Storm Destroys Long-Term Forestry Research

September 2010 saw a devastating hail storm pass through portions of Saunders County and across parts of the forestry research area at University of Nebraska-Lincoln Agricultural Research and Development Center (ARDC). Crop damage was extensive in the northeast portion of the section.

Soybeans fared the worst with almost complete loss of several studies. Corn fields fared a bit better and through the efforts of Mike Cieslik, agricultural research technician, much of the down corn was picked up and salvaged.

Overall, yield losses in the northeast windbreak system were in the range of 60% loss for corn to near 100% loss of soybeans. Fields on the west side of the section fared a bit better with bean yields of 38 bushel per acre (bu/ac) and corn yields of 102 bu/ac. Normal yields for these fields are in the range of 45-50 bu/ac for beans and 150 to 170 for corn.

The organic fields were also affected by the storm and the third year of a cover crop study was lost. Organic bean yield was 22 bu/ac and organic corn was 105 bu/ac.

While the damage to annual crops was a financial loss right at 49% of historical yield trend - just shy of triggering a crop insurance payment.

Additionally, it’s complex to put a price tag on research projects that lost valuable data or sustained such heavy damage that they have to be restarted or will no longer continue.

Crops - In the most heavily hit areas, corn yields were as low as 30 bu/ac. A stretch of 220 bu/ac was expected. Soybean yields were worse where some fields were not even harvested and expected yield was 60-70 bu/ac.

Other parts of the ARDC were not impacted by the hail, but overall loss was at right at 49% of historical yield trend - just shy of triggering a crop insurance payment.

Grazing opportunities were lost on cool season fall pastures that were shredded down to nothing by the hail. More baled hay was used to replace this loss.

A cutting of alfalfa was also decimated. Grazing opportunities were lost on cool season fall pastures that were shredded down to nothing by the hail. More baled hay was used to replace this loss. A cutting of alfalfa was also decimated. Fortunately, pastures and alfalfa came back well this last spring with no long term effects.

Structures and Vehicles - Sixty-eight buildings were damaged. Damage included roofs, windows, exterior lights, exhaust stacks, and siding. Fifty-six windows had to be replaced. Omaha Public Power District replaced 17 electric meters. Thirty-two vehicles were damaged. Necessary repairs to vehicles, such as windshields, lights, and mirrors were made, but cosmetically, most vehicles still have the battle scars of dings and dents from golf ball sized hail. The electronic

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In this issue...

- Forestry Research
- Partnering with USDA-ARS
- Milking Operations
- After the Storm
- Red Letter Days
- International Visitors
- Mead FFA Gains Real World
- Summer and fall were especially busy with visitors making their way to the ARDC for a variety of reasons. The ARDC hosts visitors from across Nebraska, the United States, and the world. While these visits are often called “tours”, most certainly involve more than just a drive through the research center. Visitors at the ARDC may have a very minimal understanding of agriculture and look to the ARDC as a way

Partnering with USDA-ARS

An ongoing partnership between the University of Nebraska and United States Department of Agriculture (USDA) Agricultural Research Service (ARS) provides for a beneficial exchange of research information and resources. USDA-ARS is well represented at the ARDC in various research areas.

The mission of the USDA-ARS program at Lincoln, Nebraska is to improve the productivity, stability of production, sustainability and profitability of crop and livestock production systems in the Great Plains. There are two groups conducting research from the Lincoln office through the Agroecosystem Management Research Unit and the Grain, Forage and Bioenergy Research Unit. USDA-ARS research is organized into national programs. Within each national program are research projects. The Lincoln USDA-ARS team held a focus group meeting at the ARDC to update stakeholders on current research projects and findings. Some of those research projects that are conducted as a cooperative effort with the University of Nebraska are highlighted in this issue of ARDC Today.

Learn more at: http://www.ars.usda.gov/nipa/lincoln

High school students from Tianjin China visiting Omaha Westside High School learn about distillers grains from UNL Extension educator Bob Meurka during a visit to the ARDC.

