University of Minnesota Extension Service
UW Extension
Minnesota/Wisconsin
Engineering Notes
Jointly published by
Department of Biosystems and Agricultural Engineering, University of Minnesota
Department of Biological Systems Engineering, University of Wisconsin–Madison
November 2001

Livestock Systems

Low Cost Parlors For Wisconsin and Minnesota Dairy Producers

David W. Kammel, Wisconsin Extension Engineer

The transition from the tie-stall barn milking system to a free stall housing and parlor milking system has been occurring on Minnesota and Wisconsin farms for several years. However, the adoption of milking parlors on smaller family dairy farms has been slow due to the large costs involved with building a traditional parlor and freestall setup.

Many family dairy farms want to maintain a herd size that allows them to avoid hiring extra farm labor. To accomplish this, the existing milking facilities need to be modernized. However, the cost of a new parlor, freestall barn, and a manure handling system is usually cost prohibitive when trying to spread the investment over 60-175 cows.

At this point, producers reach a crossroads and must decide which direction they want their operation to take. Their options usually include: remodeling the present barn; moving the cattle out of the traditional barn and into a new freestall barn and parlor at a new location; getting out of dairying; or, building a new freestall barn and a retrofit parlor inside their present stall barn. Many have found the last option to be the most attractive in meeting their future goals.

Advantages of Retrofitting Parlors In Barns

- Cost savings of 25-50% over new conventional parlors with a separate building.
- Savings can be put into building a new freestall facility to improve cow comfort.
- Provides an alternative use for empty dairy barns that remain on the property tax rolls.
- Allows for phasing in milking facility upgrades over time, reducing stress and interest costs.
- A safer and more comfortable environment for the milker.
- Doubles the number of cows milked per person per hour as compared to tie stall milking systems.

The Dairy Modernization Team would like to provide information on low cost parlors to the over 10,000 dairy farms in Wisconsin and Minnesota that could benefit from their use. Many dairy producers have already demonstrated that retrofit parlors can be an attractive option in modernizing their milking facility. In some cases, the retrofit parlor serves as a temporary milking facility and in many others it is built to serve as the long-term milking facility.

Dairy producers have found significant cost advantages in building retrofit parlors in an existing stall barn. Cost savings of up to 25-50% have been realized when using the present milking system and the building shell that already exits in the stall barn. The center driveway in a stall barn works well for a holding area and other parts of the barn can be used for housing extra cows, maternity pens, or a special needs area work area.

In This Issue

Low Cost Parlors For Wisconsin and Minnesota Dairy Producers 1
Siting Animal Production Operations 2
Sizing Silage Piles 3
New Agricultural and Alternative Energy Web Page 3
Use Winter to Make Your Farm Safer 4
Increasing pH by Low Level Aeration to Remove Soluble Phosphorus in Liquid Swine Manure 4
Farmland Tile Drainage Design Workshop 5
New Agricultural Drainage Publications Available 5
Two New Farm Business Management Publications Available .. 6
New University of Minnesota Department Head 6
Resources 7
Calendar of Events 8

Dairy producers have saved in excess of $40,000 by using their old stall barn as their milking center. These cost savings can make a nice down payment for a new freestall barn. The benefits of improved milk production and cow comfort are well documented when moving cows to a new freestall barn.

Many producers also like the idea of being able to keep their debt load down and make improvements to their milking facilities over a period of time instead of trying to pay for the facility improvements all at one time.

The UW-Extension Dairy Modernization Team has prepared a fact sheet and a new CD-ROM on low cost parlors to help demonstrate the application of retrofit parlors on Wisconsin and Minnesota family dairy farms. For ordering information see *Resources* on page 7.

