Biological Systems Engineering

Engineering Update *Spring 2009*

Engineering Update: ASABE Blue Ribbon Winner!

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Engineering Update

Biological Systems Engineering
March 2009

To: Extension Unit Directors, Extension District Directors, Extension Program Leaders, and ANR Agents

Dear Co-Workers: Engineering Update is a joint effort of Biological Systems Engineering and other interested parties. Subject matter areas include timely information on water quality, natural resource management, TMDL, air emissions, animal waste management, machinery management, precision farming, application technology, farm safety, energy, engineering education, and technology. Please use this information in your on-going Extension programs and circulate to all Extension staff and interested parties. Engineering Update is electronically accessible at: (http://www.ext.vt.edu/vce/anr/bse/index.html).

Future Ag Equipment

Farm Industrial News interviews Tony Grift an associate professor at the University of Illinois about future of ag equipment. Grift spends time handling tools and electronics to help his students understand the intricacies of automation in corn and soybean production. Grift's vision of future agriculture includes robotics.

FIN: What is the best use of robotics in crop production?

Grift: I think it would be good for us is to build mechanical weeders, especially with weed resistance problems from spraying. But the problem with mechanical weeding is you have to have good speed. We could develop a module and put 20 robots on a tractor and go through the field. But it must compete with a sprayer that takes only 30 seconds to do an acre. This is the problem with all robots. No robot can match a human being. Only one robot has been commercialized in agriculture, and this is the milking robot. Other than that, all robots are concepts.

FIN: What would automation look like in corn production?

Grift: I'm not saying we will use robots for everything. We won't have robots doing harvesting anytime soon. Harvesters need capacity. But if we look at scouting, which is how we started with this robot thing, we can make a robot to scout in the field and collect data. It would be ideal to have a whole flock of robots, like 20 or 30 of them, and let them roam around. So you'll drive by a field and see a robot roaming through the field, looking for water, nitrogen stress, weeds, etc.

As they go through the field, they communicate with each other. We've demonstrated this in the lab. You can make robots that talk to each other with all off-the shelf technology.

FIN: How would the robot work?

Grift: A robot can go on the Internet and check a weather map to see if it is a good day to weed or treat for insects. The robots will do this as a team. They will be able to get information from the Internet and from each other. Maybe robot No. 8 took a picture of a weed, downloaded it to a Web site and decided it was waterhemp. Then it checks with other robots to see how much waterhemp is in the field. If they decide something should be done, then the robots will find other robots that may be recharging batteries and send them out in the field to tackle this problem as a group.

FIN Will robots really work together?

Grift: This sounds all crazy. But in reality, you could let an ecosystem do its own thing. They [robots] could learn. They won't be great in the beginning, but over time, it will be like teaching children. You emphasize group behavior and you punish bad behavior. Over time, the robots will learn how to do things better and better.

The next step is genetic programming, which is when you make offspring. You take one robot and another and say they are doing really well and we want to make one more of you. You make the third one, but it is not exactly the same. If you put a little variation in it, then over time, some robots will have spontaneous variations. That variation will make one robot better than all the rest and all the other robots will follow this one. That's how you move from one level of sophistication to the next. This is all wow thinking and it won't be implemented in 5 to 10 years.

FIN Why don't universities work with equipment manufacturers on research?

Grift: There is quite a missing link between what we do [at the university] and what companies do. Nobody has figured out how a company can work with a university to make it mutually beneficial. Companies have little time but they have money. They have to come up with a new idea that must be on the machine by the end of the year. And they are interested in a patent.

At the university, we have the opposite. Students take a lot of time, whether they need it or not, and budgets are miniscule. Everything we do, we want it to be public. So hopefully John Deere will lead the way with its new Technology and Innovation Center in our research park. Graduate students will work there.

(R Grisso)

How To Think About Variable Rate

With fertilizer costs and 2009 cropping plans at hand, variable-rate (VR) application is an option you should explore to improve efficiency.

But where does one begin their thought process to understand the value of VR?

From farmers' experiences, their advice is to do your homework to see if VR has a fit in your fields. From their experience, here are 10 tips for looking at VR technology:

1) Plan ahead. Make buying decisions that will allow implementation of VR at a later date.
2) Allow enough time to make sure the systems are all working properly.
3) Draw on experience and knowledge from others. Have a support team that you can draw on.
4) If you are variable rating more than one product, try to avoid blending. It is a much easier system to handle field to field if you have dedicated tanks for individual products.
5) Larger air seeder tanks allow more flexibility and reduces tank changes during the season
6) Use systems that give you feedback. As applied maps and yield monitors help to confirm what you did and the results.
7) Understand practical implications between soil testing and application. Fall banding and winter wheat are examples of working within a narrow window.
8) Fine tune your system over time. You are treating your fields differently than in the past. Understand the response and make changes accordingly.
9) Define your limiting factors and their economic costs and then build the appropriate response.
10) Look for other opportunities zone management can provide.

(Adapted from Precision Pays)

Precision Boom Control Saves 5 to 30% Input Costs

GPS-based spray boom control technology shows a savings of between 5 and 30% depending on the size and shape of the field. Research shows that odd-shaped fields have higher savings because there is typically more overlap associated with spraying. A lot of growers who have already adopted the technology have expressed satisfaction.

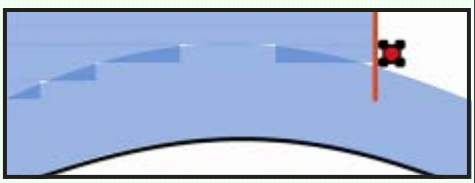
Boom-control technology is a GPS-controlled technique that enables farmers to avoid applying chemicals to areas of the field that have been previously sprayed or that don't require treatment.

Boom-control features are easy to acquire as add-ons. There are a number of boom-control products for growers to choose from. With the right product selection, retrofitting of older sprayers is also possible

Variable-rate fertilizer applications of P & K are also a viable profit-making option, when soil tests lead the way. Soil tests really should be the first step in making sure nutrient rates are at their proper levels.

In fact, in especially lean crop years, soil testing should be viewed as an especially valuable economic tool.

Farmers also should consider the merits of guidance systems. Lower-end products can be purchased for as little as $2,000 to $3,000. They are more affordable and can go a long way in reducing overlap in the fields and saving on fuel costs. Guidance systems enable producers to work longer days and may also help them better manage other resources, especially labor costs.



Maximizing Yields, It Begins With Your Planter!

It's a common question and is probably on everyone's mind; "What can I do to increase my yields"? The answer to that question requires a fully integrated approach that actually starts with your planter. **That's right, your planter!** That bag of seed never has more yield potential than it does when it gets poured into that planter box which makes your planter the first place to look for maximizing yields.

Think back to last year, were you satisfied with your emergence? Was it even? How about the plant spacing, was it even? Were there excessive skips, doubles or triples? Did your monitor stay consistent from row to row? Chances are you were not satisfied with more than one of these items so it is probably time to pull that planter into the shop, find the operators manual and give it a thorough checkup.

General Maintenance

- Check all chains for proper alignment, excessive wear, and stiffness. Lubricate with an all purpose lubricant and replace if necessary.
- Lubricate grease points as required
- Check hydraulic system for leaks.
- Make sure tire pressure is correct.

Row units

- Make sure row units are level and straight across the planter.
- Check the up-down and side to side movement. Excessive movement is a sign of worn bushings.
- Make sure closing wheels are aligned.

Disc Openers

- Check for wear. If the disc diameter is more than $\frac{1}{2}$ inch smaller than its original size it should be replaced.
- Adjust if necessary to achieve a true "V" shaped furrow, if not the furrow could have a "W" shape that will interfere with seeding depth.

Gauge Wheels

- Make sure gauge wheels are tight against the disc opener to prevent soil from accumulating between them.
- Check stops, broken stops will allow wheel to ride higher interfere with desired planting depth.

Seed Tubes

- Check for obstructions.
- Check for wear or damage. Worn or damaged tubes will allow seed to drop at an incorrect angle which will interfere with seed placement.
- Check monitor sensors.

Seed Meters (Vacuum or Finger)

- **CALIBRATE!** CALIBRATE! CALIBRATE! Even if the planter is new!! New meters as well as used meters should be calibrated for accuracy.
- The seed meter is the most important part of your planter; it is well worth the investment to have them tested for performance. This will identify the components that need to be replaced or adjusted.

Seed has become a high value investment in your operation so it is vitally important that your planter is tuned up and ready in order to maximize the value of your investment. Remember an ounce of prevention is worth a pound of cure and more return per acre.

(Tim Jordal, CCA Central Agronomist, http://www.greatlakeshybrids.com/wp-content/uploads/MaximizingYieldsItbeginswithyourplanter.pdf)

http://www.ext.vt.edu/pubs/bse/442-457/442-457.pdf

Estimate Soil Texture-by-Feel

The ability to estimate soil texture-by-feel is an important skill that field scientists should learn.

Many soil properties depend largely on soil texture, and texture impacts most land-use decisions. Soil texture strongly influences the nutrient holding ability of a soil, the amount of water the soil can store, the amount of this water that is available to plants, how fast water moves through the soil, the effectiveness of soil in cleaning up waste water, the shrink-swell nature of soil, and many other properties.

