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106th Annual Report

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Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska



July 1, 1991 to June 30, 1992

On the cover: The Platte River furnishes Nebraskans with drinking water, irrigation and recreation. This segment of the Platte, photographed by Mark Hansen near Valley, is part of the Columbus to Plattsmouth stretch studied by IANR researchers interested in the river's inhabitant's habits and needs. (Caption and photo courtesy RESEARCH Nebraska!)

The Nebraska Agricultural Research Division provides information and educational programs to all people without regard to race, color, national origin, sex or handicap.

Foreword and



106th Annual Report

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Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska



July 1, 1991 to June 30, 1992



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Research Highlights written by Adam Branting

Foreword

It is a pleasure to provide the 106th Annual Report of the UNL Agricultural Research Division (ARD). This report contains lists of current faculty; active research projects; refereed journal articles, books and book chapters, and theses and dissertations published; germplasm/cultivars released; and patents awarded. Also included are brief descriptions of selected research projects, awards received by faculty for research accomplishments, and the financial report for the period July 1, 1991 through June 30, 1992. This report was compiled in compliance with the intent of the law of the State of Nebraska that established the Nebraska Agricultural Experiment Station on March 31, 1887.

Faculty conducting research in agriculture, home economics and natural resources in the Institute of Agriculture and Natural Resources (IANR) and the College of Human Resources and Family Sciences carry research appointments in the ARD. Most faculty are on joint appointments with teaching responsibilities in the College of Agricultural Sciences and Natural Resources or the College of Human Resources and Family Sciences or serve as Extension Specialists with appointments in the Cooperative Extension Division. As of June 30, 1992, over 139 full-time equivalents in the ARD were distributed among 265 faculty members. These faculty are located on the East Campus of the University of Nebraska-Lincoln and at District Research and Extension Centers at Clay Center, Concord, North Platte, and Scottsbluff. The Agricultural Research and Development Center near Mead, Nebraska, serves as the primary site for field research with crops, trees, turf, and livestock conducted by faculty located on the East Campus.

All research activities are carried out as a part of one or more peer-reviewed, USDA-approved projects. There are currently more

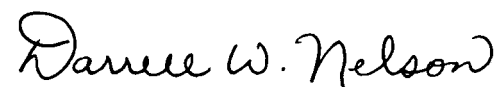
than 335 research projects supported by ARD resources. Continued investment in research is essential for maintaining and enhancing the long-term profitability and sustainability of Nebraska agriculture and ensuring the competitiveness of our products in the global market-place. Our agricultural research is focused largely on increasing the efficiency of producing crops and livestock and on increasing the quality of these commodities. Equally important is research directed at diversifying the crops and animals produced in Nebraska, adding value to agricultural commodities before transporting them from the state, and more effectively marketing our products. Other important research projects are focused on developing information essential for managing our natural resources, maintaining environmental integrity, and enhancing the quality of life for Nebraskans.

During the past 3 years, ARD has reallocated more than 20% of our federal formula and state appropriated funds to high priority programs identified in the IANR Strategic Plan while maintaining strong core research programs addressing the state's continuing needs. Program flexibility was further enhanced because grant and contract income increased about 60% during this period as a result of faculty efforts. The 3% budget reduction mandated during the current biennium coupled with the prospect of further reductions impair our ability to address important needs of Nebraskans but necessitates more focused programs and increases the importance of reallocation. The updated IANR Strategic Plan published in June 1992 will serve as the basis for reallocation decisions during the next 3 years. Programs to be emphasized include: agricultural and agribusiness profitability; water and the environment; value-added processing of commodities; families, youth and leadership development; and nutrition, food quality and food safety. We believe

that these programs are essential to the economic and social well-being of Nebraska and the region.

Results derived from various projects are published in scientific journals, trade magazines, bulletins, books, UNL publications, and departmental reports. These research results then become the information base for academic programs and educational activities of the Cooperative Extension Division. Reprints of most journal articles may be obtained by writing directly to the authors.

Researchers in the Agricultural Research Division are part of a national network of Agricultural Experiment Station scientists located at Land Grant Universities across the United States. Nebraska scientists are currently involved in approximately 65 regional projects in which they collaborate with researchers at other universities to address priority problems of regional importance. High priority is given to working cooperatively with scientists having similar interests who are employed by the USDA Agricultural Research Service and Forest Service. There are currently about 25 federally-supported scientists located on the East Campus and approximately 55 scientists at the Roman L. Hruska U.S. Meat Animal Research Center at Clay Center who work jointly with ARD researchers. A number of ARD scientists are also involved in cooperative research programs with faculty on the UNL City Campus and the University of Nebraska Medical Center.



Darrell W. Nelson, Dean
Agricultural Research Division and
Director, Nebraska Agricultural
Experiment Station
University of Nebraska



Administrative Personnel (June 1992)

University Of Nebraska Board Of Regents

Robert M. Allen, Hastings	John Payne, Kearney
Don S. Blank, McCook	Margaret Robinson, Norfolk
Nancy Hoch, Nebraska City	Rosemary Skrupa, Omaha
Nancy O'Brien, Waterloo	Charles Wilson, Lincoln

Student Regents

UNO — Michael Farquhar
UNMC — Natalie Olson
UNL — Andrew Sigerson
UNK — Kevin Mc Cully

Administrative Officers

Martin A. Massengale, President, University of Nebraska
Graham S. Spanier, Chancellor, University of Nebraska-Lincoln
Irvin T. Omtvedt, Vice Chancellor, Institute of Agriculture
and Natural Resources

Agricultural Research Division

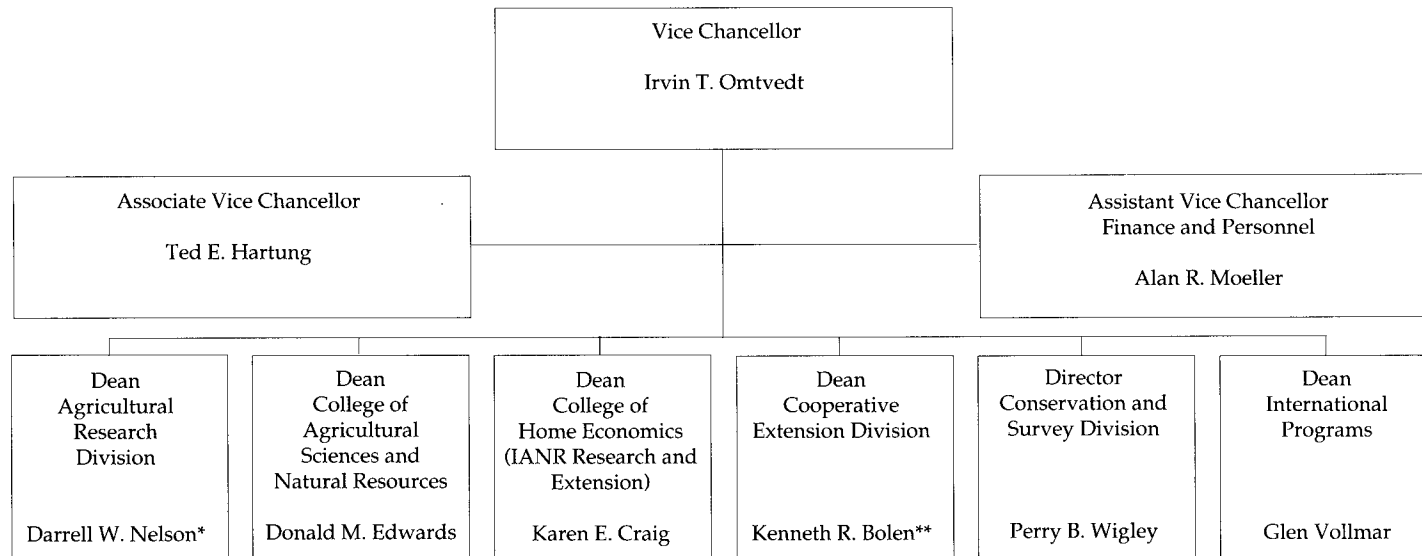
Darrell W. Nelson, Dean and Director
Dale H. Vanderholm, Associate Dean and Director
Karen E. Craig, Assistant Director/Home Economics
Steven S. Waller¹, Assistant Dean/Assistant Director
Alice J. Jones², Administrative Intern
Dora Dill, Staff Assistant
Diane Mohrhoff, Clerical Assistant III
Nelvie Lienemann, Staff Secretary III
Kathy Westwood, Staff Secretary III

Administration

ARD is one of 5 divisions within the Institute of Agriculture and Natural Resources (IANR) of the University of Nebraska. IANR was established by the Nebraska legislature in 1973 and has its headquarters on the University of Nebraska-Lincoln East Campus. The University of Nebraska system has four campuses: University of Nebraska-Lincoln, University of Nebraska Medical Center, University of Nebraska at Omaha and the University of Nebraska at Kearney. The University of Nebraska system is governed by an elected Board of Regents and administered by a system and campus administration.

¹Temporary appointment

²Appointment for part of the year



*Director, Nebraska Agricultural Experiment Station
 **Director, University of Nebraska Cooperative Extension

Organizational Chart

Institute of Agriculture and Natural Resources
 University of Nebraska-Lincoln

Administrative Units Reporting To Dean And Directors

Institute of Agriculture and Natural Resources
The University of Nebraska - Lincoln
June 1992

Agricultural/Natural Resources Departments

AGRICULTURAL COMMUNICATIONS
Gary Vacin, Head

AGRICULTURAL ECONOMICS
Sam Cordes, Head

AGRICULTURAL EDUCATION
Allen Blezek, Head

AGRICULTURAL METEOROLOGY
Blaine Blad, Head

AGRONOMY
Robert Shearman, Head

ANIMAL SCIENCE
Elton D. Aberle, Head

BIOCHEMISTRY
Marion O'Leary, Head

BIOLOGICAL SYSTEMS ENGINEERING
Glenn Hoffman, Head

BIOMETRY
David Marx, Head

ENTOMOLOGY
John Foster, Head

FOOD SCIENCE AND TECHNOLOGY
Steve Taylor, Head

FORESTRY, FISHERIES AND WILDLIFE
Gary L. Hergenrader, Head

HORTICULTURE
Paul Read, Head

PLANT PATHOLOGY
Anne Vidaver, Head

VETERINARY SCIENCE
John A. Schmitz, Head

Home Economics Departments

CONSUMER SCIENCE AND
EDUCATION
Kathleen Prochaska-Cue, Interim Chair

HUMAN DEVELOPMENT AND
FAMILY
John Woodward, Interim Chair

NUTRITIONAL SCIENCE AND
HOSPITALITY MANAGEMENT
Marilynn Schnepf, Interim Chair

TEXTILES, CLOTHING AND DESIGN
Rita Kean, Chair

Off-Campus Research Centers

AGRICULTURAL RESEARCH AND
DEVELOPMENT CENTER
Mead
Daniel J. Duncan, Director

NORTHEAST RESEARCH AND
EXTENSION CENTER
Concord
Donald B. Hudman, Director

PANHANDLE RESEARCH AND
EXTENSION CENTER
Scottsbluff
Robert D. Fritschen, Director

SOUTH CENTRAL RESEARCH AND
EXTENSION CENTER
Clay Center
Charles L. Stonecipher, Director