Siting Animal Production Operations

Larry D. Jacobson, Minnesota Extension Engineer
David R. Schmidt, Minnesota Extension Engineer

Establishing sites for new and expanded animal production facilities in Minnesota, Wisconsin, and other parts of the Upper Midwest has become increasingly difficult due to the air quality concerns of residents living near these operations. Such concerns often include the effects of nuisance odors on quality of life and the effects of odors and manure gases on both human health and the environment. "Site Selection of Animal Operations using Air Quality Criteria," a white paper that primarily addresses the development of setback distances with regard to nuisance odor issues, has recently been prepared for the National Center for Manure and Animal Waste Management (see *Resources* on page 7 for their web site address). Some general discussion on human health issues related to emissions from animal production sites is also included. Environmental concerns such as water quality impacts and recreational land use issues stemming from livestock and poultry facility emissions are only mentioned.

The predominant approach to address the release of agricultural air emissions is the use of setback distances between animal production sites and neighboring residences and businesses. Determination of setback distances is difficult and usually involves compromises—large setback distances restrict the development of new or the expansion of existing animal production sites and small setback distances are insufficient to mitigate the frequency and severity of nuisance odor events. But, the determination of appropriate setback distances is imperative to the viability of the livestock production industry. However, many setback distances are determined on the basis of anecdotal and subjective information rather than objective and scientific relationships.

The airborne emissions from animal production sites that should be considered when determining setback distances include odor, gases, dust, insects, and microorganisms. The quantity and proportions of these emitted materials are primarily a function of animal species, facility design, and management. Odors from animal production sites are probably the most important factor to consider when determining setback or buffer distances from neighbors and communities. Other airborne emissions may have a greater environmental impact, but odor is typically used as an indicator for these other pollutants, and *everyone* has a sensor for odor.

The establishment or determination of setback distances from animal production facilities can be accomplished using a guideline approach or by the use of dispersion models. Guidelines are used to determine setback distances based on criteria such as zoning or land use or empirical formulas based on animal units, animal housing system, physical size of operation, or similar parameters. The dispersion model method is a more robust tool that takes as inputs specific airborne emissions, such as odor, ammonia, or pathogens, from the animal production site as well as weather conditions, then estimates a concentration of the pollutant (odor, ammonia, etc.) downstream, which can be used to establish a setback distance.

In Minnesota, the OFFSET method is a step by step process that systematically uses empirical field odor emissions as well as weather data for the state to predict the setback distance required for several odor annoyance free frequencies levels. The first step is to identify all of the odor sources at an animal production site. The next step is to select the odor emission number on a per square foot basis for buildings or manure storage units from tabulated values. Finally, determine the total surface area of the barns and/or storage units, credit any odor control technology, and then calculate the total odor emission factors for each source.

A new extension publication that describes OFFSET in more detail, *OFFSET-Odor From Feedlots Setback Estimation Tool* (FO-07680-C), is available from the University of Minnesota Extension Service. The Biosystems and Agricultural Engineering Department has also created an online OFFSET calculator that will calculate the Total Odor Emission Factor (TOEF) and determine the setback distance at the various odor annoyance frequencies for up to five odor sources using the concepts found in the publication. For information on both, see *Resources* on page 7.

Crop Management

Sizing Silage Piles

Brian J. Holmes, Wisconsin Extension Engineer

Silage piles are a way to store silage with low initial investment. With good management, dry matter losses in storage and feedout can be kept in the range of 15-25%. Practices recommended for bunker silos* apply to silage piles as well. To obtain good forage density and avoid tractor rollovers when packing the pile, the side slopes should not be too steep. A slope of 3 ft horizontal to 1 ft vertical should be satisfactory. A face removal rate of at least 6 in/day will keep feedout losses to a reasonable level. A 12 in/day removal rate is better.

Following are the steps required to size a silage pile.