Soil texture can be determined in the field using the texture-by-feel method or the samples may be sent to a laboratory for particle-size analysis. The laboratory option is more accurate, but it is more expensive and slower because it can take weeks or months to get the results.

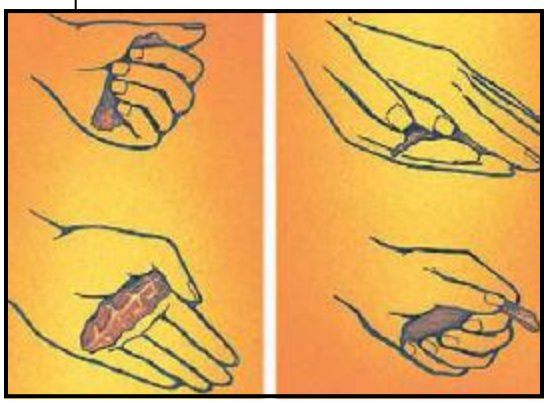
The field method is less accurate but much faster. Field scientists use texture-by-feel to provide quick reliable estimates of soil texture in the field. This method is used by researchers where numerous samples are required to capture variability, developing soil surveys, and consultants for sizing on-site wastewater disposal systems.

When the texture-by-feel method is used, the estimator takes a soil sample about the size of a marble up to the size of a golf ball. The person estimates the texture by rolling, squeezing, flattening, and pressing the soil between his fingers. Each person develops his own technique for estimating texture. The important point is that while learning the technique, you must always compare your results with laboratory data.

A computer program assesses performance for estimating particle-size distribution and soil texture. If the estimate coincides exactly with laboratory results, the score is 100%. If the estimate and laboratory results are as far apart as possible, at opposite corners of the texture triangle, the score is zero.

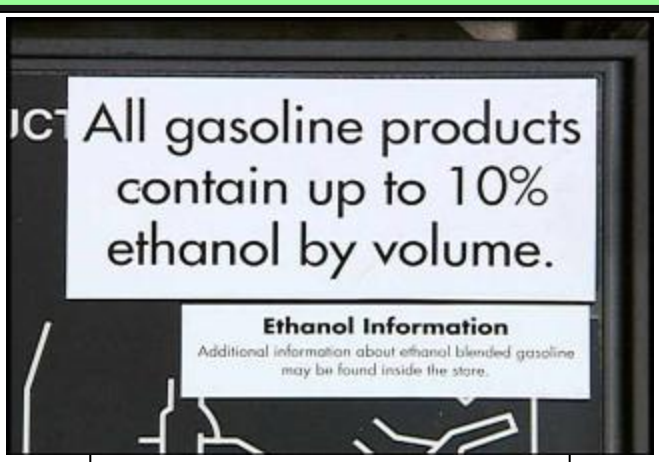
Other scores are based on the distance between points representing the estimate and the actual on a texture triangle in relation to the length of one side of the triangle. The texture estimator provides a quantitative, consistent, and easy-to-use method of assessing ones' performance. Additionally, this program allows one to observe the errors in estimates, which provides a further educational benefit.

(source: http://www.jnrlse.org/issues/view/2008/E08-0018)



Computer program is available at: www.isco.purdue.edu/irss
Select Resources then Texture Estimate Calculator

Ethanol—Better Than We Thought



Study shows that corn ethanol produces half the greenhouse emissions of gasoline.

Common sense says that burning a plant you regrow every year is better for the atmosphere than spewing out carbon dioxide that's been buried underground for eons. But the truth behind biofuels and petroleum often seems to defy common sense. Neither ethanol nor gasoline bubbles out of the ground ready to put in your tank. So to figure out which one does less environmental harm, you have to calculate all the energy that goes into making it.

For years, studies have shown that ethanol is no better—or even worse—for the environment than gasoline. Some studies even claimed that it takes more energy to make a gallon of ethanol than you get from burning it. But a new federal government-sponsored study released this week says the opposite. The report, entitled *Improvements in Life Cycle Energy Efficiency and Greenhouse Gas Emissions of Corn-Ethanol*, (found at: http://www3.interscience.wiley.com/cgi-bin/fulltext/121647166/HTMLSTART) claims that a gallon of ethanol produces nearly twice as much energy as it consumes, and that switching from gasoline to ethanol cuts greenhouse gas emissions by 54 percent.

Why such different results? Better data, say the study's authors—researchers from corn-belt universities including the University of Nebraska, Iowa State, Michigan State, and the University of Wisconsin. The pessimistic studies were based on old data about crop production and inefficient early ethanol plant designs, they claim.

The making of corn is at least as important as turning it into ethanol. Up to 65 percent of all emissions come from growing and transporting the crop, for items such as tractor fuel, fertilizer and electricity. New hybrids plants produce more corn with less fertilizer.

And new refineries run on efficient natural gas, recycle heat to use in other parts of the plant, and put the waste to crop good use. The scrap from the refineries actually makes nutritious cattle feed. So putting a feedlot right next to a refinery saves the emissions that would go into growing food separately and trucking it in. The best facilities save even more energy by collecting the manure and urine from cows and turning it into methane gas for use in the plant.

Unlike "clean coal" plants that exist only in the minds of their proponents, ultra-efficient ethanol operations are the norm. According to the study, the new facilities account for 60 percent of all U.S. ethanol production today and will produce 75 percent of national supply by the end of the year.

(Source: Sean Captain, Popular Science)

"**T**he United States now leads the world in wind power after boosting wind energy capacity by half last year," the Global Wind Energy Council says. The council notes that the US overtook Germany by building windmills that can generate 25 gigawatts of energy, about a fifth of all global wind power. The wind energy association said that "surging interest in renewable energy and worries about climate change propelled a 29% increase in wind power generation capacity across the world last year - and fueled a wind turbine industry that was worth $47.5 billion in 2008." However, the council "warned that the financial crisis has slowed U.S. financing for new projects and stalled orders for turbines."

WIND ENERGY Grows by Record 8.3 GW in 2008

Smart policies, stimulus bills are needed to maintain momentum in 2009. The U.S. wind energy industry shattered all previous records in 2008 by installing 8,358 megawatts (MW) of new generating capacity (enough to serve over 2 million homes), even as it warned of an uncertain outlook for 2009 due to the continuing financial crisis.

The massive growth in 2008 swelled the nation's total wind power generating capacity by 50% and channeled an investment of some $17 billion into the economy, positioning wind power as one of the leading sources of new power generation in the country today along with natural gas. At 2008's end, however, financing for new projects and orders for turbine components slowed to a trickle and layoffs began to hit the wind turbine manufacturing sector.

The U.S. wind energy industry's performance in 2008 confirms that wind is an economic and job creation dynamo, ready to deliver on the President's call to double renewable energy production in three years. At the same time, it is clear that the economic and financial downturn have begun to take a serious toll on new wind development. We are already seeing layoffs in the area where wind's promise is greatest for our economy: the wind power manufacturing sector. Quick action in the stimulus bill is vital to restore the industry's momentum and create jobs as we help make our country more secure and leave a more stable climate for our children.

The new wind projects completed in 2008 account for about 42% of the entire new power-producing capacity added nationally last year, according to initial estimates, and will avoid nearly 44 million tons of carbon emissions, the equivalent of taking over 7 million cars off of the road.

The amount that the industry brought online in the 4th quarter alone – 4,112 MW - exceeds annual additions for every year except 2007. In all, wind energy generating capacity in the U.S. now stands at 25,170 MW, producing enough electricity to power the equivalent of close to 7 million households and strengthening our national energy supply with a clean, inexhaustible, homegrown source of energy.

Iowa, with 2,790 MW installed, surpassed California (2,517 MW) in wind power generating capacity. The top five states in terms of capacity installed are now:

-Texas, with 7,116 MW
-Iowa, with 2,790 MW
-California, with 2,517 MW
-Minnesota, with 1,752 MW
-Washington, with 1,375 MW

Oregon moved into the club of states with more than 1,000 MW installed, which now counts seven states: Texas, Iowa, California, Minnesota, Washington, Colorado, and Oregon.

Wind power's recent growth has also accelerated job creation in manufacturing, where the share of domestically manufactured wind turbine components has grown from under 30% in 2005 to about 50% in 2008. Wind turbine and turbine component manufacturers announced, adding or expanding 70 new facilities in the past two years, including over 55 in 2008 alone.

The hope is that provisions such as those included in the House stimulus bill to restore the effectiveness of the tax incentives for renewable energy will quickly become law and provide the capital needed to continue to build projects. Because wind projects can be built quickly, positive legislation from Congress will have immediate and visible effects. Looking forward, it will also be important for the new Administration and Congress to put in place long-term, supportive renewable energy policies to make the new clean energy economy a reality."

State-by state installation information is available at www.awea.org/projects. Currently, Virginia has no projects and the closest state with projects is West Virginia with 3 projects contributing 330 MW. For more on the policies that are needed see www.newwindagenda.org.