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Catnip Oil Repels Flies - Anyone who has ever been pested by a nuisance fly knows how irritating and distracting these bothersome pests can be. In livestock production, flies (especially biting flies, such as stable flies) can have a noticeable effect on herd production and health, as animals may spend a significant amount of time trying to fend off the pests or contract diseases spread by flies.

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Catnip Oil Repels Flies

Zhu demonstrates how catnip essential oil can be utilized as a repellent for stable fly management.

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USDA-ARS Research Entomologist Jerry Zhu demonstrates how catnip essential oil can be utilized as a repellent for stable fly management.
Forestry Faculty Feature

Jim Brandle is a professor of forestry in UNL’s School of Natural Resources and conducts forestry related research at the ARDC. His main research emphasis is the role of woody plants in agricultural systems, particularly windbreaks and their effects on all aspects of crop production. Brandle’s research focuses on how windbreaks and shelterbelts work. He is also looking at the economic value of various forms of shelter and the role that windbreaks play in maintaining biodiversity on farms and ranches. Key projects involve research into the physics, or the mechanisms, of woody plant shelter and an increasing emphasis on the economic benefits of shelter, especially crop response. These studies are being pursued in cooperation with colleagues at Iowa State University and the U.S. Forest Service.

Working with the cooperates above, the second version of a crop windbreaks-economics model will soon be released. This sophisticated computer model is based on intensive studies of windbreak airflow dynamics and will quantify precise effects on crop yields and money saved. It can evaluate any shelter for the economic benefits to corn or soybean production in the north-central United States. Brandle teaches agriculture and natural resource systems and forest management introductory courses, outreach to elementary school classrooms, and woody plant growth and development. He received his doctorate and master’s degrees in forestry from the University of Missouri and his bachelor’s degree in botany from the University of Tennessee.

Ask a scientist... Economically, do windbreaks really pay off in a crop production setting? According to Brandle, financial analysis of the impacts of an investment in a field windbreak system on grain producers in the Great Plains indicates positive returns over the life of the windbreak. The analysis includes the costs of windbreak establishment and maintenance, the loss of crop yields and money saved. It can evaluate any shelter for the economic benefits to corn or soybean production in the north-central United States. Brandle teaches agriculture and natural resource systems and forest management introductory courses, outreach to elementary school classrooms, and woody plant growth and development. He received his doctorate and master’s degrees in forestry from the University of Missouri and his bachelor’s degree in botany from the University of Tennessee.

Organic Studies Part of Statewide Effort

UNL’s School of Natural Resource Sciences is part of a statewide organic agriculture effort. Studies focus on providing sufficient nitrogen for a corn/soybean/wheat rotation. Treatments include various cover crops (berseem clover and soybean) and dairy manure. Additional cover crops (cowspeas, hairy vetch and winter peas) have been considered and were part of the study damaged by the storm. The study will be repeated next year.

While manure is the obvious source for nitrogen in organic systems and the current organic standards allow manure from non-organic livestock, the expectation is that this will change in the future and manure will need to come from organically produced livestock. The availability of cover crops will provide more flexibility for organic farmers.

To date, the most success has been achieved with planting soybean immediately following wheat harvest and turning it under before the first frost. Soil sampling in the spring prior to corn planting indicates between 90 and 110 pounds of available nitrogen following the soybean cover crop.

A new study using red and white clover planted in mid to late March was initiated this past spring. Early observation indicates successful planting and the impacts on nitrogen levels will be determined following wheat harvest and again before corn planting next April. Doctoral student Katja Koehler Cole and Jianru Shi, masters student, are assisting with this project.

Healthy Farm Index Measures

Between 2007 and 2009, a research group within the UNL School of Natural Resource Sciences examined abundance patterns of bird species in organic farm systems. Data from this project demonstrated the importance of considering multiple spatial scales when managing for bird diversity in farm systems. As an extension of this project, bird data from the participating farms has been incorporated into the Healthy Farm Index. Alongside measures of bird diversity, the Healthy Farm Index incorporates multiple indicators of biodiversity and ecosystem services, in order to provide a more complete picture of the biological health of a farm, as well as highlighting the associated benefits to the farm and society.