SOUTHEAST RESEARCH AND
EXTENSION CENTER
Lincoln
Lloyd L. Young, Director

Interdisciplinary Centers

BIOTECHNOLOGY CENTER
Don Weeks, Director

ENVIRONMENTAL PROGRAMS
Ed Vitzthum, Interim Director

FOOD PROCESSING CENTER
Steve Taylor, Director

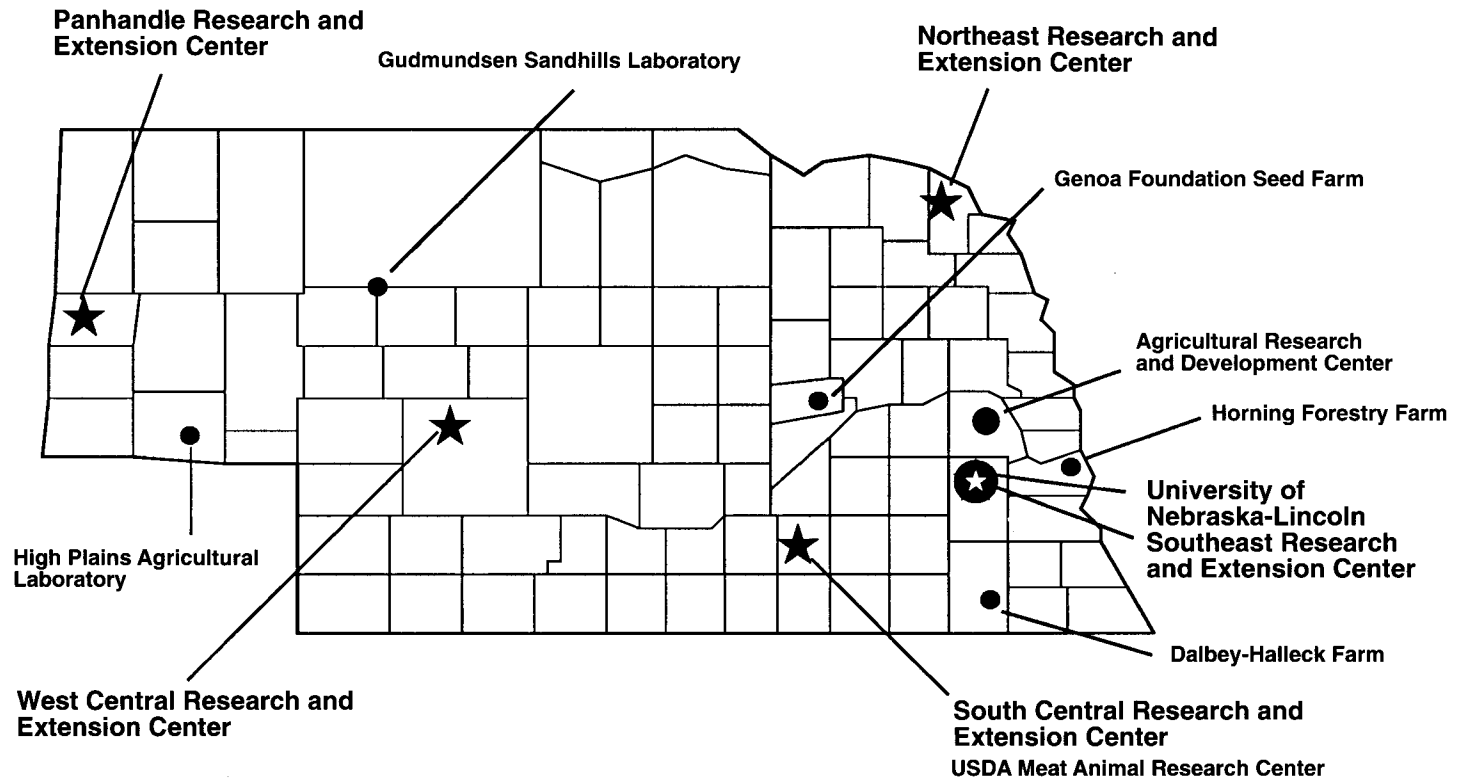
INDUSTRIAL AGRICULTURAL PRODUCTS
CENTER
Milford Hanna, Director

INTERNATIONAL TRADE POLICY
CENTER
Robert McGeorge, Director

RURAL COMMUNITY REVITALIZATION/
DEVELOPMENT CENTER
Sam Cordes, Director

SUSTAINABLE AGRICULTURAL SYSTEMS
CENTER
Charles Francis, Director

WATER CENTER
Bob Volk, Director



IANR Research Facilities



Research Highlights

The Agricultural Research Division provides leadership for research addressing problems and opportunities in agriculture, food, natural resources and home economics. Fundamental and applied research provides solutions to priority problems facing Nebraska's agriculture and food industries, develops information essential for managing our natural resources and maintaining environmental integrity, and enhances the quality of life for Nebraskans. "Research Highlights" provides a small glimpse of ARD's research efforts, reflecting the program's importance, relevance and timeliness.

Leafy spurge has been called one of the worst grassland weeds in the northern and central Great Plains, currently infesting five million acres.

While most weeds have various biocontrols (diseases or insects) that keep it in check, leafy spurge likely isn't a home-grown weed. Rather, it must have "migrated" in crop seed from another country. Without the natural biocontrols of its homeland, the weed is virtually unchecked (herbicides have little effect.)

Agronomist Scott Nissen and his multi-discipline team are looking small to find a big solution.

Using genetic screening methods, a variation of DNA fingerprinting, Nissen is hoping to find within the plants' chloroplasts telltale features that will identify the weed's ancestors and generational changes.

Like tracing the ancestral family tree, the search will begin locating leafy spurge's homeland. From that area, researchers will look for insects or diseases that will properly destroy the weed without becoming a problem for native plants of the plains.

The project, it is hoped, will serve as a model for the genetic analysis of other weeds, with applications for biocontrol.

IANR Food Scientists Susan Cuppett and Susan Sumner have joined the battle to thwart food spoilage and keep foods fresher, longer, by using an edible film to inhibit microbial growth, and flavor and moisture loss.

While edible films aren't new to the food industry (they are used on cheeses, frozen pizza crust, frozen dinners and candy), Cuppett and Sumner's film could

be used to increase shelf life on raw poultry, meat and fish and possibly some processed meats.

In addition, the film is also being looked at to eliminate the "awkward" taste often associated with microwaveable foods.

The film is produced by combining starch, glycerol, water and an anti-microbial compound and heating it on a cookie sheet, making a 1 to 2 mm film. Foods could also be dipped for coating.

Tests of the film have proved promising, often increasing the shelf life a week longer, which would have a tremendous impact on smaller producers.

While what is known as "pinkeye" is fairly common but harmless ailment in humans, it is the third costliest disease facing cattle.

Pinkeye in cattle is caused by the bacterium *Moraxella bovis* (different than the bacteria of human pinkeye), which secretes toxins that cause ulcers in the eye. Usually painful, pinkeye often causes blindness and though limitedly treatable, causes a loss in weight gain.

Bovine pinkeye research slowed in the mid-80's, according to Veterinary Scientist Doug Rogers, when researchers found they couldn't separate the hemolysin toxin from the *Moraxella bovis* bacteria and maintain it for analysis.

Graduate student Jeff Gray, in coordination with Rogers and Veterinary Scientist Paula Cray, have developed a technique that separates the hemolysin and maintains it long enough for study. In addition, Gray discovered that the hemolysin causes cell damage.

Armed with this knowledge, Rogers said interest should be rekindled into finding a better vaccine for pinkeye.

With today's consumer trying to lead a healthier lifestyle, the beef industry is trying to stay in step by using the latest in technical innovations.

Chris Calkins of the Animal Science Department is applying electromagnetic scanning (an adaptation of hospital equipment) to measure lean in beef sides, quarters and wholesale cuts. Scanning could offer a simple, safe, objective way to assess beef carcass value based on lean content.

The beef is placed in a large, long metal tube containing an electric metal coil, which creates an electromagnetic field. Computers gauge the flow of electricity through the object, identifying lean and fat content (it has been found that lean meat conducts electricity better than fat).

The scanners have been found to predict lean content within 3 to 4 pounds of actual content in a 150-pound beef quarter. It is hoped the beef industry will use this scanner to reward producers who produce leaner cattle, as well as determine the value of trimmings (which are used to make ground beef).

In response to increased concern in the use of agri-chemicals, ARD researchers are finding new and innovative ways to decrease their use without sacrificing crops.

An experimental program by Agronomist Dave Mortensen and Biological Systems Engineer Ken Von Bargen uses computer tech-

nology to apply pesticides on weeds.

An optical sensor unit detects differences in reflected light (plants, soil and crop residue reflect light differently) and zeroes in on what it identifies as weeds. A computer monitors the sensor's signal, turning on a sprayer just long enough to spot treat a weed with herbicide.

This technology could decrease the use of herbicides by 20 to 70 percent, depending on the type of weed and chemicals used. The system could be positioned higher for wide broadcast applications or lower for narrow band applications.

If all goes well in field tests, the system could soon be ready for commercial use.

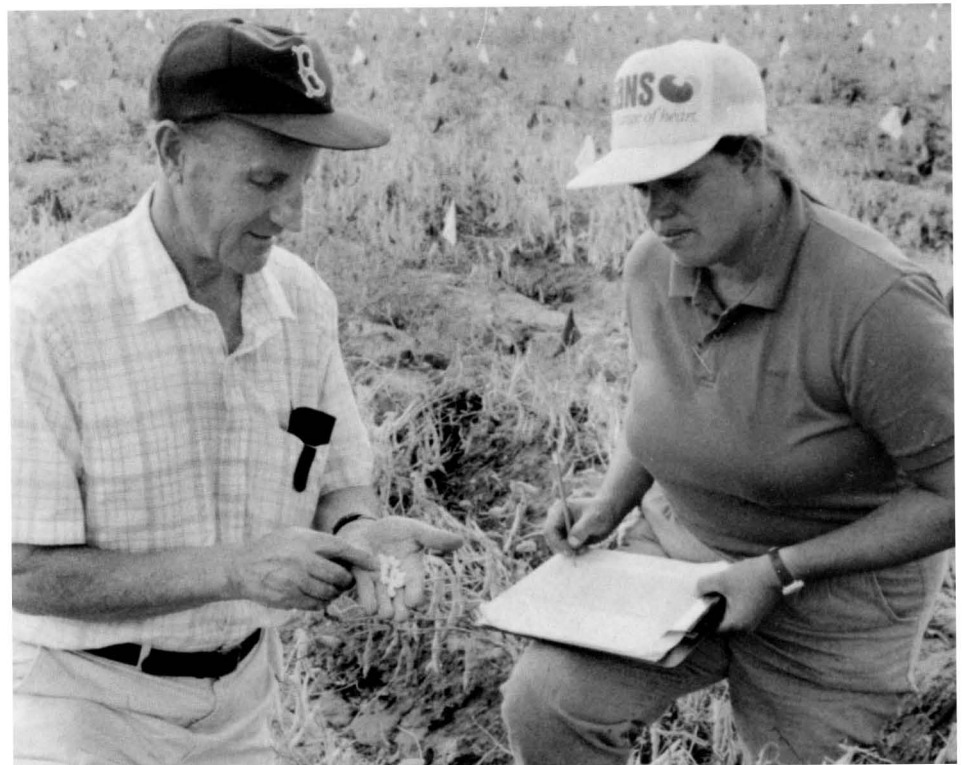
With an eye toward the environment, IANR Biological Systems Engineer Milford Hanna

and Food Scientist Rangan Chinnaswamy have developed a process to create a new plastic that uses less petro-chemicals and is more environmentally friendly.

By combining 80 percent starch, food chemicals and water with 20 percent conventional polystyrene resin, they have created a bioplastic of mostly renewable and degradable materials. This plastic type could conceivably replace "styrofoam" in foam coolers, coffee cups, egg-cartons, etc.

In addition, the process could be a tremendous boon to agriculture, as more than 15 million bushels of corn would be needed to make the foam if only half the current market was taken over by the bioplastic.

Hanna is working to eliminate any polystyrene from his bioplastics, but he notes it is a long-term goal.



Dermot Coyne, IANR dry bean breeder, and Doris Boecking, plant breeding assistant, evaluate the high quality seed of a new great northern breeding line at NU's Cooperative Dry Bean Nursery, part of the Panhandle Research and Extension Center. (Photo by Mary Bargman Crawford. Caption and photo courtesy RESEARCH Nebraska!)

In the use of pesticides, agri-chemical companies are often quick to find a lethal compound without knowing how it works. Entomologist David Stanley-Samuelsen likes to know the cause as well as the effect.

Stanley-Samuelsen and his team have developed an aspirin-like substance that effectively blocks eicosanoids, a class of molecules that trigger an insect's immune system (in this study, the tobacco hornworm). In doing so, the insect is then susceptible to diseases normally harmless to it.

But for Stanley-Samuelsen, just being able to kill the insect isn't enough. His research is now guiding him through the immune system of insects and the inner working of eicosanoids.

By finding out exactly how eicosanoids work in regulating the immune system, the development of pesticides can be designed toward using more natural compounds that will be less

environmentally harmful, highly efficient and lower in price.

Meanwhile, years of research are bringing two new species of plant life into the world, direct from the Horticulture Department and IANR Research and Extension Centers.

Completing the work of retired potato specialist Bob O' Keefe, Alexander Pavlista of the Panhandle Research and Extension Center has released a new potato, "Red Cloud."

The "Red Cloud" is a cross between a red cultivar and a scab-tolerant white cultivar. Pavlista said the potato has the same gravity as the popular Russet potatoes, making it ideal for baking, or boiling and mashing, as well as salads.

