Against the Grain

Sept 2011

FOOD AND CLIMATE CHANGE: THE FORGOTTEN LINK

Climate change endangers food security in Himalayan communities such as Dunche, in Nepal's Rasuwa District. In this photo Tamang women pound and sift wheat. (Photo credit: Minority Rights Group/Jared Ferrie)

Food is a key driver of climate change. How our food gets produced and how it ends up on our tables accounts for around half of all human-generated greenhouse gas emissions. Chemical fertilizers, heavy machinery and other petroleum-dependant farm technologies contribute significantly. The impact of the food industry as a whole is even greater: destroying forests and savannahs to produce animal feed and generating climate-damaging waste through excess packaging, processing, refrigeration and the transport of food over long distances, despite leaving millions of people hungry.

A new food system could be a key driver of solutions to climate change. People around the world are involved in struggles to defend or create ways of growing and sharing food that are healthier for their communities and for the planet. If measures are taken to restructure agriculture and the larger food system around food sovereignty, small scale farming, agro-ecology and local markets, we could cut global emissions in half within a few decades. We don't need carbon markets or techno-fixes. We need the right policies and programmes to dump the current industrial food system and create a sustainable, equitable and truly productive one instead.

GRAIN

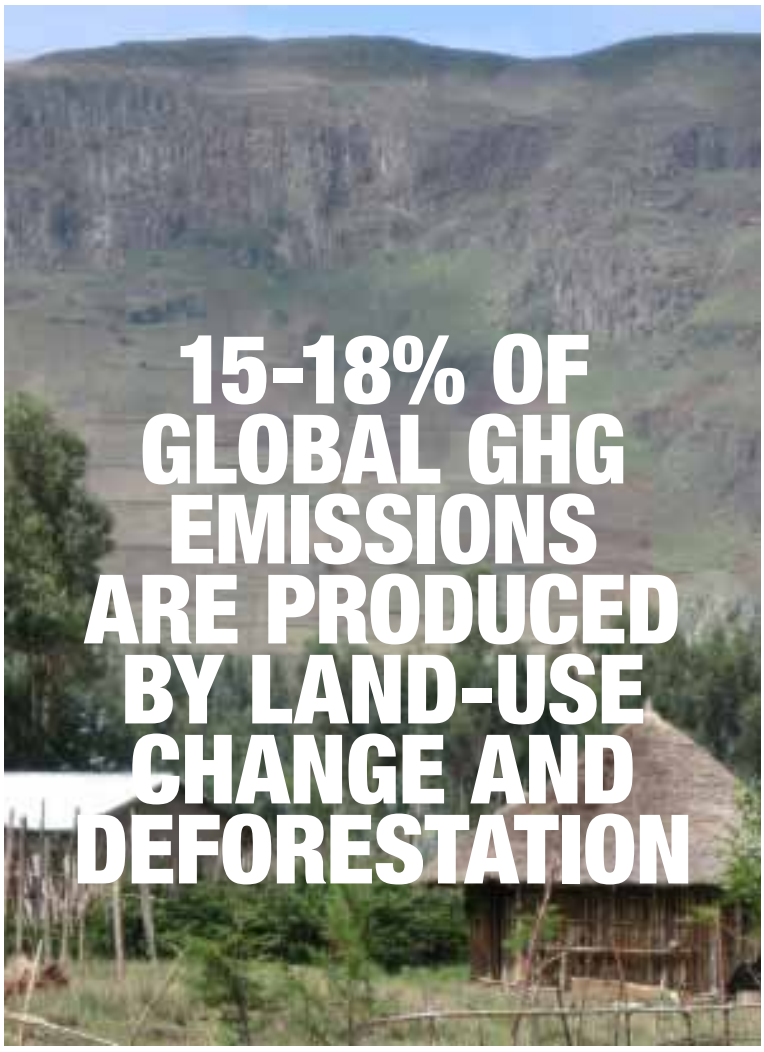
Food and climate: piecing the puzzle together

Most studies put the contribution of agricultural emissions – the emissions produced on the farm - at somewhere between 11 and 15% of all global emissions.[1] 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 waste.

The figures for agriculture's contribution also often do not account for its role in land use changes and deforestation, which are responsible for nearly a fifth of global GHG emissions.[2] Worldwide, agriculture is pushing into savannas, wetlands, cerrados and forests, plowing under huge amounts of land. The expansion of the agricultural frontier is the dominant contributor to deforestation, accounting for between 70-90% of global deforestation.[3] This means that some 15-18% of global GHG emissions are produced by land-use change and deforestation caused by agriculture. And here too, the global food system and its 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, oilpalm, maize and rapeseed. Since 1990, the area planted with these five commodity crops grew by 38%[4] though land planted to staple foods like rice and wheat declined.