Step 1: **Determine daily dry matter need**. In this example, assume the forage is hay silage and 250 animals will consume 12 lbs dry matter (DM) per animal per day. The daily consumption becomes:

250 animals x 12 lbs DM/animal-day = 3000 lbs DM/day

Step 2: **Determine volume removed each day**. If forage is packed well, the density will be greater than 14 lbs DM/ft^3. In our example, let's assume a density of 14.5 lbs DM/ft^3. The volume removed then becomes:

3000 lbs DM/day / 14.5 lbs DM/ft^3 = 206.9 ft^3/day

Step 3: **Determine the area of the pile cross-section**. Select a face removal rate during feedout. In this example, use a 1-ft removal rate. Then the cross-section becomes:

206.9 ft^3/day / 1 ft/day = 206.9 ft^2

Step 4: **Determine the average pile width**. Assume a pile depth. In this example, assume the pile will be built to a depth of 6 ft. Next, assume a forage loss rate; in this case, let's use 20%. The forage loss adjustment factor then becomes 1 + 20/100 = 1.2. The average pile width is then:

206.9 ft^2 x 1.2/6 ft = 41.4 ft ˜ 41 ft

Step 5: **Determine pile bottom width**. To the average width, add the depth times the sidewall slope. In our example, assume a slope of 3:1. The bottom width becomes:

41 ft + (6 ft x 3) = 59 ft

Step 6: **Determine pile top width**. To the average width, subtract the depth times the sidewall slope. The top width becomes:

41 ft - (6 ft x 3) = 23 ft

Step 7: **Determine the pile average length**. Assume a feeding period during which the pile will be used. In our case, let's use 200 days. The average length then becomes:

200 days x 1 ft/day = 200 ft

Step 8: **Determine the pile bottom length**. To the average length, add the depth times the end wall slope. In our example, assume a slope of 2:1. The bottom length becomes:

200 ft + (6 ft x 2) = 212 ft

The pile bottom dimensions in our example are 59 ft x 212 ft.

Step 9: **Determine the pile top length**. To the average length, subtract the depth times the end wall slope. The top length becomes:

200 ft - (6 ft x 2) = 188 ft

Step 10: The quantity of feed placed into the pile is:

3000 lbs DM/day x 1.2 x 200 days/(2000 lbs/T) = 360 T DM

Step 11: The quantity of feed fed from the pile is:

3000 lbs DM/day x 200 days/(2000 lbs/T) = 300 T DM

Ken Barnett, the Marathon County (WI) Extension Agent, has developed a spreadsheet to automate the process of sizing a silage pile. This spreadsheet is available on the Team Forage web site:

http://www.uwex.edu/ces/crops/uwforage/storage.htm

To assure access to a silage pile in all weather, a good base is required. This can be provided by concrete, asphalt, or Macadam/geotextile. *Farm and Home Concrete Handbook* (MWPS-35) contains design information for concrete slabs, and *Using All-Weather Geotextile Lanes and Pads* (AED-45) has design information for Macadam/geotextile surfaces. For ordering information on both of these MidWest Plan Service publications, see *Resources* on page 7.

**Managing and Designing Bunker and Trench Silos* (AED-43), MidWest Plan Service, Ames, IA.

Alternative Energy

New Agricultural and Alternative Energy Web Page

Bill Wilcke, Minnesota Extension Engineer
David Schmidt, Minnesota Assistant Extension Engineer

The University of Minnesota Biosystems and Agricultural Engineering Department has added a new page to its web site in response to the growing interest in alternative sources of energy and especially in agriculturally based energy sources. We will be posting short articles and handouts and links to other web sites on specific energy topics. The energy web page is located at http://www.bae.umn.edu/extens/energy/

If you have suggestions for articles or web sites to add to our energy page, feel free to contact either Bill Wilcke (wilck001@umn.edu) or David Schmidt (schmi071@umn.edu).

Safety and Health

Use Winter to Make Your Farm Safer

Mark Purschwitz, Wisconsin Farm Safety and Health Specialist

Once the stress of fall harvest is out of the way, you can use the time wisely to make your farm safer for you and your family, as well as for your employees. Now is the time to get started, because once the spring rush starts, it will be more difficult to do what is needed.

