

## How the Food Industry Can Reverse Climate Change Quickly and Profitably

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This draft last revised: 13 January 2010; comments and corrections please to RbtGoodland@gmail.com<sup>1</sup>

The FAO kindly invited me to participate in this forum after the article “Livestock and Climate Change,” co-authored by Jeff Anhang and me, appeared in the November/December 2009 issue of *World Watch*.<sup>2</sup> At this forum, the main topics that I would like to address are the impacts of livestock, mitigation, and business opportunities for the food industry.

The FAO’s *Livestock’s Long Shadow* estimates greenhouse gas (GHG) emissions attributable to livestock worldwide (that is, cattle, buffalo, sheep, goats, camels, horses, pigs, and poultry) and 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 carbon.<sup>3</sup> This implies that there are already too many livestock in the world today.

Using our background in environmental assessment at the World Bank Group, Jeff Anhang and I built on the FAO’s work to prepare our article for *World Watch*, in which we consider sources of GHGs missed in *Livestock’s Long Shadow*. We found several key sources missing, particularly in land set aside for livestock and feed production. So our article shows that livestock’s shadow is not only long but colossal, responsible for at least 51% of human-caused GHGs.

Media and internet outlets have covered our article massively, with little criticism; and the FAO graciously invited us to participate in its December 2009 expert consultation in Rome. For that consultation, we prepared a paper<sup>4</sup> showing that worldwide each year, livestock<sup>5</sup> are the leading driver of deforestation,<sup>6</sup> while consuming up to half the catch of marine organisms<sup>7</sup> and as much as half of all crops brought to market.

Our December 2009 paper asserts that most of its points do not require that people believe in human-caused climate change. Atmospheric carbon is often useful as a proxy for adverse

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<sup>1</sup> The author, Robert Goodland, has served as lead environmental adviser at the World Bank Group, and was awarded IUCN’s first Coolidge Medal for outstanding contributions to environmental conservation. He is grateful for assistance from Jeff Anhang in preparing this paper.

<sup>2</sup> The article and related information are available at [www.worldwatch.org/ww/livestock](http://www.worldwatch.org/ww/livestock) and [blogs.worldwatch.org/datelinecopenhagen/livestock/](http://blogs.worldwatch.org/datelinecopenhagen/livestock/).

<sup>3</sup> Table 3.2 in *Livestock’s Long Shadow: Environmental Issues and Options*, Steinfeld, H. et al., Rome: FAO, 2006.

<sup>4</sup> [www.wellfedworld.org/PDF/FAOConsult12-09.pdf](http://www.wellfedworld.org/PDF/FAOConsult12-09.pdf)

<sup>5</sup> Livestock is defined here to include fish produced through aquaculture.

<sup>6</sup> FAO, 2006.

<sup>7</sup> For example, 45% was the share of fishmeal used for aquaculture in 2005 according to FAO, 2006, p. 43.

impacts on natural capital. But atmospheric carbon is invisible and abstract to most people, whereas most adverse impacts on natural capital are visible and tangible. So it is sometimes useful to focus on specific aspects of natural capital, particularly when addressing climate-change skeptics.

The need to engage with climate-change skeptics was underscored in December 2009 when the United States National Cattlemen's Beef Association filed a petition in a U.S. court against a recent rule by the U.S. Environmental Protection Agency, on the grounds that "there's so much uncertainty surrounding humans' contribution to climate change." Such climate-change skepticism within the livestock sector may have been part of what provoked Carlos Seré, Director-General of the International Livestock Research Institute, not to refer to climate change when he recently admonished livestock producers in developed countries – saying that rich countries feed animals grains that "might instead have fed people."<sup>8</sup> Perhaps nobody of such stature in the livestock sector has ever made such a statement before.

In the U.S., some producers concede that climate change is underway, but seem to rely on predictions that warmer temperatures will benefit their production, while ignoring proposed incentives for them to profit from planting trees and reducing production.<sup>9</sup> In other countries such as England and Australia, producers are fighting pressure to reduce production – citing low levels of GHGs attributable to livestock in their particular country. Such views show that weak conclusions are often reached when livestock products are assessed only through a national lens.

Climate change is trans-boundary; and livestock products and feed are global commodities, so they get flown, shipped and trucked all over the world. Therefore, one must look beyond one's 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.

