



# EQ&WWM UPDATE

Newsletter of the OSU DASNR Environmental Quality & Waste Management Team

October 2009

This is the second newsletter of the EQWM Team, intended to share news and provide a forum for ideas. Newsletter article or photo submissions are encouraged.

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*Currently there are 82\* EQWM Team Members including 12 OSU departments, 2 Divisions, and 23 County/Region Extension Educators*

**Ron Elliott, Team Administrator**  
**Mike Smolen, Team Coordinator**

Doug Hamilton, Air and Waste Leader

- Air Quality, Shannon Ferrell
- Municipal Waste Management, Ilda Hershey
- Waste Management, Doug Hamilton

Hailin Zhang, Soil and Agriculture Leader

- Nutrient Management, Hailin Zhang
- Sustainability of Agriculture and Natural Resources, Kefyalew Desta and Leland McDaniel

Mike Smolen, Water Leader

- Emerging Contaminants & Pesticides, Jim Criswell
- Landscapes and the Environment, Michael Holmes
- Small Scale Water Supply and Wastewater Management, Mike Kizer
- Stream Restoration/Rehabilitation, Garey Fox
- Water Literacy, LaDonna McCowan-Ferrier
- Water Resource Conservation, Management and Policy (includes Water Conservation), Larry Sanders

The purpose of the EQWM Team is to help foster collaboration among Departments and across Divisions.

The named EQWM groups are active to various degrees with respect to seminar sponsorship and the development of extension fact sheets and TIP proposals.

\*New team members are always welcome, current members are listed at the following web site:

<http://eqwm.okstate.edu>,

Contact web site manager [Sharla Lovern](#) for needed web site updates or newsletter submissions.

## **Manure has value as fertilizer and energy – Surprise, Surprise, Surprise!**

**Doug Hamilton**  
**Extension Waste Management Specialist**

Last summer, the USDA Economic Research Service (ERS) reported to congress on manure use for fertilizer and for energy. Their primary conclusion put me in the sarcastic Gomer Pyle frame of mind suggested by the title of this article. The report arrived at the startling conclusion that manure is not waste, and has value as fertilizer and energy.

A secondary, although perhaps more important, result of their investigation is that increased use of manure for on-farm energy will not reduce its value as fertilizer.

This result should not be that surprising either. The potential energy stored in manure is correlated to its carbon content. Most processes to convert energy from manure do so by removing carbon while leaving the mass of plant nutrients intact. Generally speaking, this is similar to biological waste treatment processes. Microorganisms use the energy stored in organic matter for growth, and release CO<sub>2</sub> or CH<sub>4</sub> as end-products of their metabolism. This fact seems to get lost on those who propose to solve plant nutrient pollution problems related to manure. Take away the carbon and you have an even greater concentration of fertilizer elements.

Hardly any treatment process removes P or K from marketable end products. Nitrogen is another story. Its availability as fertilizer depends on the energy conversion process.

Anaerobic digestion conserves nitrogen. Fecal protein and urea are converted to ammonia during digestion. Of course, ammonia could be lost to the atmosphere through volatilization and nitrification-denitrification, but you can't blame its loss on the digester.

Pyrolysis does not occur at high enough temperatures to oxidize manure nitrogen. Nitrogen remains with the biochar or oil. Nitrogen will be lost if you gasify or burn these materials to produce more heat, though. According to its proponents, biochar is a good source of nitrogen, other plant nutrients, and stabilized carbon.

Gasification and incineration both oxidize manure nitrogen, forming oxides of nitrogen (NOx). NOx emissions are components of photochemical smog and acid rain.

The USDA-ERS report stated that only 5% of US cropland receives manure for fertilization. The report suggests that this percentage could and should be increased for greater economic and environmental benefits. Most manure in Oklahoma applied to cropland comes from beef feedlots and dairy farms. Poultry litter, cow-calf and stocker manure, and swine lagoon effluent are mostly applied to hay or pasture.

What is the potential for energy recovery from manure in Oklahoma? In 2007, a group of academics took a stab at the question for the South Central Region Sun Grant Initiative. The values they determined are given in Table 1.

**Table 1. Potential Energy Stored in Animal Manure Produced in Oklahoma.**

Species of Animal	Potential Energy in Manure Trillion btu/yr
Broilers	3.2
Laying Hens	0.36
Beef in Feedlots	1.6
Dairy	1.6
Swine	6.0

Those seem like big numbers. A trillion has 12 zeros after the integer. But, a Btu is a very small unit of energy. Let's take the potential energy of swine as an example:

How much electricity could be produced if we anaerobically digested all the manure excreted by pigs in Oklahoma? First of all, the data given in Table 1 is potential energy. It is the chemical energy stored in feces the second they leave the pig. At best, we can convert about 10 to 15% of this potential energy to electricity. This leaves 600 million Btu/yr, or 175 million KWh/yr of electrical energy. Still a large number, but if you consider that the typical American household uses 15,000 KWh of electricity each year, all the pigs in Oklahoma would power around 12,000 homes. That is a town roughly the size of Stillwater.

Energy from manure will more likely be used to offset energy consumed on-farm rather than to replace motor fuels, or to power the grid. In the 90's, the Winrock Foundation demonstrated that a very inefficient covered lagoon digester could provide roughly 50% of the electrical energy consumed by a swine farrowing farm in Arkansas. They estimated that a finisher farm using a more efficient digester would produce a surplus of electrical energy. A recent energy use survey conducted by Texas A&M University suggests that anaerobic digestion could

replace 100% of the electricity used by Central Texas free-stall dairies. Researchers at the University of Arkansas showed that incinerating the poultry litter stored in one broiler house could provide enough energy to heat the house through the winter.

