



Biological Systems Engineering

Engineering Update

Winter 2008

BSE Receives ASABE Blue Ribbon for Newsletter

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Engineering Update



VirginiaTech
Invent the Future

Biological Systems Engineering
December 2008

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>).



www.ext.vt.edu

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VIRGINIA STATE UNIVERSITY

Virginia Household Water Quality Program Updates

Website launch: The Virginia Household Water Quality Program's website (www.wellwater.bse.vt.edu) launched in late October. The site contains basic information about the household water quality program, drinking water clinics, and the Virginia Master Well Owner Network (VAMWON), as well as useful resources about source protection and water quality for private water supply system owners. The "Upcoming Events" page includes details about all scheduled VAMWON trainings and drinking water clinics.

First VAMWON In-service Agent Training was held in Harrisonburg

at the Rockingham County Extension Office October 29-30, 2008. A three-year grant from USDA-CSREES provided funding to conduct the first of several trainings for master well owners. The objectives of this in-service training were to: 1) increase Virginia Cooperative Extension agent knowledge of several topic areas (including ground-

water hydrology, proper well construction, management and protection, regulations pertaining to private water systems, water testing and common water quality contaminants, and water treatment options) to improve their ability to assist private water supply owners with questions and problems and 2) encourage agent facilitation of county-based drinking water clinics for private water system own-

ers. Participants were provided a 3" 3-ring binder that included resources from Virginia Cooperative Extension, Natural Resource, Agriculture and Engineering Service (NRAES), Midwest Plan Service, and other university extension programs. Seventeen Virginia Cooperative Extension (12 ANR and 5 FCS) agents representing 11 counties participated in this in-service. Our first VAMWON volunteer also attended this training. The two-day training included presentations made by university and agency personnel and industry representatives from a well drilling business and water treatment company, demonstrations with physical groundwater models, and group problem solving activities. Discussions among the attendees and presenters

were also a valuable part of this training.

Upcoming Events: Three additional VAMWON training workshops will be held in 2009, locations and dates to be announced.

Two of these trainings will be for volunteers and one will be an in-service training for VCE agents.

Please contact the Virginia Household Water Quality Program coordinator, Erin James, for additional information at ejames@vt.edu or 540-231-9058.