Whether one believes in human-caused climate change or not, it is difficult to ignore reports that have emerged in recent months on millions of livestock dying due to climatic events in countries as diverse as Australia, Argentina, India, the Philippines, and Kenya.<sup>10</sup>

Our analysis indicates that replacing livestock products with better alternatives would be the best strategy for reversing climate change, reducing GHG emissions and their atmospheric concentrations far faster than actions to replace fossil fuels with renewable energy. According to Chris Mentzel, the CEO of a solar power company, a 1% reduction in worldwide meat intake would have the same benefit as U.S.\$3 trillion in solar energy investments.<sup>11</sup>

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<sup>8</sup> <http://cgiarclimatechange.wordpress.com/2009/11/03/livestock-crucial-for-coping-with-climate-change/>

<sup>9</sup> [www.environmentalleader.com/2009/12/07/climate-bill-impact-on-ag-becomes-more-clear/](http://www.environmentalleader.com/2009/12/07/climate-bill-impact-on-ag-becomes-more-clear/)

<sup>10</sup> E.g., see [www.washingtonpost.com/wp-dyn/content/story/2009/12/08/ST2009120804530.html?sid=ST2009120804530](http://www.washingtonpost.com/wp-dyn/content/story/2009/12/08/ST2009120804530.html?sid=ST2009120804530)

<sup>11</sup> See the 14<sup>th</sup> comment at <http://blogs.worldwatch.org/datelinecopenhagen/livestock/>

Our *World Watch* article recommends a 25-percent reduction in livestock products worldwide to yield a 12.5-percent reduction in global anthropogenic GHG emissions. This would be about as much reduction as delegates tried but failed to negotiate at the December 2009 UN climate conference in Copenhagen.

Following the failure 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 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, through joint action by citizens/consumers, governments, industry, and investors.

## **Mitigation**

Our analysis indicates that broadly reducing emissions attributable to livestock has become critical, as mitigation measures in livestock production will no longer suffice. 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,<sup>12</sup> 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.

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.<sup>13</sup>

Growth in markets for livestock products is greatest in developing countries, where rainforest normally stores at least 200 tonnes of carbon per hectare – which may all may be released within a short time after forest and other vegetation are cut, burned, or chewed to create grassland for grazing livestock or for feed production. From the soil beneath, another 200 tonnes per hectare may be released, with yet more GHGs from livestock respiration and excretions. But if the production of livestock or crops is ended, then forest and soil can often regenerate and resume absorbing carbon.

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<sup>12</sup> FAO, 2006, p. 45.

<sup>13</sup> Shulze et al., 2009.

As today's worldwide livestock-related emissions are at perilous levels, an effective strategy must involve replacing livestock products with better alternatives. Substituting one meat product with another that has a somewhat lower carbon footprint would not be effective, as each kilogram of every livestock product is responsible for almost the same amount of GHGs. There is little variability between types of livestock when it comes to livestock respiration, land used to grow feed, and most of the rest of the life cycle and supply chain of livestock production. The main factors involving significant variability are enteric fermentation, grazing, and the amount of feed required to produce beef and dairy products. The difference that these factors make in total GHGs attributable to beef and dairy products versus other livestock products is relatively insignificant.

The structural causes of the 2008 food crisis remain in place, so it may not take much for another food crisis to arise. Yet the world can learn lessons from the last crisis. Notably, a limited amount of land is available to grow crops, especially with the high priority of conserving today's forests and even regenerating forest, in order to reverse climate change. Yet annual biofuel production uses 100 million tonnes of crops worldwide, while annual livestock production uses 760 million tonnes of crops worldwide.<sup>14</sup>

With projected population growth, probably the only way to produce the requisite amount of food is through a significant reduction in livestock numbers – so crops can be delivered to people directly, rather than to livestock or biofuel producers.<sup>15</sup> Increases in land productivity have long been pursued through more efficient use of such resources as water, energy, fertilizer, genetics, pest and weed control, and storage. Food efficiency is the next frontier, and it will entail significantly reducing livestock products while increasing the production of better alternatives.

### **Business Opportunities for the Food Industry**

Due to the urgency of slowing climate change, we believe that recommending change directly to industry will be more effective than recommending policy changes to governments, which may or may not eventually lead to change in industry. This is true even though industry and investors normally thrive when they are responsive to customers and shareholders in the short term, while climate change seems to pose long-term risks.

As with all other emissions in the world, GHGs 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 GHGs attributable to livestock. These GHGs likely cause more

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<sup>14</sup> Guardian, 2008.

<sup>15</sup> As each human consumes an irreducible minimum of food, meeting women's choice for family size is a powerful way to avert food crises.

harm to agriculture than they do to any other industry. Therefore, there is a compelling commercial motivation for the food industry to manage the impacts of these emissions, as soon as they are fully understood.

