Commentary IV: Food, Climate Change and Healthy Soils: The Forgotten Link

GRAIN

Abstract

Agriculture is starting to get more attention in international negotiations around climate change. The consensus is that it contributes 10–15 per cent of all global anthropogenic greenhouse gas (GHG) emissions, making it one of the key drivers of climate change. But looking at agriculture alone is not enough; it is also necessary to look at the larger food system. Beyond the emissions that occur on the farm, today's dominant industrial food system generates GHGs by transporting food around the world, by deforestation to make way for plantations and by generating waste. Pulling together the available data on these sources of emissions reveals that the global food system is responsible for around half of all global GHGs. Thus it is the food system as a whole which is at the centre of the problem of climate change.

If measures are taken to restructure agriculture and the larger food system based on food sovereignty, small-scale farming, agroecology and local markets, global GHG emissions could be cut by half within a few decades. There is no need for carbon markets or techno-fixes. What is needed are the right policies and programmes that bring about a shift from the current industrial food system to a sustainable, equitable and truly productive one.

A. Food and climate: piecing the puzzle together

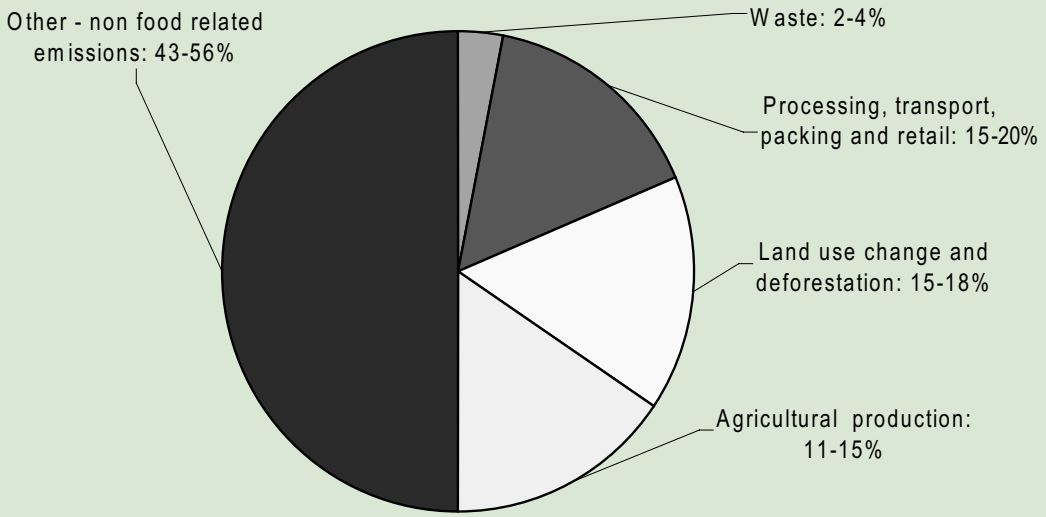
According to most studies, the contribution of agricultural emissions – the emissions produced on the farm – is between 11 and 15 per cent of all global emissions.[29] What often goes unsaid, however, is that most of these emissions are generated by industrial farming practices that rely on chemical (nitrogen) fertilizers, heavy machinery run on petrol, and highly concentrated industrial livestock operations that pump out methane.

The data for agriculture's contribution also often neglect to take into account the contribution of land-use changes and deforestation, which are responsible for nearly a fifth of global GHG emissions (WRI, undated; IPCC, 2004). Worldwide, agriculture is pushing into savannahs, wetlands, *cerrados* and forests, and is ploughing huge amounts of land. The expansion of the agricultural frontier is the dominant contributor to deforestation, accounting for 70–90 per cent of global deforestation (FAO, 2008; Kanninen et al., 2007). This means that some 15–18 per cent of global GHG emissions are produced by land-use change and deforestation for agriculture. And here too, the global food system and the industrial model of agriculture are the chief culprits. The main driver of this deforestation is the expansion of industrial plantations for the production of commodities such as soy, sugarcane, oil palm, maize and rapeseed. Since 1990, the area planted with these five commodity crops grew enormously, by 38 per cent (GRAIN, 2010).

These emissions from agriculture account for only a portion of the food system's overall contribution to climate change. Equally important are the emissions caused all along the chain, from when the produce leaves the farm until it is consumed.

Food production is the world's largest economic activity, involving more transactions and employing more people by far than any other sector. Today, food is prepared and distributed using enormous amounts of processing, packaging and transportation, all of which generate GHG emissions, although data on such emissions are hard to find. Studies looking at the EU conclude that about one quarter of overall transportation involves commercial food transport (Eurostat, 2011). Scattered figures on transportation available for other countries, such as Kenya and Zimbabwe, indicate that the percentage is even higher in non-industrialized countries, where "food production and delivery accounts for 60-80% of the total energy – human plus animal plus fuel – used" (Karekezi and Lazarus, 1995). With transportation

Figure 9: Contribution of the global food production system to total GHG emissions



Source: Estimates of GRAIN

accounting for 25 per cent of global GHG emissions, EU data enable an estimate – albeit a conservative one – for the contribution of the transport of food to GHG emissions of at least 6 per cent. Similarly, EU data derived from studies on processing and packaging of food within the EU show that these activities account for 10–11 per cent of GHG emissions (Bolla and Pendolovska, 2011), while refrigeration of food accounts for 3–4 per cent of total emissions (Garnett and Jackson, 2007), and food retail for another 2 per cent (Tassou et al., 2011; Venkat, 2011; Bakas, 2010). Based on the data for the EU, and extrapolating from the scarce figures that exist for other countries, we can estimate, conservatively, that at least 5–6 per cent of emissions result from food transport, 8–10 per cent from food processing and packaging, 1–2 per cent from refrigeration and another 1–2 per cent from retail. This amounts to a total contribution of 15–20 per cent of global emissions from all these activities.

