

Environmental Sustainability of Dairy Farm Systems - Facts about Cows and Climate Change

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Abstract

The carbon footprint of food production is under discussion at the regional, national, and international levels. For example, some European fastfood chains now offer information to their customers including not only nutritional facts, but also the carbon footprint of its tofu-, turkey-, or beef burgers. Furthermore, in the recent past, resolutions were passed to encourage a Meatless Monday or “Veg Day” at restaurants, schools, and grocery stores in an effort to promote a “green diet”. While some scientists (especially in agriculture) remain climate change skeptics, it should be clear to everyone that animal agriculture is in midst of a considerable societal debate with far-reaching consequences.

Facts and Fiction about Cows and Climate Change

Much of the discussion about livestock agriculture’s contribution to climate change stems from a United Nations Food and Agriculture Organization (FAO) report titled “Livestock’s Long Shadow” (Steinfeld et al., 2006; from here on referred to as LLS). This report determined the climate change impact of global livestock production using a method called Life Cycle Assessment, which sums up greenhouse gas emissions from the entire production chain. Included in the LLS’s calculations were crop production, land-use change (e.g., clearing

rainforest to establish pastures and cropland), the animals themselves, and the transportation of final products. The LLS report concluded that *globally* 18% of human-caused greenhouse gas emissions could be attributed to livestock agriculture, and this was a larger share than transportation. However, the authors of LLS made this claim without actually conducting a similarly comprehensive Life Cycle Assessment for the global transportation sector.

Here at UC Davis, we have published a peer-reviewed paper titled “Clearing the Air: Livestock’s Contribution to Climate Change” (Pitesky et al., 2009), which pointed out the flawed comparison between the livestock and transportation sectors, and the FAO has since admitted their mistake. Additionally, “Clearing the Air” highlighted that the global percentage is not accurate at the regional, national, or state level because in highly developed nations, such as the U.S., greenhouse gas emissions from the energy and transportation sectors of the economy dwarf emissions from the livestock agriculture sector. For example, according to U.S. EPA data from 2009, transportation and electricity production account for 26 and 31% of emissions, respectively, while livestock agriculture accounts for approximately 3%. However, in developing countries like Paraguay, the trend is likely reversed because of the small transportation and energy sectors, and a relatively large livestock sector (that has relied on clearing forests to

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establish pastures), which might contribute to more than 50% of that county's carbon footprint. Furthermore, while land-use change contributed to over one-third of the FAO's total carbon footprint for the global livestock sector, these changes are largely occurring in developing nations and not developed nations, like the U.S., where changes in land-use occurred decades ago and are now reversing. These differences in percentages clearly emphasize the need to separate emission estimates by region and also by livestock species – a step recently undertaken by the FAO and other organizations.

While we differed with the authors of LLS on their carbon footprint comparison of livestock versus transportation, as well as with the usefulness and correctness of their 18% figure, we do agree with their overall concern that satisfying upcoming animal protein demands will pose a challenge to the environment. Global animal protein production is projected to double from its year 2000 levels by 2050 and the majority of this livestock production growth will occur in the developing world. Much of the growth in the global livestock sector will occur in areas that are currently forested (i.e., parts of South America and South East Asia), which will create pressure to rely on deforestation to facilitate increased livestock production. It has been well established that significant reductions of carbon sequestering forests will have large effects on global climate change; therefore, avoiding deforestation is paramount.

By examining the historical trends in livestock production in the developed world, it becomes clear that there has been a marked improvement in efficiency, leading to reductions in numbers of animals required to produce a given amount product that satisfies the nutritional demands of society. For example, researchers at Cornell University [Capper, et al., 2009] found that compared to

1944, the 2007 U.S. dairy industry reduced its greenhouse gas emissions per unit of milk by 63%. This reduction was achieved through improved nutrition, management, genetics, etc. born through scientific research that has led to dramatic improvements in milk production per cow. According to LLS, this type of intensification of livestock production provides large opportunities for climate change mitigation and can reduce deforestation to establish pastures, thus becoming a long-term solution to more sustainable livestock production. Indeed, the authors of LLS are currently working on a follow-up paper titled “Shrinking the Shadow”, which will focus on how advanced biotechnologies, improved genetics, nutrition, and comprehensive waste management already utilized in most parts of the developed world can be applied effectively worldwide.

While the extraordinary reduction in the U.S. dairy industry's carbon footprint may be viewed by some as a vindication of modern production practices, attention should be given to the areas of opportunity that still exist, including transition cow management, lameness, and reproductive failure. Improving these and other areas on U.S. dairy farms should allow for further reductions in carbon footprint per unit of milk, and these areas often intersect with another hot issue that livestock industries face: animal welfare.

Summary

Ultimately, ignoring the carbon footprint debate will not make this issue go away for those involved in the livestock industries. The actual science behind many of the current claims has been incomplete or lacking, and it is in the best interest of producers and consumers to have environmental claims made on solid, peer-reviewed scientific data. What is needed is a global green revolution in animal agriculture,

coupled with technology transfers, to supply a growing demand for animal protein while providing environmental stewardship by using sustainable and modern production practices.

References

Capper, J.L., R.A. Cady, and D.E. Bauman. 2009. The Environmental Impact of Dairy Production: 1944 Compared with 2007. *J. Anim. Sci.* 87:2160-2167.

Pitesky, M.E., K.R. Stackhouse, and F.M. Mitloehner. 2009. Clearing the Air: Livestock's Contribution to Climate Change. *Adv. Agronomy.* 103:2-40.

Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M., and C. de Haan. 2006. *Livestock's Long Shadow.* Food and Agriculture Organization of the United Nations. <http://www.fao.org/docrep/010/a0701e/a0701e00.HTM>.