Interest in managing the risks of livestock should rise when the food industry realizes 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 fact, all large companies in the food industry likely already employ their own sustainability specialists – though they have so far apparently missed the impacts and opportunities identified by the FAO, *World Watch*, and elsewhere.

Livestock-related GHGs could be managed by governments through the imposition of taxes on carbon emissions (despite opposition from the livestock sector), in which case leaders in the food industry and investors would search for opportunities that such carbon taxes would help create. In fact, they might seek to benefit from such opportunities even in the absence of carbon taxes, as livestock-related GHG emissions are a grave risk to the food industry itself. Disruptive climate events are forecast to threaten developed markets increasingly, and to result in even more harm to emerging markets, where the food industry is otherwise forecast to achieve its greatest growth.

An individual food company has at least four incentives to respond to the risks and opportunities applicable to the food industry at large. *The first incentive* is that individual food companies already suffer from disruptive climate events, so a company's self-interest might well be served by acting to slow climate change. In affected areas, disruptive climate events can be expected to degrade not only the food industry's markets, but also its infrastructure and its ability to operate. For example, all these risks played out in the New Orleans area in 2005 following Hurricane Katrina, when Whole Foods Market, Inc. reported US\$16.5 million in losses that year due to the closure of its damaged stores in the New Orleans area, including the costs of lost sales and renovations at damaged stores. Such risks will be aggravated by extreme climate events in the future, which are expected to occur with increasing frequency and intensity worldwide.

*A second incentive* stems from the likelihood that demand for oil will rise to levels impossible to meet because of a terminal decline in production (the "peak oil" phenomenon), possibly bringing about the collapse of many parts of today's economy. Livestock products would take an extra hit because every ounce of biofuel from crops that can possibly be produced to replace conventional fuel likely will be produced—and thereby diverted from livestock—in efforts to stave off disaster. It has been predicted from within both the livestock and financial sectors that peak oil could bring about the collapse of the livestock sector within a few years. To be ahead of the competition in that scenario is another reason for leaders in the food industry to begin replacing livestock products with better alternatives immediately.

A *third incentive* is that even without peak oil, the days of cheap meat seem numbered, due to increased demand for meat and forced reductions in supply. Worldwide, cap and trade measures and possibly carbon taxes are bound to raise the price of many inputs in the life cycle and supply chain of meat and dairy products. The chair of the U.S. Senate Agricultural Committee has warned that corn prices will quickly double, saying “we are not going back to the day when we are going to subsidize the livestock industry through a crop subsidy program.”<sup>16</sup> With efforts already underway to reduce deforestation and increase reforestation, the price is likely to rise for any activity requiring deforestation – and growth in livestock production is the world’s prime driver of deforestation.

A *fourth incentive* is that a food company can produce and market alternatives to livestock products that taste similar, but are easier to cook, less expensive, and healthier, and so are better than livestock products. These alternatives are analogs to livestock products such as soy- and seitan- (wheat gluten) beef, chicken, and pork; and soy- and rice milk, cheese, and ice cream. For consumers wanting options to meat and dairy analogs, protein-rich legumes and grains are readily available alternatives.<sup>17</sup>

Meat and dairy analogs make it easy for people accustomed to eating meat and dairy products to improve on their existing preferences. These analogs enable individuals in (and from) every region of the world to retain their family recipes and cultural traditions in food virtually unchanged. Many people who partly or fully stop eating livestock products begin by consuming meat and dairy analogs, and most continue to consume them. Many tell of how sampling analogs persuaded them that they could replace livestock products in their meals.

Sales in the United States alone of soy analogs totaled \$1.9 billion in 2007, up from \$1.7 billion in 2005, according to the Soyfoods Association of North America. In comparison, sales in the U.S. of meat products (including poultry) topped \$100 billion in 2007. This 1.9 to 100 ratio suggests much room for growth in sales of meat and dairy analogs. Worldwide, the market for meat and dairy analogs is potentially almost as big as the market for livestock products. The trend for analogs is upward, as for example, Cargill recently launched a non-dairy cheese analog product.<sup>18</sup>

Meat and dairy analogs are already sold throughout the developing world, and there as in the U.S., sales have increased in recent years. So efforts to increase sales of these products in developing countries do not have to wait for similar efforts to succeed in the developed world first. In fact, analogs may be easier to sell in developing countries than in developed ones, since

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<sup>16</sup> [www.lavidalocavore.org/showDiary.do?diaryId=2932](http://www.lavidalocavore.org/showDiary.do?diaryId=2932)

<sup>17</sup> Another option might be artificial or “in vitro” meat cultivated in laboratories from cells originating from livestock, but it will be at least five years before it is known whether commercial production is possible and its cost, taste, health and environmental impacts are acceptable.