So, it is possible to replace a substantial amount of fossil fuel energy consumed by animal agriculture by tapping into the energy potential of manure. And, we can do this without diminishing its fertilizer value. The technical problems associated with getting there could occupy the time of an entire generation of scientists, engineers, and extension educators, however. That is if economists tell us it's worth pursuing in the first place.

### Monthly Seminars

The monthly Ordure Luncheon for October led by Doug Hamilton will be Wednesday the 28<sup>th</sup> in room 374 Ag Hall, OSU-Stillwater. Brown Bag Lunch starts at 12:00, Seminar at 12:30.

[http://eqwm.okstate.edu/news-1/copy\\_of\\_ordure-luncheon-seminar-series](http://eqwm.okstate.edu/news-1/copy_of_ordure-luncheon-seminar-series)

David Higgins, City of Stillwater, will be speaking on "the Stillwater Automated Waste Collection System". Mr. Higgins will talk about Stillwater's new municipal waste collection program and its design, costs and phase-in plan.

Those of you who would like to join in via internet can get the live feed at:

<http://intranet.okstate.edu/webcast>.

Log in should be available about 11:45 to test microphone, etc. Keep trying if you don't get on early.

Ordure luncheons are held the last Wednesday of the month excluding holidays.

### Oklahoma NPS Management Program Annual Report for FY2009

This report from Oklahoma Conservation Commission to EPA seeks to reflect Oklahoma's NPS management efforts through many parties in state, federal, and tribal programs.

Please submit the work you do that might relate to BMP-research or BMP-implementation, with a focus on significant accomplishments, quantified water quality improvements, and future actions planned. Particularly useful would be work such as programs with Green Seeker that reduce unnecessary application of Nitrogen, animal waste management programs, and the Poultry Education Program.

Please send your submission to Mike Smolen for compilation of related OSU programs, or directly to [candace.cunningham@conservation.ok.gov](mailto:candace.cunningham@conservation.ok.gov) with a cc to Mike Smolen by the November 18, 2009 deadline.

## EQWM Team Highlights

### Stream Trailers Reaching New Audiences

**Marley Beem**

**Extension Pond Management Specialist**

A presentation and hands-on demonstration of the stream trailer made for a well attended breakout session at the recent annual conference of the Oklahoma Floodplain Managers Association. The rain held off and we had a great outdoor session with the trailer including 4 or 5 who stayed long after to play with the trailer and talk about their experiences. An engineer said he already used one of the trailers to try out structures before they were built and one county floodplain manager is already a stream trailer presenter at outdoor classroom events. We have high hopes for expanded use of the trailers through this group.

The Oklahoma Department of Wildlife Conservation also made good use of a stream trailer at the recent Wildlife Expo which enjoyed an overall attendance of 42,000 individuals this year. The trailers are already routinely used by Cooperative Extension Educators and Conservation Commission professionals with school-age groups. Thanks to the stream trailer program, Oklahoma's current and future landowners are increasingly becoming aware of proper stream stewardship practices, including the importance of leaving riparian trees, brush and other native deep-rooted plants in place. To learn more about the availability and diverse uses of our six stream trailers, a brief presentation is available by going to [http://waterquality.okstate.edu/streamtrailer/OverviewPresentation2009\\_files/frame.htm](http://waterquality.okstate.edu/streamtrailer/OverviewPresentation2009_files/frame.htm). The actual ppt file can be downloaded from <http://waterquality.okstate.edu/streamtrailer/OverviewPresentation2009.pptx>.



**Figure 1. Stream trailer education at the 2009 Wildlife Expo by Oklahoma Department of Wildlife Conservation employees, with a “dual-stream” set-up.**

### New Publications

Carbon Offsets for the Oklahoma Landowner –  
*Adams, Jones*

<http://agecon.okstate.edu/faculty/publications/3337.pdf>

Water Rate Structure: A Tool for Water Conservation  
in Oklahoma – *Adams, Boyer, Smolen*

<http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-6510/AGEC-1017web.pdf>

**EQWM Mission:** Promote collaborative research and extension programs addressing environmental issues of Oklahoma. Increase public awareness of environmental quality and waste management research and extension programs underway in the OSU Division of Agricultural Sciences and Natural Resources, and DASNR's commitment to environmental programs as an important part of the land grant mission.

OSU DASNR Environmental Quality & Waste Management Team  
Biosystems & Agricultural Engineering ♦ 218 Agriculture Hall ♦ Oklahoma State University ♦ Stillwater, Oklahoma ♦ 74078-6021  
Tel: 405/744-5653 ♦ FAX: 405/744-6059 ♦ Email: [smolen@okstate.edu](mailto:smolen@okstate.edu)

Michael D. Smolen, Coordinator  
OSU EQ&WM Team



Charla B. Lovern, Editor  
*EQWM Newsletter*

Oklahoma State University, U.S. Department of Agriculture, State and Local Governments cooperating. Oklahoma Cooperative Extension Service offers its programs to all eligible persons regardless of race, color, national origin, religion, sex, age or disability and is an Equal Opportunity Employer.