Building on the above research, two additional measures of habitat quality for birds associated with woody cover in agroecosystems are currently being examined. First, nest survival measurements are taken daily and use of the structure of woody cover and associated local and landscape farming practices to predict breeding success of shrubland birds. As part of this effort, the microclimate habitat of Brown Thrashers and Gray Catbirds are also being compared. Second, as a complementary measure to nest success, the foraging behavior of Eastern Kingbirds is being quantified.

International Visitors at the ARDC - Continued from Page 1

of obtaining basic concepts. Other groups have specific topics that they want to learn about during a visit at the research center.

A team from Jaim India made a stop at the ARDC as part of a statewide visit hosted by Ronnie Green, University of Nebraska vice president and Harlan vice chancellor of the Institute of Agriculture and Natural Resources at UNL. Irrigation and other ag related topics were also discussed with visitors from Indonesia and Singapore hosted by Valmont Industries.

A delegation from the Vietnamese Ministry of Agriculture and Rural Development (MARD) National Agricultural Extension Center visited the ARDC and discussed Extension educational training programs for crop production professionals, partnerships with commodity boards, and on-farm research efforts with Keith Gloren, UNL Extension educator. The Nebraska Department of Agriculture also brought visitors to the ARDC from Hong Kong and Vietnam. And a group from the National Maize RD Center, Ministry of Agriculture, China learned about crop production at the ARDC.

A group of cattle producers from Argentina visited the ARDC and learned about feedlot and cow/calf research in September. Most recently, the ARDC hosted visitors from Russia as part of the “Open World” and “Friendship Force” programs. The programs facilitate open discussion and learning internationally.

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Partnering with USDA-ARS  * Continued from Page 1  

USDA-ARS entomologists are looking at an integrated “push-pull” strategy to control stable flies and other filamentous flies in livestock production. They are developing tools for reducing the impact of stable flies on livestock production. The “push” component involves utilizing botanical/organic repellents, oviposition deterrents (to deter egg laying), and larvacidal activity (to control larvae with killing agents). The “pull” component refers to utilizing odor attractants to draw the pests away from host animals, as well as oviposition attractants, and visual effects. An interesting finding by the research team shows that catnip essential oil is an effective repellent for stable flies. This plant-derived compound is also environmentally friendly.

According to USDA-ARS research entomologist/entomologist Jerry Zhu, catnip oil is one of the safest botanical insect repellents, and has been reported not only to deter stable flies, but also reduce the number of pests. Toxicity test results show that it is as safe as other EPA-proven mosquito repellents.

Ask a scientist... If catnip oil works for repelling flies, would planting catnip also deter stable flies? According to Zhu, the answer is “no”. The relatively low amount of the active repellent ingredient chemicals (nepetalactones) released from the plant is below the threshold of the effective repellency. The effect of stable flies on the weaning weight of calves is also currently being studied in collaboration with UNL Department of Animal Science. An automated sprayer was utilized this last summer. In the past, repellents were manually applied to cattle. With the automatic spraying systems, spraying is activated for 5 seconds as cattle pass through a gateway. The spray nozzles were set near the watering tanks and were only activated as the cattle left the water source.

Ask a scientist... An important part of the research project involves actually counting flies on the cattle - how is that accomplished? Stable flies tend to bite cattle on the lower parts of the legs. According to USDA-ARS research entomologist, Dave Taylor, the total number of flies observed on the visible parts of both front legs from a single angle of view is utilized as an index for stable fly infestation levels. Taylor says, “Since you can only see one half of each leg surface from a single angle, this value is considered to be the number of flies per leg, two halves make one whole.” He says that the count is instantaneous and it only takes a fly about 2 minutes to feed. An instantaneous count of 5 flies represents about 1,500 flies biting that one leg or about 4,200 biting that leg during a summer day. Taylor states, “I did not multiply the single front leg count by four. That is because the flies prefer the front legs, so we multiply by 2.8 instead of 4 to get the number of flies on the whole animal. Counts above 5 are considered to be causing economic loss.”