Emissions from agriculture account for only a portion of the food system's overall contribution to climate change. Equally important is what happens from between the time food leaves the farm until it reaches our tables.

Food is the world's biggest economic sector, involving more transactions and employing more people by far than any other. These days 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



Steep hillside farming and deforested mountains in the Philippines. (Photo credit: Trees for the Future) *At bottom*: Industrial use of heavy machinery generates most agricultural emissions.

1 The IPCC says 10-12%, the OECD says 14% and the WRI says 14.9%. See:
- IPCC, Climate Change 2007: Mitigation of Climate Change. Chapter 8: Agriculture, http://tinyurl.com/ms4mzb

2 See: WRI, World GHG Emissions Flow Chart, http://tinyurl.com/2fmebe And: IPCC. 2004. Climate Change 2001: Working Group I: 3.4.2 Consequences of Land-use Change. http://tinyurl.com/6lduxqy

3 See FAO Advisory Committee on Paper and Wood Products – Forty ninth Session – Bakubung, South Africa, 10 June 2008; and M. Kanninen et al., "Do trees grow on Money? Forest Perspective 4, CIFOR, Jakarta, 2007.

4 See: GRAIN, 'Global Agribusiness: two decades of plunder', in: Seedling, July 2010.

to find. Studies looking at the EU conclude that about one quarter of overall transportation involves commercial food transport.[5] The scattered figures on transportation available for other countries, such as Kenya and Zimbabwe, indicate that the percentage is even higher in non-industrialised countries, where "food production and delivery accounts for 60-80% of the total energy - human plus animal plus fuel – used."[6] With transportation accounting for 25% of global GHG emissions, we can use the EU data to conservatively estimate that the transport of food accounts for at least 6% of global GHG emissions. When it comes to processing and packaging, again the available data is mainly from the EU, where studies show that the processing and packaging of food accounts for between 10-11% of GHG emissions,[7] while refrigeration of food accounts for 3-4%[8] of total emissions and food retail another 2%.[9] Playing it conservative with the EU figures and extrapolating from the scarce figures that exist for other countries, we can estimate that at least 5-6% of emissions are due to food transport, 8-10% due to food processing and packaging, around 1-2% due to refrigeration, and 1-2% due to retail. This gives us a total contribution of 15-20% of global emissions from 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.10 A lot of this waste rots away

25 to 40% of the current excess CO_2 in the atmosphere comes from the destruction of soils

5 see: Eurostat. From farm to fork - a statistical journey along the EU's food chain - Issue number 27/2011 http://tinyurl.com/656tchm and http://tinyurl.com/6k9jsc3

6 FAO. Stephen Karekezi and Michael Lazarus, Future energy requirements for Africa's agriculture. Chapters 2, 3, and 4. http://www.fao.org/docrep/V9766E/v9766e00.htm#Contents

7 For EU, see: Viktoria BOLLA, Velina PENDOLOVSKA, Driving forces behind EU-27 greenhouse gas emissions over the decade 1999-2008. Statistics in focus 10/2011. http://tinyurl.com/6bhesog

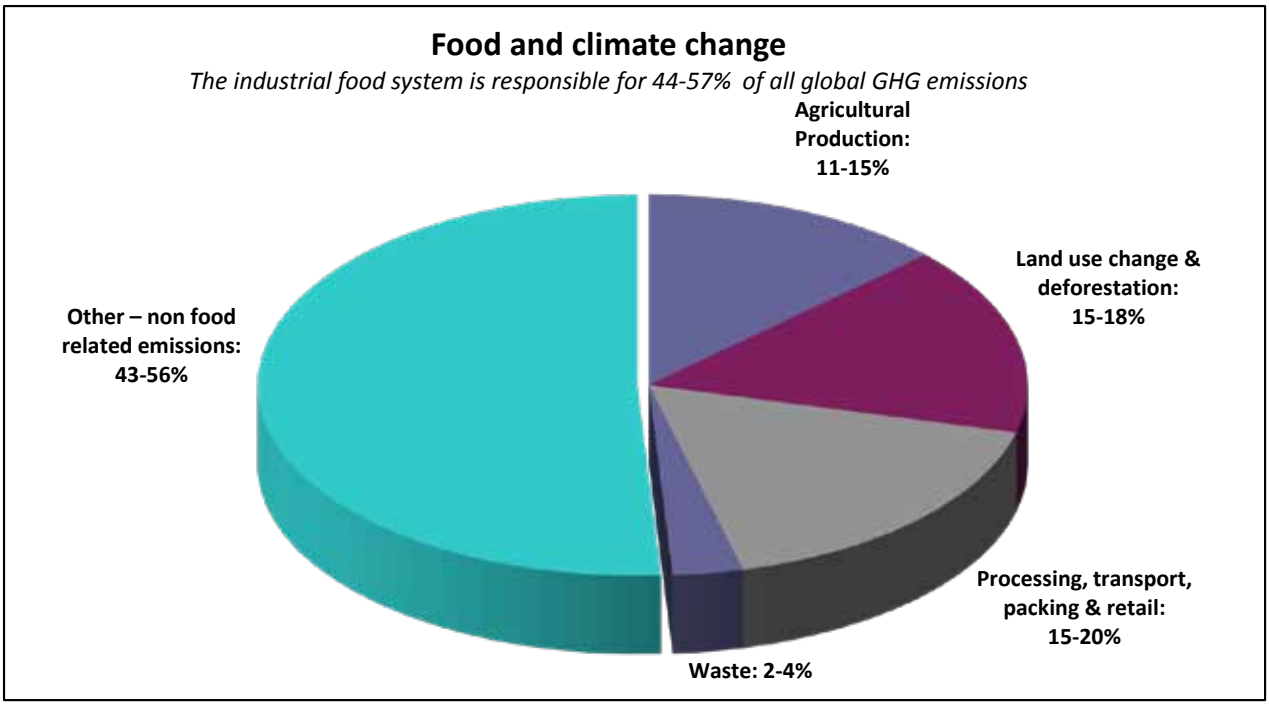
8 Tara Garnett and Tim Jackson, Food Climate Research Network, Centre for Environmental Strategy, University of SurreyFrost Bitten: an exploration of refrigeration dependence in the UK food chain and its implications for climate policywww.fcrn.org.uk/frcnPubs/publications/PDFs/Frostbitten%20paper.pdf