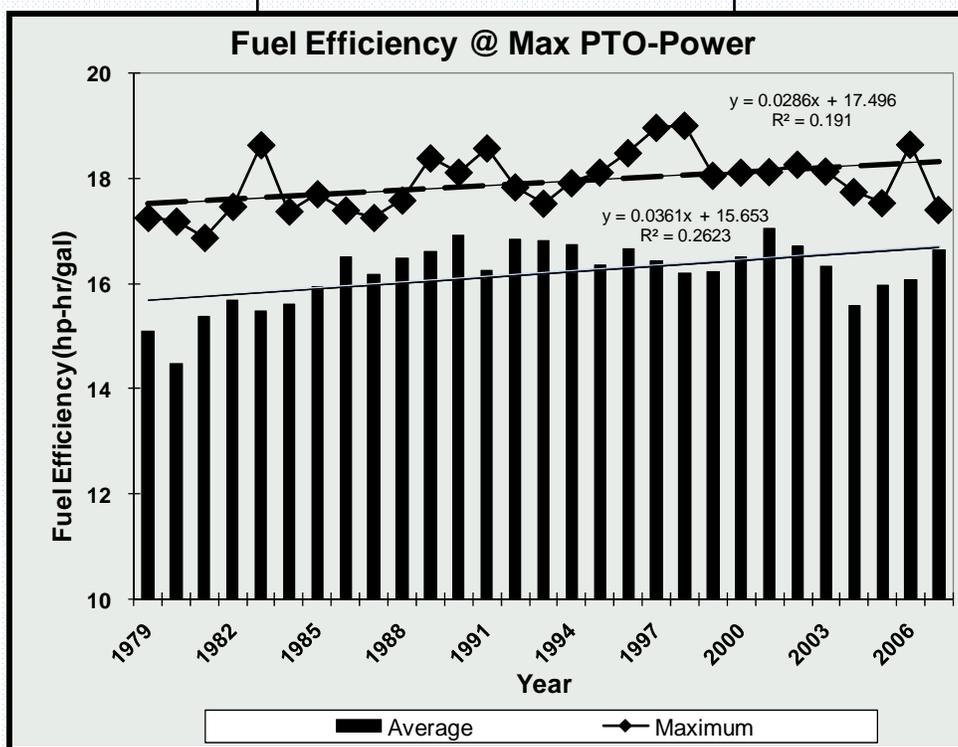
2009 Drinking Water Clinics

County	Clinic Timeframe	Contact
Caroline	Jan-Feb	Mac Saphir
King George	Jan-Feb	Regina Prunty
Dinwiddie	Feb-Mar	Mike Parrish
Prince George	Feb-Mar	Scott Reiter
Albemarle	Mar-Apr	Peter Warren
Fluvanna	Mar-Apr	John Thompson
Greene	Apr-May	Cathy Kloetzli

Current Tractor Models are 10-15% more efficient

Your tractor is likely more efficient than models bought 25 years ago. A comparison of the fuel rankings over the last 25 years bears this out. Bobby Grisso, extension engineer, charted the specific fuel consumption of tractors tested from 1980 to 2007. He found that model tested in 2007 averaged 16 horsepower-hours per gallon compared to an average of 14.5 for models tested in 1980.

"Specific fuel consumption (units of HP-hr/gallon) is a tractor's equivalent of a car's miles-per-gallon (mpg) rating," says Grisso. It refers to the amount of fuel needed to produce power, which is measured in horsepower. These fuel efficiencies are based on maximum power takeoff (PTO) at rated engine speed. Test results also have fuel consumptions at other engine speeds, as well as during full and par-



improvement since 1998 & 2004 (see figure) because of the new emission requirements for off-road vehicles. EPA restrictions have challenged engine designers but the fuel efficiency improvements are coming.

Grisso also notes that all tractors are not equal in fuel consumption and maximum value is the best fuel-efficient tractor for that year. "I'm not suggesting that a producer can justify a purchase of a new tractor based on fuel savings, however, fuel consumption should be an ongoing investigation for potential impacts," says Grisso. Review of fuel consumption data could be an important value for future tractor purchases.

tial drawbar tests. These measurements provide information about fuel efficiencies during several operating conditions.

The fuel savings could be between 10 to 15 percent or more because of improved engine design and optimal tractor-implement match for a given field condition. The savings are a result of improved engine and transmission designs. Today's tractors have more electronic controls for more efficient delivery of power to the PTO, drawbar (for pulling) and hydraulic lifts and controls.

Grisso points to a slight dip in

For more information about tractor test data for individual tractors contact: Nebraska Tractor Test Lab
PO Box 830832
35th and East Campus Loop
Lincoln, NE 68583-0832
Website: <http://tractortestlab.unl.edu/>

Tips on buying a good used tractor

Used tractors are in high demand for hobby farms. It's a good bet that many good used tractors won't take up a lot of space on dealer's lots because most of them are often spoken for before they're even available. Auctions can be a good place to find a used tractor. Don't expect to purchase the tractors at bargain prices. The cost of a good condition, 10 to 20 year old, tractor has increased in recent months, in some cases as much as 30%.

Used tractors that meet your needs can be a good investment. But finding a good used tractor takes some hard work and involves a number of steps. First, consider the brand name of the tractor. If it is not a well-known brand name tractor be sure to check into the availability of its parts because many of those tractors are made overseas. Second, don't allow the looks of the tractor distract you from acquiring details of the use and care of the tractor. Most tractors will need some type of service after 3,000 hours of use. Third, smoke may indicate engine problems. Consult a mechanic about the color of the smoke related to different engine problems. Next, consult the

book price of the tractor to get a solid starting place for its value. Each individual piece will be different, but don't rely on someone else's opinion about the tractors worth.

