

# **“Forests, Fisheries, Agriculture: A Vision for Sustainability”**

## **Expert consultation on greenhouse gas emissions and mitigation potentials in the agriculture, forestry and fisheries sectors**

**U.N. Food and Agriculture Organization in Rome, Italy, 2- 4 December 2009**

This draft last revised: 12 August 2014; comments and corrections please to RbtGoodland@gmail.com

### **I. Introduction**

The FAO graciously invited Jeff Anhang and me to participate in this consultation after our article entitled “Livestock and Climate Change” was published in *World Watch*.<sup>1</sup> While Jeff Anhang was unable to be in Rome, he and I both acknowledge with respect and appreciation the FAO’s courtesy in soliciting our participation in this consultation.

Between the FAO’s founding in 1945 and today, worldwide human population has roughly tripled, while the livestock population has increased more than six times. As a result, livestock have changed from being one of many sectors dependent on natural capital to being today’s top determinant of the future of natural capital. Notably, worldwide each year, livestock<sup>2</sup> are the leading driver of deforestation,<sup>3</sup> while consuming up to half the catch of marine organisms<sup>4</sup> and as much as half of all crops brought to market.

Considering the impacts of livestock, I will discuss them first, then briefly some related issues in natural capital, agriculture, forests, and fisheries, and will conclude with a menu of prescriptions for constructive next steps.

### **II. Livestock**

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 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

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<sup>1</sup> The *World Watch* article and additional 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>2</sup> Livestock is defined here to include fish produced through aquaculture.

<sup>3</sup> FAO, 2006.

<sup>4</sup> For example, 45% was the share of fishmeal used for aquaculture in 2005 according to FAO, 2006, p. 43.

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.<sup>5</sup> 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 – in preparing our article for *World Watch* – considered whether any sources of GHG emissions might be missed in *Livestock's Long Shadow*. The key ones that we found missing are in land set aside for livestock and feed production, along with several other significant sources. So our article shows that livestock's shadow is not only long but 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,<sup>6</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.

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 has been expected to be agreed on at the U.N. climate conference in Copenhagen on 7-18 December 2009 – simply by replacing 25% of today's livestock products with better alternatives.

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.<sup>7</sup>

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

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<sup>5</sup> FAO, 2006, Table 3.2.

<sup>6</sup> FAO, 2006, p. 45.

<sup>7</sup> Guardian, 2009.

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.<sup>8</sup>

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 must 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.

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. It is heartening to see that the FAO has taken what some may see as first steps in switching from support for exploitation of natural capital to support for the conservation and regeneration of natural capital.

### **III. Natural Capital**

Large steps appear now needed in switching from exploiting natural capital to conserving and even regenerating it where possible. To make this happen, the productivity of agriculture must quickly be boosted, with inefficient food production replaced by more efficient alternatives.

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.

As of the date of writing this paper, it was uncertain whether a new climate treaty would be agreed at the U.N. climate conference in Copenhagen on 7-18 December 2009. If no new treaty is forthcoming, then 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.

However, if a vacuum will exist in national or international regulation, then considering nature's abhorrence of a vacuum, the FAO may be well positioned to fill it. The FAO can promote good

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<sup>8</sup> Shulze et al., 2009.

practice, and work in partnership with other relevant organizations. Nevertheless, in many cases, voluntary guidelines and self-reporting have not worked well over time. So there may be an important role for the FAO to work with governments on increasing enforcement of existing legislation, as well as strengthening legislation where possible, with third-party monitoring and reinforcement and meaningful penalties wherever possible.

Food, water and climate crises are sufficiently threatening that new approaches are urgently needed.<sup>9</sup> A challenge exists for governments to work with the FAO and industry quickly to make major needed changes, rather than just incremental changes.

### *(a) Sustainable Agriculture*

Studies show that for each one-degree centigrade rise in temperature above the norm during growing seasons, a 10% decline can be expected in wheat and rice yields. For example, India's climate change-related drought last summer slashed harvests by 20%. Such correlations may create conditions for a repeat of the 2008 food crisis as soon as the coming year.<sup>10</sup>

The structural causes for 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 for the manufacture of biofuels, especially with the high priority of conserving today's forests and even regenerating more 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>11</sup>

The same crops used to manufacture biofuels and feed livestock can be used instead to feed people. The number of hungry people in the world now exceeds 1 billion for the first time ever, with a 20% increase in malnutrition expected by 2050. Already 6 million children die of hunger each year.