9 S.A. Tassou, Y. Ge, A. Hadawey, D. Marriott. Energy consumption and conservation in food retailing. Applied Thermal Engineering 31 (2011) 147-156 AND Kumar Venkat. CleanMetrics Corp. The Climate Change Impact of US Food Waste
CleanMetrics Technical Brief. www.cleanmetrics.com/pages/ClimateChangeImpactofUSFoodWaste.pdf and Ioannis Bakas, Copenhagen Resource Institute (CRI). Food and Greenhouse Gas (GHG) Emissions. www.scp-knowledge.eu/sites/default/files/KU_Food_GHG_emissions.pdf

10 Tristram Stuart, "Waste: Uncovering the Global Food Scandal", Penguin, 2009, http://tinyurl.com/m3dxc9

on garbage heaps and landfills, producing substantial amounts of greenhouse gases. Different studies indicate that somewhere between 3.5 to 4.5 of global GHG emissions come from waste, and that over 90% of them come from materials originating in agriculture and their processing.[11] This means that the decomposition of organic waste originating in food and agriculture is responsible for 3-4% of global GHG emissions.

Add the above figures together, factor up the evidence, and there is compelling case that the current global food system, propelled by an increasingly powerful transnational food industry, is responsible for around half of all human produced greenhouse gas emissions: anywhere between a low of 44% to a high of 57%. The graph below illustrates the conclusion.



Turning the food system upside down

Clearly, we will not get out of the climate crisis if the global food system is not urgently and dramatically transformed. The place to start is with the soil.

Food begins and ends with soil. It grows out of the soil and eventually goes back in 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 industrialisation of agriculture, starting in Europe and North America, replicating later through the Green Revolution in other parts of the world, was based on the assumption that soil fertility could be maintained and increased through the use of chemical fertilisers. 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 from 30 to 75% of their organic matter during the 20th century, while soils under pastures and prairies have typically lost up to 50%. There is no doubt that these losses have provoked a serious deterioration of soil fertility and productivity, as well as contributing to worsening droughts and floods.

Taking as a basis some of the most conservative figures provided by scientific literature, the global accumulated loss of soil organic matter over the last century may be estimated to be between 150 to 200 billion tonnes.[12] Not all this organic matter ended up in the air as CO2, as significant amounts have been washed away by erosion and have