Other areas to check are tires, engine noise, oil or fluid leaks around the motor and the condition of the tractor frame. Look for breaks, welds, and areas of rust. Ask to drive the tractor. This gives you an opportunity to listen to the engine sounds, and check for any excessive vibrations. If this is your first tractor purchase and you're not sure what to listen and look for, find someone who does and is willing to go with you on a test drive. While you are driving, try to shift through each gear. If a tractor comes with a loader or other implements, try them to make sure they work properly. While the tractor is moving apply the brakes to see if the differential locks are working and to make sure the tractor isn't jumping out of gear. Pay particular attention to the PTO to ensure the clutch isn't out because repairing the clutch will generally cost more than \$1,000. Finally, check out the hydraulic lifts. They can be difficult to judge, but activat-

ing the remote hose spools while the motor is running will allow you to hear whether or not they lug down the motor, which indicates that the pump is probably working.

Buying equipment on-line can be a benefit because searching the Internet is cheaper and less time consuming. With the cost of fuel, purchasing a tractor that has to be shipped a long way may prove to be more expensive than buying one at a higher price that is closer to your location. Always consider the cost of your time, renting a trailer, hiring help to bring the tractor home, and the possibility of unforeseen costs before you make your final decision.

Other Resources:

<http://edis.ifas.ufl.edu/pdf/files/AE/AE18200.pdf>

<http://extension.usu.edu/files/publications/factsheet/FM-02.pdf>

<http://homestead.org/neilshelton/usedtractor/HowtoBuyaVeryUsedTractor.htm>

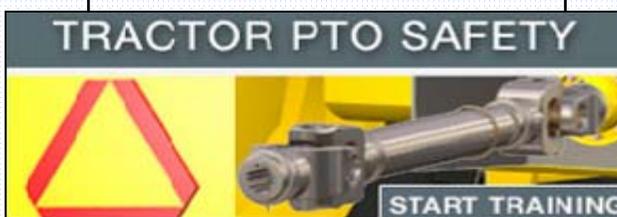
<http://www.extension.iastate.edu/AgDM/crops/pdf/a3-22.pdf>

(Adapted by R. Grisso)

Tractor PTO Safety Training: <http://www.nasdtraining.org/>

PTO Safety Interactive Training Now on NASD

The NASD Safety Training Site has been activated. The first interactive module is on PTO safety.



Plans are underway to work on two more modules in the coming year. One

on the interaction of farm machinery and motorists on public roads and the other possibly on confined spaces.

<http://www.nasdtraining.org/>

Ladder Falls During the Holidays

A trip to the emergency room can put a damper on any holiday, and one of the top reasons people make this trip is because of fall-related injuries. Standing on a chair to get those last minute decorations in place before the relatives arrive. Using a ladder for the first time in a year to hang lights from the eaves. The Centers for Disease Control and Prevention have estimated that between 2000 and 2003 over 17,000 people were treated in emergency departments as a direct result of holiday decorating accidents. Half of all these injuries involved falling from a ladder or a ladder substitute, and these incidents resulted in a significant number of fractures, puncture wounds, or strains.

This is a good time to review and/or

demonstrate the proper way to use ladders. Keep in mind that the ladder itself can present hazards to inexperienced or rushed users, including, splinters (from aging wooden ladders), pinches (watch your fingers), bruises (watch where your going), and strains (from improper lifting).

The American Academy of Orthopedic Surgeons offers some excellent advice: **Do not drink and decorate!**
<http://orthoinfo.aaos.org/topic.cfm?topic=A00367>

Proper Use of Ladders: <http://www.cdc.gov/nasd/docs/d001701-d001800/d001706/d001706.html>

CDC Statistics: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5348a1.htm>

Stacking Hay Bales is a Farm Skill with Do's and Don'ts

One topic farmers won't find are the techniques for stacking hay bales.

The proper method of stacking square hay bales is a skill more likely to be passed down from one farmer to another than read about in a book or an Extension guide sheet. Still, it is a farm skill that has some definite do's and don'ts."

