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Extended Visions Newsletter of ARDC

Agricultural Research and Development Center

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## Extended Visions, May/June 2005

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**ARDC Director's Comments**

**Celebration of Milestones**

by Daniel J Duncan, ARDC Director

In my last column, I shared with you information regarding the upcoming celebration we are having at the ARDC on Friday, June 3, 2005. As this column goes to print, we are still finalizing plans for this celebration. Many of you will be receiving a letter of invitation to this event. However, it is impossible to reach everyone with an invitation, so I would like to use my column space to invite you, the readers of Extended Visions.

**The ceremony will begin at 11:00 a.m. on June 3, 2005.** The ceremony will be followed by lunch. We will have many activities available

after lunch including tours and booths describing research and educational activities at the ARDC. *If you plan on attending, please call 402-624-8000 or e-mail csheary1@unl.edu by Friday, May 27 so we can develop an accurate lunch count.*

The person we will be naming the Research and Education Building after grew up in Saunders County and was a successful businessman in Omaha before his retirement. He still owns the family farm near Colon, visiting when possible. I hope you can attend this event and learn more about this person. I am sure you will enjoy meeting him as I have.

The timing of the renaming of the Research and Education Building is very serendipitous as we also will be celebrating the 10th Anniversary of occupying the Research and Education Building. It is hard to believe we have been in this building for 10 years. The ten years seem like yesterday in one sense and a lifetime ago in another.

Hopefully you will be able to attend this event and help us celebrate these two milestones in the history of the ARDC. □



**Please join us as we rename the Research and Education Building after a former Saunders County resident. We will also celebrate the 10th Anniversary of the building. Friday, June 3, 2005**

- 11:00 Presentations  
- By NU Vice President & IANR Harlan Vice Chancellor John C. Owens & others
- 12:00 Lunch (RSVP required)
- 1:00 Visit the displays and tours  
- Learn about the departments, research, and education at the ARDC

**RSVP Required by Friday, May 27.  
Call 402-624-8000 or e-mail csheary1@unl.edu.**



**Bringing Engineering and Technology to Agriculture**

In this issue, we feature Biological Systems Engineering. UNL's Department of Biological Systems Engineering's

research and extension programs provide education and information to the state, region, nation, and world. The department also offers undergraduate, masters, and doctoral programs in Agricultural Engineering and Biological Systems Engineering. The Mechanized Systems Management program in Biological Systems Engineering provides for undergraduate and masters education.

Biological Systems Engineering's involvement at the ARDC is found in many different areas. Undergraduate classes often visit to learn about technology, such as GPS and yield monitors. Students get a first-hand look at equipment, processes and integrated cropping systems, as well as irrigation systems. The following is a list of some of projects at the ARDC and some of the classes that obtain valuable class time at the center.

Dr. Milford Hanna, with the Industrial Agricultural Products Center Pilot Plant at the ARDC, has been involved with: a scale-up process for developing modified starch for commercialization runs; cooperating with Dr. Dojin Ryu and Dr. Loyd Bullerman, Food Science and Technology Department, in processing mycotoxin con-



*The Mechanized Systems Management 452 class learns about irrigation systems at the ARDC.*

BIOLOGICAL SYSTEMS ENGINEERING - Cont. on P. 2

**Upcoming Training and Field Days**  
**CROP MANAGEMENT DIAGNOSTIC CLINICS**



- \* **Midsummer Diagnostic Clinics - July 14 & 15**
- \* **Late Season Diagnostic Clinic - Aug. 24**
- \* **Yield Monitor Training - Sept. 7**

*(The Yield Monitor training is at the University of Nebraska West Central Research & Extension Center at North Platte)*

**A**griculture professionals and crop producers will take a close-up look at field conditions, research and techniques at University of Nebraska Cooperative Extension crop management clinics. The training will be held at ARDC with registration beginning at 7:30 a.m. and the clinic starting at 8 a.m.

In July, participants can choose to attend a crop production and pest management clinic on July 14, a soil fertility and water management clinic on July 15, or both.

The clinics provide an excellent opportunity to gain firsthand, in-field experience. Participants learn from noted subject matter specialists in areas important to crop production profitability. Certified Crop Advisor credits are available for all clinics.

A highlight at the mid-summer July clinics will be the "CSI Plots". The CSI (Crop Scene Investigation) plots will give the participants the opportunity to put their diagnostic skills to the test as they diagnose the crop production problems at hand.