(Source: the American Wind Energy Association (AWEA): www.awea.org)

Agricultural Safety Awareness Week, March 1-7, 2009

The old motto "safety first" could not be more important on the farm and in the home. From training farmers how to use farm equipment safely or to preventing rear rollovers on their tractor, to teaching the agricultural industry how to avoid dangers for children on the farm, to sharing tips about staying safe during thunderstorms, VCE has been educating the public about farm and home safety for decades. VCE's media kit (developed by Michael Sutphin) features articles to help farmers and homeowners protect themselves and their children, Extension publication on farm safety and security, a magazine article on a successful farm safety program in Rockingham County, links for details about Agricultural Safety Awareness Week.

For additional news releases, public service announcements and information on agricultural safety, go to: www.agsafetynow.com

(Contact: R. Grisso)

ASAP
Agricultural Safety Awareness Program
Farm Bureau®

GROWING THE MOST
IMPORTANT CROP
Ag Safety Awareness Week ~ March 1-7, 2009



Want to voice your support for 2,4-D?

EPA is seeking public comments on a petition to revoke all tolerances and cancel all registrations for the pesticide 2,4-D. The petition was submitted by the environmental group Natural Resources Defense Council (NRDC). The NRDC claims in their petition that EPA cannot make a finding that there is a reasonable certainty of no harm from dietary residues of 2,4-D. The petition also states that EPA also did not consider the full spectrum of potential human health effects associated with the pesticide.

The public comment process allows anyone with an opinion of the value of 2,4-D in agriculture to provide input, which should then be considered in the EPA's decision-making process.

Information on submitting comments is available at: www.epa.gov/fedrgstr/EPA-PEST/2008/December/Day-24/p30527.htm

The docket information is available at: www.regulations.gov/fdmspublic/component/main?main=DocketDetail&d=EPA-HQ-OPP-2008-0877

(R. Grisso)

Disaster Resources

The EDEN homepage provides updates on current topics and issues about disaster education. Please be sure to visit the EDEN homepage often to see the latest disaster education information, and to stay current on EDEN activities. If you have ideas for news articles on the EDEN homepage, please forward them to Abigail Borron (aborron@purdue.edu). They are always looking for new information!

I'd like to bring to your attention a newly introduced federal website, DisasterAssistance.gov, which should help streamline information sharing for individuals who have been affected by a disaster. Primarily for individuals who are seeking information about assistance following a disaster, the site and the information available is recognized by multiple government agencies. You may want to share the information about this site with staff, faculty, and Extension Educators at your institution. This information will be valuable to share as you interact with other state and federal agencies within your state or territory, and with the public. Check the EDEN homepage, or visit **www.disasterassistance.gov**

Next week, the executive committee will be working on several important topics. Committee work and the function of the EDEN committees will be included in the conversation. As a reminder to all delegates, and Points of Contact at every Institution, you are encouraged to participate on any of the EDEN committees. Most committee work is done by conference call and email, and face-to-face at the annual meeting. Your involvement and skill can add to the value and success of the committee work. Even if you can't attend the annual meeting, you can be actively involved in helping build a better resource for EDEN and Cooperative Extension.

Here is a list of committees and a brief description of their function. This information is also available on the EDEN website under "About EDEN."

The EDEN eXtension Community of Practice (www.extension.org/disasters) continues to grow with more expertise in a variety of skill areas. Your expertise and skill could add to the value of the Disaster Education Community of Practice. Virginia Morgan, the EDEN chair elect, is coordinating the eXtension efforts. Contact Virginia (morgamv@auburn.edu) for more information about eXtension.

If you would like to participate in any of these EDEN committees, please contact the chair of the committee and offer your expertise. Most committee work is online or through conference calls. If you have questions about any of the committees, or about their work, please contact the chair of the committee, or contact me (dfilson@psu.edu). If you have suggestions for topics to consider for the committees, please offer your thoughts. Our organization works best when all of you contribute and participate.

Any organization is only as effective as the membership. We cannot function effectively or efficiently without you, the delegates at each of your institutions. I really appreciate the effort you provide as a delegate for EDEN. If you have suggestions of how the organization can be even better, please share your ideas with me. Your suggestions are important, and I want to encourage you to become more involved in EDEN and with Disaster Education.

(R. Grisso)

Spring Lawn Mower Tune Up

Experience proves that a well-maintained mower reduces emissions up to 50%, reduces fuel consumption up to 30% and restores horsepower up to 7.5%. A typical engine tune-up includes changing the oil, spark plugs and air filter.

Why Tune Up? There are a number of benefits, for you and the environment, including: extending the life of your equipment, reducing fuel consumption up to 30%, conserving natural resources, reducing emissions up to 50%, which protects the environment, restores your horsepower by 7.5%, and improves the startability of your engine.

Changing Your Oil

For optimum performance, you should change the oil in your small engine at least once per season, or every 25 hours of use.

Most small engine manufacturers provide maintenance kits that come with the correct oil and volume for your engine. You can also purchase oil separately through our online store or through participating dealers and retailers.

Step 1: Getting Started. Start the engine and run it until it is warm. Stop the engine. WARNING: Be sure to disconnect the spark plug wire, and secure it away from the spark plug to prevent accidental starting.

Clean around the oil fill and drain plug area to prevent dirt and debris from falling into the crankcase. Remove the dipstick, if equipped.

Step 2: Draining the old oil. Tilt the mower deck with the air filter or spark plug side up, and position some newspaper and an oil pan beneath the mower. Use a socket wrench to turn the plug counter clockwise, allowing the old oil to drain.

If the plug also serves as a fill cap, it may have two prongs so you can loosen it by hand or with a screwdriver or hex key for additional torque.

Replace the drain plug by twisting clockwise and tightening with a box wrench or adjustable wrench.

Step 3: Engines with Oil Filter. If your engine does not have an oil filter, skip this step. If your engine has an oil filter, replace it at least once per season. You replace the oil filter by twisting counterclockwise on the body, using a filter wrench or pipe wrench. Examine the sealing surface on the oil filter adapter for debris or gasket material. Clean if necessary.

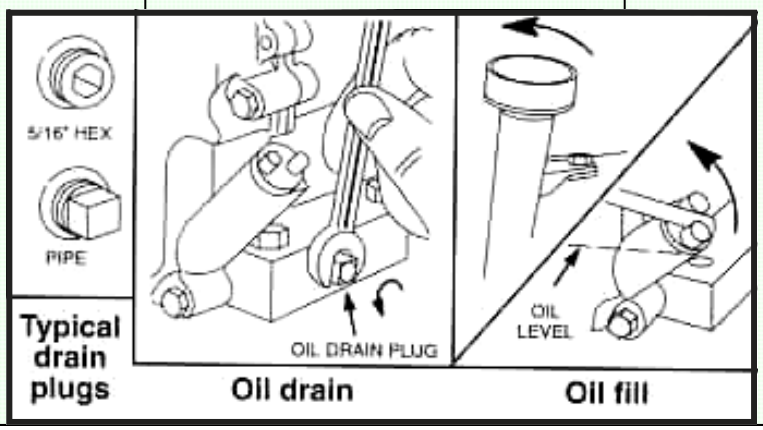
Lightly oil the filter gasket with clean engine oil. Install a new filter, screwing in by hand until the gasket contacts the filter adapter. Tighten the filter an additional 1/2 to 3/4 turn.

Step 4: Fill with New Oil. Pour in the correct amount of oil for your engine, based on this oil capacity chart, or your owner's manual. NOTE: Oil capacity on most small engines is 20 oz (0.6 L), which may be LESS than the total amount of oil you have purchased. Overfilling of oil is very common, and is easily avoided.

Dispose of the oil and soiled rags in accordance with local statutes. Run the engine at idle and check for leaks.

Changing Spark Plugs

Changing your spark plug is one of the easiest ways to ensure accurate and easy starting for your engine. This should be done every season.



(Continued on page 11)

Spring Lawn Mower Tune Up

(Continued from page 10)

Some spark plugs are pre-gapped, so all you need to do is remove the old spark plug and replace it with the new one. If not, gap the plug according to manufacturer's specifications.

Step 1. Be sure engine is stopped. Disconnect the spark plug wire, and clean the area around the spark plug to avoid getting debris in the combustion chamber when you remove the plug.

Step 2. Remove the spark plug using a spark plug socket and/or socket wrench.

Step 3. Install the new spark plug finger tight. Then tighten 1/4 to 1/3 turn more with the socket wrench.

Air Filter Replacement

Air filters should be replaced every 3 months or after 25 hours of use, whichever occurs first, more often under dusty conditions. Small engines use one of three types of air filters; foam, paper, and a combination of foam and paper.

How To Change a Paper Air Filter

A paper air filter element works by causing any air that is intended to enter the combustion chamber of the engine to pass through a filtering device made with microscopic holes in it. The paper element traps the dirt particles on the outside of the element.

1. Loosen cover screw.
2. Tilt cover down.
3. Carefully remove and discard paper cartridge.
4. Install new cartridge with paper pleat out.
5. Close cover.
6. Tighten screw securely.

How To Change a Foam Air Filter

The "foam only" style air filter system works by trapping dirt and debris through the use of motor oil spread throughout the oil foam holding medium. A dry or non-oiled oil foam filter will trap only the largest particles. If the air filter element is foam only, it MUST be oiled and serviced regularly.

1. Remove air filter screw.
2. Carefully remove air filter assembly and discard foam.
3. Clean all metal air filter assembly parts.
4. Saturate new foam filter with fresh engine oil. Wrap foam in clean cloth and squeeze to remove excess oil.
5. Assemble foam filter so lip extends over edge of air filter body.
6. Reinstall air filter assembly carburetor.

