

**“The Overlooked Climate Solution:
Joint Action by Governments, Industry, and Consumers”**

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I. Abstract

Following the failure of the December 2009 climate conference in Copenhagen, there is no clear path for quick worldwide large-scale increases in renewable energy and energy efficiency, though such action is needed to keep greenhouse gas (GHG) emissions down over the long term. In the meantime, better alternatives to livestock products can be scaled up and have a large positive effect on climate quickly and at minimal cost, through joint action by government, industry, and citizens/consumers.

The ability of individuals to make a significant difference in climate change through a single, relatively simple change in their food choices is distinguished from choices in energy – where the same effect entails pushing consumers to make dozens of changes in behavior. Necessary as those changes will be over time, they will require decades and cost trillions of dollars by governments and industry, before the required consumer action can be fully taken.

II. What Copenhagen Overlooked

In 2006, the FAO published a 388-page report entitled *Livestock's Long Shadow*. That report analyzes the climate impacts of livestock – assessing for the first time in a major publication the greenhouse gas (GHG) emissions attributable to livestock's supply chain from forests cleared to supermarkets. According to that report, the only way to increase global supplies of meat and dairy products is through more intensification and more deforestation.

That assessment by the FAO was echoed in a recent public statement by the Director-General of the International Livestock Research Institute, Dr. Carlos Ceres, who wrote that rich countries feed animals grains that "might instead have fed people." Perhaps nobody of such stature in the livestock sector has ever made such a statement before.

Livestock's Long Shadow estimates GHG emissions attributable to livestock worldwide. It shows that atmospheric carbon from the respiration of all organisms – along with oxidation and erosion of soil organic matter – already exceeds the capacity of photosynthesis to absorb such carbon.¹ This implies that there are already too many livestock in the world today.

Using our backgrounds in environmental assessment at the World Bank Group, Jeff Anhang and I prepared an article for *World Watch* – in which we consider whether any sources of GHG emissions might have been missed in *Livestock's Long Shadow*. The key ones that we found missing are in the land set aside for both livestock and for feed production, along with several other significant sources. So our article suggests that livestock's shadow is not only long but

¹ FAO, 2006, Table 3.2.

colossal, responsible for at least 51% of human-caused GHG emissions.

If livestock are responsible for at least 51% of anthropogenic GHG emissions, then mitigation measures no longer suffice, and broadly avoiding emissions attributable to livestock becomes critical. For example, improvements in the pasture-raising of livestock can somewhat increase carbon stores in soil. However, only about 8% of meat is produced from pasture-raised livestock,² and there is little land available to increase this amount without causing deforestation. Further, when livestock are pasture-raised, they emit as much as three times the amount of methane as do intensively-raised livestock. Moreover, the possibility for mitigation to increase soil carbon is available for only the first part of the lives of most pasture-raised livestock, as most are intensively raised and fed crops for the second part of their lives.

Our *World Watch* article first recognizes the importance of broadly avoiding emissions attributable to livestock; then it develops a case for achieving almost as much GHG reduction as was expected to be agreed on in Copenhagen – simply by replacing 25% of today's livestock products with better alternatives. According to Chris Mentzel, the CEO of a solar power company, our article shows that a 1% reduction in worldwide meat intake would have the same benefit as U.S.\$3 trillion in solar energy investments.³

Coverage of our article by media outlets and on the internet has been voluminous. But a good measure of this seems due to unfortunate coincidence. That is, at the time our article was published, reports began to emerge from one country after another regarding harm to crops and livestock as a result of disruptive climate events. In November 2009 alone, livestock in India, Argentina, and the Philippines were among those reportedly harmed significantly by climatic events. Livestock dying from drought in Kenya have been proposed as possibly the first source ever of violent climate conflict.⁴

These recent reports should be unsurprising, as it had been predicted that the most harm to crops and livestock would occur in countries where people can least afford it. More broadly, it has been forecast that 75% to 80% of harm caused by increasing levels of atmospheric carbon will occur in developing countries, although they contribute only about one-third of GHG emissions.

