Welcome
Welcome to the first issue of BAE Plain Talk. BAE Plain Talk is an electronic update from the Department of Biological and Agricultural Engineering. BAE Plain Talk will be produced six times per year. Information presented will include abstracts from research projects as well as extension and departmental updates. You may request topics or provide feedback by email to Joe Harner at jharner@ksu.edu.

Departmental News

Taylor Receives Honor
Dr. Randy Taylor, professor in Biological and Agricultural Engineering has been selected one of two Fall Faculty of the Semester recipients for the College of Agriculture. The award is determined by a panel of students and faculty through Agricultural Student Council. Dr. Taylor and the other Faculty of the Semester recipient, Dr. Steve Thien, professor in Agronomy, will be recognized at the College of Agriculture Awards and Recognition Assembly, Sunday, April 17.

Congratulations Randy!
Water Supplementation of Tallgrass Prairie at Konza Prairie Biological Station

By: James Koelliker, Professor and Head of Biological and Agricultural Engineering

I have been running an ongoing 14-year interdisciplinary study of water supplementation to offset evapotranspiration losses and minimize moisture deficits during the growing season on ungrazed and annually burned tallgrass prairie. Additions of about one inch are made at the fully-watered target area six feet either side of the of a single line of sprinklers when a combination of calculated evapotranspiration, from weather data at the Headquarters station, and measurement of soil water indicates that the top three feet of soil can hold up to two inches of additional water that can be used effectively by the plants. Variables measured along irrigated and control (no water) transects include: soil moisture, plant water potential, annual net primary production (ANPP), reproductive effort, plant species composition, soil organic C and N, microbial biomass, N mineralization, plant C and N content, and litter decomposition.

Results show that on average 300 mm (12 inches) of additional water is needed annually (range from 100 to 400 mm) from mid-June until mid-September. Average increase in NPP during the first 8 years was 21% for the fully supplemented area. In 2002, a severe drought from May 28-July 27 resulted only 33 mm of rain at the site, the driest in 113 years at Manhattan for this same period. We measured an 80% increase in ANPP (by far the greatest difference in any year). The figure shown illustrates the relationship between water and ANPP for 2002. We have 10 years of data now to determine the water-use coefficient for native prairie, too. Stacy Hutchinson worked on this project for her master’s degree.

This study is collaboration with several other scientists on the LTER project and it has had over twenty undergraduate research assistants involved with it. Work continues and we have a water and nitrogen addition interaction study that has just completed its fourth ear of operation. Plans are to continue this work indefinitely.

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Extension Update

Spray Technology Project Evaluates Ways to Improve Canopy Penetration of Crop Protection Products

By: Bob Wolf, Application Technology Specialist

This past summer and fall aerial and ground application systems were field tested to determine the ability of each to improve getting penetration and coverage into the lower portions of plant canopies. An aerial application study sponsored by Agriliance was conducted August 30, 2004 over a circle of fully canopied soybeans near Ingalls, KS. A total of 10 treatments were used to evaluate 4 different tank mix materials designed to improve canopy penetration. The products were compared to water alone and applied at 1 and 3 gallons per acre. Water-sensitive droplet collection papers were placed in the top, middle, and bottom of the soybean canopy to evaluate penetration and coverage. DropletScan™ software was used to measure the differences. The data will be presented during the ASAE Session at the National Aerial Application Meeting in Reno, Nevada this December.

Field studies involving a ground sprayer equipped with an Energized Spray Process (ESP) system were conducted to determine the ability of this process to improve canopy penetration. The ESP system utilizes contact charging of the spray liquid prior to atomization at the nozzles. The charge creates a high-intensity electrostatic field between the nozzle and plant. The intent of this process is to improve coverage on both the upper and undersides of the plants leaves as well as potentially increasing penetration into the lower parts of the canopy. Both efficacy and droplet spectra data were evaluated in treatments comparing glyphosate and paraquat, three common nozzle types, and electric charge vs. no charge. Another set of treatments to compare nozzle types and electric charge were conducted to determine differences in canopy penetration and coverage. Data from the efficacy studies will be reported at the North Central Weed Science Meetings this December in Columbus, Ohio. The other data is being summarized and will be reported in meetings later this winter.

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Kansas Livestock Environmental Stewardship Launches Website

By: Joe Harner, Extension Engineer, Grain and Livestock Systems

The Kansas Livestock Environmental Stewardship (KLES) web page is available at http://www.oznet.ksu.edu/kles. Funding for web page was provided in part by a US EPA Section 319 Nonpoint Source Pollution Control Grant administered by the Kansas Dept of Health and Environment Bureau of Water. The development of the web page was a cooperative effort between...
Sprout Software, a small business specializing in web pages, Kansas State University, and Kansas Department of Health and Environment. Input for web site content was provided by representatives from the K-State Departments of Agronomy, Biological and Agricultural Engineering, Animal Science and Industry, and KCARE along with the watershed specialists.