How to Change Dual Element Air Cleaners

Combination filters provide the highest degree of air filtering in the industry. The foam portion is used as a pre-cleaner for the paper element. Pre-cleaning the air increases the life of the more expensive paper element. Air passes through 2 types of filtering mediums providing clean air for the engine.

If you have a combination air filter with pre-cleaner replace pre-cleaner every 25 hours or every season, and replace cartridge every 100 hours or every season.

If you do not have a pre-cleaner replace cartridge, change the filter every 25 hours or every season, more often under dusty conditions.

1. Remove knob(s) and cover.
2. Carefully remove foam pre-cleaner, when so equipped.
3. Reinstall cartridge, nut(s), pre-cleaner and cover.
4. Retighten knob(s) securely.
5. Replace if very dirty, damaged, or doesn't fit properly.

Time spent on maintenance reduces down time on the job, reduces the amount you spend on fuel, and reduces the number of mowers you need to purchase by extending the life of your mower.

(R. Grisso)

Virginia Waives Hay Hauling Rules

VDOT has lifted requirements for hay and feed haulers due to lingering drought conditions in 18 counties. At the request of the state ag department, the transportation and motor vehicles departments authorized a temporary waiver of registration and license requirements, along with normal weight and width restrictions.

Virginia Ag Commissioner Todd Haymore says the waiver will help farmers meet their livestock feed needs through the rest of the winter. It's effective through March 30, 2009.

The waiver pertains only to statewide shippers of hay and feed products. Loads are restricted to a maximum 12' width provided the shippers adhere to hauling-permit regulations and safety guidelines as published in the Virginia Hauling Permit Manual. For more details on waiver restrictions, see URL below.

(R. Grisso)

www.vdacs.virginia.gov/news/releases-b/020509hayexempt.shtml

Agent Questions

Question #1: In the most recent TeeJet Catalogs (#50) states for 80 degree fan nozzles to use a 30 inch boom height. The older catalogs suggest a 18 inch boom height. Why the difference?

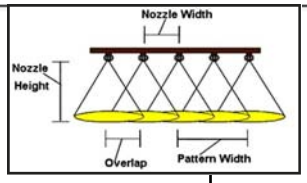
Answer: The new catalog lists the "Optimum" spray height on the individual spray tip pages. The new recommendations show the spray tip height which gave the best uniformity or lowest CV (coefficient of variation). The older catalogs were for minimum boom height and as the nozzle angle gets wider (110 degree), the boom is set so low that it is hitting the ground in typical field spraying. Use Table 1 as suggested boom height with the understanding that as the boom exceeds 36 inches—the potential for spray drift increases.

Check spray overlap by spraying clean water onto a flat surface (concrete) and observing drying patterns. Effective application requires avoiding skips and major overlaps in the spray pattern.

Table 1. Suggested minimum spray heights.

	Spray Height (in)			
	20" Spacing Overlap		30" Spacing Overlap	
Spray Angle Degrees	30%	100%	30%	100%
65	22-24	-NR-	-NR-	-NR-
80	17-19	26-28	26-28	37-39
110	10-12	15-17	14-18	25-27

-NR- Not recommended.



Question #2: The handheld GPS units used by the county offices have been having problems lately. We turn them on and they start tracking satellites then go to a blank screen with a thin vertical line on it. We thought it was a battery issue but that did not cure the problem. Is there any possibility that we might have to update some type of information before they will work again? We are anxious to know as we use them for measuring acreage and site data collection on a regular basis.

Answer: The WAAS DGPS updated to a new satellite in fall 2007 and the address for the Garmin units needs to be updated. Garmin has a fix for this problem but will require a download and update of firmware.

Check your Garmin version number (find operator's manual). For the Garmin Legend's, the most current is 3.90 and update by going to:

http://www8.garmin.com/support/agree.jsp?id=25

The Garmin Unit will need to be connected to computer that has internet access.

NEW BSE Extension Factsheet

New factsheet develop by Hipkins, Grisso, Wolfe and Reed is entitled, "Droplet Chart / Selection Guide" and will have the VCE Publication number of 442-031 (www.ext.vt.edu/pubs/bse/442-031/442-031.pdf).

This 2-page factsheet covers the issues of choosing nozzles and droplet sizes for spray applications and the need to consider coverage and potential drift issues.

Two charts are effective in showing the guidelines for nozzle selection: 1. When choosing a nozzle, consider both flow rate and droplet size. 2. Base decision on target and properties of active ingredient. 3. Avoid using nozzles and pressures that will produce a volume median diameter (VMD) of less than 200 microns (fine-very fine). 4. Always read the label. Pesticide product labels may specify what droplet size to use and how much liquid to apply to a given area. This will direct nozzle selection and, in turn, affect spraying equipment configuration and calibration.
(R. Grisso)

Chart 1. Droplet range for application/pest control[1].

Application	Droplet Category[2]	Approximate VMD Range[3] (in microns)
Fungicide		
foliar protective or curative	Medium (M)	226-325
Insecticide		
foliar contact or stomach poison	Medium (M)	226-325
foliar systemic	Coarse (C)	326-400
soil-applied systemic	Coarse (C) Very Coarse (VC) Extremely Coarse (XC)	326-400 401-500 > 500
Herbicide		
foliar/postemergent contact	Medium (M)	226-325
foliar/postemergent systemic	Coarse (C)	326-400
soil-applied/preemergent systemic	Coarse (C) Very Coarse (VC) Extremely Coarse (XC)	326-400 401-500 > 500

Chart 2. Droplet size classification chart

Droplet Category[1]	Symbol	Color Code	Approximate VMD Range[2] (in microns)
Very Fine	VF	Red	< 145
Fine	F	Orange	145-225
Medium	M	Yellow	226-325
Coarse	C	Blue	326-400
Very Coarse	VC	Green	401-500
Extremely Coarse	XC	White	> 500

Safety Online Videos

Full-Length Titles Available in English

- Be Safe and Sound (Says Safety Hound)
- Cattle Handling Safety
- Helping Four-Legged Friends Survive the Storm
- In the Blink of an Eye
- Industrial and Agricultural Mower Safety Practices: A Safety Training Program for Operators of Disc-Type Mowing Equipment
- Industrial and Agricultural Mower Safety Practices: A Safety Training Program for Operators of Rotary-Type Mowing Equipment
- Livestock Safety for Kids
- Rhythm of the Seasons: A Journey Beyond Loss
- Safety for Fish Farm Workers
- Someone
- Sound Advice for Farming
- A Tractor Accident Can Happen to Anyone
- Tractor Safety - Yearly OSHA Compliance Training
- Visiting a Farm? Be Safe and Sound Says Safety Hound
- We're Going to Hound You about Winter Safety

Full-Length Titles Available in Spanish

- Industrial and Agricultural Mower Safety Practices: A Safety Training Program for Operators of Disc-Type Mowing Equipment
- Industrial and Agricultural Mower Safety Practices: A Safety Training Program for Operators of Rotary-Type Mowing Equipment
- Livestock Safety for Kids
- Safety for Fish Farm Workers

URL Link: http://www.cdc.gov/nasd/menu/video/video2.html

Safety Video Abstracts: http://www.cdc.gov/nasd/menu/video/video_abstracts.html

VCE Energy Series Publications

14 ENERGY SERIES publications (non peer-reviewed) have be posted to the web (on January 2009). These publications were developed as part of the NASULGC/DOE Building Science Community of Practice. The contact authors are Robert Grisso and Martha Walker.

What about the Air Conditioning System? VCE Publication Number 2901-9001.

What about Using Ceiling Fans? VCE Publication Number: 2901-9002.

What about the Ductwork? VCE Publication Number: 2901-9003.

What about Fluorescent Lighting? VCE Publication Number: 2901-9004.

What about the Heating System? VCE Publication Number: 2901-9005.

What about Insulation? VCE Publication Number: 2901-9006.

What about the Laundry Area? VCE Publication Number: 2901-9007.

What about Mold? VCE Publication Number: 2901-9008.

What about the Water Heater? VCE Publication Number: 2901-9009.

What about Windows? VCE Publication Number: 2901-9010.

What Are The Differences Between Mobile and Modular Homes? VCE Publication Number: 2901-9011.

What Can Builders Do to Help Prevent Moisture Problems in New Construction? VCE Publication Number: 2901-9012.

What Does the Shape of the House Have to Do With Energy Efficiency? VCE Publication Number: 2901-9013.

