CLIMATE CHANGE

By Peter Wright and Curt Gooch

Climate change will impact manure managament – What farmers should prepare for

Climate change, and even the potential for climate change, will add to increasing societal pressures to improve manure management. The emphasis and attention on climate change will also raise other environmental concerns that manure management will need to address. Farms will need more storage and flexibility in application to minimize environmental loss of nutrients. Eventually treatment systems will be needed to maximize the value of manure while limiting the potential disadvantages.

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Wetter winters are predicted for the Northeast. Combining this with the usual, or even increased variability of weather patterns, increases the likelihood of significant winter melts. These melts can cause significant runoff that move recently spread manure into surface waters or cause groundwater contamination. To reduce the risk of winter spreading, more farms will need to increase their storage period and/or implement manure treatment systems that separate water from manure.

Longer and more variable summer seasons and the potential for droughts will provide the opportunity for double cropping, which will allow additional in-season time to spread manure. Drought conditions will increase the economic viability or need for irrigation. Variability in precipitation or wetter springs and falls will increase the need for tile drainage in fields. These changes will provide additional opportunities to spread manure with irrigation equipment as well as create challenges to keep nutrients and pathogens out of drainage systems.

Climate change will bring increased societal pressure on agriculture. The increased media coverage and the actual impacts on consumers will increase society's focus on all environmental issues. Evaluating and reducing greenhouse gas (GHG) emissions from agriculture will be highlighted. There may even be a carbon footprint on food labels, as is already the case in some other developed nations. Livestock production has been identified as a contributor to GHG and although comparatively not a major contributor, livestock agriculture will continue to come under more and more pressure to control emissions, including those from manure management systems.

More watersheds containing animal agricultural operations will come under Total Maximum Daily Load (TMDL) limitations carrying a non-point component. Control of phosphorus entering fresh water and nitrogen in salt water will be emphasized. Subsurface drainage and manure management impacting both surface water and groundwater are identified as contributors of nitrogen and phosphorous.

Farmers should evaluate their farm for the use of these practices that will increase in importance in the future:

More summer manure applications with incorporation to minimize nutrient losses and emissions are in the future of farms.

- Construct more manure storage to prevent spreading manure at inopportune times. Restrictions on late winter spreading

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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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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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