The stacking pattern suggested is similar to Pattern #2 found at <http://www.wikihow.com/Stack-Hay>, with the following changes.

One, the stack would hold together better if the bales were stacked flat (twines up) rather than on edge. The bot-



tom layer could be stacked on edge, if desired, to reduce twine rot from moisture wicking.

Two, build the stack to its full footprint and then build from the corners toward the middle, making sure to keep the corners square and plumb. This gets really important when the stack gets 20 layers high.

Three, for stability, make sure the stack height does not exceed 1.5 times the shortest base dimension. For example, if the stack is 20 feet wide and 40 feet long, the height should not exceed 30 feet.

Once the stack is built, it should be tarped to prevent rainfall spoilage, assuming this is an outside stack.

New home health care emergency preparedness and response resources

New home health care emergency preparedness and response resources are available. Please feel free to distribute widely to others who might be interested in these resources.

Emergency Preparedness

Packet for Home Health Agencies National Association for Home Care & Hospice (NAHC)

http://www.nahc.org/regulatory/EP_Binder.pdf

Preparedness Planning for Home Health Care Providers (DHS)

http://www.dhs.gov/xprepresp/programs/gc_1221055966370.shtm

Disaster Planning Guide for Home Health Care Providers (DHS)
<http://www.dhs.gov/xlibrary/assets/oha-home-health-care-preparedness.pdf>

(Adapted by R. Grisso)

Emergency Preparedness Case Studies

Emergency preparedness and management show great potential as growth areas for Extension programming. This Commentary examines two such programs. In Brown County, Kansas, Extension's decision to get in-

involved in emergency management resulted in significantly increased funding, a renewal of faith by local county government, and a successful response to the 2007 ice storm. In Alaska, the decision to begin teaching emergency response officials and the public how to use Global Positioning System (GPS) receivers re-

sulted in a large new audience in a previously untapped program area outside of 4-H.

For additional information see Journal of Extension at: <http://www.joe.org/joe/2008october/comm1.shtml>

Eliminate One Field Operation

As row crop budgets tighten and producers cover more acres, it's important to evaluate each field operation.

Tillage practices and operations are continually changing over time as equipment changes and new systems are developed. As we have experienced this past year, fuel costs are currently rising and can represent a significant portion of the typical crop production budget. For this reason it is important that producers evaluate each tillage operation they make and determine if the benefits outweigh the costs. By reducing the number of trips through the field, producers can save fuel and labor and reduce machinery costs and wear.

Numerous examples of producers reducing the number of tillage operations can be shared. As mentioned earlier, gross returns to crop production are related to yield. High yields, however, can be obtained with any of several well-managed tillage systems. As producers have changed from conventional to conservation tillage, they've eliminated trips across the field and in many cases with no effect on yield.

The question becomes, "What is the anticipated outcome of shredding stalks?" Is it to improve water distribution in furrow irrigated acres (thus not needed when irrigating with pivots)? Is it to improve planting by reducing the residue in the row? Research

shows that if the planter is properly weighted and down-pressure springs are used to keep the proper planting depth, there is no advantage to removing the residue. Attachments are available for the planter to handle the residue at planting time if need be. Better yet, the combine can be used to process the residue at harvest time and eliminate the need for a shredding operation.

It is important that producers evaluate and analyze each tillage or field operation they make. Reducing operations can add to the producer's bottom line by reducing fuel, labor and machinery costs. When properly managed, yields are maintained and often increased due to the improved timeliness of the remaining operations.

Emergency Response: Flooding Resources

University of Missouri Extension developed a video for FEMA on flood fighting with sandbags. MU Extension has placed this

video online for your use or you could order some if you wanted to distribute - no copyright issues.

Direct access to the website is list below.

The overview site is <http://extension.missouri.edu/cemp/flood.html>

Video of sandbags to fight Floods:

mms://etcs.ext.missouri.edu/2008_11_12_sandbags.wmv

Hybrid Cars Too Quiet?