Nevertheless, weak conclusions are often reached when livestock products are assessed through a national or even regional lens. Livestock products and feed are global commodities, so they get flown, shipped and trucked all over the world; and climate change is transboundary. So policymakers must look beyond their own borders in considering the impacts of livestock on climate. In this way it becomes understandable – and even necessary – to imagine a world where not all land today dedicated to livestock and feed would remain so.

While generally overlooked, there is vast carbon absorption foregone today in land set aside for grazing livestock and growing feed. Yet any amount of foregone carbon absorption has exactly the same effect as an increase in emissions of the same magnitude. Moreover, carbon absorption available from land used for livestock and feed production is the only feasible way to absorb a significant amount of today's atmospheric carbon in the near term.⁵

² FAO, 2006, p. 45.

³ See <http://www.mauiweekly.com/page/content.detail/id/500866/The-Copenhagen-Fools.html>.

⁴ Guardian, 2009.

⁵ Shulze et al., 2009.

Considering the land used for livestock and feed that could regenerate forest, along with the high levels of relatively short-lived methane attributable to livestock, reducing livestock numbers would be the quickest way to reverse climate change. Yet renewable energy has been the most-discussed option for reversing climate change. This option must be pursued to keep emissions down over the long term. However, consumers will have to wait many years for industry and investors to develop sufficient renewable energy infrastructure across the world to reduce emissions significantly. Conversely, better alternatives to livestock products can be scaled up and have a positive effect on climate quickly – through joint action by citizens/consumers, governments, industry, and investors.

III. Beyond Copenhagen

No new climate treaty was agreed at the December 2009 U.N. climate conference in Copenhagen. As no new treaty is forthcoming, regulation may be left to the local level. This means that where regulation is most needed, it may be least likely to be passed, as the short-term perceived self-interest of constituents may prevent their legislators from effecting what is needed.

In some ways, atmospheric carbon can be a useful proxy for broadly measuring adverse impacts on natural capital. Similarly, opportunities to decrease atmospheric carbon can be a useful proxy for potential benefits in the areas of natural capital.

While atmospheric carbon can be used as a proxy for adverse impacts on natural capital, for specialists in forests, fisheries, and agriculture to do their work, they must focus on specific aspects of natural capital. It can also be useful to focus on adverse impacts on natural capital rather than atmospheric carbon when addressing people who are skeptical that climate change is anthropogenic. The reason for this is that atmospheric carbon is invisible and abstract to most people, whereas most adverse impacts on natural capital are visible and tangible. People skeptical of human-caused climate change may want to consider that most of the points in this paper do not actually require that they believe in human-caused climate change.

Consistent with the main focus of this conference on policy, next will be set out a detailed assessment of issues for government, along with recommendations, followed by briefer assessments and recommendations for industry and consumers.

A. Government

Hitherto, governments have sought food security in two main ways. The first way to reach food security has been through boosting productivity on existing agricultural lands in a “green revolution,” using inputs such as fertilizers and biocides. Indeed, there is still significant scope to boost productivity by improved agricultural practices. The second way toward food security involves converting more forest to agriculture. However, this undermines the world’s priority of reducing carbon by sequestration. In addition, much carbon is released by conversion of forest to food production by burning the cut forest and its subsequent rotting.

There is a third way that most governments have ignored, namely promoting an increase in the nutritional value of agricultural land. This means feeding more people from existing arable lands, while improving human diets. It means phasing down the least efficient land uses (livestock and feed) and focusing instead on the more direct and efficient human nutrition (soy, grains, vegetables). About 70% of meat is produced in developing countries. A 25% reduction

in this least efficient human food would not only achieve the promise of Copenhagen in terms of GHG reduction, but would help governments to achieve their objectives in food security.

To grow better alternatives to meat and dairy products, less than half the acreage is required as that which is needed to produce meat and dairy products themselves. It would not only improve the nutritional efficiency of land⁶ but also reduce the high wastage in meat and dairy production.⁷

Nearly all (97%) of the chronically hungry live in South Asia and Africa, the two regions most at risk from and devastated by climate change. Projected melting of glaciers feeding the major rivers of China and India may be the biggest threat to food security that humanity has ever faced.