<sup>18</sup> [www.cargill.com/news-center/news-releases/2009/NA3020258.jsp](http://www.cargill.com/news-center/news-releases/2009/NA3020258.jsp)

with generally less meat and dairy consumption, there is a lower hurdle for getting people to give up meat and dairy products. Such a phenomenon has occurred in other sectors – such as mobile banking, which has achieved greater popularity in developing countries than in developed ones, where consumers are habituated to using brick-and-mortar banks and automated teller machines.

Large organic-food companies might find opportunities in analogs especially appealing. Such companies could establish subsidiaries to sell meat and dairy analogs, possibly exclusive of meat or dairy products. They could significantly scale up production and sales of analogs within a few years at a reasonable capital cost and with an attractive return on investment. Since meat and dairy analogs are produced without the GHG-intensive processes used in raising livestock – such as animals’ CO<sub>2</sub> and methane emissions, and usage of land for growing feed and grazing livestock – analog products are responsible for a small fraction of the GHGs attributable to livestock products. Additional revenues might be captured from the sale of carbon credits for this reduction in GHG emissions.

Analogues are most indistinguishable from meat and dairy products when they are chopped, breaded, sauced, spiced, or otherwise processed, so among the least risky strategies might be for a company subsidiary to build a chain of fast-food outlets featuring soy burgers, soy chicken products, sandwiches made with various meat analog products, and/or soy ice cream. If such a chain grows profitably, then other food companies would be tempted to copy from the first mover.

If the production of meat and dairy analogs increases significantly, then their costs will decline, a key advantage particularly in challenging economic times. Cost reductions may follow from economies of scale and increased competition among analog producers, and because a key feedstock for biodiesel is soy oil. Meeting the significantly higher forecast demand for biodiesel may yield surpluses of soy meal, which is not only a co-product of soy oil but a raw material for many meat and dairy analogs. Surpluses in stocks of soy meal would drive down its price.

### **Marketing of Analogs**

To achieve high growth in analog consumption will require a significant investment in marketing, as meat and dairy analogs will be new to many consumers. A successful campaign would avoid negative themes and stress positive ones. For instance, recommending that meat not be eaten one day per week suggests deprivation. Instead, the campaign should pitch the theme of eating all week long a line of food products that is tasty, easy to prepare, and includes a “superfood,” such as soy, that will enrich their lives. When people hear messages about food, they are listening particularly for words that evoke good taste, ease and speed of preparation, low price, comfort, popularity, and good health. Consequently, several other themes should be tapped to build an effective marketing campaign:

- Analogues can be marketed as superior to meat and dairy products, thus appealing to the same consumer urges that drive purchases of other analog products.

- Analogs are less expensive, less wasteful, easier to cook, and healthier than livestock products.
- By replacing livestock products with analogs, consumers can collectively take a single powerful action to mitigate most GHGs worldwide. Labeling analogs with certified claims of the amount of GHGs averted can give them an extra edge.
- In developing countries, where per-capita meat and dairy consumption is lower than in developed countries, consumers often see meat and dairy products as part of a better life, and have not yet been informed about their adverse impacts. Yet meat and dairy analogs can yield even better outcomes, particularly if they are marketed with such intent.

Following the track record of green businesses, the first target of such a campaign should be environmentalists, on the basis that eating meat and dairy analogs is the best way to combat climate change. They can be expected to spread such messages to other people, and may press for analogs to be served at meetings they attend and for the GHGs thereby avoided to be well publicized.

Likely most susceptible to messages about new foods and fast foods are children, who are prone to act on advertising, having less-ingrained habits than adults, and often seeking to catch the wave of a new trend. Parents often join in eating a fast food meal or other food product that their children insist be bought for them. At the same time, children are being increasingly educated on climate change in school, and are searching for activities that allow them to experiment with what they have learned. So marketing meat and dairy analogs to children should be a priority.

Further, food companies can market meat and dairy analogs through strategic alliances with other companies. They can engage with schools, governments, and nongovernmental organizations. Environmentalists with relevant skills can be recruited to conduct ongoing, comprehensive tracking of GHGs attributable to livestock products and analogs. Politicians and celebrities can be enlisted to pitch for consumers to choose alternatives to livestock products.

We recommend that when grocers plan displays and slotting fees, they consider the benefits of displaying meat and dairy analogs side-by-side with meat and dairy products. This would expose analogs to many consumers who may not otherwise be exposed to them, and thereby facilitate an increase in their sales. It would permit the achievement of good sales results that normally occur when consumers are shown multiple forms of a product on the same shelf. Where analogs cost less than meat products, displaying one beside the other may have an enhanced benefit for grocers. That is, if consumers find in a side-by-side comparison that analogs are cheaper than livestock products, then side-by-side placement may help grocers keep up their overall sales volumes in an economic downturn.