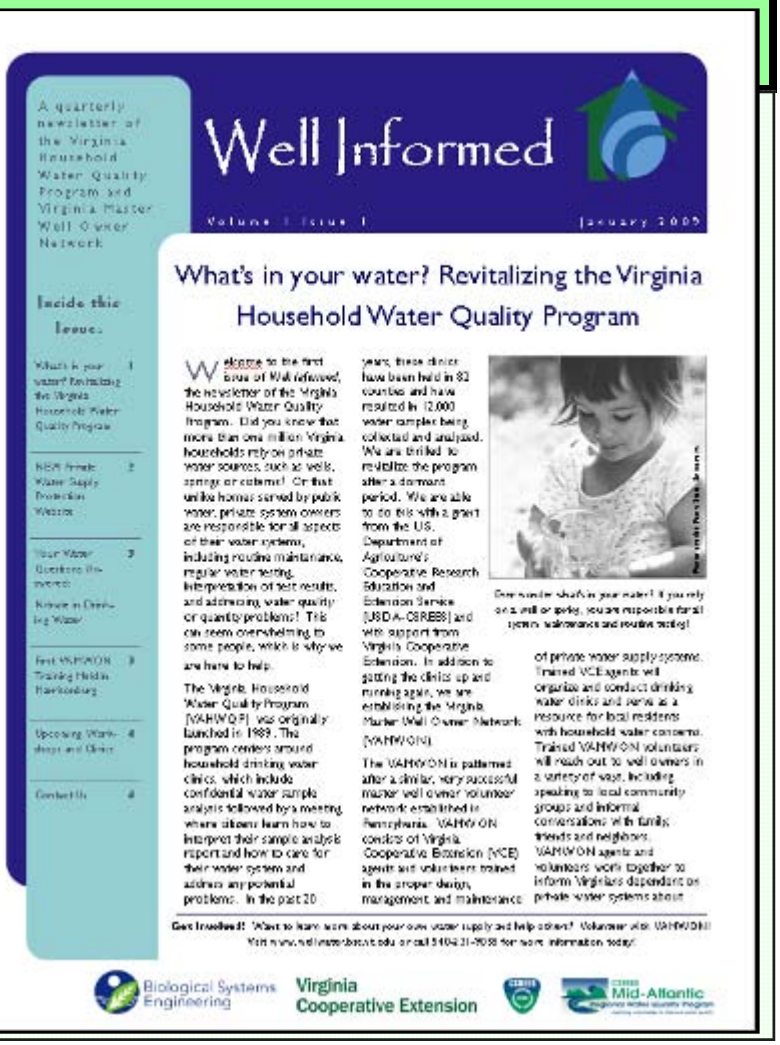
Estimating Appliance and Home Electronic Energy Use. VCE Publication Number: 2901-9014.

Well Informed Newsletter

As part of an effort to expand and revitalize the Virginia Household Water Quality Program, we are pleased to introduce our quarterly newsletter, *Well Informed*. The newsletter will have useful articles about source protection, private water system care, common water contaminants, and treatment options for problem waters. Issues will also contain up-to-date information about upcoming county drinking water clinics and Virginia Master Well Owner Network volunteer and agent training workshops across the state. Primary distribution of *Well Informed* will be electronically via our listserv and will be available at the Resources section of our website: www.wellwater.bse.vt.edu.

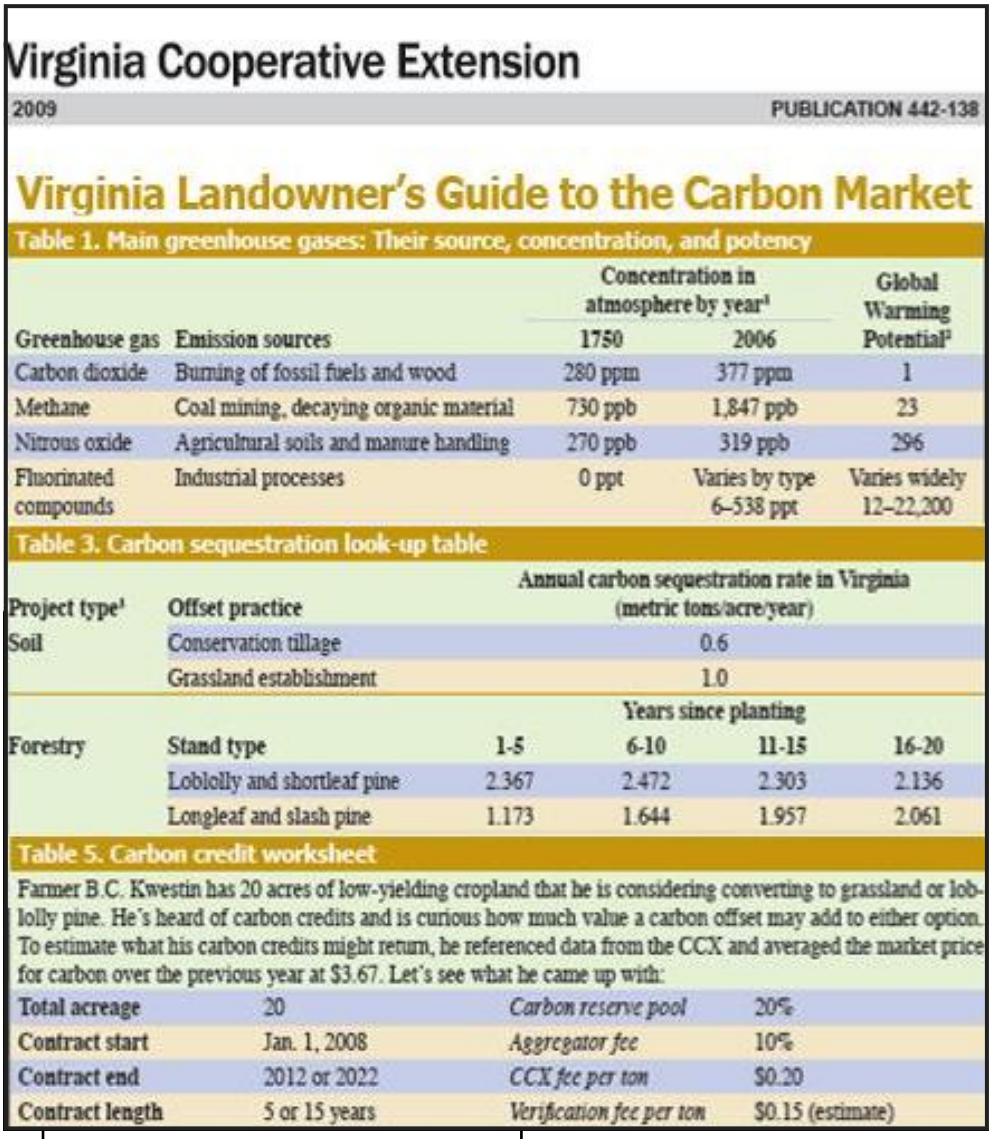
Please contact Erin James at to have your name added to the listserv.

(Erin James—ejames@vt.edu)



New VCE publication: Virginia Landowner's Guide to the Carbon Market

New factsheet developed by Ignosh, Stephenson, Yancey, Whittle and Alley is titled, "Virginia Landowner's Guide to the Carbon Market" and will have the VCE Publication number of 442-138 and is available at: www.ext.vt.edu/pubs/bse/442-138/442-138.pdf



Virginia Cooperative Extension

2009 PUBLICATION 442-138

Virginia Landowner's Guide to the Carbon Market

Table 1. Main greenhouse gases: Their source, concentration, and potency

Greenhouse gas	Emission sources	Concentration in atmosphere by year[1] 1750	2006	Global Warming Potential[2]
Carbon dioxide	Burning of fossil fuels and wood	280 ppm	377 ppm	1
Methane	Coal mining, decaying organic material	730 ppb	1,847 ppb	23
Nitrous oxide	Agricultural soils and manure handling	270 ppb	319 ppb	296
Fluorinated compounds	Industrial processes	0 ppt	Varies by type 6–538 ppt	Varies widely 12–22,200

Table 3. Carbon sequestration look-up table

Project type[1]	Offset practice	Annual carbon sequestration rate in Virginia (metric tons/acre/year)
Soil	Conservation tillage	0.6
	Grassland establishment	1.0

		Years since planting			
Forestry	Stand type	1-5	6-10	11-15	16-20
	Loblolly and shortleaf pine	2.367	2.472	2.303	2.136
	Longleaf and slash pine	1.173	1.644	1.957	2.061

Table 5. Carbon credit worksheet

Farmer B.C. Kwestin has 20 acres of low-yielding cropland that he is considering converting to grassland or loblolly pine. He's heard of carbon credits and is curious how much value a carbon offset may add to either option. To estimate what his carbon credits might return, he referenced data from the CCX and averaged the market price for carbon over the previous year at $3.67. Let's see what he came up with:

Total acreage	20	*Carbon reserve pool*	20%
Contract start	Jan. 1, 2008	*Aggregator fee*	10%
Contract end	2012 or 2022	*CCX fee per ton*	$0.20
Contract length	5 or 15 years	*Verification fee per ton*	$0.15 (estimate)

By now, you've probably heard about concerns over increasing concentrations of greenhouse gases (GHG) such as carbon dioxide in the earth's atmosphere (Table 1). Currently, there are no federal laws in the United States governing GHG emissions. However, many states, companies, and even individuals are agreeing to voluntarily limit their GHG emissions through carbon offsets or by some other means.

A carbon offset is created by voluntarily removing carbon dioxide from the atmosphere or by working to prevent the emission of a GHG in the first place. Once a carbon offset is created, measured, and verified, the carbon offset can then gain value as a tradable commodity in the carbon market. In the US, the primary market is the Chicago Climate Exchange (CCX). This exchange represents North America's only voluntary, but legally binding, GHG trading market. Renewable energy, conservation tillage, grassland establishment and forest management practices each offer opportunities for landowners to register a carbon offset and possibly earn additional revenue via the carbon market (Table 3). This publication describes the carbon market and provides a worksheet to estimate the gross revenue a carbon offset may generate for a particular land management practice (Table 5).