Generally in recent decades, large agricultural producers growing export crops have been favored across the world over small farmers growing crops for local self-sufficiency. However, the FAO's Food Summit in November 2009 endorsed making developing countries self-sufficient in agriculture. The need is not for total national economic independence and self-sufficiency, but for greater emphasis on domestic food production, especially staples. Also needed are more connections between agriculture and nutrition as well as poverty reduction.

Most export agriculture depends on industrial monoculture plantations. These deplete soils, intensify erosion, and require large amounts of fertilizers and pesticides. On the other hand, economic motivations to decrease export agriculture should come from pressure to stop externalizing major costs such as those relating to deforestation, biodiversity loss, and carbon sequestration. In addition, as fuel and energy prices rise, and until renewable energy can be significantly increased, producers will be keen to shorten supply lines, in order to reduce costs.

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<sup>9</sup> A 2° C rise in average global temperatures has been considered the limit of tolerability; now some predict 6°C by 2100 (Le Quéré, 2009).

<sup>10</sup> UN Rapporteur for Food Rights Olivier de Schutter in Reuters, 2009.

<sup>11</sup> Guardian, 2008.

The challenge of producing 50% more food by 2030 would be reduced if some amount of livestock products is replaced with better alternatives. In fact, projected population growth means that perhaps the only way to produce the requisite amount of food may be through a significant reduction in livestock numbers – so crops can be delivered to people directly, rather than to livestock.<sup>12</sup> Otherwise, some as yet unknown, radical new food production methods would be required to enable available land to feed more people. A shortage of new land available for agriculture practically eliminates any other option, particularly as the imperatives of climate change require reducing GHG emissions and increasing carbon sequestration.

The FAO has long sought to boost land productivity by making 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.

### ***(b) Sustainable Forests***

GHG emissions from deforestation and forest fires are now reported to exceed those from transportation across the world. Tropical forest occupying land the size of New York State is now lost each year, and the carbon thereby released into the atmosphere accounts for roughly 17% of all global GHG emissions. Related road-building in forests, logging, and climate change-induced droughts are leading to increases in the frequency of forest fires and other wildfires, further increasing emissions.<sup>13</sup>

It will be a long time before the world's transportation fleet becomes emission-free. But right now, 17% of global GHG emissions could be eliminated by halting the cutting and burning of tropical forests. To do so would require making it more profitable for economically poorer but forest-rich nations to preserve and even regenerate their forests, rather than cut them down for livestock grazing and feed production. Such measures are expected to be discussed at the U.N. climate conference in Copenhagen on 7-18 December 2009.

There may be more than one economic driver of deforestation in any particular area. For example, the clear, proximate cause of deforestation in an area of the Amazon forest region is in most cases a motivation to graze cattle. But if such forest were not destroyed to graze cattle, then it might be destroyed to produce livestock feed; or cattle might come first, and feed production shortly thereafter.

A secondary motivation proposed for deforestation is government's desire to accommodate population growth. However, most livestock and feed production is large scale and not labor intensive, implemented by large corporations that provide few amenities for populations to grow. If tropical forest in any case is indeed driven by a government's desire to accommodate population growth, then this is likely to be a very poor economic choice in the long run, particularly in light of climate change in recent years. It has been proposed that avoided deforestation is the most economic method of managing GHG emissions.<sup>14</sup>

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<sup>12</sup> As each human consumes an irreducible minimum of food and other resources, meeting women's choice for family size is a powerful way to avert food crisis. It matters greatly if world population reaches 8, 9 or 10 billion by 2050, as UNPF projects.

<sup>13</sup> Earth Policy Institute, 2009.

<sup>14</sup> Stern, 2006.

### ***(c) Sustainable Fisheries***

77% of fish species are threatened by fishing, 8% of them depleted, 17% overexploited, and 52% fully exploited. Species composition is shifting from large predators towards smaller fish species. Current mismanagement of oceans is producing much less productive simplified ecosystems.

While marine resources are overexploited, marine habitats important for replenishment of fishery resources are being destroyed. Bottom trawling, the most destructive legal fishing method in the world, is eliminating seagrasses, shellfish banks, and both shallow-water and deep-water coral reefs. Yet these habitats play an important role in carbon sequestration. About 7% of 'blue carbon sinks' are being lost annually, or seven times the rate of loss of 50 years ago.