UPCOMING TRAINING AND FIELD DAYS - Cont. on P. 2

BIOLOGICAL SYSTEMS ENGINEERING - Cont. from P. 1

taminated grain; and Dr. Thomas Clemente, Department of Agronomy - Center of Biotechnology, in processing GMO soybeans.

Dr. Dean Eisenhauer teaches UNL's Mechanized Systems Management 452 class, Irrigation Management. The class visits the ARDC to evaluate and compare efficiencies of center pivots and linear move systems, as well as to learn about the computer controlled systems of center pivots at the ARDC.

Dr. Slava Adamchuk teaches UNL's Site-Specific Crop Management (Agronomy, Mechanized Systems Management and Agricultural Engineering) course. The class visits the ARDC to attain hands-on experience with combine yield monitors. The students will ride in an ARDC combine and observe yield monitors in use and then examine the maps created from the monitors. They also learn about Veris mapping fields. The Veris electrical conductivity mapping unit records electroconductivity of the soil at different depths to identify different soil types. And the class performs soil sampling while at ARDC.

The department is also involved in the Carbon Sequestration Project. The project involves research on how best to store carbon in soil, improve crop production efficiency in the Western Corn Belt and protect the environment. Dr. Derrel Martin is involved with the tillage affects and water management components.

Biological Systems Engineering faculty are also often involved in Cooperative Extension programs at the ARDC. They specialize in areas such as irrigation, precision agriculture and reduced/no-tillage practices and share their experience and studies via programs such as the Crop Management Diagnostic Clinics, Crop Management Winter Programs and others.

Faculty, staff and specialists present information at Cooperative Extension programs such as the Crop Management Diagnostic Clinics, Crop Management Winter Programs. In this issue of *Extended Visions*, we feature two of the many faculty members of Biological Systems Engineering.

**Dean Eisenhauer** is a Professor of Biological Systems Engineering and coordinator of the water science undergraduate program. He brings students to the ARDC to learn about irrigation systems.

Eisenhauer's time is split between research and teaching. His teaching focuses on water science engineering hydrology, soil conservation and watershed management, and irrigation systems management.



Dean Eisenhauer

His research focuses on the following:

hydrologic impacts of land and water use practices in agricultural regions; engineering of vegetative buffers for riparian and upland ecosystems; field measurement of Green-Ampt infiltration parameters; spatial variability of infiltration in hydrology and irrigation; and water measurement techniques in shallow streams and irrigation pipelines.

Eisenhauer earning his Ph.D. in Agricultural Engineering from Colorado State University - Fort Collins and his B.Sc. and M.S.

degrees in Agricultural Engineering from Kansas State University - Manhattan. He is also a registered professional engineer.

**Paul Jasa** is an Extension Engineer and a Research Engineer in the Department of Biological Sciences Engineering. He is well known by many ag producers as he often presents information at field days and meetings statewide and nationwide.

Those attending crop management programs and the No-Till Conference at the ARDC, as well as the Soybean Day & Machinery Expo in Wahoo have most likely learned from Jasa's presentations.

Jasa's area of specialization is no-till system management and precision agriculture and he is also a frequent contributor to Crop Watch, a crop production and crop scouting newsletter published by the University of Nebraska Cooperative Extension.

Some of Jasa's education programs include: no-till planting equipment and no-till system management; conservation tillage equipment and system evaluation; cultural practices for soil and water conservation; site specific crop management from a systems approach; calibrating yield monitors and combine dynamics; and interpreting precision ag maps and developing management zones.

Jasa has been working with planting equipment and tillage system evaluation in the University setting since 1978. He holds a B.Sc. in Agricultural Engineering and a M.S. in Agricultural Engineering, both from the University of Nebraska. He stresses the systems approach to crop production, focusing on profitability and the long-term benefit.



Paul Jasa presenting to a group at the Crop Management Diagnostic Clinics held at the ARDC.

BIOLOGICAL SYSTEMS ENGINEERING - Cont. on P. 3

## Luetkenhaus Honored at ARDC Reception

A reception was recently held at the ARDC to honor Greg Luetkenhaus. Greg worked with the Foundation Seed Division for 20 years. We wish Greg the very best as he pursues other endeavors! □



Greg was presented with a certificate of appreciation by Dan Duncan, ARDC Director.