A major humanitarian problem for governments will soon be how to feed the projected eight or nine billion people by 2050. Food production must double within 40 years. Yet today, food production is barely keeping up with demand. Climate change will exacerbate this problematique. If governments, industry, and consumers fail to reverse climate change within five to ten years, what happens in 2050 will become moot. Yet the world should be able to feed these people, because we are already growing enough – but only if it is eaten directly by people. Most grain today is used to feed livestock and to fuel vehicles.

The number of land-based livestock now raised annually is approximately 56 billion.⁸ While the world focuses on reducing carbon dioxide emissions from fossil fuels, which resides in the atmosphere for 100-1000 years, the transition away from fossil fuels looks unlikely to be fast enough to prevent the critical threshold of 2° C warming. On the other hand, the half-life of methane from livestock is less than 10 years, and over a 20-year timeframe has a global warming potential over 100 times that of carbon dioxide.⁹ Meanwhile, land set aside for livestock and feed production could itself absorb huge amounts of atmospheric carbon. Therefore, reducing livestock production seems the fastest and lowest cost means of preventing climate disruption.

There is consensus among agricultural experts that raising food productivity is essential, possibly by means of another green revolution. Basically, there are only five options to double food production by 2050: (1) Raise agricultural yields; (2) increase production limits; (3) reduce waste; (4) expand agriculture into forest; and (5) improve diets. Only the latter can suffice on its own.

Another way to frame the issue is to ask whether farmland should be expanded into presently uncultivated ecosystems, mainly forest. This would be extremely costly and very difficult. General adoption of Western diets would need 3 million square kilometers of forest to be destroyed by 2050, which means land amounting to two-thirds the size of the Amazon forest.

⁶ Note that improving human diet efficiency by increasing the plant-based ratios of the human diet is quite different from boosting livestock and dairy ‘feed conversion efficiency,’ which means phasing down pasture-feeding, while ramping up feedlots, stall feeding and factory-farms for meat, egg and dairy production. On the contrary, efficiency should mean reducing the feed and grains allocated to livestock.

⁷ Tristram, 2009.

⁸ CO₂ respired from a given weight of livestock is roughly the same, including roughly two billion ruminants (cattle, sheep, goats), plus pigs and poultry. Farmed fish are included, but as they are cold blooded they exhale less CO₂ per kilogram. More than half caught oceanic fish become fishmeal for pond fish, livestock and pets. World meat production is now nearly 300 million tons annually. The average American eats more than 2 kilograms of meat weekly, Europeans about half that.

⁹ CO₂ is defined as having a GWP of one. Ammonia from cattle manure oxidizes to N₂O; much also originates from nitrate fertilizers. The Greenhouse Gas Protocol (GHG Protocol.org) is the most widely used international accounting tool for government and business leaders to understand, quantify, and manage greenhouse gas emissions.

The likelihood of increasing productivity on existing farmland is implausible. Asian fertilizer use soared forty-fold in fifty years, while yields rose only four-fold. India's yields have plateaued, with excessive subsidies offered on water and electricity to pump it, as well as urea-based fertilizer. The water table gets deeper every year.

Deforestation worldwide burgeons according to Global Forest Resources Assessment 2010, now exceeding 3 million hectares annually.¹⁰ Some experts assert that the world needs to convert yet more forest to agriculture for food.¹¹ This is actually terrifying, and unnecessary. Halving GHG emissions by 2050 means we have to use all the GHG-sequestration we can possibly muster, and certainly not reduce sequestration capacity. Too much forest has already been destroyed. The world needs more forest than today in order to stabilize climate and sequester carbon.¹²

To the extent that further areas might be deforested for food, that would result in less carbon sequestration capacity, along with much more carbon emissions generated from burning and rotting forest being converted to agriculture. There are no clear ideas of how much more forest should be cleared for more food, no agreed-on criteria to select which tracts of forest to remove, and no criteria to know when enough forest has been converted, hence when to stop and let the forest remnants get on with carbon sequestration.