Thirty million tons or 36% – by some accounts as much as 50% – of global fisheries' catch each year are used to feed livestock. Globally, pigs and chickens alone consume six times the amount of seafood as do American consumers, and twice as much as Japanese consumers.<sup>15</sup> Stopping diversion of marine organisms to livestock would significantly reduce pressure on the world's dwindling fisheries, while reducing climate risks.

### ***(d) Back to Livestock***

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 fully 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 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.

Besides GHG emissions attributable to livestock products, they are also highly inefficient in their use of water, when compared to better alternatives. For example, assessments have shown as much as 200,000 litres of water used in the production of each kilogram of beef, versus 2,000 litres of water per kilogram of soybeans.<sup>16</sup> Besides the amount of water used for livestock products, they are responsible for high levels of feedlot runoff, pollution of rivers and coastal waters (red tides), and eutrophication, leading to decreases in populations of aquatic organisms, and diminished availability of clean water. Livestock across the world have also been implicated

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<sup>15</sup> Jacquet et al., 2009.

<sup>16</sup> Pimentel et al., 1997.

as key drivers of today's depletion of water tables, decreased percolation rates of rain into soils, and desertification, all of which are intensifying on a worldwide basis.

#### **IV. Recommendations**

I expect that participants in this consultation would want first to discuss and then start acting quickly on constructive next steps. The first priority may be to agree on shared principles for more sustainable forests, fisheries, and agriculture. Then, as specific actions to be considered, I propose the following priorities. The FAO should work with governments, other international organizations, and other stakeholders to:

##### ***In the Livestock Sector***

- Recognize that if poor or rich livestock producers are unwilling to pursue alternative livelihoods, then they will 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. Governments should then work with the FAO to provide assistance, such as retraining and payments for land and animals, to support both small and large producers as they face inevitable changes.
- Support efforts underway to clarify the amount of GHG emissions attributable to the life-cycle and supply chain of livestock products – particularly the validity of the estimate of at least 51% of anthropogenic GHG emissions attributable to livestock products published in *World Watch*. One key aspect to be clarified would be reasonable measures of the biomass of livestock raised worldwide. *Livestock's Long Shadow* uses a population of 21.7 billion per annum, while elsewhere the FAO reported a population of 56 billion livestock in 2007.
- Recognize that while confirmation of the amount of GHGs attributable to livestock awaits, it is already clear that reforestation is a top priority. So the FAO should work with governments to implement reforestation on a large scale. A high priority is to map areas most ripe for reforestation, on technical and economic bases; and to create a framework for ongoing tracking of GHGs from both livestock products and alternatives, across the world.
- Partner with leading companies in the food industry to promote the production and marketing of better alternatives to livestock products.

##### ***In Plant Agriculture***

- Promote (a) improved nutrition for the poor, especially the vulnerable, including through micronutrient supplementation, fortification of staples, and the use of home gardens; (b) small-scale, one-season extending dams as generally more prudent than large irrigation schemes; (c) protection for low-lying deltaic rice-production areas highly vulnerable to sea-level rise; (d) disease-resistant and drought-proofed seeds; (e) crop storage, farm-to-market transport, training, and extension; (f) dissemination of satellite information on field soil fertility, moisture content, and disease status (e.g., Rapid Eye, EADS, Astrium); (g) increased biogas capture from household pigs and poultry, and nitrous oxide capture from chemical fertilizers; (h) fertilizers that do not emit N<sub>2</sub>O, with revision of procurement rules to foster such fertilizers; and (i) no-till Conservation Agriculture in which seeds are drilled directly into the ground through vegetative cover.

- Provide assistance to small-holder farmers as one of the most effective ways to meet local needs, eliminate hunger, and reduce fuel costs and GHG emissions from transportation.
- Commission GHG emissions accounting for all relevant work.

### ***In the Forestry Sector***

- Promote (a) bans on industrial logging; (b) conservation of all old-growth forests, peatlands and mangroves; (c) accelerated regeneration of areas used for grazing livestock and feed production, and other degraded lands back to forest;<sup>17</sup> (d) development of tree plantations on suitable non-forested lands; (e) compensation to forest-dwellers for maintaining forests; and (f) halting FAO's carbon credit assistance where forest is cut for oil palm, livestock grazing, or feed production.
- Provide guidance (including online training materials) to help forest owners and member nations obtain carbon credits, but only in the very best of carbon funds.<sup>18</sup>
- Campaign to prevent and extinguish forest fires and other wildfires.<sup>19</sup>
- Support groups promoting a global GHG tax as a strong means to convert today's agriculture to a more sustainable path.
- Promote only the most energy- and water-efficient biofuels that entail no deforestation, particularly of mangroves, or diversion of crops used for human food, such as maize.