UPCOMING TRAINING AND FIELD DAYS - Cont. from P. 1

July 14 clinic topics include: Corn Plant Distribution - Population, Twin Rows, Equidistance; Corn Rootworm Technology; Liberty Link vs. Roundup Ready System; Diagnostic Lab Update; Soybean Rust, and Relay Cropping - Wheat and Soybeans.

July 15 clinic topics include: Occasional Tillage; Managing Limited Water; Sprinkler Head Efficiencies - Surge Tech, Split Row; Root Dynamics; Corn Nitrogen Credits & Nitrogen Credit Calculation; and Water Optimization.



The clinics will help participants stay informed about today's everchanging world of crop production. Last year's participants indicated that the average profits gained from attending were an additional \$5.52 per acre. Those just out of school, well-seasoned producers and crop production professionals all will benefit from this clinic and be able to use this information daily.

Trainers are from the UNL faculty and the agricultural industry. The clinics provide an unbiased approach by highly skilled trainers. In addition to the tried and true information, participants learn firsthand what the presenters have experienced in their research.

Early registrations for each one-day clinic is \$130 for registration received up to one week in advance. After that, registration is \$180.

To register, call (402) 624-8030, via fax at (402) 624-8010, via e-mail at cdunbar2@unl.edu, or write to University ARDC, CMDC Programs, 1071 County Road G, Ithaca, Neb. 68033. Detailed information and registration available at <http://ardc.unl.edu/cmdc.htm>.

### SOYBEAN MANAGEMENT FIELD DAYS

The seventh annual Soybean Management Field Days is set for August 9 - 12. "Growing America's Future" is the theme of this year's event that will offer producers unbiased and research-based information to improve their soybean profitability.

UPCOMING TRAINING AND FIELD DAYS - Cont. on P. 3

## Why Attend Crop Management Diagnostic Clinics? Look at the record....

The Crop Management Diagnostic Clinic programs were first developed in 1996 as a solution for agribusiness professionals seeking out continuing education credits. There is an ongoing need for in-depth training opportunities in crop management and diagnostics. Since the clinics first began, nearly 3,500 registrants have participated in the clinics.

Information from participants has been gathered over the years (from 1996-2004) to assist in making sure the programs stay in line with participants needs. Here are some of the findings from that data:

- **99% of the participants have been somewhat or very satisfied with the programs**
- **81% probably or definitely will make changes in their business/operation based on what they learned**
- **89% probably or definitely will attend future clinics**
- **88% ranked the clinics as above average or one of the best compared to other educational opportunities available**
- **93% probably or definitely would recommend the clinics to others**
- **Acres influenced by the clinics annually ranges from 4,000,000 to over 7,000,000**
- **The average estimated value of knowledge gained and/or anticipated changes are \$5.23 per acre.** □

UPCOMING TRAINING AND FIELD DAYS - Cont. from P. 2

The event consists of four field stops across the state, each with demonstration plots, lunch and time for questions. Producers can obtain ideas and insight about the challenges they face in producing a quality crop at a profitable price in today's global economy.

Topics include: Conventional Soybean Weed Control and Roundup Ready Resistance Management; Growing Soybeans for High Yield and Quality; Soybean Aphids and Rust; and More Soybean Dollars in Your Pocket.

Last year's participants placed an average value on the knowledge gained and/or anticipated changes in practices at \$6.65 per acre.

By participating in the *Soybean Management Field Days*, producers will see their checkoff dollars at work bringing leading technology and ideas to producers. Participants from 55 counties representing 175 towns and cities and nearly 700,000 acres in Nebraska came to Soybean Management Field Days last year.

Presenters include university specialists, educators and industry consultants.

The field days begin at 9 a.m. and conclude at 2:30 p.m. Free registration is available the day of the event. Dates, locations and directions are:

**August 9 - Holdrege** - *Rick Bergman Farm* - From I-80: Take Exit 257. 9.1 miles south of I-80 & Hwy 183 interchange and 1/3 mile east on County Road 740. From Holdrege: 7 miles north on Highway 183 and 1/3 mile east on County Road 740.

**August 10 - Orchard** - *Mike Beelaert Farm* - From Orchard: 5 miles west (or 6 miles north of Ewing). Field is located 1/4 mile north of intersection of Hwy 20 and 45B on 508 Ave.

**August 11 - Central City** - *Don & Jim Benner Farm* - From Central City: 6 miles west on Hwy 30, 1/4 mile south on 11th Rd. Field site is on the east side of the road. From Chapman: 4 miles east on Hwy 30, 1/4 mile south on 11th Rd.