One of the first things to do is to be sure all safety devices are in operating condition on machinery you put away for the winter, while harvest activities are still fresh in your mind. Find and fix any safety-related problems you may have noticed but did not take time to repair, such as a missing or broken shield, burned-out light bulb, troublesome switch, or faded SMV emblem. Do the same for other equipment which you might use this winter or next spring. Next year you may be in a hurry and not take the time to fix them.

In addition, take care of any safety-related field problems, such as a hidden hole or washout. By next spring they may have slipped your mind again.

A key task is to conduct an all-farm inspection. Inspecting machinery for safety problems is crucial, but you need to take a slow and observant walk around the entire farmstead. Make a deliberate effort to look at buildings and other structures. Check such things as wiring; the condition of steps, walkways, and ladders; gates and fences; and anything else that could cause an injury to you or someone else. Hazardous areas such as chemical storage buildings or manure storages should have warning signs as well as barriers to keep children and unauthorized people out. General housekeeping is important to prevent slips and falls, and sets the overall tone for a safe and orderly operation. Contact your county Extension office for Extension publications on conducting farm safety inspections.

Think about emergency needs such as fire extinguishers or emergency phone numbers, and whether they are located for easy and rapid use. Everyone who lives or works on the farm should be instructed on where to call for help. Someone on the farm should be trained in basic first aid.

Training of family members and employees can be conducted in the winter as well. You can obtain and read Extension safety publications, and many county Extension offices have or can obtain safety videos that you can borrow. Children can be involved in a family discussion of farm hazards and safe practices.

There are many things you can do during winter to make your farm safer. Don't wait until spring, when time is at a premium and everyone is in a hurry. Your safety, as well as that of your family and employees, is too important.

Manure Management

Increasing pH by Low Level Aeration to Remove Soluble Phosphorus in Liquid Swine Manure

Jun Zhu, Minnesota Extension Engineer

The use of advanced techniques such as chemical precipitation and biological processes to remove phosphorus (P) from wastewater is not a new topic. A great deal of work has been done to study P removal techniques to treat municipal and industrial wastewater. But, the techniques used are complex and costly, and thus may not be suitable for swine producers. In recent years, researchers have attempted to modify treatment techniques in an attempt to fit into a farm-scale waste management plan. However, limited success has been reported because the modified techniques are still expensive and require high maintenance.

These modified treatment techniques were developed to produce effluent with low soluble P concentration so the water can be used as drinking water for animals without causing health problems. However, under most circumstances, the treated liquid will be applied to cropland as fertilizer or soil amendment. The criterion for producing livestock drinking water is stringent and entails significant capital and operational expenses. As long as the soluble P concentration in the receiving land can be balanced to avoid significant runoff, less expensive, low-level treatment may suffice to reduce the excess soluble P in swine manure before discharge. To date, little information is available to develop economically viable methods to remove soluble P from swine manure that are specially tailored to the needs and financial capabilities of swine producers.

The mechanism behind the removal of soluble P is pH dependent. As pH increases from 7 to 12, these compounds become more stable and will not be hydrolyzed to release P into the solution. Therefore, chemical compounds such as $Ca(OH)_2$ and $Fe_2(SO_4)_3$ are often added in industrial wastewater treatment facilities to form phosphate precipitates such as $Ca_5(PO_4)_3OH$, and $FePO_4$. This reduces the P concentrations in the treated waste. However, when this process is used for treating swine manure, it is expensive and may cause secondary environmental pollution by raising the concentrations of chlorides and sulfates in the soil that receives the treated sludge. Since swine manure already contains a certain amount of Ca and Fe, under appropriate pH conditions, these chemicals may react with soluble P to form insoluble compounds. So, removal of P by using existing Ca and Fe in the manure without additional chemicals is of economic and environmental interest and deserves further research.