Ask a scientist... Where do the flies come from for your research? Are they native to the research locations or do you have to introduce the eggs, larvae and insects? Stable flies are one of many pests on livestock animals and can be found almost everywhere abundant in Nebraska during the summer. So there is no need to nurture the flies. Taylor notes that stable flies are not native to North America. Most evidence indicates that they originated in Africa and have been transported to other regions. They are a problem for livestock farmers because they feed on the blood of the animal during a summer day. Taylor states, “I did not multiply the single front leg count by four. That is because the flies prefer the front legs, so we multiply by 2.8 instead of 4 to get the number of flies on the whole animal. Counts above 5 are considered to be causing economic loss.”

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* Switchgrass Studied Since Dust Bowl  
* UNL-USDAR research on switchgrass has been making headlines as a potential bioenergy source in recent years. In 2008, the results from a five year study showed that switchgrass produced an impressive five times more energy than needed to grow harvested and it produced it in cellulosic ethanol.

This may be the first time many people heard about switchgrass, but studies on this perennial began in Nebraska in the 1930s. USDA-ARS researchers Ken Vogel, Rob Mitchell, and Marty Schmer provided the following history of switchgrass development and research in an article published at UNL extension.org. In the article, “Switchgrass for Biofuel Production”, the team details the following historical account.

USDA-ARS researchers conducted research on pre-harvest control of E. coli O157:H7 in beef cattle feedlots. They studied the E. coli habitats in the cattle intestine and the beef feedlot pen surface material. What they found is that the feedlot surface is more than just unpromised manure. It has its own microbial community structure.

USDA-ARS microbiologist, Lisa Duroso says, “This means that the bad E. coli face a different set of challenges in the feedlot. It also means that there are opportunities to control the bad E. coli in the feedlot, where it is already struggling to survive.” Researchers also sought out to find if the location of E. coli O157:H7 correlates with areas of high manure deposition in feedlots through feedlot pen mapping. What they found is that the bacteria is not localized to only the places where there is high manure deposition – it can be found throughout the feedlot pen.

Duroso notes that these results are changing the way researchers think about controlling the bad E. coli – the solution will involve mapping for controlling the fecal source material. This research is showing that once the bacteria leaves the animal, it can be broadly distributed in the environment.

The USDA-ARS livestock waste management research team includes: Lisa Duroso and Dan Miller, microbiologist John Gilley, agricultural engineer; Seth Lamb, engineering graduate student; and Jennifer McGhee, Jaime LaBrie, and Ryan McGhee, lab technicians.

Ask a scientist... Studying livestock waste may not seem like the most glamorous job, so the question for USDA-ARS microbiologist, Lisa Duroso, is how did you enter this field? Duroso started out in public health and was part of a team at the United States Centers for Disease Control and Prevention that implemented a nation-wide system for fingerprinting E. coli O157:H7. She says that following the bacteria led naturally back to the source – livestock manure. The nutrients in feces can be a resource for crops, and the bacteria in feces are important for animal health, animal nutrition, and human food safety. She adds, “Livestock manure may seem unglamorous, but it is exciting for me to be working on ‘the fecal frontier’.”

Mead FFA Gains Real World Farmers Market Experience

The Mead FFA Chapter’s farmers market project was featured in a previous issue of ARDC Today when the project was in its early stages and the chapter had just attended a training session at the ARDC. Mead was one of 3 chapters chosen to participate in a Specialty Crop Block Grant Program project by the Nebraska Department of Ag. They received classroom materials, workshop training, and more than $5,000 to purchase growing tools, booth supplies, and promotional signs. The goal of the program is to get more young people involved in the production and sales of locally grown produce.

The FFA students spent their spring and summer tending to the vegetables, growing sweet corn, tomatoes, peppers, and more. They then harvested their crops and sold them at the Village Pointe Farmers Market in Omaha August through October 1.

According to Mead’s FFA sponsor, Thomas Dux, the students made about $200 dollars during the three farmer’s markets that they went to. He says, “This was the first year for the students to participate in the farmers market and to plant their vegetables. So the goal for this year was just to get experience. The students are already looking forward to next year and thinking about what things they can do differently to have more success growing and selling their products.”

The project also provided the students with an opportunity to promote FFA in an urban setting.

MPS Freeman, Hana Mayfield states, “The farmers market was a great way to gain experience in agriculture and in FFA. It also gave me a chance to put to use all the skills and information we have learned in our ag classes so far.”