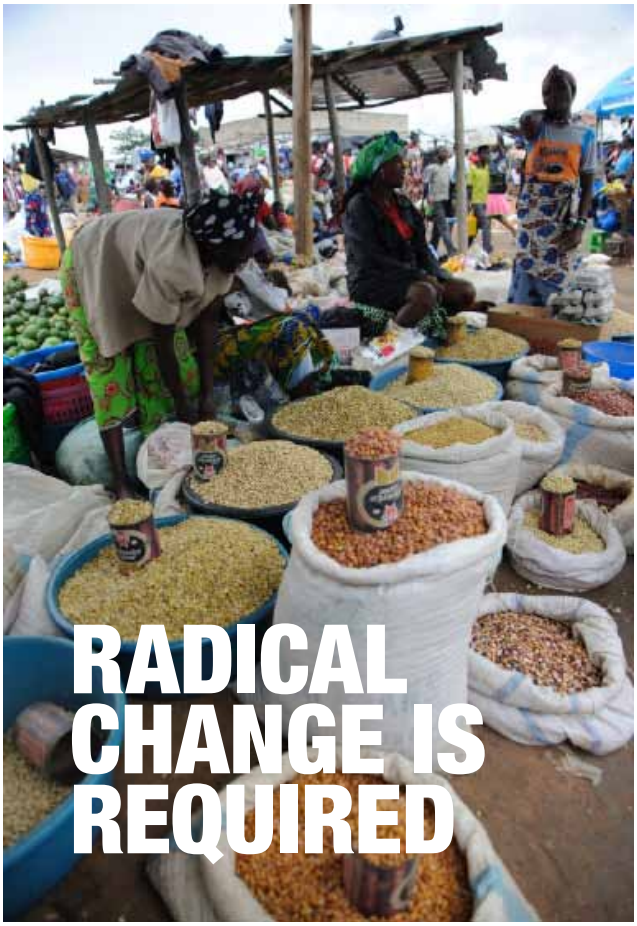
11 Jean Bogner, et. al. Mitigation of global greenhouse gas emissions from waste: conclusions and strategies from the IPCC. Fourth Assessment Report. Working Group III (Mitigation) http://wmr.sagepub.com/content/26/1/11.short?rss=1&ssource=mfc

12 Figures used for calculations were:
a) an average loss of 4,5- 6 kg of SOM/m2 of arable land and 2-3 kg of SOM/m2 of agricultural land under prairies and not cultivated
b) an average soil depth of 30 cm, with an average soil density of 1 gr/cm3
c) 5000 million ha of agricultural land worldwide; 1800 million ha of arable land, as stated by FAO
d) a ratio of 1,46 kg of CO2 for each kg of destroyed SOM

been deposited in the bottom of rivers and oceans. However, it can be estimated that at least 200 to 300 billion tonnes of CO2 have been released to the atmosphere due to the global destruction of soil organic matter. In other words, 25 to 40% of the current excess of CO2 in the atmosphere comes from the destruction of soils and its organic matter.

There is some good news hidden in these devastating figures. The CO2 that we have sent into the atmosphere by depleting the world's soils can be put back into the soil. All that is required is a change of agricultural practices. We have to move away from practices that destroy organic matter to practices 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. GRAIN research has shown that, if the right policies and incentives were in place worldwide, soil organic matter contents could be restored to pre-industrial agriculture levels within a period of 50 years – which is roughly the same time frame that industrial agriculture took to reduce it.[13] ***The continuing use of these practices would allow the offset of between 24-30% of current global annual GHG emissions[14].***



Shorter circuits of food distribution could cut back on transportation and the need for packaging, processing and refigeration.

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, increased incorporation of trees and wild vegetation, and so on. Such an increase in diversity would, in turn, increase the production potential, and the incorporation of organic matter would progressively improve soil fertility, creating virtuous cycles of higher productivity and higher 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. 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, as the years go by, higher targets for soil organic matter incorporation. More food would be produced in the process.

To be able to do it, we would need to build on the skills and experience of the world's small farmers, rather than undermining them 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 put us on a path 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 address its overall contribution to climate change: The first is a shift to local markets and shorter circuits of food distribution, which will cut back on transportation and the need for packaging, processing and refrigeration. The second is a reintegration of crop and animal production, to cut back on transportation, the use of chemical fertilisers 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 gets serious about putting these four shifts into action, it is quite possible that we can cut global GHG emissions in half within a few decades and, in the process, 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 knowledge and skills are in the hands of the world's farmers and we can build on that. The only hurdles are political, and this is where we need to focus

13 See: 'Earth matters: tackling the climate crisis from the ground up'. In: Seedling October 2009. http://www.grain.org/e/735

14 The conclusion is based on the assumption that organic matter incorporation would reach an annual global average rate of 3.5 to 5 tonnes per hectare of agricultural land. For more detailed calculations, see: GRAIN, 'Earth matters: tackling the climate crisis from the ground up'. In: Seedling October 2009, table 2.

GOING FURTHER

Seedling special on food and climate change, October 2009
http://www.grain.org/article/categories/16
Small farmers can cool the planet'. A GRAIN powerpoint presentation
http://www.grain.org/e/4168
'The food and climate connection', a video by Whyhunger
http://www.grain.org/bulletin_board/entries/4243

GRAIN is a small international non-profit organisation that works to support small farmers and social movements in their struggles for community-controlled and biodiversity-based food systems. *Against the grain* is a series of short opinion pieces on recent trends and developments in the issues that GRAIN works on. Each one focuses on a specific and timely topic

The complete collection of *Against the grain* can be found on our website at
http://www.grain.org/articles/

GRAIN,
Girona 25 pral., 08010 Barcelona, Spain
Tel: +34 93 301 1381, Fax: +34 93 301 16 27
Email: *grain@grain.org*
www.grain.org