I thought that any *quiet* technology was a good thing -- such as the new breed of electric and hybrid cars that are whisper-quiet. However, there is new information that these cars are dangerous to pedestrians, since people don't hear them coming. Quiet cars can be especially dangerous to bicyclists who depend very much on hearing vehicles .

This is an example of an "unintended consequence" from the development of new technologies. One article mentions researching various sounds that could be added to make these vehicles noisier (please don't use the obnoxious beeping

sound of the electric cars in the Atlanta airport!). At least one manufacturer is already looking into synthesizing an engine sound for electric cars -- ironically, their approach uses active noise cancellation, like some people wear on airplanes, to *produce* noise. There is also a bill before Congress that would direct the Department of Transportation to establish safety standards for very quiet vehicles.

Below are a couple of articles that discuss this new "hazard."

Adopted from December Safety News & Notes by Carol J. Lehtola

Hybrid Cars Too Quiet for Pedestrian Safety? Add Engine Noise, Say Researchers (found at: <http://www.sciencedaily.com/releases/2008/11/081117091633.htm>)

That Blissfully Quiet Electric Car Might Just Kill You (found at: <http://blog.wired.com/cars/2008/04/that-blissfully.html> site also has a video)

Handling of Animals-Contingency Plans

USDA Animal and Plant Health Inspection Service
Proposed rule: Handling of Animals-Contingency Plans

APHIS is proposing to amend the Animal Welfare Act regulations to

add requirements for contingency planning and training of personnel by research facilities and by dealers, exhibitors, intermediate handlers, and carriers to better prepare for potential disasters. Comments must be

received by December 22, 2008.

Review instructions and guidelines at: <http://edocket.access.gpo.gov/2008/E8-25289.htm>

Farm Shop Safety

Service and maintenance tasks can often lead to serious injury. The farm shop and the field are the primary locations where repair operations are completed. Make sure your farm shop is part of a farm safety solution, not a problem.

Organize your workshop so that everything has a designated place. Make sure items are secure so they will not fall on anyone. Clean walkways to reduce trips and falls.

When working on agricultural equipment, make sure that the equipment is turned off, all rotating parts have stopped moving, and safety locks are put in place.

Keep all guards and shields in

place on power equipment.

Use hand tools only for their intended purpose.

Equip your shop with Ground Fault Circuit Interrupters to help prevent electrical shock.

Make sure your shop is well lit. If the shop is heated, ensure it is properly vented and that flammable liquids are kept out of the shop area.

Wear personal protective equipment (PPE) when performing repair jobs. Standard PPE for a farm shop should include leather gloves, chemical-resistant gloves, safety glasses, face shields, earplugs or muffs, steel-toed boots, respirators, hard hats, protective aprons and welding

shields.

Inspection

1. Are electrical cords undamaged?
2. Is an appropriate fire extinguisher present and operable?
3. Is a fully supplied first aid kit available?
4. Are guards and shields in place?
5. Are walkways clear of debris?
6. Are chemicals stored in a locked cabinet?

Information supplied by the National Safety Council's Agricultural Division. For more information visit the National Safety Council website: www.nsc.org

(Adapted by R. Grisso)

Tips: Snow Shoveling Safety

Blue Cross Blue Shield recommend that people keep heart health in mind and "take it easy" when clearing driveways and sidewalks. Here are some facts about shoveling:

- ✓ Snow shoveling is hard work. The good news is that shoveling snow for 15 minutes qualifies as a moderate physical daily activity recommended by the U.S. Surgeon General. The bad news is that for many sedentary, out-of-shape Americans, shoveling heavy, wet snow for 10 minutes is equivalent to running on a treadmill until exhausted.
- ✓ The cold temperatures don't help, raising blood pressure in people who don't normally have a blood pressure problem and posing an even greater risk to people with high blood pressure.
- ✓ Several easy steps can prevent illness and injuries while shoveling snow in winter. First, anyone who has one of the following conditions should probably not shovel snow without his or her physician's permission. The list of conditions includes:
 - ✓ A personal or family history of heart disease or asthma
 - ✓ Already sustained a heart attack
 - ✓ A history of back problems