Raising manure pH can be achieved chemically, but can also be done by aerating a manure slurry. In settled slurry, ammonia in solution is neutralized by dissolved CO_2 to form ammonium bicarbonate that keeps the pH about neutral. Passing an aerating gas mixture through the slurry purges CO_2 out of solution and causes pH to rise. Based on a laboratory-scale experiment conducted at the University of Minnesota Southern Research and Outreach Center at Waseca, we found that the manure pH can be raised by low-level aeration at an aeration rate of 0.016 ft^3/ft^3 manure/minute. For both intermittent (on and off every two hours) and continuous aeration treatments, the manure pH increased by about 1 unit (from 6.5 to 7.5) within the first day of operation. This increase in pH was accompanied by a 75% reduction in soluble P concentration in the liquid manure. In this study, we also found that continuous aeration did not show an advantage over intermittent aeration in removing soluble P. So, using intermittent aeration can reduce energy consumption by 50%, as compared to continuous aeration.

The information obtained from this study has indicated that it is possible to effectively reduce soluble P concentration in liquid swine manure at a potentially reduced cost. With this information, further research can be directed to the development of a simple aeration system that can be applied to the current manure storage to provide minimum aeration for a short period of time for P removal. The liquid portion of the treated manure that contains low soluble P can then be spread immediately after the treatment, while the solid portion can be processed separately. In this way, the environmental concerns about P pollution due to swine production might be significantly reduced.

Water Management

Farmland Tile Drainage Design Workshop

Jerry Wright, Minnesota Extension Engineer

Two workshops on farmland soil water management and tile drainage design are being planned for Minnesota during the winter of 2002. The first workshop will be held March 4-6, 2002 at the Southwest State University campus in Marshall, Minnesota. The Marshall workshop will last three days. The second, a two-day workshop, will be held in the Red River Valley region, the date and location yet to be determined.

Each workshop will cover basic subsurface tile drainage design (planning, tile sizing, lateral spacing, Minnesota Drainage Guide), economics, environmental concerns, a hands-on workup of a tile drainage design, and tile drainage experiences from a contractor and farmer. The third day at the Marshall workshop will include concurrent sessions on various topics such as University of Minnesota tile drainage research activities, land alternatives to tiling, and climate changes.

There will be opportunities for discussion which will provide useful information for farmers, landowners, tile drainage contractors, crop consultants, soil water technicians, decision-makers, and others.

The workshops will be co-sponsored by the University of Minnesota Extension Service, South Dakota Extension Service, North Dakota Extension Service, Minnesota West Community & Technical College-Canby, and Southwest State University in partnership with the Minnesota Land Improvement Contractors Association.

Pre-registration is required. Contact Jean Spohr at spohrjm@mrs.umn.edu or 320-589-1711, or Jerry Wright at jwright@umn.edu to receive a program brochure.

Publications

New Agricultural Drainage Publications Available

Gary R. Sands, Minnesota Extension Engineer
Jerry Wright, Minnesota Extension Engineer

Two new University of Minnesota Extension Service publications address planning, design and performance of tile drainage. These publications are the first of an upcoming series on agricultural drainage.

Agricultural Drainage: Planning an Agricultural Subsurface Drainage System (BU-07685-GO)

Topics include economics, system capacity and drainage coefficient, topography and system layout, drain depth and spacing, drain sizing, use of drain envelopes, environmental impacts, surface inlets and installation quality. There are also general rules of thumb, recommendations, design tables and references to resources and agencies for more detailed information. This publication was designed for farmers, engineers, public agencies, crop consultants, Extension educators, and water quality professionals across the Midwest region. The authors of this publication are University of Minnesota Extension Engineers Jerry Wright and Gary Sands.

