## Climate Change

*By Jennifer Pronto and Frank Mitloehner*

# Can agriculture be sustainably intensified to meet human needs and protect the environment?

**Fact or Fiction? Livestock produces 18% of all anthropogenic GHG globally.**

Fiction. This is a fiction that was initiated by the United Nations Food and Agriculture Organization (FAO) report *Livestock's Long Shadow*. The report was important, being the first to highlight the important contributions livestock has on the environment. However, the assessment undertaken for this report was lacking in several ways and has since been revised and replaced by more recent FAO publications. *Livestock's Long Shadow* reported on emission values from livestock in different regions of the world, both developing and industrialized countries, then averaged those values to arrive at a single number representing worldwide livestock emissions, hence the 18%. It is generally accepted that the strategies used to manage livestock vary greatly between countries, and thus result in GHG emissions that are much higher in the less efficient, developing countries. Therefore, this "average value" is not representative of emissions or, more importantly, potential emissions reductions that exist in more industrialized countries with efficient, technology-driven agriculture. While it is the job of the FAO to report on global issues related to agriculture, the international media used this global figure to describe impacts in their respective regions. By no means does US livestock contribute to 18% of the nation's GHG, but rather contributes 3.4%, while many developing countries have livestock carbon footprints of well over 50%.

**Animal agriculture has become more efficient due to advances in breeding, housing and food production.**

**Fact or Fiction? Livestock produces even more than 18%, namely 51%, of all GHG globally. (Worldwatch Institute)**

Fiction. This is based on a small group of former World Bank employees, who formed the so-called Worldwatch Institute. This group disregarded the laws of physics and chemistry by claiming that the global warming potential (the impact of different gases in the atmosphere) for methane was much higher than that used by the entire international scientific community. It is almost universally accepted in the scientific community that methane is 25 times more potent in the atmosphere than is carbon dioxide. However, this group has claimed that methane is 71 times more potent, and if the higher value is used, the overall GHG impact of livestock on the environment is most certainly higher, arriving at the conclusion that livestock produce 51% of anthropogenic emissions. Such deliberate exaggerations defying laws of physics and chemistry are not just unscientific but lead us to a wrong path for solutions. Instead of focusing public attention on their main contribution to climate change, which is the use of fossil fuels, it suggests that it is really consumption of animal protein that is the worst culprit.

**Fact or Fiction? Livestock produces more GHG than transportation.**

Fiction. This conclusion from the *Livestock's Long Shadow* report is fiction. The report considered all GHG emissions involved in animal production, including emissions from growing animal forage, to arrive at the final value of livestock's

GHG impact on the environment. Conversely, when quantifying the impact of global transportation activities, only the emissions from burning fossil fuels while driving were taking into consideration, and not the resources utilized in manufacturing the transportation vehicles. Accurate figures for the US include contributions from the transportation sector as 26%, energy production and use as 31%, and livestock production as 3.4% of the national anthropogenic GHG inventory.

**Fact or Fiction? Grazing systems produce less GHG than conventional animal production in confinement systems.**

Fiction. Grazing represents a lower intensity form of animal production when compared to confinement system animal agriculture. The animals used in a grazing system have a larger carbon footprint than the animals used in a high-intensity confinement operation, essentially because more grazing animals are needed to produce the same amount of meat or milk from confined systems. To the same effect, fewer higher-producing animals are needed to produce outputs, therefore lowering the GHG impact of those final goods. Additionally, the microbes that produce methane in the rumen of the cow thrive on roughage, and naturally grazing conditions maximize this feedstuff component, while high-intensity confinement operations feed considerable amounts of concentrate and protein, which leads to much reduced methane production per unit of product (i.e. milk).

**Fact or Fiction? Animal agriculture in the United States has decreased GHG emissions by 2/3 over the past 70 years.**

Fact. Animal agriculture as a whole has become drastically more efficient in the past several decades due to advances in animal breeding, animal housing and food production. Today there are 16 million fewer dairy cattle in the US compared to 1950. And even though these numbers have decreased so drastically, milk production nationally has grown 60%. The carbon footprint of a glass of milk is 2/3 smaller today than it was 70 years ago. ❐

*__Dr. Frank Mitloehner__ is a Professor and Extension Specialist at UC-Davis, specializing in agricultural air quality and sustainability. He delivered this talk at the 2015 Dairy Environmental Systems and Climate Adaptations Conference in Ithaca, NY. It was met with great enthusiasm by conference participants, as many professionals in the field struggle with dispelling the myths that arise surrounding animal agriculture and greenhouse gas (GHG) emissions. In his conference delivery, and in his day to day efforts, Dr. Mitloehner attempts to disprove the most damaging of these myths, and to clearly put forth values that accurately explain the GHG impacts of producing milk, meat and other animal products.*

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Climate change will impact manure management

*continued from page 19*

may be implemented. Nutrient application during the growing season will be encouraged and with time will likely become standard procedure.

- Use solid-liquid separation to provide an additional 20% of storage volume, possibly use separated solids as bedding or as a soil amendment, and to reduce GHG emissions.
- Cover manure storage to limit the precipitation that needs to be stored. Also, collect and then burn GHGs.
- Improve housing to provide better ventilation and cleaner surfaces that reduce aerobic reactions and GHG emissions before manure collection.
- Add anaerobic digestion of manure as part of a manure management system to obtain tipping fees, reduce odors and pathogens, and produce green energy while reducing GHG.
- Increase summer spreading to reduce nutrient and pathogen contamination, increase nutrient uptake and avoid compaction.
- Use double cropping to apply manure at different times and to utilize nutrients applied.
- Follow precision nutrient management to meet the need for specific nutrient applications, including manure, and to increase yields while minimizing losses.
- Implement erosion control in fields as more frequent and more intense storms move soil into waterways.
- VTA maintenance as variable moisture conditions when harvesting may increase leachate and runoff.
- Monitor subsurface drainage systems to ensure no direct losses occur during or subsequent to manure spreading operations.
- Use drainage management to limit the flow from tiles during fallow periods, increasing the retention time, can help phosphorous and nitrogen to be absorbed by the soil and to reduce losses. Bioreactors can be installed at the end of tiles to provide a media for adsorption or bacterial treatment.
- Add a treatment system to concentrate nutrients and reduce the moisture content in manure. Anaerobic digestion is a good pre-treatment step to most of these nutrient concentrating systems. Products with specific nutrient content in a concentrated form allow more precise applications, more economical transport to distant fields, and/or export from farm and for use by others. ❐

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