Over at the West Central Research and Extension Center, Horticulturist Dale Lindgren will release a new species of the Penstamon flower. The "Cobaea Henry" is unlike most Penstamons as it has an unusually large bloom colored from lavender to rose.

Penstamons are used primarily for the home or for roadside beauty, or to reclaim areas for native plants.

While horticulturists and other food scientists spend lifetimes developing highly efficient, nutritious and delicious foods, what the consumer does to them in preparation may be just as important.

Nutrition Scientists Marilyn Schnepf and Judy Driskell have studied nutrient retention in frozen peas and corn, fresh potatoes, broccoli and cauliflower after being cooked in various ways.



Starch-based bioplastic foam oozes from an extruder's nozzle as Rangan Chinnaswamy (left) adds starch and Milford Hanna adjusts controls. Using a process they invented, these IANR researchers produce extruded bioplastic foam made mostly of readily renewable and biodegradable materials. (Photo by Mark Hansen. Caption and photo courtesy RESEARCH Nebraska!)

The vegetables were conventionally and microwave steamed, as well as conventionally and microwave boiled. Schnepf and Driskell found that microwave steaming retained the most nutrients in all five vegetables, while the most nutrients were lost in conventional boiling.

Essentially, the longer vegetables cook and the more water used to cook them, the greater the nutrient loss. However, despite the cooking method, the vegetables retained significant sources of the nutrients studied, thus disproving a wide-held belief that important nutrients are "washed away" by boiling.

Though a sensory panel later evaluated all four types of cooked vegetables and didn't come to a consensus of which cooking method was more appealing to their taste buds, the theory is that the convenience of microwaving vegetables will hopefully increase consumption.

Animal Scientist Mike Brumm of the Northeast Research and Extension Center and Agricultural Economist Tim Powell are finding that profitability will increase when pigs are given less space.

Acting on economic principles, Brumm and Powell analyzed pig performances and overall economic outcome at 6,7,8,9 and 10 square feet of space per finisher pig.

They found that less space is optimal. Though pigs tend to gain less weight when they are crowded, that cost is offset by the ability to bring more pigs into the growing/finishing barn, thus making more money per square foot.

Though more feed is necessary, extra feed is less expensive than a



The extrusion process combines conventional plastic resin beads with starch, food chemicals and water to create functional, water-resistant, starch-based plastic foam containing only 20 percent polystyrene. (Photo by Mark Hansen. Caption and photo courtesy RESEARCH Nebraska!)

new barn and its necessary outfitting (lighting, heating, etc).

Brumm and Powell remind producers that this finding needs to be incorporated into an overall management system.

Feeding efficiently has been on the minds of Animal Scientists Terry Klopfenstein and Rick Stock, who have been looking at the cost of feeding ethanol production byproducts - wet grains and thin sillage - to feedlot cattle.

Wet grains, a moist yellow mixture of ground corn kernels, are mostly protein. Thin sillage, a yellow liquid, contains about 95 percent water and 5 percent high protein dry matter.

While previous research has shown that the byproducts can be a nutritious part of cattle diets, it is costly to ship the liquids to

feedlots. However, it is also very costly to dry out the byproducts for feed use.

After a two-year study, Stock and Klopfenstein have found that it is worth the price to feed cattle wet byproducts. In various tests combining wet grains with regular feed, and replacing water with thin sillage, they found cattle not only did well but slightly improved their performance.

It is hoped to increase efficiency and lower costs, small ethanol plants can be built close enough to feedlots to maximize economic potential.

Sandpit lakes, particularly common along the Platte River, have long been popular for cabins and recreation. But as of late, many patrons have become concerned that their lakes are

becoming...well...icky.

A number of lakes have experienced algal blooms, blue-green algae stimulated by phosphorous and other nutrients. Though it isn't clear why it is happening (as Sandpit water is generally clean when the lakes are formed), Kyle Hoagland of Forestry, Fisheries and Wildlife has been researching techniques of clearing up the algae.

Instead of using chemical toxicants, which try to destroy the algae but are generally unsuccessful over long periods of time, Hoagland and graduate student John Holtz are finding limited success by using ferric sulfate.

Ferric sulfate is a fairly corrosive

element that lowers the pH in the water and drags the phosphorous to the bottom. Tests so far have been limited to jars and 250-gallon tanks, but the results are encouraging.

The next step is to cordon off part of a sandpit and test on a larger scale. If that works, then the process could have broader applications.

As our natural resources continue to dwindle, producers must continue to search for their most efficient use while remaining profitable.

Joel Cahoon, a water management specialist at the South Central Research and Extension Center, has been working on a problem very close to corn producers' pocket books.

Cahoon's experiments, using computer models and field tests, are showing that during years of drought, corn producers may not have to plant only part of their fields with corn and leave the rest to dryland crops like sorghum.

Rather, his studies are showing that limited irrigation at the proper times in the proper amount can allow for full planting and only slightly reduced yields.

Computer models show that if corn is watered during tasseling (when most of the ear's growth takes place) and is used properly (not so much as to soak past the roots or produce runoff) that the stress the corn will receive won't decrease profits as much as producing half a harvest of dryland crops.

Testing will continue over the next several seasons, but Cahoon notes interest has been high from corn producers.



Donald Lee, Scott Nissen and Robert Masters discuss the fine points of leafy spurge identification in an East Campus nursery containing specimens from different locations. (Photo by Mark Hansen. Caption and photo courtesy RESEARCH Nebraska!)

As with any business, governmental regulation can be crucial to the success of investment and sales. To inform Senators and Congress of the value of various legislation, Agriculture Economist Azzeddine Azzam has been working toward developing a simple econometric model.

The model uses information on corn, soybeans, cattle and hog sectors in Nebraska, as well as the whole nation, to find how agricultural policies affect the state economy.

The model translates the real workings of each sector and its interaction with other sectors, using numerical relationships estimated from historical observations and policy developments in that sector.

According to the findings, Nebraska's agricultural economy responds radically to farm policy, as opposed to many other states with more economic diversity. This proves the need for legislatures to look at the impact of national policies on state economies, and not only on national economics.

Azzam said the model could be expanded to include chemical and fertilizer regulations.

Many factors contribute to how well agriculture does. The climate of the state and the world is obviously a bit more than a mitigating factor.

Betty Walter-Shea of Agricultural Meteorology studies these effects using the latest in geophysical remote sensing technology.

Remote sensing gathers information on surface electromagnetic radiation interactions to define parameters of certain processes, such as evapotranspiration and photosynthesis.



Weed Scientist Dave Mortensen (left) and Biological Systems Engineer Kenneth Von Barga calibrate the sensor on the weed sensor-intermittent sprayer system they're developing. This optical sensor distinguishes plants from soil background. (Photo by Mark Hansen. Caption and photo courtesy RESEARCH Nebraska!)

In doing so, remote sensing offers the potential to monitor changes due to climate change and to estimate effects due to climate change in Nebraska, as well as the global climate.

Some of Walter-Shea's projects include international programs in Russia and Kansas. Her research involves defining spectral and angular characteristics of reflected and emitted radiation of various vegetative surfaces.

In 1988, the two most popular insecticides, chlordane and heptachlor, were banned for termite control due to suspected human health risks. To protect homes/buildings from very expensive termite damage, several new generation insecticides have been registered; however, their fate in soils and the environment remains unknown. Termites cause over one million dollars annually

in damage to farm and urban homes and/or buildings in Nebraska.

Shripat Kamble of Environmental Programs/Water Center has been conducting research to determine vertical/horizontal movement and dissipation of these insecticides in various soil types under midwestern climatic conditions. He has built structures at the ARDC near Mead to represent conditions similar to the home environment.

The research data will allow us to answer many questions such as "What should be the spacing between application points to provide a continuous chemical barrier against termites?"; "What are the chances of well water contamination if the well is within a certain distance from the home?"; and "How long will these insecticides provide termite control in acidic, alkaline, sandy, silty-loam or clay soils?"

Many homeowners have fumed and fussed at the site of Brown Patch disease in the front yard. Plant Pathologist Gary Yuen would like to rid Nebraskans of the pesky lawn foe.

Brown Patch disease is caused by *Rhizoctonia solani*, a killer fungus pathogen that enters a grass leaf through natural openings or the cut of a dull mower blade, causing patches or circles of dead grass.

Yuen is looking at two methods to halt brown patch. One is using a non-pathogenic species of *Rhizoctonia* as a biocontrol agent that will limit or attack the pathogen. He is also trying to identify new varieties of tall fescue that will be resistant to brown patch when grown in Nebraska.

Lest we get too impressed with our ability to manipulate nature, it is helpful to remember that humanity is but a small part of the ecological system. The planet has long survived on its own using a variety of defense mechanisms.

Humanity has a lot to learn about how the planet cleans itself from harmful materials. Biochemist Stephen Ragsdale hopes that anaerobic bacteria will show him how their unique appetite can benefit the environment and the chemical industry.

Anaerobic bacteria are organisms that live without oxygen, feeding on "waste" chemicals such as carbon monoxide. Ragsdale hopes to discover how they survive and harness their processes to help detoxify chemical waste.

For instance, scientists have known that nickel and cobalt were required in the anaerobes' biological process that converts carbon monoxide. Ragsdale discovered that those metals are found in the enzymes in the anaerobes. By focusing on the genes that create enzymes, he will determine what makes the enzymes work as the catalyst.

These and future discoveries could lead to the use of this bacteria for converting chemical waste into useful materials such as acetic acid (used in making plastic) or organic matter such as amino acids.

In the years since the deregulation of the rail industry in 1980, a shift in price discrimination has occurred from large-load grain shippers to small-load grain shippers, according to Agricultural Economist Dale Anderson.

Anderson studied five years of shipping costs before and five years after the Staggers Rail Act of 1980, which deregulated the rail industry.

What Anderson found was that while large-load shippers bore higher costs before regulation, deregulation found the rail industry trying to lure big loads by



Agricultural Economist Tim Powell (left) and Animal Scientist Mike Brumm studied the economics of space allocations for growing-finishing pigs. They found providing less space per pig than previously recommended for optimal pig performance may boost profit potential. (Photo by Ron Cleveland. Caption and photo courtesy RESEARCH Nebraska!)

dropping prices (which was also caused by competition) while raising prices for smaller loads. In response, the small-load grain shippers began to move their business to the trucking industry.

While overall rate discrimination has declined, it is still the highest in the Plains states, largely because of long distances to large markets and a lack of alternate shipping transport.

Sometimes, according to Agricultural Meteorologist Don Wilhite, government doesn't plan ahead.

Wilhite, Director of the International Drought Information Center, said many state, national and international governments more often than not fail to notice a crisis situation until it is at its worst.

A drought is unlike hurricanes or floods, where the damage comes quickly and is readily visible. Droughts can take some time to reach a problem stage, and their effects tend to be long lasting.

Because droughts happen quite often, officials need to take a proactive stance with various contingency plans to mitigate the impact, rather than deal with a crisis at its apex. Increased communication between government agencies are crucial as integrated monitoring can more easily spot problems.

Wilhite and others have had to raise their voices for sometime to get officials to realize that any plan is better than no plan. Ten years ago, three states had drought contingency plans. Today, 27 states have plans and three are in the planning stages.

In addition, Wilhite has worked with the governments of the United States, Brazil, Philippines,

China, and Australia. Also, he has held seminars for nations in Africa, Asia, and has an upcoming conference in South America.

It isn't Ozzie and Harriet anymore.

Today's youth face problems that David and Ricky couldn't imagine. Drugs and alcohol, loneliness, abuse, sexually transmitted disease and other such risks face Nebraska adolescents every day.

For the last several years, John Woodward of Human Development and the Family has been gathering basic data on the young people of Nebraska.

The Nebraska Adolescent Health Survey, developed by Woodward and based on a similar survey from the University of Minnesota, was administered to 235 members of Nebraska 4-H and 61 rural ninth graders. Youth were asked about general information, health, mental health, substance abuse, sexual activity and abuse, resources for help seeking and self-esteem.

The data shows that 4-H youth may be slightly less at risk than general rural youth, due to a variety of factors. Woodward said that there may be no correlation with being in 4-H, as those attracted to 4-H may be more disposed to be a part of a positive group experience.

This data gives Woodward a better idea of what rural youth are facing today. From here, programs will need to be implemented to better serve the youth of Nebraska (particularly getting parents, educators and communities involved) to minimize risks.

Consumer Science and Education Professor Raedene Combs

has been studying the costs of rural housing for elderly, single women.

Combs has found that women with government assistance pay on average 32 percent of their income on housing costs, seven percent more than women with no government assistance and a full 18 percent more than elderly, male heads of households.