### **Sources of Investment**

A company with a sound plan for increasing sales of meat or dairy analogs is likely to find sufficient commercial financing from investors seeking investment opportunities that promise to



reduce climate risks. It may also find concessional financing through development finance institutions, “climate funds,” and various “ethical” funds.” But it may need to raise awareness among investors unfamiliar with meat and dairy analogs.

Investors can be shown that it is in their self-interest to avoid new investments in the production of meat and dairy products, and rather seek investments in analogs. Compared with transportation, power or energy projects, analog projects can be implemented quickly, with relatively low levels of incremental investment, larger amounts of GHGs mitigated for the same amount of investment, and faster returns on investment. Renewable-energy infrastructure has both long and complex product-development cycles and capital-intensive requirements; so by the time the required large amounts of financing and political will have been assembled and sufficiently acted on, tipping points may long since have been passed for irreversible climate disruption.

### **Role for the FAO**

If livestock producers (rich or poor) are unwilling to pursue alternative livelihoods, then they may have no choice but to manage both the impacts of climate change on their livelihoods and the high level of GHGs attributable to their animals. The FAO should work with governments to provide assistance, such as retraining and payments for land and animals, to support both small and large producers as they face inevitable changes.

The FAO should recognize that halting deforestation and forest fires, as well as promoting reforestation, are priorities. It should work on mapping areas ripe for reforestation on technical, economic, and social bases, and on creating a framework for ongoing worldwide tracking of GHGs from both livestock products and alternatives. The FAO should also consider partnering with leading companies in the food industry to promote the production and marketing of better alternatives to livestock products.

### **Benefit Package**

Meat and dairy analog projects will not only slow climate change, but also ease food crises, as it takes a much smaller quantity of crops to produce any given number of calories in the form of an analog than a livestock product. Analog would also alleviate the global water crisis, as the huge amounts of water needed for livestock production would be freed up. Health and nutritional outcomes among consumers would be better than from livestock products. Analog projects are more labor intensive than livestock projects, so they can create both more jobs and more skilled jobs. They also can avert harmful labor practices found in the livestock sector but not in analog production, including slave labor in areas such as the Amazon forest region. Workers producing livestock products can easily be retrained to produce analogs.

Some livestock will inevitably continue to be raised, especially where they are important in mixed farming systems. Raising livestock has been one of the few ways for poor rural

populations to create assets and earn income. But that is increasingly less common, as dramatic growth in recent years in the use of computers, mobile communications, mobile banking, microfinance, and off-grid electricity has created a multitude of new opportunities for poor rural communities.

For many years, advocacy of alternatives to livestock products has been based on arguments about nutrition and health, compassion for animals, and environmental issues other than carbon intensity. These arguments have mostly been ignored and the consumption of livestock products worldwide has increased, leading some to believe that such advocacy may never succeed.<sup>19</sup> Even urging governments to mandate reductions in livestock production on grounds of climate change may prove ineffective because of the food industry's own large lobbying capacity. But if the business case for meat and dairy analogs is clear, then those who would normally lobby governments can appeal directly to leaders in the food industry, who should welcome them as champions. The business risks of analog projects would be similar to those in most other food manufacturing projects, but the risks would be mitigated by the fact that much of the necessary infrastructure (such as for growing and processing grains) already exists.

The key change would be a significant reduction in livestock products. Industry-led or supply-led growth has been successful in other industries, such as the computer and mobile-phone industries, which suggests that it can be successful with meat and dairy analogs. Generally, the food industry worldwide has a very sophisticated marketing capacity, making high growth from marketing new food products practically a norm—even before one considers the extra lift that might be achieved from interest in slowing climate change.

The risks of business-as-usual outweigh the risks of change. The case for change is no longer only a public policy or an ethical case, but is now also a business case. We believe it is the best available business case among all industries to reverse climate change quickly.

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<sup>19</sup> E.g., see “Livestock sector environmental assessment” (239-261) by Robert Goodland in *Nachhaltigkeit in der Landwirtschaft: Landwirtschaft in Spannungsfeld zwischen Ökologie, Ökonomie und Sozialwissenschaften*, Hardtlein, M., et al. (eds), Berlin: E. Schmidt Verlag [for] Umwelt Stiftung: Deutsche Bundesstiftung Umwelt, 1999, 421 pp.