, particularly phosphorus.

Ravi Kumar is now working with SCAD, a non-government organisation that is involved



Charcoal dust under an electron microscope

with 400 villages and over a thousand women's groups, to test whether the process would increase the water retention of the ground and the yield of their crops. "If the tests are successful," Ravi says, "the farmers will use the charcoal-rich compost on their farms and bag it for sale; the process could then snowball and spread to a billion rural people around the world. This would raise rural income, achieve the aim of sequestering significant amounts of carbon dioxide and also increase the global supply of food."

The incentive for farmers would not be in the capture of carbon dioxide but from making, using and selling charcoal. Ravi Kumar has many projects that could relieve the poverty of rural communities and not all of them involve mixing it with soil. If burnt as fuel, of course, its carbon dioxide will be released, just as it is released from the un-charred plant material. However, if farmers are convinced of its value as a soil improver, particularly as the cost of artificial fertiliser rises, an increasing amount of the charcoal will find its way into the soil.

Big farms will need the more sophisticated units that are being developed by western industries. Although these are more efficient there is a danger. These industries want to earn credits through carbon trading in order to finance the high costs of the equipment. Trading carbon credits sounds sensible until you think of small farmers who could not possibly keep separate records of how much charcoal they use for cooking, or selling, or putting into the ground. Nor could they enter into trans-national contracts. And monitoring would require an army of – possibly corrupt – bureaucrats. Instead, agri-businesses would seize the opportunity and, as the value of carbon credits rises, land would be used for the most efficient sequestration-crops, like hemp, in competition with food-crops. Small-scale farmers would be out-competed and add to the epidemic of suicides or join the disastrous migration to city slums.

Forget about important people meeting at important conferences, emitting hot air from their mouths and greenhouse gases from their flights. Forget about mega-scale technofixes like putting us under a thicker layer of cloud or adding carbonic acid to the oceans, which are already dangerously acidic. Think small-scale multiplied by a billion ordinary people throughout the world. Think of allotments, urban parks and market gardens. This is a technology in its infancy so there is plenty of scope for experiment, community co-operation and business start-ups.

Charcoal-enriched cultivation is not new. Large areas of 'terra preta' – rich dark fertile soil – have been found in the Amazon rainforest where surrounding areas have hardly any topsoil. Pre-Columbian pottery shards, also found, indicate that a civilisation had thrived on the use of charcoal to provide fertility where there was none before. Fungal activity has perpetuated the soil's fertility ever since, demonstrating that the process is permanent.

Sequestration of carbon dioxide using charcoal may be the best way, possibly the only way, to avoid the worst effects of global warming and, eventually, to bring the concentration of carbon dioxide in the atmosphere back to pre-industrial levels and the climate back to stability. It should become standard practice for farmers throughout the world to bury charcoal while cultivating their crops.