Many factors contribute to low income among rural, elderly women. Many are full time homemakers without employer benefits or pensions. Most, having outlived their spouses and drawn from their resources, find themselves financially strapped.

Combs reasons that government needs to expand housing assistance to provide affordable housing for rural communities in the short run, and long term empowerment of women in the future to prevent such a disadvantage.

Tourism and travel is one of the fastest growing industries in the United States and in the North Central Region, providing opportunities for economic diversification, according to Rita Kean and Shirley Niemeyer of Textiles, Clothing and Design.

In a tri-state (Iowa, Minnesota and Nebraska) project on tourism and crafts marketing, Kean and Niemeyer distributed questionnaires by mail to over a 1,000 craftspeople, retailers and tourists.

They hoped to identify marketing strategies most useful to craftpeople and retailers in selling to tourists. Data showed that craftspeople and retailers have an opportunity to grab a lot of the tourist dollars, because tourists responded that shopping was an important activity to get an "authentic" remembrance of their trip.

	Rank	Rsch	Ext	Tch	Other	Area of Responsibility
Agronomy						
Robert C. Shearman	Professor	0.40	0.30	0.30		Head
Bruce E. Anderson	Associate Professor	0.40	0.60			Forage Management
David J. Andrews	Professor	0.25			0.75	Millet and Sorghum Breeding
Timothy J. Arkebauer	Assistant Professor	0.85		0.15		Crop Environment Physiology
P. Stephen Baenziger	Professor	0.75		0.25		Small Grains Breeding and Genetics
Ralph B. Clark ¹	Professor				USDA	Sorghum Physiology
Max Clegg	Associate Professor	0.85		0.15		Crop Physiology
William A. Compton	Professor	0.90		0.10		Corn Breeding
John W. Doran	Professor				USDA	Soil Biochemistry
Jerry D. Eastin	Professor	0.85		0.15		Crop Physiology
James R. Ellis	Associate Professor				USDA	Soil Microbiology
Charles A. Francis	Professor	0.30	0.30		0.40	Crop Production/Sustainable Ag.
Kenneth D. Frank	Associate Professor	0.25	0.25		0.50	Soil Testing
George L. Graef	Assistant Professor	0.85		0.15		Soybean Breeding
Robert Graybosch	Assistant Professor				USDA	Wheat Genetics
Blaine Johnson	Assistant Professor	0.80		0.20		Quantitative Genetics
Alice J. Jones	Associate Professor	0.50	0.50			Soil Conservation
Donald J. Lee	Assistant Professor	0.40		0.60		Plant Genetics
David T. Lewis	Professor	0.40		0.60		Soil Genesis and Classification
Jerry Maranville	Professor	0.85		0.15		Sorghum Physiology
Alexander Martin	Professor	0.33	0.67			Weed Science
Stephen C. Mason	Associate Professor	0.50		0.50		Crop Production
Robert A. Masters	Assistant Professor				USDA	Range Weed Control
Dennis McCallister	Associate Professor	0.40		0.60		Soil Chemistry
Lloyd N. Mielke	Professor				USDA	Soil Physics
Kenneth Moore	Associate Professor				USDA	Forage Quality
David A. Mortensen	Assistant Professor	0.75		0.25		Weed Science
Lowell E. Moser	Professor	0.35		0.65		Forage Physiology
Lenis A. Nelson	Professor	0.50	0.50			Crop Variety Evaluation/New Crops
Scott J. Nissen	Assistant Professor	0.55		0.20		Weed Physiology
Jeffrey Pedersen	Associate Professor				USDA	Sorghum Genetics & Breeding
Edwin J. Penas ¹	Associate Professor	0.25	0.75			Soil Fertility
C. James Peterson	Associate Professor				USDA	Wheat Genetics
James F. Power	Professor				USDA	Soil Fertility
William L. Powers	Professor	0.88		0.12		Soil Physics
Donald H. Sander	Professor	0.50	0.50			Soil Fertility
James S. Schepers	Professor				USDA	Soil Chemistry
Patrick J. Shea	Associate Professor	0.80		0.20		Herbicide Dissipation
David R. Shelton	Assistant Professor	0.80	0.20			Cereal Chemist
Joseph H. Skopp	Associate Professor	0.50		0.50		Soil Physics
Robert C. Sorensen ¹	Professor			1.00		Soil Fertility, Teaching Coordinator
Roy F. Spalding	Professor	0.50		0.10	0.40	Hydrochemist
James E. Specht	Professor	0.80		0.20		Soybean Physiology and Breeding
Paul E. Staswick	Associate Professor	0.85		0.15		Molecular Genetics
Robert N. Stougaard ¹	Assistant Professor	0.25	0.75			Weed Science
James Stubbendieck	Professor	0.50		0.50		Range Ecology and Management
Charles Y. Sullivan	Professor				USDA	Crop Physiology
Dale Swartzendruber	Professor	0.90		0.10		Soil Physics
Mary Thomas-Compton	Assistant Professor	1.00				Popcorn Breeding
Gary E. Varvel	Associate Professor				USDA	Soil Management
Kenneth P. Vogel	Professor				USDA	Grass Breeding
Steven S. Waller	Professor	0.55		0.45		Range Management & Improvement
Daniel T. Walters	Associate Professor	0.60		0.40		Soil Management
Wallace W. Wilhelm	Associate Professor				USDA	Crop Physiology

¹Ended research appointment during 1991-1992

²Began research appointment during 1991-1992

	Rank	Rsch	Ext	Tch	Other	Area of Responsibility
Animal Science						
Elton D. Aberle	Professor	0.35	0.34	0.31		Head
Mary M. Beck	Associate Professor	0.70		0.30		Poultry Physiology
Gary L. Bennett	Associate Professor				USDA	Systems
Dennis R. Brink	Professor	0.30		0.70		Ruminant Nutrition
Robert A. Britton	Professor	0.70		0.30		Ruminant Biochemistry
Chris R. Calkins	Associate Professor	0.70		0.30		Meats
Ronald K. Christenson	Professor				USDA	Physiology
Edgar T. Clemens	Professor	0.50		0.50		Gastroenteric Physiology
John D. Crouse ¹	Associate Professor				USDA	Meats
Larry V. Cundiff	Professor				USDA	Breeding
Calvin L. Ferrell	Associate Professor				USDA	Nutrition
J. Joe Ford	Professor				USDA	Physiology
Earl W. Gleaves ¹	Professor	0.25	0.75			Poultry Production
Richard J. Grant	Assistant Professor	0.70	0.30			Dairy Nutrition
Keith E. Gregory	Professor				USDA	Breeding
H. Edward Grotjan, Jr.	Professor	0.60		0.40		Physiology
Thomas G. Jenkins	Associate Professor				USDA	Breeding
Rodger K. Johnson	Professor	0.60		0.40		Swine Breeding
Steven J. Jones	Associate Professor	0.50		0.50		Meats
Jeffrey F. Keown	Professor	0.30	0.70			Dairy Management
James E. Kinder	Professor	0.60		0.40		Beef Physiology
Roger J. Kittok	Associate Professor	0.85		0.15		Reproductive Physiology
Terry J. Klopfenstein	Professor	0.70		0.30		Ruminant Nutrition
Robert M. Koch ¹	Professor	1.00				Research Geneticist
Mohammed Koohmaraie	Assistant Professor				USDA	Meats
Larry L. Larson	Associate Professor	0.50		0.50		Dairy Physiology
Dan B. Laster	Professor				USDA	Reproductive Physiology
Donald G. Levis	Professor	0.25	0.75			Swine Physiology
Austin J. Lewis	Professor	0.70		0.30		Swine Nutrition
Kreg A. Leymaster	Associate Professor				USDA	Breeding
Donald D. Lunstra	Professor				USDA	Breeding
Roger W. Mandigo	Professor	0.60		0.40		Meats
Phillip S. Miller	Assistant Professor	0.60		0.40		Swine Nutrition
Merlyn K. Nielsen	Professor	0.60		0.40		Beef Breeding
Jerome C. Pekas	Associate Professor				USDA	Nutrition
Rick J. Rasby	Associate Professor	0.25	0.75			Beef Production
Andrew J. Roberts	Assistant Professor				USDA	Physiology
Rick A. Stock	Associate Professor	0.50	0.50			Feedlot Nutrition
Thomas W. Sullivan	Professor	0.65		0.35		Poultry Nutrition
L. Dale Van Vleck	Professor	0.05		0.15	USDA	Breeding and Genetics
Thomas H. Wise	Assistant Professor				USDA	Physiology
Jong-Tseng Yen	Associate Professor				USDA	Nutrition
Lawrence D. Young	Associate Professor				USDA	Breeding
Dwane R. Zimmerman	Professor	0.50		0.50		Swine Physiology
Biochemistry						
Marion H. O'Leary	Professor	0.45		0.25	0.30	Head, Enzymes
Rumar V. Banerjee ²	Assistant Professor	0.85		0.15		Mechanistic Enzymology
Raymond Chollet	Professor	0.90		0.10		Photosynthesis
Richard Dam	Associate Professor	0.84		0.16		Nutritional Biochemistry
Sylvia C. Darr ²	Assistant Professor	0.40		0.10	0.50	Molecular Biology
John H. Golbeck	Professor	0.30		0.20	0.50	Biophysics/Chemistry of Photosystems
Robert V. Klucas	Professor	0.90		0.10		Nitrogen Fixation
Herman W. Knoche	Professor	0.80		0.20		Lipid Biochemistry
John P. Markwell	Assistant Professor	0.90		0.10		Plant Biochemistry
Stephen W. Ragsdale ²	Associate Professor	0.85		0.15		Enzymes
Robert J. Spreitzer	Assistant Professor	0.85		0.15		Plant Molecular Genetics
Fred W. Wagner	Professor	0.90		0.10		Enzymes

¹Ended research appointment during 1991-1992

²Began research appointment during 1991-1992

	Rank	Rsch	Ext	Tch	Other	Area of Responsibility
Biological Systems Engineering						
Glenn J. Hoffman	Professor	0.35	0.50	0.15		Head
Leonard Bashford	Professor	0.55		0.35	0.10	Tractors & Design Engineering
Rangaswamy Chinnaswamy	Assistant Professor	1.00				Cereal Grain Utilization
Mohamed Dahab ²	Associate Professor	0.25			0.75	Solid & Hazardous Waste Management
James A. DeShazer ¹	Professor	0.75		0.25		Livestock Environment
Elbert C. Dickey ¹	Professor	0.25	0.75			Soil & Water Conservation
Dean E. Eisenhauer	Associate Professor	0.75		0.25		Surface Irrigation & Chemigation
John E. Gilley	Associate Professor				USDA	Soil Erosion
Robert D. Grisso	Associate Professor	0.25	0.75			Agricultural Machinery
G. L. Hahn	Professor				USDA	Livestock Housing & Stress Management
Milford A. Hanna	Professor	0.40		0.10	0.50	Food and Bioprocess Engineer
Terry A. Howell	Professor				USDA	Irrigation Scheduling
David Jones	Assistant Professor	0.35	0.65			Product Handling & Storage
Michael Kocher	Associate Professor	0.40		0.60		Controls Engineer
Louis I. Leviticus	Professor	0.40		0.10	0.50	Power & Machinery Engineering
Derrel L. Martin	Associate Professor	0.65		0.35		Sprinkler Irrigation
Timothy McDonald ¹	Assistant Professor				USDA	Image Processing
Michael Meagher	Assistant Professor			0.20	0.80	Bioprocess Engineering
George E. Meyer	Associate Professor	0.60		0.40		Plant Growth Modeling
Lloyd Mielke	Professor				USDA	Soil Management/Tillage
Jack A. Nienaber	Associate Professor				USDA	Animal Calorimetry
Dennis D. Schulte	Professor	0.50		0.50		Pollution Control & Energy Systems
LaVerne Stetson	Professor				USDA	Agricultural Electricity
Thomas L. Thompson	Professor	0.70		0.30		Computerized Information Systems
Kenneth Von Bargaen	Professor	0.55		0.45		Equipment Systems Management
Darrell Watts	Professor	0.60	0.40			Water Quality/Irrigation
Wayne Woldt ²	Assistant Professor	0.25	0.50		0.25	Bioenvironmental Engineering
Biometry						
David B. Marx	Professor	0.50		0.50		Head
Kent Eskridge	Associate Professor	0.60		0.40		Statistical Consultant
Stephen D. Kachman	Assistant Professor	0.75		0.25		Statistical Consultant
Anne Parkhurst	Professor	0.70		0.30		Statistical Consultant
Walter W. Stroup	Professor	0.35		0.65		Statistical Consultant
Linda J. Young	Associate Professor	0.75		0.25		Statistical Consultant
Entomology						
John E. Foster	Professor	0.38	0.50	0.12		Head
Frederick P. Baxendale	Associate Professor	0.25	0.75			Turf Insects
Stephen D. Danielson	Assistant Professor	0.25	0.75			Forage Insects
Mary Ellen Dix	Associate Professor				USDA	Shelterbelt Insects
Mark. O. Harrell	Associate Professor				1.00	Nebraska Forest Service
Leon G. Higley	Assistant Professor	0.80		0.20		Insect Ecology
Tony Joern	Professor				1.00	Insect Ecology
Wayne L. Kramer	Assistant Professor				1.00	Medical Entomology
Z B Mayo	Professor	0.80		0.20		Cytogenetics of Greenbugs
Lance J. Meinke	Associate Professor	0.80		0.20		Soil Insects
James J. Petersen	Professor				USDA	Livestock Entomology
Thomas O. Powers	Associate Professor				1.00	Molecular Biologist
Kenneth P. Pruess	Professor	0.80		0.20		Aquatic Insects
Brett C. Ratcliffe	Professor				1.00	Insect Curator
Blair D. Siegfried	Assistant Professor	0.80		0.20		Insect Toxicologist
David W. Stanley-Samuels	Assistant Professor	0.55		0.20		Insect Physiologist
Gustave D. Thomas	Professor				USDA	Livestock Entomology
Anthony J. Zera	Assistant Professor				1.00	Insect Endocrinology