Agricultural Drainage: Soil Water Concepts (BU-07644-GO)

This is an 8-page, heavily illustrated publication presenting concepts that are fundamental to understanding how subsurface drainage affects soil water and the water balance. It explains–with practical examples–the components of the water balance in the crop/soil system and their relationship to drainage. It also has answers to common questions about drainage, soil water, and hydrology to help guide policy makers as they address broad issues related to agricultural drainage. This publication was designed for agriculturists, engineers, soil scientists, local and state policymakers, Extension educators, and water quality professionals. The author of this publication is Gary Sands.

For information about obtaining these publication, see *Resources* on page 7.

Two New Farm Business Management Publications Available

Purchasing and Leasing Farm Equipment, NCR-615

After land costs, the cost of acquiring farm machinery services is the largest single production expense for many crop farms. The new publication *Purchasing and Leasing Farm Equipment*, NCR-615, explains the variety of choices that crop farmers face when determining how to obtain farm machinery services. The publication explains the typical plans that financial institutions and equipment manufacturers offer for financing the purchase of farm equipment. It also discusses rental and lease agreements, including explanations of lease terms, lease contracts, and the leasing process.

One section discusses tax and financial considerations; another compares the advantages of purchasing and leasing and presents a plan for comparing financing plans. The final section of the 10-page brochure presents a detailed example comparing a lease contract and a loan/purchase agreement.

The authors of *Purchasing and Leasing Farm Equipment* are Raymond Massey, University of Missouri; and William Edwards, Iowa State University. *Purchasing and Leasing Farm Equipment*, NCR-615, costs $4.00 per single copy, plus state sales tax.

Acquiring and Managing Resources for the Farm Business, NCR-610D

The new publication *Acquiring and Managing Resources for the Farm Business*, NCR-610D, is the fourth in a proposed six-part series written for, and dedicated to, farm operators and managers in the U.S. With its focus on the acquisition and management of resources, the publication addresses one of today's most challenging aspects of farm management.

The first two chapters of the book explain how to acquire farm real estate. Chapter 1 focuses on renting farmland and facilities. Issues discussed include selecting the type of lease arrangement, developing economically fair leases and sound written lease arrangements, and keeping appropriate records. Chapter 2 deals with the purchase of farm real estate, including the analysis of possible purchases and financing such purchases via a mortgage or contract for deed arrangement.

Chapter 3 discusses management of the machinery system. Topics include developing machinery cost budgets; making individual machine and system-wide decisions; deciding how to acquire the use of machinery services; and keeping appropriate records.

Chapters 4 and 5 discuss managing farm personnel. Chapter 4 covers planning and staffing issues. This includes determining staffing needs as well as recruiting and selecting new employees. Chapter 5 focuses on various aspects involved in managing a work force. This includes employer responsibilities in managing employees effectively as well as compliance with various laws and regulations.

In addition to detailed discussions of the concepts and principles of acquiring and managing resources, the 90-page publication contains a series of worksheets designed to help farmers develop rental and sales agreements. It also contains assessment tools for personnel supervision along with employment application and interview forms. Tables, diagrams, and other illustrations help to clarify the book's major topics.

Ken Thomas, a retired extension specialist in farm management from the University of Minnesota, wrote *Acquiring and Managing Resources for the Farm Business* and the other five volumes in the series Business Management for Farmers. The series Business Management for Farmers should prove useful to farmers, educators, lenders, consultants, and others, including persons considering farming as a career. Like Part IV, Parts I, II, and III of the series deal with managing an established farm business. Part V will focus on the issue of getting established in farming, while Part VI will deal with planning the late career/retirement years.

Acquiring and Managing Resources for the Farm Business, NCR-610D, costs $8.00 per single copy, plus state sales tax.

Both publications are produced by MidWest Plan Service (MWPS) in cooperation with the North Central Farm Management Extension Committee (NCFMEC). Both MWPS and NCFMEC are cooperative outreach efforts supported by the 12 land-grant universities of the North Central United States.

These publications can be ordered from either the University of Minnesota or the University of Wisconsin. For ordering information see *Resources* on page 7.