Information on the KLES site was designed for Kansas livestock producers with a focus on environmental stewardship. One unique feature is a 10-question assessment for livestock producers. The assessment allows individuals to evaluate the environmental stewardship of their current practices. Each question is based on controllable practices, such as location of feeding sites, drainage or vegetation. Currently assessments are available for small farms, youth/4-H projects, cow-calf, stocker, feedlot, dairy, sheep and goats. KLES provides links to various state organizations and other available information. Nearly 300 producers have taken an assessment, either on or off line, at a trade show or during a site visit. We plan to expand the web site to include more assessments and information in the coming months.

**Grain Storage Top 10 List**

*By: Joe Harner, Extension Engineer, Grain and Livestock Systems*

Grain storage capacity, on-farm and commercial, exceeds 1 billion bushels in Kansas. During bumper crop years, such as 2004, all storage facilities are full. Elevator managers and producers with on farm storage are responsible for the well being of their investment – $3 billion worth of grain in their storage structures. Those responsible for managing stored grain should take their investment management job as seriously as a banker. Across the country, average storage losses caused by insects and molds are estimated to be 10 cents per bushel. If this value holds true for Kansas, then the annual loss is $100 million or about $40 per Kansan.

**Top 10 Grain Storage Management Tips**

1. Start by cleaning facilities inside and out. Any space where insects can live – inside or outside of the structure – must be cleaned. In cases where physical cleaning is not possible, a chemical approach is required.

2. Cool grain quickly. Insects and molds have a difficulty reproducing when the grain temperature is below 50 F. Generally, it is recommended to cool the grain to 35 to 40 F. However, for grains harvested between May and August, it is beneficial to reduce the temperature as soon as possible to below 70 F using intermittent aeration.

3. Monitor incoming moisture. Aeration fans deliver small quantities of air but were never intended to dry grain. Their purpose is to change the grain temperature. Problems are created when high moisture grain enters the storage structure.

4. Adjust harvesting and handling equipment. Grain that contains broken kernels or trashy material is harder to store. The more broken kernels, the more surface area exposed for insects to nibble. Equipment, excessive handling or dry grain are the three leading causes of broken kernels.
5. Clean grain. Normally, weedy material has a higher moisture content than grain. Foreign material may accumulate in isolated pockets in a grain bin and interfere with aeration. Excess moisture and the inability to cool these pockets may result in ideal breeding areas for insects, fungi or molds.

6. Monitor stored grain. Schedule inspection times. Temperature, moisture and odor are the most commonly monitored conditions. Once the grain temperature and the outdoor air temperature are below 45 F, monthly monitoring should be adequate. If the average grain or air temperature is above 45 F, inspect every 2 weeks.

7. Be observant. Many stored grain problems can be stopped in the early stages if you are paying attention. Odor is a common indicator of grain spoilage. When there are multiple steel bins at a site and one bin roof has no snow or frost while the others do, the grain may be heating. Visual evaluation inside a bin is also useful. Moisture migration may be detected by slimy feeling grain on the surface or drip spots on the underside of a roof.

8. Promote safety. Safety should be first and foremost on the minds of everyone working near grain storage facilities. Follow all manufacturers’ guidelines related to chemical use. Use caution when climbing metal ladders during cold weather. Heavy clothing, cold or wet ladder rungs can create hazards. A minimum of two people should be present when sampling grain bins and no one should ever enter a bin when equipment is running or is going to be turned on.

9. Know your marketing plan. Use that plan to develop a management strategy for maintaining the quality of stored grain. This is particularly necessary when storing grain into the late spring or summer months. Rewarming of the grain may be necessary to prevent moisture migration within a grain mass due to temperature differences.

10. Be ready to act quickly. Grain storage problems do not disappear once they are detected. Grain that is heating should be cooled, turned or marketed immediately to prevent further damage. Once heating is detected the problem will only get worst unless some action is taken. Heating grain may cause structural damage as well as charred grain if no action is taken.

**Farm Safety Program Update**

*By Kerri Ebert, Extension Assistant*

In July, John Slocombe, Extension Farm Safety Specialist, and Kerri Ebert, Extension Assistant, traveled to the National Education Center for Agricultural Safety in Peosta, Iowa to become Master Trainers for HOSTA -- Hazardous Occupations Safety Training in Agriculture. As Master Trainers, John and Kerri recruited county agents to become Community Lead Instructors and use the proposed new curriculum materials in their H.O.T. classes in 2005. HOSTA is part of a USDA-funded National Safe Tractor and Machinery Operation Program that will establish
national standards for teaching tractor and machinery safety. Kansas’ first Community Lead Instructor Training was December 15, 2004.