¹Ended research appointment during 1991-1992

²Began research appointment during 1991-1992

	Rank	Rsch	Ext	Tch	Other	Area of Responsibility
Environmental Programs						
Shripat T. Kamble	Associate Professor	0.25	0.75			Pesticide Impact Assessment
Edward F. Vitzthum	Associate Professor	0.25	0.75			Coordinator/Environmental Program
Food Science and Technology						
Steve L. Taylor	Professor	0.40	0.34	0.26		Head, Food Toxicology
Lloyd B. Bullerman	Professor	0.60	0.10	0.30		Food Microbiology/Mycology
Susan B. Cuppett	Assistant Professor	0.60		0.40		Food Lipids
Glenn W. Froning	Professor	0.75		0.25		Poultry Products
Robert W. Hutkins	Assistant Professor	0.65		0.35		Food Biotechnology
David S. Jackson	Assistant Professor	0.70	0.30			Cereals/Oilseeds Processing
Michael M. Meagher	Assistant Professor	0.80		0.20		Food Engineering
John Rupnow	Associate Professor	0.40		0.60		Food Biochemistry/Microbiology
Khem H. Shahani	Professor	0.45		0.05		Food Chemistry
Durward A. Smith	Associate Professor	0.40	0.60			Horticultural Food Crops Processing
Susan S. Sumner	Assistant Professor	0.30	0.70			Food Microbiology
Randy L. Wehling	Associate Professor	0.50		0.50		Food Analysis
Michael G. Zeece	Assistant Professor	0.75		0.25		Food Protein Chemistry
Forestry, Fisheries and Wildlife						
Gary L. Hergenrader	Professor	0.17	0.16	0.17	0.50	Head
James R. Brandle	Associate Professor	0.61		0.10	0.29	Forestry
Ronald M. Case	Professor	0.40		0.60		Wildlife
Stephen G. Ernst	Assistant Professor	0.75		0.25		Forestry
Mark O. Harrell	Associate Professor	0.25			0.75	Nebraska Forest Service
Kyle D. Hoagland	Associate Professor	0.75		0.25		Fisheries
Ron J. Johnson	Associate Professor	0.31	0.43		0.26	Wildlife
Terrence B. Kayes	Associate Professor	0.25	0.75			Fisheries
Ned B. Klopfenstein	Assistant Professor				USDA	Forestry
Edward J. Peters	Associate Professor	0.40		0.60		Fisheries
Willis J. Rietveld	Professor				USDA	Forestry
Julie A. Savidge	Assistant Professor	0.40		0.60		Wildlife
Michele M. Schoenberger	Assistant Professor				USDA	Forestry
Horticulture						
Paul E. Read	Professor	0.43	0.33	0.24		Head, Plant Tissue Culture
Dermot P. Coyne	Professor	0.96		0.04		Vegetable Breeding
Jay B. Fitzgerald ¹	Associate Professor	0.21	0.34	0.45		Ornamentals
Roch E. Gaussoin	Assistant Professor	0.25	0.75			Turfgrass Management and Physiology
William A. Gustafson	Associate Professor	0.25	0.60	0.15		Fruit and Nut Crops
Laurie Hodges	Assistant Professor	0.40	0.60			Vegetable Production & Development
Garald L. Horst	Associate Professor	0.75		0.25		Turfgrass Physiology and Management
Ellen T. Paporozzi	Associate Professor	0.50		0.50		Ornamentals
Terrance P. Riordan	Associate Professor	0.89		0.11		Turf Breeding
Sotero S. Salac	Associate Professor	0.50		0.50		Ornamentals
Durward A. Smith	Associate Professor	0.18	0.27		0.55	Food Processing

¹Ended research appointment during 1991-1992

²Began research appointment during 1991-1992

	Rank	Rsch	Ext	Tch	Other	Area of Responsibility
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Plant Pathology

Anne K. Vidaver	Professor	0.75	0.15	0.10		Head
Martin B. Dickman	Assistant Professor	0.85		0.15		Genetics of Host/Parasite Interactions
Roy C. French	Assistant Professor				USDA	Viruses and Nucleic Acids
Stan G. Jensen	Associate Professor				USDA	Corn and Sorghum Diseases
Leslie C. Lane	Associate Professor	0.85		0.15		Virus Diseases
Willem G. Langenberg	Professor				USDA	Virus Diseases
Amit Mitra	Assistant Professor	1.00				Plant Vector/Plant Transformation
James Partridge	Associate Professor	0.80		0.20		Corn and Sorghum Stalk Rot
Thomas O. Powers	Associate Professor	0.85		0.15		Nematology
James R. Steadman	Professor	0.90		0.10		Epidemiology of Vegetable Diseases
James L. Van Etten	Professor	0.90		0.10		Microbial Physiology
John E. Watkins	Professor	0.25	0.75			Small Grains, Turf and Alfalfa
Gary Y. Yuen	Assistant Professor	0.85		0.15		Soilborne Diseases

Veterinary Science

John A. Schmitz	Professor	0.65	0.15	0.20		Head
Raul Barletta	Assistant Professor	0.90		0.10		Molecular Biology
Alex Chen	Associate Professor	0.85		0.15		Cellular Immunology
Catherine E. Dewey ²	Assistant Professor	0.35		0.65		Swine Medicine
Ruben O. Donis	Assistant Professor	0.90		0.10		Molecular Virology
Alan R. Doster	Professor	0.20		0.07	0.73	Diagnostic Pathology
Gerald E. Duhamel	Assistant Professor	0.75		0.10	0.15	Diagnostic/Research Pathology
E. Denis Erickson	Professor	0.15		0.10	0.75	Diagnostic Bacteriology
Dee Griffin	Associate Professor	0.30		0.50	0.20	Beef Cattle Medicine
Deborah Hamernik	Assistant Professor	0.75			0.25	Transgenic Animal Systems
Clinton Jones	Associate Professor	0.75		0.25		Molecular Virology
Clayton L. Kelling	Associate Professor	0.94		0.06		Research Virology
Rodney A. Moxley	Associate Professor	0.20		0.10	0.70	Diagnostic/Research Pathology
Fernando Osorio	Associate Professor	0.50			0.50	Diagnostic/Research Virology
Louis J. Perino	Assistant Professor	0.30		0.50	0.20	Beef Cattle Medicine
Marvin B. Rhodes ¹	Professor	1.00				Immunochemistry
Duane N. Rice	Professor		0.87	0.06	0.07	Dairy and Beef Cattle Diseases
Douglas G. Rogers	Assistant Professor	0.15		0.05	0.80	Diagnostic/Research Pathology
Gary P. Rupp	Professor	0.30		0.50	0.20	Director, GPVEC, Beef Cattle Medicine
Norman Schneider	Associate Professor	0.25		0.50	0.25	Preveterinary Advisor, Toxicology
S. Srikumaran	Associate Professor	0.85		0.15		Immunology
Barbara Straw ²	Professor		0.80	0.10	0.10	Swine Diseases
Eva A. Wallner-Pendleton	Assistant Professor		0.60		0.40	Poultry Diseases
Dale M. Webb	Assistant Professor				1.00	Diagnostic Pathology

Home Economics Departments

Consumer Science and Education

Gwendolyn Newkirk ¹	Professor	0.17	0.12	0.71		Chair
Kathy Prochaska-Cue	Associate Professor	0.25	0.50	0.25		Interim Chair, Family Management
E. Raedene Combs	Professor	0.50		0.50		Housing, Aged
Elizabeth Davis	Assistant Professor	0.25		0.75		Family Economics

¹Ended research appointment during 1991-1992

²Began research appointment during 1991-1992

	Rank	Rsch	Ext	Tch	Other	Area of Responsibility
Human Development and the Family						
John C. Woodward	Professor	0.42	0.06	0.52		Chair
Douglas A. Abbott	Associate Professor	0.25		0.75		Youth at Risk
John D. DeFrain	Professor	0.50		0.50		Youth at Risk
Jeanne Karns ²	Assistant Professor	0.25		0.75		Infant Social Development
William H. Meredith ¹	Associate Professor	0.25		0.75		Youth at Risk
Craig W. Smith	Associate Professor	0.25		0.75		Family Interactions
Paula Davey Zeece	Assistant Professor	0.25		0.75		Child Care
Nutritional Science and Hospitality Management						
Marilynn Schnepf	Associate Professor	0.36		0.64		Interim Chair, Foods
Judy Driskell	Professor	0.50		0.50		Nutrition
Julie Albrecht	Assistant Professor	0.25	0.75			Ext. Food Specialist
Nancy M. Betts	Associate Professor	0.49		0.51		Nutrition
Fayrene Hamouz	Assistant Professor	0.30		0.70		Restaurant Management
Constance Kies	Professor	0.50		0.50		Nutrition
Nancy Lewis	Assistant Professor	0.44		0.56		Nutrition
Kaye Stanek	Assistant Professor	0.25		0.75		Nutrition
Textiles, Clothing and Design						
Rita C. Kean	Associate Professor	0.25	0.15	0.60		Chair, Textiles and Apparel Merchandising/Marketing
Patricia Cox Crews	Associate Professor	0.25		0.50	0.25	Textile Conservation and Science
Joan Laughlin	Professor	0.10		0.20	0.70	Textiles
Shirley Niemeyer ²	Associate Professor	0.25	0.75			Environmental Issues and Housing
Ann Ziebarth ¹	Assistant Professor	0.25	0.75			Rural Sociology/Labor Market Analysis
Off-Campus Research Centers						
Northeast Research and Extension Center						
Donald B. Hudman	Professor	0.23	0.69		0.08	Director
Michael C. Brumm	Associate Professor	0.50	0.50			Animal Science (Swine Production)
William L. Kranz	Assistant Professor	0.25	0.75			Biological Systems Engineering
Terry L. Mader	Associate Professor	0.50	0.50			Animal Science
Russell S. Moomaw ¹	Professor	0.49	0.51			Agronomy (Crop Varieties & Herbicides)
Timothy A. Powell	Assistant Professor	0.40	0.60			Agricultural Economics (Farm Management)
Charles A. Shapiro	Associate Professor	0.50	0.50			Agronomy (Soils & Agronomic Crops)
David P. Shelton	Professor	0.50	0.50			Biological Systems Engineering (Soil Conservation)
John F. Witkowski	Professor	0.50	0.50			Entomology (Crops, Insects & Chemigation)
Panhandle Research and Extension Center						
Robert D. Fritschen	Professor	0.42	0.50		0.08	Director
Burton A. Weichenthal	Professor	0.50	0.50			Associate Director and Animal Science (Beef Cattle)
David D. Baltensperger	Associate Professor	0.75	0.25			Agronomy (Crop Breeding)
Gregory Binford ²	Assistant Professor	0.50	0.50			Agronomy (Soil Science)
Dale M. Groteleuschen	Associate Professor	0.50	0.50			Diagnostic Veterinary Science (Vet. Science)
Gary L. Hein	Assistant Professor	0.50	0.50			Entomology (Entomology)
Eric D. Kerr	Professor	0.50	0.50			Plant Pathology (Plant Path)
Drew Lyon	Assistant Professor	0.50	0.50			Agronomy (Dryland Crops)
Alex Pavlista	Assistant Professor	0.25	0.75			Horticulture (Potatoes)
Patrick E. Reece	Associate Professor	0.50	0.50			Agronomy (Range & Forage)
Ivan G. Rush	Professor	0.25	0.75			Animal Science (Beef Cattle)
John A. Smith	Associate Professor	0.50	0.50			Biological Systems Engineering (Machi Systems)
Robert G. Wilson	Professor	0.50	0.50			Agronomy (Weed Science)
C. Dean Yonts	Associate Professor	0.50	0.50			Biological Systems Engineering (Irrigat