**August 12 - Holland** - *Steve DeBoer Farm* - From Lincoln: From I-80/South Hwy. 77 intersection (Exit 397) 15 miles south on Hwy 77, then 6 1/4 miles east on Panama Road. OR from Hickman, 1.5 miles south to flashing yellow light, east 2 1/4 miles. Field site is on the south side of Panama Rd on the east edge of Holland. From Hwy 43/158th Street Junction with Hwy 2: 9 miles south (158th Street turns into 162nd Street). Then 4.75 miles west on Panama Road.

Continuing education credits for the Certified Crop Advisor program will be available.

For more information, visit the web site at <http://arcd.unl.edu/soydays.htm> or contact the Nebraska Soybean Board at (800)852-BEAN or University of Nebraska Cooperative Extension at (800)529-8030.

*Soybean Management Field Days* are sponsored by the Nebraska Soybean Board in cooperation with Cooperative Extension in the University's Institute of Agriculture and Natural Resources and are funded through checkoff dollars. □

## SOLUTION DAYS

### \* Near Goehner - August 30 & 31

**S**olution Days 2005 will provide practical solutions to everyday agronomic questions. Producers, farm managers, and dealers will learn how to work smarter, not harder at the field days to be held August 30 & 31 near Goehner, Nebraska. Take Exit 373 on I-80 and go 1/4 mile south.

Increasing efficiency while decreasing expenses and minimizing losses are key in succeeding in today's ag marketplace. This event will offer realistic solutions for meeting the challenges of higher crop yields while keeping production costs economical.

*Solution Days 2005* is sponsored by the Nebraska Soybean Board and NK Brand Syngenta Seeds in cooperation with University of Nebraska Cooperative Extension, a division of the University of Nebraska-Lincoln's Institute of Agriculture and Natural Resources. Presenters include industry consultants and University of Nebraska specialists. The program runs from 9:00 am to 2:30 pm each day with in-field presentations.

The program is valued at \$125. Complimentary tickets are available from the Nebraska Soybean Board and NK Brand Syngenta Seeds. Participants are asked to bring their completed ticket panel to the field day to expedite registration.

Presentations will include: Overcoming Soybean Yield Barriers and Soybean Rust Update; Relay Cropping - More Crops, More Profit; Managing Sunlight With Corn Hybrid; and Tailoring Technologies For Your Farm.

For more information, visit <http://arcd.unl.edu/solutiondays.htm> or Nebraska Soybean Board at (800)852-BEAN or Nebraska Cooperative Extension at (800)529-8030. □



## Calendar of Events

### MAY

16	Marietta Livestock 4-H Club Meeting	6:30-9:00
17	CMDC Field Scout Training	8:00-5:00
18	American Public Works	
	Local Chapter Training	9:00-3:30
19	UNMC Student Tour	8:00-1:00
26	Children Exposed to Meth Workshop	8:00-5:00

### JUNE

2	Nebraska Dairy Princess Program	8:00-1:30
3	ARDC R&E Building Dedication/ 10 Year Celebration	11:00
7	Quality Assurance Training	2:00 & 7:00
9	Quality Assurance Training	2:00-4:00
13	Final Animal ID Day	8:00-5:00
14	Saunders County Extension Board Meeting	7:00-10:00pm
16	NC-1020/21 Meeting	8:00-7:00pm
21-22	Beekeeping Queen Rearing Workshop	8:00-5:00
23-25	Master Beekeeping Workshop	8:00-5:00

### JULY

6	4-H Council Meeting	7:30-9:30
14	Crop Management Diagnostic Clinic	8:00-5:00
15	Crop Management Diagnostic Clinic	8:00-5:00

BIOLOGICAL SYSTEMS ENGINEERING - Cont. from P. 2

## Research Project Coordination

**Stuart Hoff** is an Ag Research Technician III with the Biological Systems Engineering Department and is the manager of the Rogers Memorial Farm.

Hoff also serves as the Federal Excess Property Screener for the research center. This job duty includes seeking out excess items that the Federal Government no longer has need or use for, which the ARDC and associated departments can utilize. Once the property is received it must be inventoried, and reported in biannual audits to the USDA and the Government Services Administration. When the university has finished utilizing the items they must be returned.