- ✓ High blood pressure
- ✓ High cholesterol level
- ✓ A history of smoking
- ✓ A history of inactivity

For healthy, active individuals, suggest the following guidelines:

- ✓ Use the right shovel. Shovels with S-shaped handles and non-stick blade surfaces will usually require less effort and minimal bending to move snow. Or, consider pulling the snow out of the way, which requires less exertion.
- ✓ Avoid stimulants (for example, caffeine and nicotine) that can raise your heart rate and restrict blood vessels. Avoid shoveling immediately after having eaten a large meal.
- ✓ Warm up and stretch muscles before shoveling, especially in the morning. Muscles are less susceptible to injury during physical activity after a warm-up.
- ✓ Drink plenty of fluids before and during shoveling to avoid dehydration, but not coffee (see above). Breathing cold air dehydrates the body.
- ✓ Dress in layers. Wear a scarf or mask and/or goggles. Inhaling cold air may constrict arteries, decreasing your heart's oxygen supply.
- ✓ Start slowly to avoid a sudden load on the heart. An average snow shovelful of heavy, wet snow weighs up to 16 pounds.

That means for every 10 minutes of typical shoveling, you'll be clearing up to 2,000 pounds of white stuff. To lift snow, bend from the knees. Remove heavy snow in two stages. First, skim off the top layer, and then remove the bottom. If snow is too heavy to lift, push it out of the way. Take frequent breaks as needed.

- ✓ Immediately stop if you feel pain or discomfort. No one knows your body as well as you do.
- ✓ If you have a lot to shovel, consider hiring a removal service.

If using a snow blower, follow safety precautions:

- ✓ Never attempt to clear a clogged or stuck blade or auger before shutting off the power, and avoid wearing objects that can easily get caught in the blade, such as a long scarf.
- ✓ Before starting, be sure children and others stand clear to avoid being injured by hidden objects thrown into the air.
- ✓ Even using a snow blower will elevate heart rates, so consult your doctor if you have a history of heart problems.

(Adapted by R. Grisso)

New BSE, VCE Publications

Algal Biofuel Production

Algal Biodiesel Production, an extension publication, was developed by Zhiyou Wen and Michael Johnson. The publication is in response to the increasing interests across the nation in using microalgae for biodiesel production.

Currently, biodiesel is made from a variety of feedstocks including pure vegetable oils, waste cooking oils, and animal fat; however, the limited supplies of these feedstocks impedes the further expansion of biodiesel production. Microalgae have long been recognized as a potentially good source for biofuel production because of their high oil content and rapid biomass production.

In recent years, microalgae as an alternative biodiesel feedstock have gained renewed interest from researchers, entrepreneurs, and the general public. The objective of this publication is to introduce the basics of algal biofuel production and the current status of this emerging biodiesel source.

The publication uses layman's language to describe many aspects related to this area.

It starts with the pros and cons of current feedstock for biodiesel production.

The background of algae is thoroughly covered, while clarifying the terms: "microalgae" vs. "macroalgae."

Other topics include: microalgae used as a biofuel source, other usages of algae, the synergism between CO₂ emission and algal culture, and mass cultivation systems (open ponds and closed photobioreactors) for microalgae.

Recent research and development of algal biofuel production and the economics of algal biofuel production are also described. Finally, an outlook of the future for algal biofuel production is discussed.

Investing in GPS Guidance Systems?

VCE Publication 448-076, was posted on October, 2008. Gordon Groover and Robert Grisso authored a factsheet to help farmers access technology investments.

The price of GPS guidance system technology continues to decline as its capabilities

increase. Many farmers question if or when they should invest in this technology. The major advantage of using GPS is input savings from more precise field application of seed, fertilizers, chemicals, fuel, and labor, as well as increased benefits to the farm production process (extended working time, reduced fatigue, etc.).