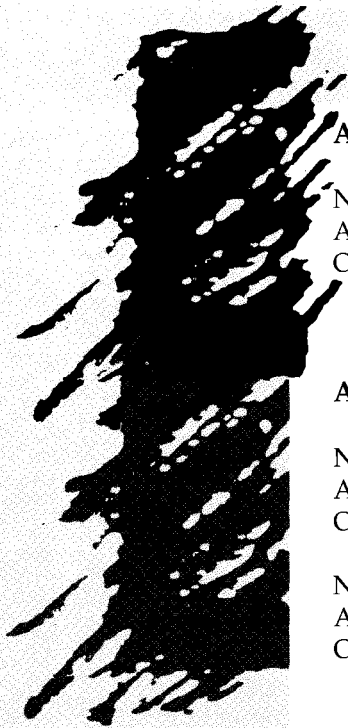
¹Ended research appointment during 1991-1992

²Began research appointment during 1991-1992

	Rank	Rsch	Ext	Tch	Other	Area of Responsibility
South Central Research and Extension Center						
Charles L. Stonecipher	Professor	0.14	0.78		0.08	Director
Joel Cahoon	Assistant Professor	0.50	0.50			Biological Systems Engineering (Water Quality Management)
Benjamin L. Doupnik, Jr.	Professor	0.50	0.50			Plant Pathology (Field Crop Diseases)
Roger Elmore	Assistant Professor	0.50	0.50			Agronomy (Crop Production)
Richard Ferguson	Assistant Professor	0.50	0.50			Agronomy (Soil Fertility)
Leroy Peters ¹	Professor	0.50	0.50			Entomology
Fred W. Roeth	Professor	0.50	0.50			Agronomy (Weed Control/Water Quality)
Roger Selley	Associate Professor	0.25	0.75			Agricultural Economics (Farm Management)
Robert Wright ²	Assistant Professor	0.50	0.50			Entomology
Southeast Research and Extension Center						
Loyd D. Young	Professor	0.05	0.87		0.08	Director
West Central Research and Extension Center						
Lavon J. Sumption	Professor	0.46	0.47		0.07	Director
Don D. Adams	Associate Professor	0.50	0.50			Animal Science (Range Cattle Nutrition)
John B. Campbell	Professor	0.50	0.50			Entomology (Livestock/Crops)
Richard Clark	Associate Professor	0.40	0.60			Agricultural Economics (Farm-Ranch Management)
David M. Danielson ¹	Professor	1.00				Animal Science (Swine Nutrition)
Delwyn D. Dearborn	Professor	0.50	0.50			Associate Director
Gene H. Deutscher	Professor	0.28	0.72			Animal Science (Beef Cattle Reproduction)
Gary W. Hergert	Professor	0.50	0.50			Agronomy (Soils-Water Quality)
Jerre Johnson	Professor	1.00				Veterinary Science (Pathology)
Norman L. Klocke	Associate Professor	0.50	0.50			Biological Systems Engineering (Water Resources)
Dale T. Lindgren	Associate Professor	0.50	0.50			Horticulture
James T. Nichols	Professor	0.50	0.50			Agronomy (Range-Forage)
Paul T. Nordquist	Professor	1.00				Agronomy (Corn Breeding)
Gail A. Wicks	Professor	0.50	0.50			Agronomy (Ecofarming/Weeds)

¹Ended research appointment during 1991-1992

²Began research appointment during 1991-1992



Faculty Awards and Recognition

Many of the faculty of ARD are widely recognized as leaders in their discipline. Numerous faculty serve as officers or directors in their professional societies and state, regional, national and international organizations. They also serve as editors and associate editors of professional journals. Many receive special recognition for their contributions in research. The following are the ARD faculty honored in 1991 for excellence in research.

Agricultural Meteorology

Name:
Award/Recognition:
Organization Providing Award:

Elizabeth A. Walter-Shea,
IANR Team Effort Award
Institute of Agriculture and Natural
Resources
University of Nebraska-Lincoln

Agronomy

Name:
Award/Recognition:
Organization Providing Award:

David A. Andrews
International Agronomy Award
American Society of Agronomy

Name:
Award/Recognition:
Organization Providing Award:

P. Stephen Baenziger
Fellow
American Association for the
Advancement of Science

Name:
Award/Recognition:
Organization Providing Award:

John Doran
Fellow
Soil Science Society of America

Name:
Award/Recognition:
Organization Providing Award:

Patrick J. Shea
Distinguished Achievement in Weed
Science Research
North Central Weed Science Society

Name:
Award/Recognition:
Organization Providing Award:

Patrick J. Shea
IANR Team Effort Award
Institute of Agriculture and Natural
Resources
University of Nebraska-Lincoln

Name:
Award/Recognition:
Organization Providing Award:

James Stubbendieck
Fellow
Society for Range Management

Name:
Award/Recognition:
Organization Providing Award:

Kenneth P. Vogel
Fellow
Crop Science Society of America

Animal Science

Name:
Award/Recognition:
Organization Providing Award:

Elton Aberle
Signal Service Award
American Meat Science Association

Name:
Award/Recognition:
Organization Providing Award:

Elton Aberle
Inducted Into Membership
Nebraska Hall of Agricultural
Achievement

Name:
Award/Recognition:
Organization Providing Award:

Michael Brumm
University of Nebraska-Lincoln
Livestock Service Award
Walnut Grove Products Company

Biological Systems Engineering

Name: Robert Grisso
Award/Recognition: IANR Team Effort Award
Organization Providing Award: Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln

Name: Milford Hanna
Award/Recognition: Research Award
Organization Providing Award: Gamma Sigma Delta

Name: Milford Hanna
Award/Recognition: Engineer of the Year Award
Organization Providing Award: American Society of Agricultural Engineers

Name: LaVerne Stetson
Award/Recognition: Fellow Award
Organization Providing Award: American Society of Agricultural Engineers

Name: Kenneth Von Bargen
Award/Recognition: IANR Team Effort Award
Organization Providing Award: Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln

Entomology

Name: Frederick P. Baxendale
Award/Recognition: IANR Team Effort Award
Organization Providing Award: Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln

Name: David W. Stanley-Samuelson
Award/Recognition: Junior Faculty Recognition for Excellence in Research
Organization Providing Award: Agricultural Research Division
University of Nebraska-Lincoln

Horticulture

Name: D. P. Coyne
Award/Recognition: 1991 Outstanding Research Award
(Career)
Organization Providing Award: American Society for Horticultural
Science

Name: G. L. Horst
Award/Recognition: IANR Team Effort Award
Organization Providing Award: Institute of Agriculture and Natural
Resources
University of Nebraska-Lincoln

Name: T. P. Riordan
Award/Recognition: IANR Team Effort Award
Organization Providing Award: Institute of Agriculture and Natural
Resources
University of Nebraska-Lincoln

Plant Pathology

Name: Martin B. Dickman
Award/Recognition: Junior Faculty Recognition for
Excellence in Research
Organization Providing Award: Agricultural Research Division
University of Nebraska-Lincoln

Name: Gary Y. Yuen
Award/Recognition: IANR Team Effort Award
Organization Providing Award: Institute of Agriculture and Natural
Resources
University of Nebraska-Lincoln

Name: John E. Watkins
Award/Recognition: IANR Team Effort Award
Organization Providing Award: Institute of Agriculture and Natural
Resources
University of Nebraska-Lincoln

Veterinary Science

Name: Duane N. Rice
Award/Recognition: UNL Livestock Award
Organization Providing Award: Walnut Grove Products Company

Name: S. Srikumaran
Award/Recognition: International Fogarty Fellowship
Organization Providing Award: National Institutes of Health

Textiles, Clothing and Design

Name: Patricia Cox Crews
Award/Recognition: AHEA/Manufactured Fibers Research
Award for Excellence in Textiles Research
Organization Providing Award: American Fiber Manufacturers
Association and the AHEA Foundation

Panhandle Research and Extension Center

Name: Robert G. Wilson
Award/Recognition: 1991 Education and Research Award
Organization Providing Award: Nebraska Fertilizer Ag-Chemical Institute, Inc.

Professorships

Title: Sunkist Fiesta Bowl
Recipient: Lowell Moser
Department: Agronomy

Title: Harlan College Professorship of Agriculture
Recipient: Ronald Hansen
Department: Agricultural Economics

Title: Wagner College Professorship
Recipient: Terry Klopfenstein
Department: Animal Science

Title: Morrison College Professorship
Recipient: Milford Hanna
Departments: Biological Systems Engineering
Food Science and Technology

Title: Burt and Dorothy Maxcy Professorship
Recipient: Steve Taylor
Department: Food Science and Technology

Title: Holmes Distinguished Professorship
Recipient: Dermot Coyne
Department: Horticulture

Title: Allington College Professorship
Recipient: James Van Etten
Department: Plant Pathology



Research Projects

Each faculty member with an ARD appointment has a federally-approved research project. A number of faculty have multiple projects. There are approximately 335 approved research projects in agriculture, natural resources and home economics. Projects are generally 3-5 years in duration. Faculty are also part of a national network of Agricultural Experiment Station scientists located at Land-Grant Universities across the United States. ARD researchers are currently involved with about 65 regional research projects in which they conduct cooperative research with scientists at other universities addressing problems of regional and national importance.

Research projects are listed by departments. An asterisk (*) indicates that the project was discontinued in fiscal year 1991-1992.

Agricultural/Natural Resources Departments

Agricultural Communications

18-001 Dissemination of research information (G. L. Vacin)

Agricultural Economics

10-071 Impacts of transportation changes on agricultural marketing and local communities (D. G. Anderson)

*10-101 Determinants of farm size and structure in north central areas of the U.S. (G. A. Helmers, M. E. Baker, B. B. Johnson)

10-103 Price spreads and market structure in the beef marketing industry: theory and measurement (A. M. Azzam)

10-104 Empirical evaluation of integrating fundamental and technical market analysis (L. H. Lutgen, J. G. Kendrick)

10-106 Private strategies, public policies, and food system performance (A. M. Azzam)

10-107 Management information and management practices on Nebraska farms/ranches (H. D. Jose)

10-108 Monitoring and analysis of farm real estate market development in Nebraska (B. B. Johnson)

10-109 Nebraska water law (J. D. Aiken)

10-110 Water management and conservation in western irrigated agriculture (R. J. Supalla, D. L. Martin)

10-111 Quantifying long-run agricultural risks and evaluating farmer responses to risk (D. M. Conley, G. Helmers)

10-112 Legal aspects of national and international regulations of agricultural trade (R. L. McGeorge)

10-113 Impacts of federal agricultural policy on rural communities (S. Cordes, J. Royer, P. Gessaman)

10-114 Labor management of farms in size transition (R. E. Massey)

10-115 Evaluating alternative risk management strategies for Nebraska grain producers (T. Park)

10-117 Factors affecting the evolution of world agricultural markets: implications for U.S. policy (E. W. F. Peterson)

10-118 Economics of beef cattle management systems in Nebraska (G. H. Pfeiffer)

10-119 Policy implications for farm household and rural community responses to economic changes (B. B. Johnson)

10-120 Structure, efficiency, and viability of agribusiness organizations (J. S. Royer)

Agricultural Education

24-030 Evaluation of Interventions in Leadership Development Programs (R. D. Dillon, E. H. Miller)

Agricultural Meteorology

27-002 Chemistry of atmospheric deposition - effects on agriculture, forestry, surface waters and materials (S. B. Verma)