Animal Manure Management

Our animal manure management program is engaging in two new projects, one in manure nutrient management and energy recovery from small farms and the other on agricultural air quality focusing on ammonia emissions from broiler houses. The two projects are described below.

Project1: Assessing opportunities for implementing combined nutrient management and energy recovery technologies in the Shenandoah Valley to minimize nutrient loss from farms.

For many years, nutrient management in watersheds has focused on controlling nutrient loss. While this worked, it is imperative that options that remove excess nutrients from the source before being utilized in the watershed be considered. We propose a planning and design project to evaluate options for dairy farmers and communities in the Rockingham and Augusta County areas for anaerobic digestion (AD) systems used in conjunction with nutrient management/reduction technologies to achieve reduced pathogen and nutrient transport to surface waters of the Chesapeake Bay. The project objectives are to:

1. build on existing efforts to characterize manure and other potential feedstock resources in the Rockingham and August County regions (where most of Virginia's dairies are concentrated) that will assist farmers and communities identify logistical opportunities and constraints for more efficient manure handling and nutrient reduction strategies;
2. provide farmers, community leaders, and other interested stakeholders in the watershed with information on the environmental and economic feasibility of bundling biomethane production and utilization with other nutrient management/ reduction and technologies to give farmers more options to optimize agronomic use, facilitate nutrient export and transportation, and reduce nutrient loading in the watershed.

The study will examine economic feasibility on how AD and associated nutrient reduction and/or management technologies could be implemented in the Shenandoah Valley under three possible management scenarios 1) individual farms, 2) community or multi-farm basis, and 3) multi feedstock processing e.g. co-mingling dairy manure with other organic feedstocks in the watershed. Implementation of these systems on farms in the watershed will result in a reduction of nutrient and pathogens transported to the Chesapeake Bay.

While this project focuses in the Shenandoah Valley, we see the results from the study usable in other areas of the state and the country with small size farms.

Project 2: Integrating education and development of biodegradable litter amendment to en-

(Continued on page 17)

Animal Manure Management

(Continued from page 16)

hance ammonia emissions mitigation practices in poultry houses

Reducing ammonia emissions from poultry production is an important factor in reducing national ammonia emissions inventory. Among animal husbandry operations, poultry is the largest contributor to ammonia emissions (664 kT of the total 2,419 kT) according to U.S. EPA (2004). Broilers and turkeys account for about 70% of poultry ammonia emissions. This is an integrated research and extension project. The objectives of this project are to:

1. develop a biodegradable litter amendment (BLA) to reduce ammonia emissions determine the effective organic BLA application rates to reduce ammonia volatilization from broiler litter
2. conduct pilot scale studies to evaluate the effectiveness of the BLA on reducing ammonia emissions under production conditions
3. develop and implement a collaborative, consensus-based adaptive evaluation protocol between researchers and poultry producers to identify and analyze economic, behavioral and cultural barriers to implement BMPs to manage ammonia emissions
4. develop an agricultural air quality extension education program to enhance understanding of air quality issues related to ammonia in Virginia.

Agricultural crop residues will be steam treated to produce BLA. The BLA will be analyzed for ammonia removal capacity both in the laboratory and broilers produced under actual growing conditions. The consensus based evaluative model will be developed by engaging a project advisory group continuously in process of identifying barriers to adopting BMPs. A sustainable education program focusing on county extension agents training and the production of educational materials will be developed in liaison with the National eXtension program in air quality education in animal agriculture. The project will produce a new litter amendment, a user friendly evaluative model to evaluate BMP adoption, and a sustainable air quality education in animal agriculture.

We will need your participation in this project later in the year. In light of the pending regulations on agricultural emissions currently being talked about, we plan to have listening sessions in four locations of the state to hear from the local community, their perceptions of agricultural air quality. The feedback we get from the listening sessions will help us shape our educational efforts in the area of agricultural air quality.

(Jactone Arogo)

ARS Device Applies Poultry Litter

A new field tool developed by Agricultural Research Service scientists applies poultry litter to fields in shallow bands, reducing runoff of excess nutrients like phosphorus and nitrogen.

Poultry litter - a combination of poultry manure and bedding material, such as pine shavings or peanut or rice hulls - is a natural fertilizer. The conventional method of applying it to fields utilizes a broadcast spreader, which scatters the litter across the soil surface. Because it rests on top of the soil, the litter is vulnerable to runoff in heavy rains.

The new tool developed by ARS agricultural engineer Tom Way and his colleagues at the agency's National Soil Dynamics Laboratory in Auburn, AL, offers a solution. The tool digs shallow trenches about 2 to 3 inches deep in the soil. It then places the poultry litter in the trenches and covers it with soil. Burying the litter significantly reduces the risk of runoff.

Designed to attach to a tractor, the litter applicator can dig four trenches as it is pulled through the field.

Collaborators in six states have used Way's litter applicator in their research, with positive results. The scientists applied the litter to bermudagrass forage plots, and then watered the field with a rainfall simulator.

When the litter was applied with Way's new tool, phosphorus and nitrogen runoff were 80 to 95 percent lower than when the litter was applied in the conventional manner.

Way has also collaborated with ARS scientists throughout the country to examine the tool's effectiveness with different crops. They used the new implement in experiments in corn fields in Alabama, Kentucky and Maryland; cotton fields in Mississippi and Georgia; and in bermudagrass and tall fescue stands in Alabama.

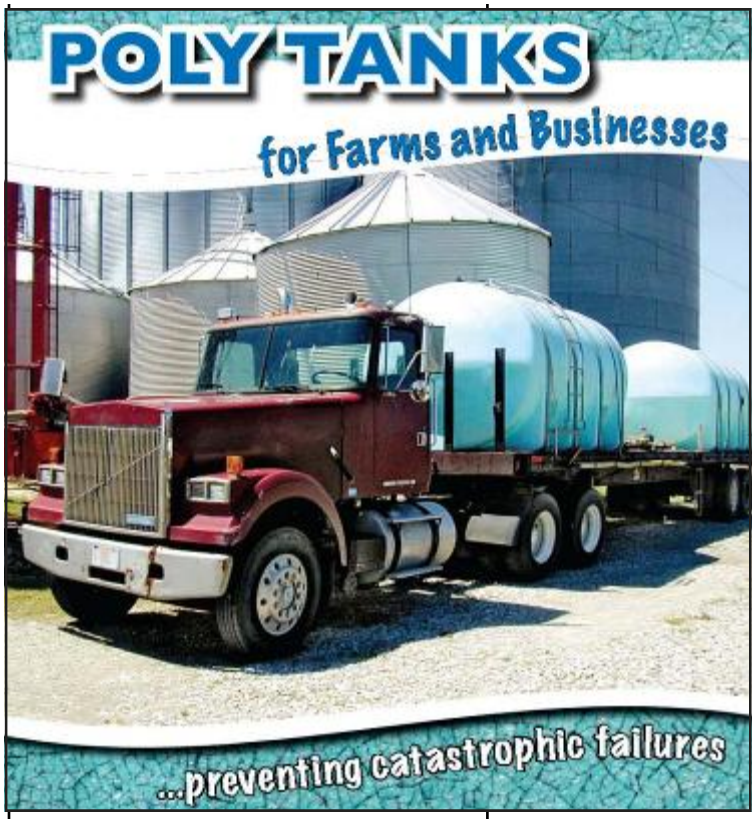
Their results showed that the new tool has the potential to reduce water pollution significantly when used to apply poultry litter to a variety of crops. Now ARS is pursuing a patent and seeking companies to manufacture and market the litter applicator.

(source Tom Way, ARS-USDA)

Poly Tanks and Load Safety

Two publications from Purdue University are currently available on the use of on-farm poly tanks and their safety and over the road security for farm loads.

Poly Tanks for Farm Businesses, Preventing Catastrophic Failures PPP-77 High density polyethylene tanks have been used successfully by growers and commercial pesticide application businesses for years. While the benefits of poly tank ownership are well established, the risk of tank failure is real. Like any piece of equipment, poly tanks need to be inspected and maintained to ensure that the benefits of use outweigh the risk of tank failure and product release. Fred Whitford has made a study of tank problems and has created this publication on poly tanks. Available to download: **www.btny.purdue.edu/Pubs/PPP/PPP-77.pdf.**



Securing The Load PPP-75 Another publication also available with credit going to Fred Whitford is a guide on securing loads properly on your farm truck or trailer.