The process of evaluating an investment in any new technology is straightforward and centers on comparing annual costs to annual benefits. If the benefits are greater than the costs, then it's time to invest in the new technology. Some benefits and costs are easily measured, while others must be evaluated by the business managers based on their own experiences. The purpose of this publication is to provide an example of the procedures a farmer could use to determine if GPS guidance system technology is a wise investment. It is structured around understanding: 1) how to determine costs, 2) how to measure savings and benefits, 3) how to annualize costs and savings, 4) what the results mean to a farm business, and 5) sensitivity analysis.

Manure Management: Announcement

The Livestock and Poultry Environmental Learning Center of eXtension will have its last educational webcast for this year on December 19, 2008 at 2:30 pm EST. The webcast meeting room opens 15 minutes before the start time at the following website: http://www.extension.org/pages/Live_Webcast_Information

The webcast will discuss the "Manure Management Planner (MMP) Software". The MMP currently supports 34 states (AL, AR, CA, CO, DE, FL, GA, IN, IL, IA, KS, MA, KY, MD, MI, MN, MO, MS, MT, NE, ND, NJ, NM, OH, OK, OR, PA, RI, SD, TN, UT, VT, WA and WI). Virginia is not one of these states and it would be good to hear from you if we

should make a request for VA to be included.

The MMP is a windows based computer program that helps create manure management plans for crop and animal feeding operations. The user enters information about the operation's fields, crops, storage, animals, and application equipment. MMP helps the user allocate manure (where, when and how much) on a monthly basis for the length of the plan (1-10 years). This allocation process helps determine if the current operation has sufficient crop acreage, seasonal land availability, manure storage capacity, and application equipment to manage the manure produced in an environmentally responsible man-

ner. MMP is also useful for identifying changes that may be needed for a non-sustainable operation to become sustainable, and determine what changes may be needed to keep an operation sustainable if the operation expands. The MMP automatically generates fertilizer recommendations and estimates manure N availability based on each state's Extension and/or NRCS guidelines. For more details on MMP go to <http://www.agry.purdue.edu/mmp>

Upcoming webcasts from the LPELC can be found at: http://www.extension.org/pages/Upcoming_Webcasts

(Contact: Jactone Arogo Ogejo)

Q&A: What about Long-Term Storage of Gasoline?

A question was directed about issues with the cheaper gasoline prices that may induce producers to buy a large quantity and store until needed. Does 10-20% ethanol change the picture?

My response: - It would not matter if the gasoline has or does not have ethanol, I would probably invest in some fuel stabilizer if I bought gasoline

for long-term storage. Please make sure those that plan on more than a year to ask more questions and monitor their investment.

Ethanol blends well with gasoline, but it also is completely mixable in water. Because it mixes easier with water than gasoline, the ethanol will be drawn from the gasoline into the water at the bottom,

separating from the gasoline. Two layers of product will exist, a layer of gasoline on top and an ethanol layer on the bottom. This is a problem for most vehicles. This can be an issue especially with marine & boat storage.

Helpful resources: <http://www.oregon.gov/ENERGY/RENEW/Biomass/docs/EthanolHandlingGuide.pdf>

Estimating Appliance and Home Electronic Energy Use

If you're trying to decide whether to invest in a more energy-efficient appliance or you'd like to determine your electricity loads, you may want to estimate appliance energy consumption.

ESTIMATING ENERGY CONSUMPTION

Use this formula to estimate an appliance's energy:

$(\text{Wattage} \times \text{Hours Used Per Day} \div 1000 = \text{Daily Kilowatt-hour (kWh) consumption})$

$(1 \text{ kilowatt (kW)} = 1,000 \text{ Watts})$

Multiply this by the number of days the appliance is used during the year for the annual consumption. Calculate the annual cost to run an appliance by multiplying the kWh per year by the local utility's rate per kWh consumed.

Note: To estimate the number of hours that a refrigerator actually operates at its maximum wattage, divide the total time the refrigerator is plugged in by three. Refrigerators, although turned "on" all the time, actually cycle on and off as needed to maintain interior temperatures.