27-003	Exchange of carbon dioxide and other atmospheric tract gases in vegetated ecosystems (S. B. Verma)	12-072	Introduction, multiplication, evaluation, preservation, cataloguing and utilization of plant germplasm (D. J. Andrews, K. P. Vogel)	12-154	Agronomy and cropping systems (M. D. Clegg, S. C. Mason)
27-004	Spectral radiation techniques to estimate productivity and water stress in vegetation (B. L. Blad, E. Walter-Shea)	*12-080	Chemical aspects of nutrient movement and availability in sandy soils (R. C. Sorensen)	12-155	Perennial forage grass breeding for Nebraska (K. P. Vogel)
27-005	A climate data base and model for estimating crop yields (K. G. Hubbard)	*12-125	Modeling the water use and growth of plants (T. J. Arkebauer)	*12-156	Integrated weed control in grasslands of the central plains (R. A. Masters)
27-007	Drought and climate change: response and policy implications (D. A. Wilhite)	12-135	Soil productivity and erosion (A. J. Jones)	*12-157	Physical, chemical, and biological interactions between mycorrhiza, soil and plants (J. R. Ellis, L. N. Mielke, P. J. Shea)
27-008	Variables in agricultural-weather information systems (K. G. Hubbard)	12-139	Nitrogen source utilization in crop and soil management systems (J. S. Schepers, J. F. Power)	12-158	Crop rotations and manure versus conventional fertilizers and chemical practices (C. A. Francis, A. R. Martin, S. C. Mason, J. F. Power, P. J. Shea, D. T. Walters)
27-009	Climate and agroecosystem modeling: developing information for decision making (A. Weiss)	*12-142	Influence of production practices on yield and grain quality of maize and winter wheat (S. C. Mason)	*12-160	Increasing the efficiency of fertilizer nitrogen and phosphorus for grain crops (D. H. Sander)
27-010	Environmental and genotypic control of assimilate allocation in grain crops (S. B. Verma, T. J. Arkebauer)	12-144	Winter wheat germplasm development and evaluation (C. J. Peterson, R. A. Graybosch)	12-161	Impacts of soil management practices on nutrient cycling in the agricultural ecosystem (D. T. Walters)
27-011	Relationships between remotely-sensed spectral properties of vegetated surfaces and biophysical properties (E. A. Walter-Shea)	*12-148	Morphology and physiology of selected perennial grasses (L. E. Moser)	12-162	Ecological and agronomical manipulation of Nebraska rangeland vegetation (J. L. Stubbendieck)
Agronomy		12-149	Breeding sorghum and pearl millet for USA and developing countries (D. J. Andrews)	12-165	Quantitative inheritance, selection theory and methods, and germplasm enhancement in grain sorghum (B. E. Johnson)
12-001	Corn breeding and genetics (W. A. Compton, P. T. Nordquist)	12-150	Water and temperature effects on sorghum and millet as related to grain production and breeding (J. D. Eastin, C. Y. Sullivan)	12-166	Sorghum genotype responses to mineral element stresses (R. B. Clark)
12-002	Improvement and evaluation of oats and barley (P. S. Baenziger)	12-151	Tillage influence on crop production and physical properties of the soil surface and rhizosphere (A. J. Jones)	12-167	Physical factors controlling microbial aspects of movement and transformation of solutes in soil (J. M. Skopp, J. W. Doran)
12-011	Properties of Nebraska soils as related to soil genesis, classification, survey and land use (D. T. Lewis)	12-152	Renovation and improvement of Nebraska range and pasture (S. S. Waller)		
12-055	Genetics, breeding and evaluation of common wheats, durums and triticales for Nebraska (P. S. Baenziger)	*12-153	Resource efficient cropping systems for Nebraska (C. A. Francis)		

- *12-168 Analysis of genetic recombination in maize populations using molecular markers (W. A. Compton, M. A. Thomas-Compton, P. E. Staswick)
- 12-171 Selecting wheat and other cereal grains with improved market quality (D. Shelton, P. S. Baenziger, C. J. Peterson)
- 12-172 Studies on the physiological basis for improving efficiency of nitrogen metabolism (J. W. Maranville)
- 12-173 Evaluating plant nutrient needs and product quality (K. D. Frank)
- 12-174 Market quality of hard wheat for domestic and international foods (D. Shelton)
- 12-175 Improving the forage quality of grasses for Nebraska and the Central Great Plains (K. J. Moore)
- 12-177 Genetic determinants of baking quality in wheat (R. A. Graybosch)
- 12-178 Dissipation and bioavailability of herbicides and other pesticides in soil (P. J. Shea)
- *12-179 Improvement and evaluation of doubled haploid techniques in wheat (P. S. Baenziger, C. J. Peterson, R. A. Graybosch)
- 12-180 Improved production efficiency based on increased herbicide application efficiency (D. A. Mortensen, K. Von Bargaen)
- 12-181 Development of profitable reduced herbicide weed management systems through integration (A. R. Martin)
- 12-182 Investigating milkweed as an alternative source of fiber (L. A. Nelson, K. VonBargaen, P. Crews, A. K. Vidaver, D. D. Baltensperger, J. B. Campbell, R. W. Elmore)
- *12-183 Weed management strategies for turfgrass and onions (R. N. Stougaard)
- 12-184 Soybean breeding and genetic studies for Nebraska (G. L. Graef)
- 12-185 Methodology of comparing best management practices for groundwater quality protection (W. L. Powers)
- 12-186 Popcorn breeding for yield and expansion volume (quality) (M. Thomas-Compton)
- 12-187 Molecular characterization of genetic variation in soybeans (D. J. Lee)
- 12-188 Development of an intermittent sprayer system for reducing chemical input in Nebraska cropping systems (D. A. Mortensen, K. VonBargaen, G. E. Meyer, G. A. Wicks)
- 12-189 Mapping of loci affecting the uptake and utilization of nitrogen in maize (B. Johnson, D. Lee, J. Maranville, W. Wilhelm, J. Schepers)
- 12-190 Leafy spurge: analysis of genetic variation by cpDNA characterization (S. J. Nissen)
- 12-191 Exploring the interface of qualitative and quantitative variation (P. S. Baenziger)
- 12-192 Molecular control of soybean vegetative storage protein gene expression (P. E. Staswick)
- 12-193 Investigating alternative grain and oil crops for Nebraska (L. A. Nelson)
- 12-194 Novel methods for soybean genetic improvement and genomic analysis (J. E. Specht)
- 12-195 Biometrical genetics, selection theory and methods and germplasm improvement in maize (B. Johnson)

- 12-196 Reaction of synthetic organic compounds with the inorganic components of soils (D. L. McCallister)
- 12-197 Tissue and cell physiology of sorghum (M. D. Clegg)
- 12-198 Jasmonate regulated gene expression in soybean (P. Staswick)
- 12-199 Herbage and livestock production potential from native warm-season grasses (B. E. Anderson, L. E. Moser)
- 12-201 Maintenance, increase and distribution of elite germplasm (R. Helsing)
- 12-202 Winter wheat germplasm enhancement and performance evaluation (C. J. Peterson, R. A. Graybosch)
- 12-203 Flow of water and particles in soils and porous media (D. Swartzendruber)
- 12-204 Biological and ecological basis for a weed management model to reduce herbicide use in corn (D. A. Mortensen, R. G. Wilson, S. J. Nissen)
- 12-205 Establishing Eurasian origin(s) of North American leafy spurge using DNA markers (S. Nissen, R. A. Masters, D. Lee)
- 12-206 Water and carbon economy of plants in relation to rhizospheric and atmospheric dynamics (C. Y. Sullivan)
- 12-208 Measurements of injected herbicide mobility and persistence in groundwater (R. F. Spalding)
- 12-210 Environmental and genotypic control of assimilate allocation in grain crops (T. J. Arkebauer, S. B. Verma)
- 12-211 Environmental and genotypic control of assimilate allocation in grain crops (M. D. Clegg, J. W. Maranville, J. D. Eastin)
- 12-207 Maize production practice influence on grain and stover yield and quality (S. C. Mason)
- 12-209 Procedures for assessing impacts of nonpoint agrichemicals on ground water (R. F. Spalding)
- 12-212 Water relations, gas exchange and growth of plants and canopies (T. J. Arkebauer)
- 12-213 Resource efficient cropping systems for Nebraska (C. A. Francis)
- 12-214 Nutrient management to sustain productivity while protecting surface and groundwater quality (D. H. Sander, D. T. Walters)
- 12-215 Integrated weed management to improve grasslands of the central great plains (R. A. Masters)
- 12-216 Resource efficient crop production systems (M. D. Clegg, S. C. Mason)
- 12-217 Nutrient use efficiency in sorghum and pearl millet (J. W. Maranville)
- 12-218 Soil and crop management practices for erosion control and sustained productivity (J. W. Doran, L. N. Mielke, W. W. Wilhelm, J. R. Ellis, J.F. Power, J. E. Gilley, G. E. Varvel)
- 12-219 Management of soil, water, and nitrogen resources to protect ground water quality (J. S. Schepers, W. W. Wilhelm, L. E. Stetson, G. E. Varvel, J. F. Power, J. W. Doran)
- 12-220 Selecting wheat and other cereal grains for enhanced end-use performance characteristics (D. R. Shelton, P. S. Baenziger, C. J. Peterson, R. A. Graybosch)
- 12-221 Physiology, growth, and development of selected perennial forage grasses (L. E. Moser)
- 12-222 Physiological evaluation of cultural and genetic factors influencing seasonal and instantaneous WUE (J. D. Eastin)
- Animal Science**
- 13-036 Dairy herd management strategies for improved decision making and profitability (L. L. Larson, F. G. Owen)
- 13-055 Biophysical models for poultry production systems (M. M. Beck)
- *13-058 Physiological mechanisms and reproductive management of the postpartum interval and puberty in the bovine female (J. E. Kinder, R. J. Kittok)
- *13-068 Well-being and productivity of poultry under various environmental and management conditions (E. W. Gleaves)
- 13-071 Evaluating the utilization of grain diets fed to finishing cattle (R. A. Stock, R. A. Britton, T. J. Klopfenstein, T. L. Mader)
- 13-080 Factors regulating protein turnover and growth in skeletal muscle (S. J. Jones)
- 13-083 Improving dairy cattle genetically (J. F. Keown)
- 13-086 Sustainable beef growing-finishing systems (T. J. Klopfenstein, R. A. Stock, R. A. Britton)
- 13-087 Influence of nutrition upon the reproductive endocrine system of the bovine (J. E. Kinder, R. J. Kittok)
- 13-088 Physiological and management aspects of expression of estrus and ovulation rate in swine (D. R. Zimmerman, R. K. Johnson, R. J. Kittok, M. M. Beck)
- 13-089 Metabolism in chick brains: cellular aspects (M. M. Beck)
- 13-090 Muscle proteolysis and meat tenderness (C. R. Calkins, S. J. Jones)

- 13-091 Evaluation of management practices and traits that influence reproductive efficiency (J. E. Kinder, M. K. Nielsen)
- 13-093 Regulation of synthesis of LH and FSH by estradiol in bovine females (J. E. Kinder, H. E. Grotjan)
- 13-094 Nutritional impact on gastrointestinal morphology and physiology (E. T. Clemens)
- 13-095 Regulation of porcine leydig cell function (R. J. Kittok, J. E. Kinder, H. E. Grotjan)
- 13-096 Forage protein characterization and utilization for beef cattle (T. J. Klopfenstein, L. E. Moser, T. Thompson, S. S. Waller, B. E. Anderson)
- 13-097 The genetics of body composition in beef cattle (M. K. Nielsen, R. J. Rasby)
- 13-098 Role of gonadotropin heterogeneity in reproductive function (H. E. Grotjan, J. E. Kinder, R. A. Britton)
- 13-099 Acidosis and metabolic disorders (R. A. Britton, R. A. Stock, T. J. Klopfenstein)
- 13-100 Physiological and nutritional aspects of improving reproduction in dairy cattle (L. L. Larson)
- 13-101 Genetic variation for reproduction and energy utilization in mice (M. K. Nielsen)
- 13-102 Regulation of ovarian follicular development by circulating progesterone in the bovine (J. E. Kinder)
- 13-103 Skeletal problems in poultry (T. W. Sullivan)
- 13-104 Optimizing the utilization of dietary fiber by dairy cows (R. J. Grant)
- 13-105 Nutrition of prolific sows (A. J. Lewis, P. S. Miller)
- 13-106 Nutritional value of cereal grains for poultry (T. W. Sullivan, D. J. Andrews, P. S. Baenziger)
- 13-107 Copper and zinc in beef cow reproduction (D. Brink, R. J. Rasby)
- 13-108 Enhancing reproductive efficiency of boars (D. G. Levis)
- 13-109 Genetic regulation of pork production (R. K. Johnson)
- 13-110 Factors regulating protein synthesis, degradation and growth in skeletal muscle (S. J. Jones)
- 13-111 Processed and manufactured meat technology (R. W. Mandigo)
- 13-112 Protein and energy constraints of rapid lean growth (P. S. Miller, A. J. Lewis)
- 13-113 Regulation of gonadotropin synthesis and secretion and ovarian follicle development pre- and postpuberty (J. E. Kinder, R. J. Kittok)
- Biochemistry**
- 15-022 Regulation of photosynthetic processes (R. Chollet)
- 15-040 Regulation of photosynthetic processes (J. P. Markwell)
- *15-047 Characterization of the ACTH receptor: polypeptide structure and life cycle (R. J. Krueger)
- 15-048 Molecular control of photosynthetic energy production (J. P. Markwell)
- 15-049 Enhancing beneficial microorganisms in the rhizosphere (R. V. Klucas)
- 15-050 Functional hemoglobins in plants (R. V. Klucas)
- 15-052 Chloroplast heteroplasmic suppression (R. J. Spreitzer)
- 15-053* Biosynthesis of chlorophyll *b* (J. P. Markwell)
- 15-054 Isotope fractionation in biological systems (M. H. O'Leary)
- 15-055 Structure, function and mechanisms of action of peptidases (F. W. Wagner)