Personnel

New University of Minnesota Department Head

After nine years of dedicated service and outstanding leadership as the University of Minnesota Biosystems and Agricultural Engineering (BAE) department head, Vance Morey has stepped down. Vance has returned to the faculty as a full professor and continue to have teaching, research, and extension responsibilities.

Following an internal search for a new department head, Kevin Janni was selected and took over the reins as head in September 2001. Kevin has been a faculty member in BAE since 1980. For the first 16 years as a faculty member he had classroom teaching and research responsibilities. In 1996 he took on extension responsibilities with a focus on dairy facilities. His recent research has included work on air quality and biofilters to control livestock and poultry odors.

Resources

Page 2: Low Cost Parlors for Wisconsin and Minnesota Dairy Producers

To order the fact sheet and CD-ROM on low cost parlors visit the Wisconsin Center for Dairy Profitability web page: http://cdp.wisc.edu or call Arlin Brannstrom at 608-265-3030.

Page 2: Siting Animal Production Operations

National Center for Manure and Waste Management
http://www.cals.ncsu.edu/waste_mgt/natlcenter/center.htm

Online OFFSET calculator
http://www.bae.umn.edu/extens/manure/
(Click on Odor, then look for the Calculator under Setbacks.)

OFFSET-Odor From Feedlots Setback Estimation Tool (FO-07680-C)
Call the University of Minnesota Extension Distribution Center at (612)-624-4900 or (800) 876-8636 or visit online at http://www.extension.umn.edu/units/dc/

Page 3: Sizing Silage Piles

Automating the process of sizing a silage pile (spreadsheet)
http://www.uwex.edu/ces/crops/uwforage/storage.htm

Midwest Plan Service publications—see right

Page 3: Agricultural and Alternative Energy Web Page

http://www.bae.umn.edu/extens/energy/

Page 5: Farmland Tile Drainage Design Workshop

To register or receive a program brochure, contact Jean Spohr at sporhjm@mrs.umn.edu or 320-589-1711, or Jerry Wright at jwright@umn.edu.

Page 5: Agricultural Drainage Publications

Agricultural Drainage: Planning an Agricultural Subsurface Drainage System (BU-07685-GO)
http://www.extension.umn.edu/distribution/cropsystems/DC7685.html

Agricultural Drainage: Soil Water Concepts (BU-07644-GO)
http://www.extension.umn.edu/distribution/cropsystems/DC7644.html

Both publications are also available by calling the University of Minnesota Distribution Center at (612) 624-4900 or (800) 876-8636 or visit online at http://www.extension.umn.edu/units/dc/

Midwest Plan Service Publications

MWPS-35 *Farm and Home Concrete Handbook*
AED-43 *Managing and Designing Bunker Silos*
AED-45 *Using All-Weather Geotextile Lanes and Pads*
NCR-615 *Purchasing and Leasing Farm Equipment*
NCR-610D *Acquiring and Managing Resources for the Farm Business*

You can order these and many other MidWest Plan Service publications from

MWPS Orders
219 Biosystems and Agricultural Engineering
University of Minnesota
1390 Eckles Ave
St. Paul MN 55108
mwps@gaia.bae.umn.edu
http://www.bae.umn.edu/extens/mwps/
(612) 625-9733

or

MWPS Orders
Biological Systems Engineering Department
University of Wisconsin
460 Henry Mall
Madison WI 53706
(608) 262-3310

Calendar of Events

November 25-27, 2001, **Minnesota Farm Bureau Federation Annual Meeting**, Radisson Hotel South, Bloomington, MN. Contact Kristin Harner at 651-905-2118 or kharner@fbfs.com.

November 27-29, 2001, **North American Farm & Power Show,** Convention Center, Minneapolis, MN. Contact Tradexpos at 800-949-3976, or e-mail tradexpos@smig.net, or see www.tradexpos.com.