Hoff and his wife, Karla, make their home in Lincoln. They have a son and a daughter. He received a B. Sc. degree in Mechanized Systems from UNL in 1986. He worked with the department from 1989 to 1995, then worked with the irrigation systems at the ARDC until the fall of 2004 and has served as the manager of the Rogers Memorial Farm since that time.



Stuart Hoff

## Rogers Memorial Farm

The Rogers Memorial Farm also plays an integral role in research, extension and academic programs provided by the Biological Systems Engineering Department. The Rogers Memorial Farm is a no-till research farm owned by the University of Nebraska-Lincoln and is operated by Biological Systems Engineering in cooperation with several other University departments and USDA agencies.

Located approximately 10 miles east of Lincoln, the 300-acre farm is typical of many small dryland farms in southeast Nebraska. Several University classes use the farm as an outdoor laboratory for real life situations and experiences.

Biological Systems Engineering has dedicated the Rogers Memorial Farm to soil and water conservation activities, evaluating and demonstrating both cultural and structural practices. Crops are raised using no-till tillage systems with rotations of corn-soybeans-soybeans on the level bottomland, soybeans-grain sorghum-soybeans-wheat on the sloping, terraced uplands, and some grain sorghum-soybeans in between. Acres are distributed as follows: corn (35), soybeans (130), grain sorghum (40) and wheat (35).

*History....* In 1947, the Rogers Memorial Farm was bequeathed to the University of Nebraska as a memorial to Edward Alfred Rogers. Rogers was a UNL graduate, who died in service during World War II.

Cattle breeding experiments were conducted at the farm from 1947 to 1966. Biological Systems Engineering (formerly known as Agricultural Engineering) began management of the farm in 1966. In 1985, the University's Institute for Agriculture and Natural Resources and the Board of Regents entered into an agreement with the U.S. Soil Conservation Service (now known as the National Resources Conservation Service) which designated the Rogers Memorial Farm as the "Conservation Demonstration Farm." Today, the Rogers Memorial Farm stands not only as a living memorial, but also as a center for soil and water conservation research and educational programs.

*Research....* Research projects range from early planting of soybeans to residential wastewater treatment using a constructed wetland. Research on and demonstration of

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**BIOLOGICAL SYSTEMS ENGINEERING**  
- Cont. from P. 3

structural conservation practices have included different terrace layouts, terrace types, terrace outlets, and drainage systems. Woodland and windbreak renovation and establishment practices are being evaluated, using both the farmstead and the streamside riparian areas.

Some production related research is conducted using strip trials, just as many farmers would do on their own farms. Hybrid and variety testing, row spacing and population studies, planting date comparisons, and fertilizer trials are examples of some of the cultural production practices being evaluated. Results from this type of applied research are being used to fine-tune the farm's general crop production, to demonstrate aspects of the farm, and to support Extension programs.

Studies by other departments included work on forestry (including woodlot management and development of a black walnut enterprise), control of pocket gophers, field scouting of insects, and basic studies on coyotes.

Biological Systems Engineering faculty and staff conduct a variety of experiments includ-

ing tillage and erosion studies, stiff-grass hedges and riparian buffer zones and runoff monitoring stations. Machine vision, Global Positioning Systems and other technologies are used in the research. Students are often involved in these projects and gain valuable educational and professional experience. □

**A Closer Look at the Saunders County Extension Board and 4-H Council**

In the previous issue of *Extended Visions*, we provided information on current Saunders County Extension Board and the 4-H Council members and the regions they represent. This month, we take a closer look at these governing organizations that provide important guidance for Extension and 4-H.

Nine individuals represent citizens of Saunders County on the Cooperative Extension Board. Their volunteer role is to be the eyes and ears of the local Cooperative Extension program. Each member represents a specific community sector or geographical area and also contributes to the overall program direction of the Extension outreach effort.

The Saunders County Board of Supervisors appoints the Extension Board members to a three-year term of service. The President of the Saunders County 4-H Council also serves on the Extension Board.

The extension board serves as an advocate for UNL Cooperative Extension in Saunders County. The board provides assistance to extension staff in establishing and accomplishing extension education program goals and objectives. Annually, the board assists in developing an operating budget and local educational priorities. The board is involved with issues related to programming, property and resource management, and personnel.

The Saunders County Extension Board meets at least six times a year. The next scheduled meeting of the Saunders County Extension Board is Tuesday, June 14, 2005 at 7:30 p.m. at the ARDC / Saunders County Extension Office near Mead. The agenda is posted at the Courthouse the week before each meeting.