### ***In Fisheries***

- Quickly phase out bottom trawling, with monitoring and enforcement; and discourage diversion of marine organisms for animal feed, or capture of fish on any endangered or critically depleted species lists (such as swordfish, and bluefin or other tuna).
- Designate marine reserves around 'blue carbon sinks' (e.g., sea-grass beds, coral, shellfish beds).
- Promote (a) conservation of global fish stocks until each one recovers adequately; (b) third-party monitoring of catch size agreements; (c) meaningful penalties for violations of international quotas, especially seizing fishing vessels and fining CEOs; (d) compliance with international fish and whaling agreements and quotas; and (e) 'No-Fishing' zones with monitoring, especially during breeding seasons.

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<sup>17</sup> One recently-publicized method is 'farmer managed natural regeneration,' piloted in Mali, Niger, and Burkina Faso. This is one among many methods that are available to be tried across regions, with further study as needed.

<sup>18</sup> For example: Reducing Emissions from Deforestation in Developing Nations, Kyoto Protocol's Clean Development Mechanism, the BioCarbon Fund, Forest Carbon Partnership Facility, Kyoto Protocol Joint Partnership, Community Development Carbon Fund, Prototype Carbon Fund, Forest Carbon Partnership Facility, and Umbrella Carbon Facility. N.b., none of these mechanisms are here endorsed, and some may suffer from significant flaws (FoE, 2009).

<sup>19</sup> The voluntary nature of FAO's commendable guidelines (e.g., 2007 *Voluntary Guidelines on Responsible Management of Planted Forests*, and 2007 *Voluntary Guidelines on Fire Management*) has not yielded adequate effectiveness.



### *To be reduced or dropped*

Funding for the following should be reduced or dropped, to make more resources available for investments in sustainability and food security:

- All large-scale livestock and feed production; industrial logging of old-growth forest; crops produced in tropical industrial export plantations; food-based crops used to manufacture biofuels; most marine commercial fisheries, until they recover to exploitable levels.

### **V. Conclusions**

I look forward to hearing your feedback at this conference and in the days to come. I certainly recognize that government officials among the participants at this conference will be sifting through many menus of recommendations, and will be bound to perceive some difficult political choices and tradeoffs. I know this because I worked for many years as a civil servant with often conflicting accountabilities to my managers, to clients, and to other stakeholders, particularly civil society.

As a result, I know that it is often easiest to choose the most comfortable path. On the other hand, it was probably many people all over the world choosing the most comfortable path that got us into the crises that we now face – that is, crises of global climate change and shortages of food and clean water, as well as great financial and economic distress all over the world.

So I encourage you to consider that the overriding context of our conference is the historic crises that we are living through, and which we have come to Rome to try to do our part in solving. This suggests that we in this room will be held accountable less to our managers and to our clients than to the long-term public interest – or to put it more succinctly, to history. And public servants in this room have the power to make a significant difference – by using the usual tools of penalties, incentives, and rewards, which you are skilled in creating and applying.

Making such a decision as to work toward a 25% reduction in livestock products would likely be an uncomfortable choice, considering the millions of meat eaters and livestock producers across the world. However, as I have described, today's amount of livestock products is likely a key driver of global climate change, and shortages of food and clean water. So if you use your skills well, then even meat eaters and livestock producers may appreciate your efforts in the long run.

One effort in particular that could benefit from your skills and attention would be any endeavor that could improve the resolution of conflicts across different government ministries that are prone to disagree. Any success in this area that you might achieve in your country may be of great interest to your counterparts elsewhere – since as you know, it is not uncommon for example for a finance ministry to push for stopping a harmful subsidy, while an agriculture ministry in the same government may press to maintain it.

A critical question is whether today's crises will be resolved only after much more conflict and harm occur – or after less conflict and harm, through intelligent but perhaps somewhat uncomfortable choices that you will make. I trust you will make the most intelligent choices, guided by the long-term public interest; and I trust you will remember that history shall be your judge.

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