Examples:

Window fan:

$(200 \text{ Watts} \times 4 \text{ hours/day} \times 120 \text{ days/year}) \div 1000$
 $= 96 \text{ kWh} \times 8.5 \text{ cents/kWh}$
 $= \$8.16/\text{year}$

Personal Computer and Monitor:

$(120 + 150 \text{ Watts} \times 4 \text{ hours/day} \times 365 \text{ days/year}) \div 1000$

$= 394 \text{ kWh} \times 8.5 \text{ cents/kWh}$
 $= \$33.51/\text{year}$

WATTAGE

Locate the wattage of most appliances stamped on the bottom or back of the appliance, or on its nameplate. The wattage listed is the maximum power drawn by the appliance. Since many appliances have a range of settings (for example, the volume on a radio), the actual amount of power consumed depends on the setting used at any one time.

If the wattage is not listed on the appliance, you can still estimate it by finding the current draw (in amperes) and multiplying that by the voltage used by the appliance. Most appliances in the United States use 120 volts. Larger appliances, such as clothes dryers and electric cook tops, use 240 volts.

The amperes might be stamped on the unit in place of the wattage. If not, find a clamp-on ammeter—an electrician's tool that clamps around one of the two wires on the appliance—to measure the current flowing through it. You can obtain this type of ammeter in stores that sell electrical and electronic equipment. Take a reading while the device is running; this is the actual amount of current being used at that instant.

When measuring the current drawn by a motor, note that the meter will show about three times more current in the first second that the motor starts than when it is running smoothly.

(Continued on page 14)

Estimating Energy Use (cont.)

(Continued from page 13)

Many appliances continue to draw a small amount of power when they are switched "off." These "phantom loads" occur in most appliances that use electricity, such as VCRs, televisions, stereos, computers, and kitchen appliances. Most phantom loads will increase the appliance's energy consumption a few watt-hours. These loads can be avoided by unplugging the appliance or using a power strip and using the switch on the power strip to cut all power to the appliance.

TYPICAL WATTAGES OF VARIOUS APPLIANCES

Here are some examples of the range of nameplate wattages for various household appliances:

- Aquarium = 50-1210 Watts
- Clock radio = 10
- Coffee maker = 900-1200
- Clothes washer = 350-500
- Clothes dryer = 1800-5000
- Dishwasher = 1200-2400 (using the drying feature greatly increases energy consumption)
- Dehumidifier = 785
- Electric blanket- *Single/Double* = 60/100
- Fans
 - Ceiling = 65-175
 - Window = 55-250
 - Furnace = 750
 - Whole house = 240-750
- Hair dryer = 1200-1875
- Heater (*portable*) = 750-1500
- Clothes iron = 1000-1800
- Microwave oven = 750-1100
- Personal computer

- ◇ CPU - awake / asleep = 120/30 or less
- ◇ Monitor - awake/asleep = 150/30 or less
- ◇ Laptop = 50
- Radio (*stereo*) = 70-400
- Refrigerator (*frost-free, 16 cubic feet*) = 725
- Televisions (*color*)
 - ◇ 19" = 65-110
 - ◇ 27" = 113
 - ◇ 36" = 133
 - ◇ 53"-61" Projection = 170
 - ◇ Flat screen = 120
- Toaster = 800-1400
- Toaster oven = 1225
- VCR/DVD = 17-21 / 20-25
- Vacuum cleaner = 1000-1440
- Water heater (*40 gallon*) = 4500-5500
- Water pump (*deep well*) = 250-1100
- Water bed (*with heater, no cover*) = 120-380

Resources:

http://apps1.eere.energy.gov/consumer/your_home/appliances/index.cfm/mytopic=10020

<http://standby.lbl.gov/>

<http://www.energystar.gov/>

http://www.consumerenergycenter.org/home/appliances/small_appl.html

(Adapted by R. Grisso)

Visit our website:
<http://www.bse.vt.edu>