Just in time for Hazardous Occupation Training, the Farm Safety Office has a grain flow/engulfment demonstrator to give away to the first county agent who lets us know he/she would like to have it. It had been available for loan, but with departmental renovations, we don’t have a place to store it anymore, so if you’d like to take possession of the grain flow/engulfment demonstration box, it’s yours for the asking. Call 785-532-2976 to make arrangements.

Kansas AgrAbility Project Completes Successful Year

By Kerri Ebert, Extension Assistant

The Kansas AgrAbility Project completed its second year of operation in May 2004. Kansas AgrAbility helps farmers, farm employees and farm family members who have disabilities, accommodate their disability into their farming operation. The Project is a partnership between the K-State Research and Extension Farm Safety Program and Southeast Kansas Independent Living (SKIL) in Parsons, KS.

In Year 2, Kansas AgrAbility received 1,353 calls which resulted in 97 customers and 189 goals for those customers. Customer goals range from providing educational materials to making recommendations for farm or equipment modifications and locating funding sources. In addition to working directly with farmers, Kansas AgrAbility also generates awareness of the program by making presentations and training professionals who work with people with disabilities. AgrAbility trained and/or presented information to county agents, independent living counselors, vocational rehabilitation counselors, social workers, speech-language pathologists, physical therapists, occupational therapists and community-based Medicaid managers. The Project’s focus for Year 3 is senior farmers. During the first two years, approximately one-third of Kansans served by AgrAbility were over age 65.

Mobile Irrigation Lab (MIL) Update

By: Danny Rogers, Extension Irrigation Engineer

The Mobile Irrigation Lab program has been very low key but activities should be increasing shortly. The goal of MIL is to provide educational programs and technical assistance to irrigated agricultural producers. Key components of the program have included development of decision support software products and providing hands on training for the use of software.

Two featured programs are KanSched, an ET based irrigation scheduling program, and FuelCost, an irrigation energy efficiency analysis program. MIL has also had on-farm irrigation demonstration sites and conducted a number of center pivot performance evaluations. Many of these activities were focused in south central Kansas, although the program is available statewide. Statewide activities will continue but the new focus area will be the Ogallala area of western Kansas.
The first major announcement for MIL in 2005 is the hiring of Mr. Kent Shaw as the MIL Project Coordinator. Kent brings a wealth of experience on Kansas water policies and irrigation issues to the MIL program. He will be starting on January 30 and be stationed at the SWREC in Garden City. Another major MIL activity is the development of a new version of KanSched that will incorporate requests by users for additional data analysis and printing capability within the program. This will be introduced in late 2005. MIL activities are best requested through the county extension agent.

**BAE Program and Computer Software Web Sites**

- **Website:** Biological & Agricultural Engineering  
  **URL Address:** [http://www.bae.ksu.edu](http://www.bae.ksu.edu)  
  **Contact Person:** James K. Koelliker, Department Head  
  **Brief Description:** Agricultural Engineering  
  **Target Audience:** General

- **Website:** Precision Agriculture Web Site  
  **URL Address:** [www.oznet.ksu.edu/precisionag/](http://www.oznet.ksu.edu/precisionag/)  
  **Contact Person:** Randy Taylor  
  **Brief Description:** Precision Agriculture

- **Website:** Kansas Environmental Leadership Program  
  **URL Address:** [http://www.oznet.ksu.edu/kelp](http://www.oznet.ksu.edu/kelp)  
  **Contact Persons:** Judy Willingham, Morgan Powell  
  **Brief Description:** Kansas Environmental Leadership Program  
  **Target Audience:** Kansas citizens, local government, agricultural and environmental groups, state agencies.

- **Website:** Kansas AgrAbility Project  
  **URL address:** [http://www.oznet.ksu.edu/agrability](http://www.oznet.ksu.edu/agrability)  
  **Contact Persons:** John Slocombe, Kerri Ebert  
  **Brief Description:** Kansas AgrAbility Project  
  **Target Audience:** General

- **Website:** Agricultural Safety and Health Program  
  **URL Address:** [http://www.oznet.ksu.edu/agsafety](http://www.oznet.ksu.edu/agsafety)  
  **Contact Persons:** John Slocombe, Kerri Ebert  
  **Brief Description:** Farm safety information  
  **Target Audience:** General