The Saunders County 4-H Council is directly responsible to the Saunders County Extension Board and represents the interests of youth, parents and leaders. The objectives and duties of the 4-H Council are to:

- \* Help plan a sound county 4-H program based on goals and factual information
- \* Help determine policies for the county 4-H program; serve as a sounding board for ideas and programs
- \* Publicize 4-H work in Saunders County
- \* Assist in carrying out 4-H events and activities
- \* Make 4-H available to every boy and girl who are age 8 by January 1 of the current year and have not passed his or her 19th birthday by January 1 in Saunders County
- \* Assist 4-H leaders



The 4-H Council is made up of 18 members: 10 adults and 8 4-H members. A nomination form

is published in the 4-H newsletter for mail-in nominations and a nomination committee suggests candidates. Election ballots are mailed to all currently enrolled 4-H members and 4-H volunteers annually. Adults serve a three-year term and 4-Hers serve a 2-year



**M.E.A.D**  
*Making Education in Agriculture Different*

**A New Twist on Those "Creepy Crawlers"**

by Ag Literacy Students

Paul Naby, a grad student from UNL, visited the Ag Literacy class in April. He discussed the importance of forensic entomology with the class, including importance of insects when investigating crime scenes. He also talked about how people are becoming more aware of the importance of this area of science due to the new popular TV show CSI. After his power point presentation and insect collection showing, Paul opened the floor up for questions. The students, especially Randall Reed, enjoyed to hear what Paul had to say. Randall Reed said, "Being an entomologist would be cool, but gross at the same time. The pay would be great also, due to the fact that some make 300+ dollars an hour." □



Entomologist, Paul Naby shared an insect collection with agriculture literacy students.

**Crop Management Winter Programs**



Program evaluations were completed by participants in the recent Crop Management Winter Programs offered by University of Nebraska Cooperative Extension. From these evaluations the information below was gathered.

There were **260** private industry agribusiness professionals and farm operators in attendance. Participants represented **54** Nebraska counties and **96** towns and cities, plus **8** states. Conservatively, the workshops influenced crop management on **2,353,536 acres** of cropland or **16%** of Nebraska's corn, soybean, sorghum and alfalfa acres. The average estimated value of knowledge gained and/or anticipated practice changes on a per acre basis by participants totaled **\$8.62** per acre - bringing the total dollar impact to **\$20,291,403**. □

term. The council meets at least four times a year.

What are the benefits of serving on the Extension Board or the 4-H Council? These are great opportunities to develop leadership skills, represent the community, and make new friends along the way. Those who are interested in serving in either organization should be able to comprehend and communicate concerns about programs, participate in group decision making and have good communication skills.

If you are interested in being considered as a future candidate for the Saunders County Cooperative Extension Board or the Saunders County 4-H Council, please contact University of Nebraska Cooperative Extension at (800)529-8030 for more information. □



**University of Nebraska Education... It's a Prize Winning Education!**

From time to time, we share facts about the value of a University of Nebraska-Lincoln education in the *Big Red Truths* column. Check out these details...

- \* UNL ranks 31st in the nation among all public and private universities in the number of freshman Merit Scholars.
- \* UNL is second in the US in per capita enrollment of National Merit Scholars.
- \* UNL alumni include three Nobel Prize winners and eight Pulitzer Prize winners.
- \* UNL is one of only 62 research universities that hold membership in the Association of American Universities (AAU).
- \* UNL students have included 22 Rhodes Scholars, 18 Goldwater Scholars and 11 Truman Scholars. □

This issue of *Extended Visions* was produced and edited by Deloris Pittman, Marketing & Promotions Manager. *Extended Visions* is published bimonthly by the University of Nebraska ARDC & University of Nebraska Cooperative Extension in Saunders County, 1071 County Road G, Room A, Ithaca, Nebraska, 68033-2234. For more information, call 402-624-8000 or 1-800-529-8030. Check out our web site at <http://ardc.unl.edu>. E-mail [dpittman1@unl.edu](mailto:dpittman1@unl.edu). Copyrighted 2004, ARDC.

Daniel J. Duncan, Director, University of Nebraska-ARDC \* Keith Glewen, Extension Educator Unit Leader

BIOLOGICAL SYSTEMS ENGINEERING information provided by Stuart Hoff of the University of Nebraska-Lincoln Department of Biological Systems Engineering