Recent data on available productive land for all additional agriculture (such as biofuel production, agro-forestry, and tree plantations) is alarming. Energy prices are driving up crop prices, now that the world's financial crisis seems to be subsiding. Subsidies and the concentration of capital in the biofuel business seem excessive, distorting how land is used. Heavy South-South land-buying that results in exporting food to rich buyers appears to be boosting land prices.¹³

It has been proposed that much more than 200-280 million hectares of productive land worldwide exists not already used in agriculture, including degraded lands.¹⁴ If so, then more deforestation is inevitable, no matter how much effort is expended toward Reducing Emissions from Deforestation and Degradation, known as REDD.¹⁵

The 1997 Kyoto Protocol excluded credits from conserving the carbon-sequestration services of forests. Yet preventing deforestation is the most powerful and lowest cost way to reduce climate

¹⁰ Of course, arid lands sequester much less GHG than forests do, but desertification rages on at nearly 4 million hectares annually, and arable lands lost to soil erosion exceed 5.5 million hectares annually.

¹¹ For example, Holmgren, 2009.

¹² GHG Sequestration: (a) The 2008 (Oct.) (273pp.) Johan Eliasch's report (www.occ.gov.uk) Climate Change: Financing Global Forests goal is to halve emissions from deforestation by 2020 and to make global forests carbon neutral by 2030. This seems too modest and incommensurate with the need. It might be politically palatable, but it seems too risky for such a critical goal. (b) James Lovelock writes (New Scientist 23rd Jan 2009): "There is one way we could save ourselves and that is through the massive burial of charcoal. It would mean farmers turning all their agricultural waste - which contains carbon that the plants have spent the summer sequestering - into non-biodegradable charcoal, and burying it in the soil..."

¹³ Grain, 2009.

¹⁴ Nilsson, 2009.

¹⁵ REDD-Monitor: "REDD: An introduction". 2009; www.redd-monitor.org/redd-an-introduction. REDD refers to a broad agreement to pay less-industrialized countries to protect their forests. Some countries want to include payments in a broader carbon market, whereby they would receive carbon credits in return. Brazil would prefer funds to be paid without any credits being given in return - i.e., directly into the Amazon Fund. See Peskett et al., 2008.

risks.¹⁶ High-emissions countries can buy up intact forest to be conserved as carbon sinks in perpetuity with monitoring.¹⁷ These need to be ramped up substantially. REDD and the commendable Norway/Brazil forest protection scheme¹⁸ to reduce first Amazonian and then other deforestation hold promise.

Copenhagen failed to agree on a plan to allow countries to claim either cash or GHG-emission credits for changes in managing their forests to sequester carbon. In any event, both REDD and the Norwegian/Brazil schemes are arguably dwarfed by what is needed, and cannot compete with the deforestation if it occurs, as it seems bound to, in pursuit of expanding livestock and feed production. IUCN's 2009 "True Cost of REDD" report found that many poor farmers in tropical rainforest zones would stand to benefit from an agreement, due to the low income that they currently receive from 'slash and burn' agricultural production.¹⁹

The world should in general not convert more forest to food production. Cases for exceptions seem to be few. On the contrary, the emphasis should be on a massive expansion of forest regeneration, reforestation and tree plantations on degraded lands for GHG-sequestration and employment generation. After trees peak in their CO₂ sequestration abilities (after about 50-100 years), they may be selectively logged. However, the survival of much of the world's forests may well depend of the survival of local communities. According to the International Alliance of Indigenous and Tribal Peoples of Tropical Forests, about one billion local people control a quarter of the world's remaining forests.

Following the publication of "Livestock and Climate Change" by Jeff Anhang and me, the FAO graciously invited us to participate in two fora. The first was an FAO expert consultation in Rome, Italy in December 2009 on greenhouse gas emissions and mitigation potentials in the agriculture, forestry and fisheries sectors. The second was an FAO-organized session at the Global Forum for Food and Agriculture during International Green Week in Berlin, Germany in January 2010. For each of those two fora, we prepared presentations that contain many details that interested people may want to read.²⁰ Rather than repeat all the points in those presentations, following is an updated summary of our policy recommendations.