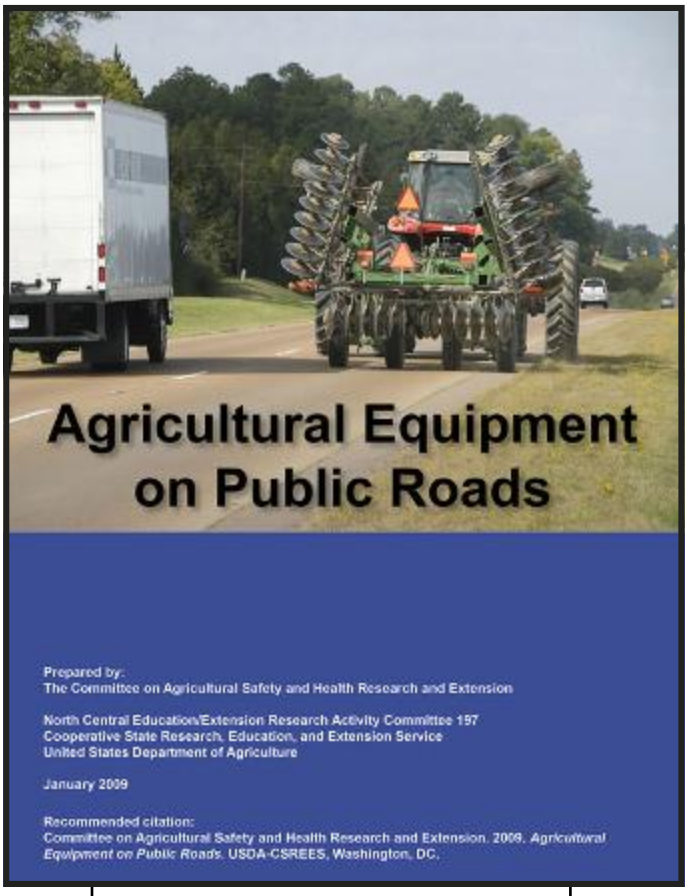
Losing cargo on the road is serious business. The proper loading, positioning, and securing of cargo on a truck or trailer can prevent accidents in transit. This publication refers to government securement regulations and describes proper techniques for securing cargo on farm and commercial trucks and trailers. Download from:

www.btny.purdue.edu/Pubs/PPP/PPP-75.pdf.

(R. Grisso)

Ag Equipment on Public Roads

GUIDANCE FOR AGRICULTURAL EQUIPMENT ON PUBLIC ROADS



After investigating dangers associated with farm equipment on public roads, a committee convened by the U.S. Department of Agriculture's Cooperative State Research, Education, and Extension Service (CSREES) has recommended that guidelines be established for farm-equipment manufacturers, standard-setting organizations and government agencies.

Urbanization of traditional agricultural-production regions and changing production practices have led to a substantial increase in the mix of agricultural equipment and licensed motor vehicles on public roads, creating safety problems.

Federal, state and local government bodies rarely give this area of roadway safety any attention because agriculture-related collisions comprise a low percentage (0.2 percent) of all vehicle collisions. The impacts of changing demographics that characterize the urban/rural interface are not well researched or understood.

The report was developed by the USDA-CSREES North Central Regional Committee on Agricultural Safety and Health Research and Extension. Recognizing the need to quantify and qualify risks of vehicular collisions, the report suggests research, policy, standards development, and extension and outreach priorities for agricultural equipment on public roads.

The report addresses the rural/urban traffic interface, state and federal regulations, higher-speed tractors and transport of workers on public roadways with farm equipment.

The report also calls for research describing the characteristics of crashes between motor vehicles and agricultural equipment, using standard reporting guidelines.

The committee believes that engineering design standards should be used to incorporate automatic and passive protection for drivers and riders of agricultural equipment during public-road use. Safety-education programs are needed to educate both the public and farmers on best practices for operating agricultural equipment on public roads, approaching slow-moving vehicles on public roads and the effects of excluding agricultural equipment from road weight and use restrictions.

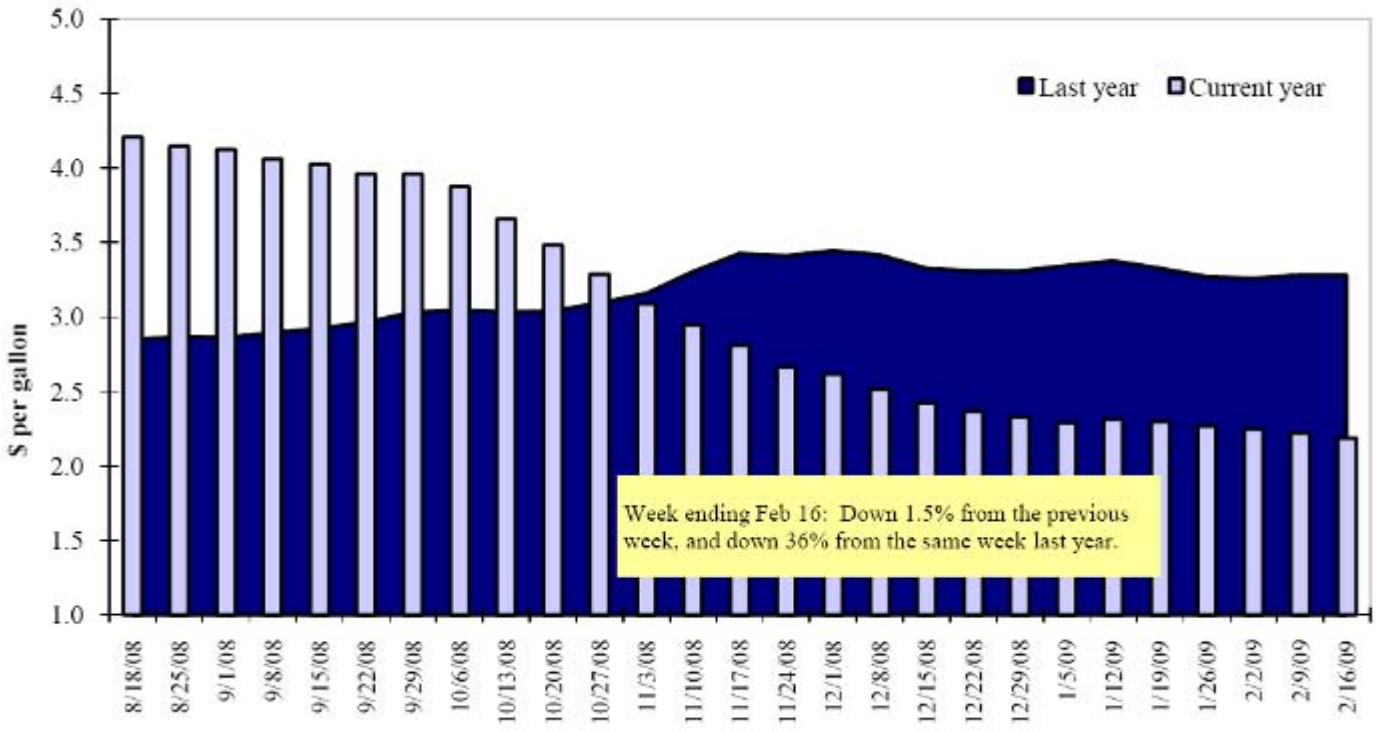
The report also recommends policy changes for a consistent source of funding for research into hazards, risks and best safety practices, and for the development of a Uniform Vehicle Code that reflects uses of modern agricultural equipment, which should be adopted by all states.

The full text of the report is available online at http://filebox.vt.edu/users/rgrisso/Papers/Ext/AEpublicroads.pdf

(R. Grisso, 197 Member)

Year's Impact of Diesel Fuel Prices

Weekly Diesel Fuel Prices, U.S. Average



Source: Retail On-Highway Diesel Prices, Energy Information Administration, Dept. of Energy

What is a BTU?

There are a lot of different ways to heat a house or building. One measure of heat inherent in a product is its BTU or British Thermal Unit. One BTU is the amount of energy it takes to heat one pound of water one degree Fahrenheit. For example, coal has approximately 24,916,000 BTU per ton or 12,450 BTU per pound. Compare that to shelled corn which has about 8200 BTU per pound.

If you are thinking of heating a house with natural gas (100,000 BTU per therm), wood (22,000,000 BTU per cord), electricity (3400 BTU per kWh) or corn (460,000 BTU per bu), the units can get in the way of evenly comparing.

Another challenge is the efficiency of different forms of fuels. Not all fuels are equally efficient just as all furnaces are not equally efficient. An inefficient system will use more BTUs to do the same amount of heating as a more efficient system.

Below is a link to a spreadsheet put together by the Energy Information Administration: http://www.eia.doe.gov/neic/experts/heatcalc.xls

Biomass products like corn, wood, and wood pellets did come in very competitively even with corn at $5.35 per bushel ($190.00 per ton is approximately $5.35 per bushel).

There are considerations of more work with wood and corn but at the very least this can provide a method of comparison.

(Source: John Hay, Extension Educator, Nebraska Cooperative Extension)

Stormwater Education

Extension Assists Prince William County with Stormwater Education

VCE has been assisting Prince William County (PWC) with educational and outreach activities in support of its stormwater program since 1998. PWC operates its stormwater program in compliance with the federal Clean Water Act (CWA) and to meet the County's goals to protect streams and wetlands, reduce nonpoint source pollution, and maintain water quality. The County's NPDES MS4 (National Pollutant Elimination System Municipally Separate Stormwater System) Permit requires implementation of 6 minimum measures intended to reduce pollution from stormwater. Two of these measures are public education and outreach. Because of Extension's abilities in these two areas, VCE provides environmental, natural resource and basic technical assistance activities in support of the following programs:

1. Great 'Scapes Lawn Education
2. Master Gardener Volunteer Training and Support
3. Stormwater Management Education

For the Stormwater Management Education program, VCE is assisting PWC conduct a series of workshops targeted at educating homeowners and businesses on both the impacts of stormwater pollution and practical means of reducing those impacts. A recent workshop was given in January, 2009, by Mark Aveni, Director of the PWC's Watershed Management Branch (WMB), Public Works Department and Patty Dietz of WMB and Paige Thacker, a Horticultural Agent with VCE-Prince William Unit. Ms. Dietz and Thacker covered the sources of stormwater pollution and the simple fact that stormwater is not treated prior to discharge to streams.