Classmate, Lauren Taylor, added, “The farmers market is a great experience and I enjoyed meeting people who came to buy our produce.”

Members of the Mead Public School FFA Chapter got hands-on experience in the farmers market business this summer and fall. Pictured left to right are: Hana Mayfield, Haley Konecky, Jenna Schutt, Michelle Garcia, Lowell Johnson, and Lauren Taylor.

Divis Joins Business Team

Sarah Divis has joined the Greater Nebraska Business Center as an accounting associate. Divis is working with the counties in the Southeast Research and Extension district. Her primary duties include: accounts payable, reconciliation, financial reporting, and administrative support. She received her bachelor’s degree in business administration with a concentration in accounting, economics, and management from Midland Lutheran College in Fremont.
Livestock - Slage which had just been harvested prior to the storm, had to be rebagged after the storm to maintain its oxygen free containment for storage until next season. Hail punctured thousands of holes in these poly bags which are up to 200 feet long. Feedlot cattle, reduced bruising that needed time to heal to maintain meat quality, which resulted in a delay in marketing and added cost.

Cattle scheduled for pen research trials were restricted from stalk grazing on fields that had thousands of bushels of corn lying on the ground. Additional cattle were brought in to graze the most damaged fields in an attempt to capture the valuable commodity. This required special management that involved adapting the cattle to a finishing diet prior to putting them out to graze to prevent acclidization.

After accounting for the costs for grazing management and cattle gain, the return was only about 10% of the net revenue expected if it had not hailed. One benefit was a significant reduction in the volunteer stalk grazing on fields that had thousands of bushels of corn lying on the ground. Additional cattle were brought in to graze the most damaged fields in an attempt to capture the valuable commodity. This required special management that involved adapting the cattle to a finishing diet prior to putting them out to graze to prevent acclidization.

Research Lost - Storm damage brought entomology and turf studies to a grinding halt. Foundation buffalograss fields were hit hard. While the grass did recuperate, yields per acre were lower, most likely because the plants didn’t have a chance to regrow before winter. Forestry research damage was overwhelming. The forestry research feature article on pages 1-2 of this issue goes into further detail.

Corn breeders lost 320 evaluation plots. Sorbene fungicide evaluation plots were destroyed. The carbon sequestration project (CSP) suffered over $80,000 worth of equipment damage. Volunteer corn management in the CSP necessitated delays in corn planting and fertility decisions. On the other hand new research opportunities arose to study how volunteer corn impacts corn rootworm pestilence and how lost grain impacts nitrogen needs of the following year’s crop.

This fall, the University of Nebraska-Lincoln announced the dismantlement of minimalizing operations at the ARDC. UNL’s Department of Animal Science manages the dairy research unit and had engineer Berger said UNL will work closely with three graduate stu-

Berger says that research emphasis is shifting from large scale lactation studies to more individual animal research that will be conducted on UNL’s campus with 225 lactating cows. This modern research is “very different from that historically conducted at the ARDC facility,” Berger added.

The shift also is intended to more closely integrate UNL’s dairy research with other Agricultural Research Division life sciences research including cattle nutrition and the Gut Function Initiative, said David Jackson, interim dean of ARD.

The move is driven partly by budget concerns, as renovation would entail several million dollars.

The dairy research unit at ARDC typically has 150-175 cattle and is staffed by a couple of employees. The new lab in Lin-

The dairy research unit at ARDC typically has 150-175 cattle and is staffed by a couple of employees. The new lab in Lincoln will employ two full-time staff, Berger said.

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According to USDA research geneticist, Ken Vogel, initial re-

search on switchgrass at the University of Nebraska was spearheaded by former UNL Agronomy Department Head, Dr. Franklin Kitt. Keim recruited Newell who was a high school principal in the D denen Port, Nebraska using prairie grasses in biology classes. Vogel notes that this was during the depression - and was an indicator of Dr. Keim's persuasiveness. Vogel states, "The grass breeding project has remained a cooperative USDA and University of Nebraska project, although all the personnel on the project are now USDA employees. Currently, the primary support of the University of Nebraska is research facilities, research infrastructure, and collaborating staff.