Priorities for governments everywhere should include a prompt withdrawal of financial and fiscal support wherever it is provided for any large-scale livestock or feed projects. For non-arable land, governments should in most cases support reforestation, or setting aside of land to regenerate forest. Where needed and appropriate, governments should promote the reallocation

¹⁶ Births outweigh deaths by more than 100,000 per day. Thomas Wire has calculated that providing women choice or family planning is probably the most cost effective measure. US\$7 spent on family planning reduces GHG by one ton. \$13 spent on reduced deforestation reduces GHG by a ton, \$24 for wind energy, \$51 for solar power. It matters greatly whether todays 6.8 billion humans grow to 8, 9 or 10 billion by 2050. As overweight/obese/overconsuming people (1.5 billion) now exceed hungry/undernourished/underconsuming people (1.1 billion), overconsumption by the rich is by far a more serious cause of today's environmental problems than overpopulation by the poor.

¹⁷ High-emitting nations also must reduce their GHG emissions by 25%-40% by 2020 compared with 1990 emissions levels.

¹⁸ The Norway-Brazil Amazon Funds expect to raise US\$21 billion by 2020 from public and private sources. www.amazonfund.gov.br.

¹⁹ The process whose acronym is LULUCF acknowledges that forests soak up GHG and sequester them. Countries conserving forests get credit. Logging corporations are pressuring their governments to insert a clause into the rules claiming that by "Sustainable Forest Management" one could cut most trees without losing credits.

²⁰ See <http://awellfedworld.org/sites/awellfedworld.org/files/pdf/FAOConsult12-09.pdf> and <http://awellfedworld.org/sites/awellfedworld.org/files/pdf/GoodlandFoodIndustryBerlinJan2010.pdf>

of arable land for production of the most efficient foods for human nutrition (e.g., grains and vegetables). Governments everywhere should introduce GHG emission taxes that would penalize inefficient food production, thus helping to reduce livestock and feed production. This tax should be strictly revenue neutral, through commensurate reductions in income tax. The proceeds from GHG taxes may be fully rebated to each family, or some may be allocated to accelerate the development of renewable energy.

Governments' own procurement policies should promote low-carbon foods, and government functions should offer meat and dairy analogs as a matter of routine.²¹ Governments should provide incentives for food retailers to offer meat and dairy analogs – much as they promote fuel-efficient vehicles. Public sector support should be made available for developing labeling of the carbon intensity of foods at the retail level.²² Governments should work with the health insurance industry to reduce premia for those who consume healthy, low-carbon diets while raising premia for people who choose to do otherwise.

In the U.S. House of Representatives, some significant initiative appears to be underway. House Agriculture Committee Chair Collin Peterson emphasized:

*The livestock industry likes \$1.80 corn and they built an industry based on \$1.80 corn which was never realistic because it was subsidized and they got cheap feed. And now when they have to pay the actual value, the model doesn't work so well... We need to get to as much of a market-based situation as we can and you need \$3.50-4.00 to grow corn. And the more environmental regulations they put on us and all of this other stuff, the more it's going to cost. The livestock people need to get used to it and people are going to have to pay more for meat. That's where this is headed.*²³

B. Industry

As with all other emissions in the world, the emissions attributable to livestock should be considered as impacts managed or owned by the industry or sector that emits them. But the livestock sector sits within the larger food industry – which in total produces much smaller volumes of livestock products than the volumes it produces of grains, legumes, fruits, and vegetables, all of which are exposed to the impacts of emissions attributable to livestock. Moreover, this exposure is probably greater than the exposure of any other industry to the very same emissions. Therefore, there is a compelling commercial motivation for the food industry to manage the impacts of these emissions, as soon as they are understood.

Interest in managing the risk of livestock should rise even higher when the food industry realizes that there are pragmatic business opportunities that would balance the impacts – namely, to produce better alternatives to livestock products. Nobody else owns or can manage the existing impacts and available opportunities as directly as can the food industry. So ideally, the impacts and opportunities will be first understood and then managed directly by the food industry. In

²¹ See Jowett, 2009.