November 27-29, 2001, **Minnesota Dairy Extravaganza**, Convention Center, Minneapolis, MN. Call Pat Kearney at 320-231-7893.

December 7, 2001, **Pasture Series: Over-wintering Livestock**, West Central Research & Outreach Center, Morris, MN. See wcroc.coafes.umn.edu, or call 320-589-1711.

December 13, 2001, **Minnesota Dairy Expo & Forage Conference**, Holiday Inn, St. Cloud, MN. Call 320-255-6169 or 800-450-6171, or salfe001@umn.edu or mfgc@umn.edu.

January 8, 2002, **Winter Crops Day**, Kasson and Lewiston, MN. See sroc.coafes.umn.edu, or call 507-835-3620.

January 8-9, 2002, **Wisconsin Frame Builders Conference**, Radisson Convention Center, Wausau, WI.

January 9, 2002, **Winter Crops Day,** Waseca-Farmamerica and Lake Crystal, MN. See sroc.coafes.umn.edu, or call 507-835-3620.

January 18, 2002, **Legislative Farm Forum: Future of Animal Agriculture in Minnesota**, South Central Technical College, North Mankato, MN.

January 31-February 2, 2002, **Upper Midwest Regional Fruit & Vegetable Growers Conference and Trade Show**, Civic Center, St. Cloud, MN. Contact Marilyn Johnson at 763-434-0400.

February 14, 2002, **Crops and Soils Day**, Southwest Research and Outreach Center, Lamberton, MN. See swroc.coafes.umn.edu, or call 507-752-7372.

April 3, 2002, **Horticulture Day**, Southwest Research and Outreach Center, Lamberton, MN. See swroc.coafes.umn.edu, or call 507-752-7372.

April 6, 2002, **Horticulture Day**, Waseca High School, Waseca, MN. See sroc.coafes.umn.edu, or call 507-835-3620.

June 18, 2002, **Summer Field Day**, Southern Research and Outreach Center, Waseca, Minnesota. See sroc.coafes.umn.edu, or call 507-835-3620.

June 19, 2002, **Summer Field Day**, Southwest Research and Outreach Center, Lamberton, MN. See swroc.coafes.umn.edu, or call 507-752-7372.

Minnesota/Wisconsin

Engineering Notes

Jointly Published by

Department of Biosystems and Agricultural Engineering
University of Minnesota
219 Biosystems and Agricultural Engineering Building
1390 Eckles Avenue
St. Paul, MN 55108-6005
(612) 625-9733
Web: www.bae.umn.edu

Our mission is to conduct research and educate people to solve engineering problems in agricultural and biological environments.

The Department of Biosystems and Agricultural Engineering is affiliated with the College of Agricultural, Food and Environmental Sciences; the Institute of Technology; the University of Minnesota Extension Service; and the Agricultural Experiment Station of the University of Minnesota. The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, veteran status, or sexual orientation.

University of Minnesota, United States Department of Agriculture, and Minnesota Counties Cooperating

University of Minnesota Newsletter Team: John M. Shutske, Deb Hansen, and Christy McKibben. This publication is available in alternative formats upon request.

John M. Shutske
Minnesota Extension Engineer

Department of Biological Systems Engineering
University of Wisconsin
460 Henry Mall
Madison, WI 53706
(608) 262-3310
Web: bse.wisc.edu

Mission: to provide internationally-recognized teaching, research and outreach programs of excellence in the development and application of biological, engineering, and management principles to solve problems relating to biological systems for the benefit of the citizens of Wisconsin, the Nation, and the world.

The Department of Biological Systems Engineering is affiliated with the College of Agricultural and Life Sciences of the University of Wisconsin–Madison. University of Wisconsin–Extension, United States Department of Agriculture and Wisconsin Counties Cooperating providing equal opportunities in employment and programming including Title IX requirements.

This newsletter can be found on the web at http://www.bae.umn.edu/extens/