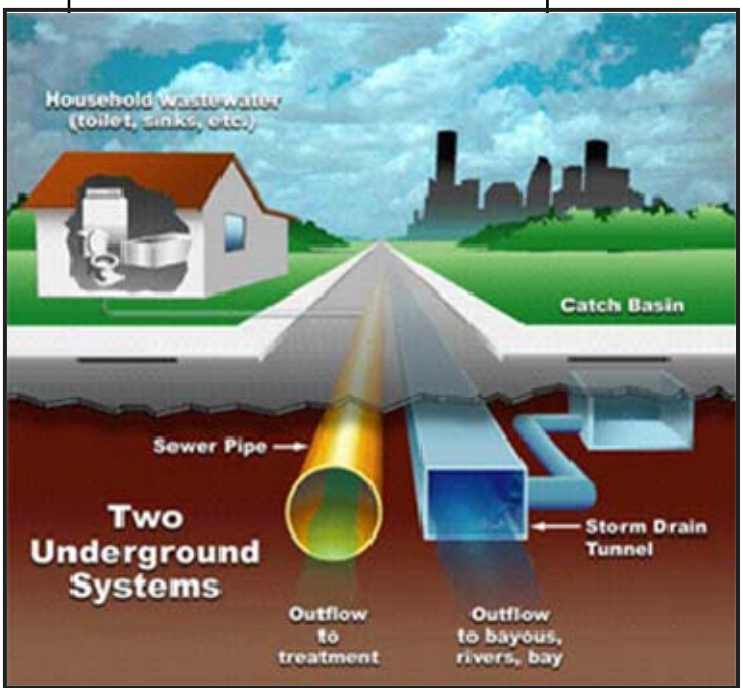
Ms. Thacker then covered several simple practices intended to reduce it, including:

- Removing debris from storm drains
- Clean parking lots and paved areas of leaves, trash and sediment (pick up the dirt-don't sweep dirt into the gutter)
- Reduce the amount of road salt
- Cover stored materials or store them inside
- Test soil in lawn areas every 3 years and fertilize in the fall, not the spring.
- Compost or reuse plant trimmings

As an incentive to attend, PWC provides for a credit of up to 30% of the amount of the recently instituted stormwater fee. The full credit requires attendance at the seminar, return of followup educational materials, and a site inspection.

Several state Extension programs across the nation have been developed to provide similar services. VCE is exploring the development of a similar statewide program in partnership with the Virginia Department of Conservation and Recreation. Presently, there are 98 NPDES MS4 permitted entities within the Commonwealth of Virginia.

(D. Sample)



Stormwater System, Illustrating Outflows are Untreated

BSE Faculty in the News

Enzyme cocktail converts cellulosic materials, water into hydrogen fuel. Tomorrow's fuel-cell vehicles may be powered by enzymes that consume cellulose from woodchips or grass and exhale hydrogen.

Researchers at Virginia Tech, Oak Ridge National Laboratory (ORNL), and the University of Georgia have produced hydrogen gas pure enough to power a fuel cell by mixing 14 enzymes, one coenzyme, cellulosic materials from nonfood sources, and water heated to about 90 degrees (32 degrees C).

The group announced three advances from their "one pot" process: 1) a novel combination of enzymes, 2) an increased hydrogen generation rate -- to as fast as natural hydrogen fermentation, and 3) a chemical energy output greater than the chemical energy stored in sugars – the highest hydrogen yield reported from cellulosic materials.

"In addition to converting the chemical energy from the sugar, the process also converts the low-temperature thermal energy into high-quality hydrogen energy," said Percival Zhang, assistant professor of BSE.

"It is exciting because using cellulose instead of starch expands the renewable resource for producing hydrogen to include biomass," said Jonathan Mielenz, leader of the Bioconversion Science and Technology Group at ORNL.

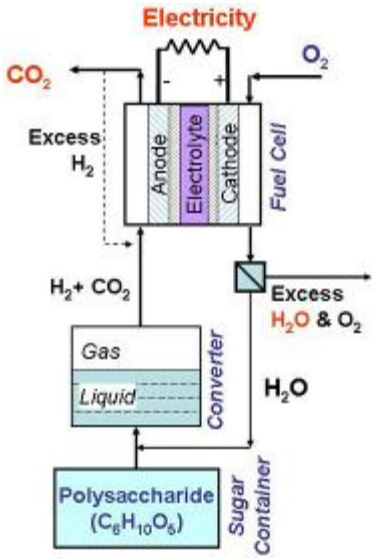
The researchers used cellulosic materials isolated from wood chips, but crop waste or switchgrass could also be used. "If a small fraction, even 2 or 3%, of yearly biomass production were used for sugar-to-hydrogen fuel cells for transportation, we could reach transportation fuel independence," Zhang said. He added that the 3 percent figure is for global transportation needs. The US would actually need to convert about 10% of biomass – which would be 1.3 billion tons of usable biomass.

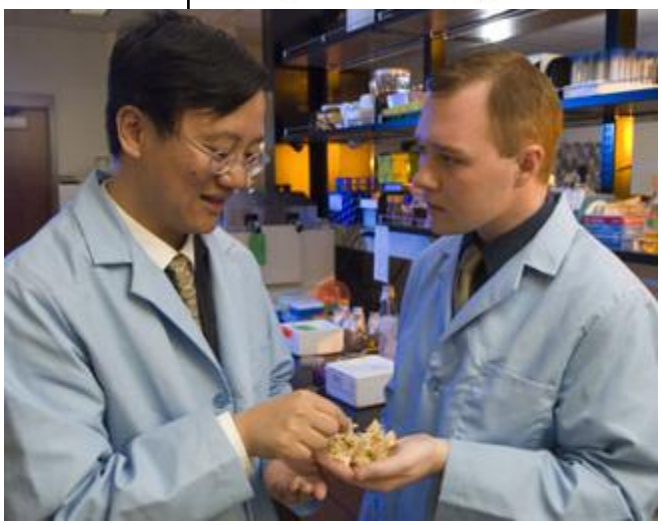
The most recent research is published in the Wiley journal (Chemistry and Sustainability http://dx.doi.org/10.1002/cssc.200900017), in the article "Spontaneous High-Yield Production of Hydrogen from Cellulosic Materials and Water Catalyzed by Enzyme Cocktails," by Virginia Tech student Xinhao Ye and post doctoral associate Yiran Wang, both in BSE; Robert C. Hopkins and Michael W. W. Adams of the Department of Biochemistry and Molecular Biology at the University of Georgia; Barbara R. Evans and Mielenz of the ORNL Chemical Sciences and Biosciences Divisions, respectively; and Zhang.

The research is supported by the Air Force Office of Scientific Research; Zhang's DuPont Young Professor Award, and the U.S. Department of Energy.

Learn more about Zhang's work. http://filebox.vt.edu/users/ypzhang/research.htm

(By Susan Trulove, BLACKSBURG, Va., February 16, 2009)





Deere's Module-Building Picker Available in '09

The long anticipated announcement that John Deere's model 7760 on-the-go, module-building cotton picker will be commercially available in '09 came at the Beltwide Cotton Conferences in San Antonio.

The new John Deere picker builds unique 8'x7½' plastic-wrapped round modules. Case IH's version of an on-the-go, module-building picker, which builds half-sized traditional modules, was introduced in 2006 and is now in its third generation.

The module builder receives the cotton from the accumulator. A rockshaft and 11 heavy-duty rubber belts gently shape the round module into a size from 36 to 90 inches in diameter. The completed round package, wrapped by the special protective film, is then ejected onto a module handler which holds the package until the operator is ready to drop the module. The wrapped module, unloaded at the end of the field, is protected from the weather and provides easy transportation flexibility.

This is a big step forward in new technology to bring even more productivity to cotton harvesting operation. The picker will build a round module on the machine while harvesting cotton. Then it will wrap the cotton module in a protective film to preserve fiber and seed quality, and minimize any crop loss during handling and transport.

Without stopping the machine during picking, the operator can carry the module to the end of the field to be transported later to the gin. The efficient, non-stop harvesting system eliminates unloading into a boll buggy and processing in a module builder. Ultimately, the producer saves time, fuel and manpower when harvesting and processing the cotton.

The new systems have the potential to do away with the module builder and the boll buggy. Not only can you eliminate these two pieces of equipment, you can also eliminate the tractors and labor that go with each, potentially saving over $22 per acre.

It's possible that module trucks could also be eliminated with the round modules loaded onto a flatbed trailer. The accumulator was designed to store cotton while the module builder is processing the picked cotton. With a 320 cubic feet capacity, the accumulator has the storage to allow the picker to harvest non-stop at up to 4.2 mph in most conditions.

(www.JohnDeere.com/Ag)