²² Monika Pearson of Sweden's National Food Administration in close collaboration with the Environmental Protection Agency is integrating nutritionally-based recommendations with national environmental objectives, especially on GHG emissions. Within each food group, foodstuffs have been judged on their environmental impact on climate, pesticide use, biodiversity and eutrophication.

²³ See www.lavidalocavore.org/show_Diary.do?diaryId=2932.

fact, all large companies in the food industry already employ their own environmental specialists. However, those specialists have apparently so far overlooked the impacts and opportunities identified in *Livestock's Long Shadow*, *World Watch*, and elsewhere.

Incentives are that meat and dairy prices are set to soar as soon as climate risks are taken seriously. Analogs need less petroleum, create more sustainable jobs, and are more convenient for consumers. If vendors promote analogs, palates will follow.

It seems that industrial livestock production is becoming an obsolescent, sunset industry. Climate and other environmental imperatives, as well as costs, all militate against this industry. Meat and dairy analogs will improve corporate profit margins. They will sell well because of their quality, including ease and speed of preparation and delivery, and good taste. Preferences change readily if price, taste and other benefits are realized. Labeling of carbon intensity will help to improve consumption choices.

Scaling up analogs will insulate food corporations from rising oil prices. 'Peak oil' makes it likely that industry will be forced to produce less meat and dairy products. Analog manufacturers can gain carbon credits, as analogs are much less carbon intensive than meat and dairy products.

Food industry leaders such as Cargill²⁴ and Whole Foods seem to be moving in this direction. Any significant innovation in this area by food industry leaders will tend to lower the costs both of climate disruption and climate adaptation.

C. Individuals

Many experts have recently targeted the general public with messages about livestock and climate change. For example:

- Dr. Andy Thorpe at the University of Portsmouth calculated that 200 cows emit methane each year equivalent to the emissions from a family car driven 111,850 miles.
- Dr. Rajendra Pachauri, Chair of the Intergovernmental Panel on Climate Change, emphasized: "A major shift toward plant-based diets is imperative if we are to have even a chance of preventing catastrophe according to top climate leaders... In terms of immediacy of action... reducing meat consumption clearly is the most attractive opportunity."
- Sir Paul McCartney is promulgating a worldwide Meat Free Monday campaign for the general public, and spoke in December 2009 to the European Parliament on this topic, along with Dr. Rajendra Pachauri and Olivier de Schutter, UN Special Rapporteur on the Right to Food.
- Former U.S. Vice President Al Gore has authored a *Global Warming Survival Handbook*, which indicates that "refusing meat" is the "single most effective thing you can do to reduce your carbon footprint." He now often speaks publicly along these lines.

²⁴ Cargill, the largest privately held company in the United States (six times the size of McDonald's) recently launched a 100 percent non-dairy cheese analogue for pizza and other prepared food applications" that "replicates the functionality of dairy protein and replaces it fully at an outstanding cost advantage for the manufacturer." According to Cargill, "its appearance, taste and texture perfectly match those of processed cheese."

- Lord Stern of Brentford, former World Bank Chief Economist, and lead author of the Stern Review on the Economics of Climate Change, has publicly stated: “Meat is a wasteful use of water and creates a lot of greenhouse gases. It puts enormous pressure on the world’s resources. A vegetarian diet is better.”

After some media outlets cited and even exaggerated a claim by Dr. Frank Mitloehner in a speech in March 2010, asserting that the climate impact of livestock had been overestimated, numerous independent analyses followed up to show that this claim is false.²⁵

The many recent efforts by public figures and media outlets to raise awareness among individuals are commendable. However, even more powerful momentum to reverse climate change by replacing meat and dairy products with better alternatives can be developed through collaborative efforts by governments, industry, and the general public.

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²⁵ See for example these publications: (1) <http://www.theatlantic.com/food/archive/2010/04/the-myth-of-green-beef/38810/>; (2) http://www.cjr.org/the_observatory/meat_vs_miles.php, (3) <http://blogs.alternet.org/patthomas/2010/03/24/livestock-climate-change-and-a-mediocre-media/>, (4) http://environment.change.org/blog/view/meat_is_still_a_climate_villain, (5) <http://blog.greenhearted.org/2010/03/when-something-smells-funny-follow.html>

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