Not all of what the food system produces gets consumed. The industrial food system discards up to *half* of all the food that it produces in its journey from farms to traders, to food processors, to stores and supermarkets. This is enough to feed the world's hungry six times over (Stuart, 2009). Much of this waste rots on garbage heaps and landfills, producing substantial amounts of GHGs. Different studies indicate that between 3.5 and 4.5 per cent of global GHG emissions come from waste, and that over 90 per cent of them come from materials originating in agriculture and its processing (Bogner et al., 2008). This means that the decomposition of organic waste originating in food and agriculture is responsible for 3–4 per cent of global GHG emissions.

Considering all these factors, it would appear that the current global food system, propelled by an increasingly powerful transnational food industry, is responsible for around half of all anthropogenic GHG emissions – between a low of 44 per cent and a high of 57 per cent.

B. Turning the food system upside down

Clearly, we will not resolve the climate crisis if the global food system is not urgently and dramatically transformed. The place to start is with the soil. Food production begins and ends with soil. It grows out of the soil and eventually goes back into it to enable more food to be produced. This is the very cycle of life. But in recent years humans have ignored this vital cycle: we have been taking from the soil without giving back.

The industrialization of agriculture, which started in Europe and North America and was later replicated in the Green Revolution that took place in other parts of the world, was based on the assumption that soil fertility could be maintained and increased through the use of chemical fertilizers. Little attention was paid

to the importance of organic matter in the soil.

A wide range of scientific reports indicate that cultivated soils have lost 30 to 75 per cent of their organic matter during the twentieth century, while soils under pastures and prairies have typically lost up to 50 per cent. Without doubt, these losses have provoked a serious deterioration of soil fertility and productivity, as well as a higher risk exposure to droughts and floods.

Taking as a basis some of the most conservative figures provided by the scientific literature, the global accumulated loss of soil organic matter (SOM) over the past century can be estimated to be between 150 and 200 billion tons.[31] Not all this organic matter has ended up in the air as CO_2; significant amounts have been washed away by erosion and deposited at the bottom of rivers and oceans. However, it can be estimated that at least 200 to 300 billion tons of CO_2 have been released to the atmosphere due to the global destruction of soil organic matter. In other words, 25 to 40 per cent of the current excess of CO_2 in the atmosphere results from the destruction of soils and their organic matter.

There is some good news hidden in these devastating figures: the CO_2 that has been emitted into the atmosphere through soil depletion can be put back into the soil through a change in agricultural practices. There has to be a shift away from practices that destroy organic matter to ones that build up the organic matter in the soil. We know this can be done. Farmers around the world have been engaging in these very practices for generations. Research by GRAIN (2009) has shown that if the right policies and incentives were in place worldwide, soil organic matter contents could be restored to pre-industrial agricultural levels within a period of 50 years, which is roughly the same time frame that industrial agriculture took to reduce it. The continuing use of these practices would allow the offset of 24–30 per cent of current global annual GHG emissions.[32]

The new scenario would require a radical change in approach from the current industrial agriculture model. It would focus on the use of techniques such as diversified cropping systems, better integration between crop and animal production, and increased incorporation of trees and wild vegetation. Such an increase in diversity would, in turn, increase the production potential, and the incorporation of organic matter would progressively improve soil fertility, creating a virtuous cycle of higher productivity and greater availability of organic matter. The capacity of soil to hold water would increase, which would mean that excessive rainfall would lead to fewer, less intense floods and droughts. Soil erosion would become less of a problem, and soil acidity and alkalinity would fall progressively, reducing or eliminating the toxicity that has become a major problem in tropical and arid soils. Additionally, increased soil biological activity would protect plants against pests and diseases. Each one of these effects implies higher productivity and hence more organic matter available to soils, thus making possible higher targets for incorporation of soil organic matter over the years. More food would be produced in the process (see also the commentary of Leu on mitigating climate change with soil organic matter in organic production systems in this chapter).

This shift in agricultural practices would require building on the skills and experience of the world's small farmers, rather than undermining and forcing them off their lands, as is now the case. A global shift towards an agriculture that builds up organic matter in the soil would also contribute to removing some of the other major sources of GHGs from the food system. There are three other mutually reinforcing shifts that need to take place in the food system to support its overall contribution to climate change. The first is a shift to local markets and short circuits of food distribution, which would reduce transportation and the need for packaging, processing and refrigeration. The second is a reintegration of crop and animal production, which would also cut transportation, as well as the use of chemical fertilizers and the production of methane and nitrous oxide emissions generated by intensive meat and dairy operations. And the third is the stopping of land clearing and deforestation, which will require genuine agrarian reform and a reversal of the expansion of monoculture plantations for the production of agrofuels and animal feed. If the world becomes serious about undertaking these four shifts, it is quite possible for global GHG emissions to be cut by half within a few decades, and, in the process, this would go a long way towards resolving the other crises affecting the planet, such as poverty and hunger. There are no technical hurdles standing in the way; the world's farmers already possess the requisite knowledge and skills, and these can be further developed. The only hurdles are political, which is where we need to focus our efforts.