The USDA-ARS forage and biomass research team continues to improve cultivars of perennial grasses such as switchgrass, big bluestem, indiangrass, and native legumes for bioenergy use and feedstock. The team is seeking out ways to keep production costs down, enhance environmental benefits, and utilize marginal lands.

Major research objectives include:

- Improved management practices and tools for grazed grasslands in the Central Plains and Midwest.
- Improved plant materials for grasslands of livestock production systems in the Central Plains and Midwest.
- Improved plant materials, primarily switchgrass, for biomass energy production systems.
- Develop sustainable production systems for switchgrass and other perennial grasses for biomass energy.

**Ask a scientist...** Where can switchgrass be produc-

**Wheat for the World - Wheat is an important crop for feeding a hungry world. This cereal grain has been a staple in diets worldwide for centuries due to the numerous food products made from wheat.**

USDA-ARS researchers have identified a new mutant gene conditioning low polyphenol oligosaccharide (PPO) in bread wheat. Why? This is important?

Asian noodles are consumed regularly by a significant popula-

organize food. The low levels of PPO in wheat can help lessen this effect.

Other research projects underway include: genetic improve-

The wheat and barley to wheat stripe rust, stem rust, and other cereal rusts improving tolerance to herbicides used to control weeds; and wheat streak mosaic virus studies.

USDA-ARS researchers working with wheat projects include: Bob Grabsch, research geneticist and research plant pathologists, Roy French and Satyanarayana Tatineni.

**Soil Management - Corn stover is an additional source for bioenergy and it also can be co-fed with distillers grains to livestock. However, there is concern that removal of the stalks, leaves, and cob is detrimental to soil quality. Research on corn stover removal has been conducted at the ARDC since 2001 by the USDA-ARS. The studies focus on both rained and irrigated fields. The soil management group is conducting this long-term study to determine just how much corn stover residue is needed to maintain soil carbon content (soil quality) and crop productivity. They are looking at soil greenhouse gas emissions and impacts on soil organic carbon. Their research also in-

Efficient use of water and nitrogen are not only crucial to make a profit for producers, but are critical from an environmental standpoint, as well. Current research by the soil management team also includes development of management strategies for meeting agronomic, environmental and societal crop production demands.

The team is look-

**Enhancing Sorghum - Sorghum is another biomass feedstock that has the benefit of versatility for producers since it can be raised for livestock feed, human consumption, or for bioenergy. Research is being conducted on molecular genetics and diseases of sorghum and the enhancement of this crop for biofuel, food and value.**

The trait the research group is primarily focusing on is the cell wall polymeric lignin. Lignin helps plants maintain strength and disease resistance. Low lignin is desirable for cellulosic bioenergy or sorghum varieties used for forages and energy since it takes longer to break down. However, high lignin is expected to produce more energy through combustion since it burns efficiently. Scientists are alter-

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Efficient use of water and nitrogen are not only crucial to make a profit for producers, but are critical from an environmental standpoint, as well. Current research by the soil management team also includes development of management strategies for meeting agronomic, environmental and societal crop production demands. The team is looking at ways to optimize inputs such as water and nutrients. They want to find out if there are different or better practices that should be utilized in fields with residue removal. And they are looking at the ecosystem, as well - observing carbon sequestration, leaching, and greenhouse gas emissions. The research team is comparing the diversity and activity of soil microorganisms in different management systems. From their research findings, the team plans to develop precision management tools and protocols that can be utilized by those who remove corn stover and residue from their fields.

The projects are a cooperative effort with UNL’s Department of Agriculture and Natural Resources. The USDA-ARS soil management team includes: Gary Varvel, Brian Wiendahl, and Virginia Jin, soil scientists, and Marty Schmer, research agronomist.

** Maximizing the economic value of sorghum varieties from around the world is also being studied to investigate the presence and abundance of novel starch biosynthesis pathway genes.**

USDA-ARS researchers working with these projects include: Jeff Pedersen, research geneticist; Scott Satzler, research molecular biologist; and Deanna Funnell-Harris, research plant pathologist.