- 15-056 Analysis and metabolism of oxysterols (R. Dam)
- 15-057 Chloroplast heteroplasmic suppression (R. J. Spreitzer)
- 15-058 Genetic modification of chloroplast rubisco (R. J. Spreitzer)
- 15-059 Structure and chemistry of compounds involved in the interactions between wheat and hessian fly (H. W. Knoche)
- 15-060 Structure, function and organization of photosystem I reaction center (J. H. Golbeck)
- 15-061 Environmental and genotypic control of assimilate allocation in grain crops (F. W. Wagner)
- 15-062 Mammalia cobalamin- dependent enzymes (R. Banerjee)
- 15-063 Enzymology of anaerobic CO₂ fixation and bioremediation (S. W. Ragsdale)
- Biological Systems Engineering**
- 11-001 Evaluation of performance of new tractors (L. I. Leviticus)
- 11-044 Improvement of thermal processes for food (M. A. Hanna)
- 11-067 Irrigation scheduling methods for efficient water and energy use (D. G. Watts, D. L. Martin)
- 11-077 Irrigation and farmstead electrical demands, load management and safety (L. E. Stetson)
- 11-079 Agricultural tractor testing board: policies and procedures (K. VonBargen, R. D. Grisso, G. Hoffman)
- 11-080 Improving field productivity and predicting energy requirements of soil-engaging equipment (R. D. Grisso, L. L. Bashford, L. N. Mielke)
- 11-081 Electronic image measurement, modeling, and control of plant growth for improved ag profitability (G. E. Meyer)
- 11-082 Decision support systems for the agricultural producer (T. L. Thompson)
- 11-083 Starch graft copolymers (R. Chinnaswamy, M. A. Hanna)
- 11-084 Systems approach to improved energy and water use in greenhouses (D. D. Schulte, G. E. Meyer, J. B. Fitzgerald)
- 11-085 Evaluation of tractor performance and test data (L. L. Bashford)
- 11-086 Development of engineering tools to enhance grain industry profitability (D. Jones)
- 11-087 Fertigation techniques for furrow-irrigated crops using surge irrigation (D. G. Watts)
- 11-088 Movement of agricultural chemicals beneath conservation tilled-furrow irrigated land (D. E. Eisenhauer, R. B. Ferguson, F. W. Roeth, R. F. Spalding)
- 11-089 Environmental and genotypic control of assimilate allocation in grain crops (G. E. Meyer)
- 11-090 Modeling responses of growing pigs (T. L. Thompson)
- 11-091 Development of engineering solutions for machine control systems for handicapped farmers (L. I. Leviticus, M. F. Kocher)
- Biometry**
- 23-001 Applications of statistics to research in agriculture (D. B. Marx, W. W. Stroup, A. M. Parkhurst, K. Eskridge)
- Entomology**
- *17-042 Cytogenetic factors associated with the development of aphid biotypes (Z B Mayo)
- *17-043 Ecology and management of soil insects in corn and soybeans (L. J. Meinke)
- 17-045 Black fly damage thresholds, biology and control (K. P. Pruess)
- 17-046 Impact of the soil environment on survival of immature western corn rootworms (R. J. Wright, L. J. Meinke, G. L. Hein)
- 17-047 Spatial dynamics of leafhopper pests and their management on alfalfa (S. D. Danielson)
- 17-048 Ecology and management of legume insects (S. D. Danielson)
- 17-049 Molecular taxonomy of black flies (K. P. Pruess, T. O. Powers)
- 17-050 Integrated management of stable flies and house flies on confined livestock (G. D. Thomas, J. J. Petersen, S. R. Skoda)
- 17-051 Arthropods associated with buffalograss and other turfgrasses in Nebraska (F. P. Baxendale)
- 17-052 National investigation of soybean stress from defoliating pests: northern region (L. G. Higley)
- 17-053 Arthropod induced stress on soybeans: evaluation and management (L. G. Higley, J. F. Witkowski)
- 17-054 Biochemistry and physiology of lipids, prostaglandins and related eicosanoids in insects (D. W. Stanley-Samuels)
- 17-055 Physiological consequences and management of arthropod leaf injury to plants (L. G. Higley)
- 17-056 Determinants of insecticide toxicity in resistant pest and nontarget aquatic insect species (B. D. Siegfried)
- 17-057 Genetic factors associated with the development of aphid biotypes and insecticide resistance (Z B Mayo)
- 17-058 Biology, ecology, and management of diabrotica species (L. J. Meinke)
- Environmental Programs**
- 25-001 Continuing participation in the national agricultural pesticide impact assessment program (S. T. Kamble)

Food Science and Technology

- 16-027 Food quality changes and energy consumption associated with thermal processing in foodservice system (J. H. Rupnow)
- 16-033 Marketing and delivery of quality cereals and oilseeds in domestic foreign markets (L. B. Bullerman)
- 16-044 Role of cathepsins H and L in muscle protein degradation (M. G. Zeece)
- *16-047 The isolation and development of antioxidants from plant sources (S. L. Cuppett)
- 16-048 Development of new processes and technologies for the processing of poultry products (G. W. Froning)
- *16-049 Utilization of cereal grains and waste products for exotic mushroom and fungal biomass production (L. B. Bullerman, S. L. Cuppett, M. A. Hanna)
- 16-050 Genetics and physiology of *Streptococcus thermophilus* (R. W. Hutkins)
- 16-051 Starch technology: production, characterization, and utilization (D. S. Jackson)
- 16-052 Analytical methods for food process control and measurement of processing induced changes (R. L. Wehling)
- 16-053 Role of proteinase inhibitors in protein degradation (M. G. Zeece)
- 16-054 Chemical and physical quality characteristics of horticultural crops and their products (D. Smith)
- 16-055 Food allergies and sensitivities (S.L. Taylor, J. H. Rupnow)
- 16-056 Mold and mycotoxin hazards in foods, feeds and the environment (L. B. Bullerman)
- 16-057 The design of an enzyme reactor for the conversion of hemicellulose to monosaccharides (M. Meagher)
- 16-058 Occurrence, control and prevention of pathogenic bacteria in foods (S. S. Sumner)
- 16-059 Identification, purification and characterization of bacteriocins and their evaluation as agents (J. H. Rupnow)
- 16-060 Evaluation and characterization of antioxidants from plant sources (S. L. Cuppett)

Forestry, Fisheries and Wildlife

- 26-006 Interactions of wildlife and agricultural systems in Nebraska (R. M. Case, J. R. Brandle)
- 26-008 Forest tree improvement—selection, breeding and investigation of gene control and structure (S. G. Ernst)
- *26-009 Strategies and procedures for advanced generation breeding of N.C. forest species (S. G. Ernst, D. F. VanHaverbeke)
- 26-010 Effects of water stress on growth and survival of certain deciduous tree species in Nebraska (M. R. Kuhns)
- 26-011 Windbreak shelter effects (J. R. Brandle)
- 26-012 Biology, ecology, and control of dioryctria borers of pines (M. O. Harrell)
- 26-013 Ecology and enhancement of wildlife populations in Nebraska (J. A. Savidge)
- 26-014 Wildlife damage management for sustainable systems (R. J. Johnson)
- 26-015 Molecular characterization of shoot induction competence events in *Populus deltoides* (S. G. Ernst)
- 26-016 Integrated pest management—vertebrates in Nebraska (S. E. Hygnstrom)

26-017	Water quality and water quantity criteria for Nebraska fishes (E. J. Peters)	21-015	Epidemiology of diseases of bean and other vegetables in Nebraska (J. R. Steadman)	Veterinary Science	
26-018	Avian species in diverted farmland (J. A. Savidge)	21-022	Biocontrol of soil-borne plant pathogens (G. Y. Yuen)	14-009	Prevention and control of enteric diseases of swine (R. Moxley)
26-019	Primary water quality determinants of attached algal communities in Nebraska (K. D. Hoagland)	21-037	Fungicide management strategies for control of rusts, leaf spots, and blights of grass hosts (J. E. Watkins)	14-014	Bovine respiratory disease (M. B. Rhodes)
26-020	Evaluation of environmental factors and fish species for aquaculture development in Nebraska (T. B. Kayes)	21-038	Use of recombinant DNA technology to study population genetics of soybean cyst nematode (T. O. Powers)	*14-036	Immunity to infectious bovine rhinotracheitis (S. Srikumaran)
Horticulture		21-039	Reduction of corn losses caused by nematodes in the North Central Region (T. O. Powers)	14-039	Nebraska SPF swine laboratory (J. A. Schmitz, A. Hogg)
20-036	Genetics, breeding and cultural interactions of dry edible beans (<i>Phaseolus vulgaris</i> L.) (D. P. Coyne, J. R. Steadman, A. K. Vidaver, D. S. Nuland)	21-040	DNA replication and gene expression of chlorella viruses (J. L. VanEtten)	14-040	Occurrence of mycotoxins in feed and foods and their effects on animal and human health (N. R. Schneider)
20-040	Genetic improvement of beans (<i>Phaseolus vulgaris</i> L.) for yield, pest resistance and nutritional value (D. P. Coyne, J. R. Steadman)	21-041	Pathogenic determinants of phytopathogenic fungi (M. B. Dickman)	14-043	Development of rapid diagnostic techniques for virus diseases of livestock (F. A. Osorio)
20-048	Influence of nitrogen and sulfur on growth and development of ornamental plants (E. T. Paparozzi)	21-042	Characterization and genetics of bacterial plant pathogens and endophytic bacteria (A. K. Vidaver)	14-044	Bovine respiratory syncytial virus subunit vaccine, immunity, and rapid diagnosis (C. L. Kelling)
20-050	Cultural practices to minimize environmental stress on vegetable crop production and physiology (L. Hodges, J. R. Brandle)	21-043	Detection and properties of plant viruses of Nebraska (L. C. Lane)	*14-047	Molecular analysis of latent herpesvirus infection (C. Jones)
20-051	Physiology and development of turfgrasses for low resource requiring environments (G. L. Horst)	21-044	Biological control of soilborne diseases of dry bean and turfgrass with antagonistic bacteria (G. Y. Yuen)	14-048	The immunobiology of enteric diseases of swine and cattle (G. E. Duhamel)
20-052	Introduce and develop high value crops from hardy wood plant germplasm for the North Central Region (W. A. Gustafson, Jr.)	21-045	Enhanced nematode diagnostics by polymerase chain reaction (T. O. Powers, J. P. Noe)	14-049	Molecular characterization of virus-host cell receptor interactions (S. Srikumaran)
20-053	Breeding and development of buffalograss and other low maintenance species for central great plains (T. P. Riordan)	21-046	Host-parasite interactions between fungal pathogens and their hosts (J. E. Partridge)	14-051	Induction of cellular immunity to BHV-1 by anti-clonotypes (S. Srikumaran)
Plant Pathology		21-047	Development of vectors and their use in plant transformation and plant gene regulation studies (A. Mitra)	14-052	Interaction of persistent viruses with the bovine immune system (F. A. Osorio)
21-012	Electron microscopy in agricultural research (W. G. Langenberg, E. M. Ball)	21-048	Investigations of management strategies for control of rusts, leaf spots, and blights of winter wheat and turfgrass (J. E. Watkins)	*14-053	An accurate determination of the pseudorabies infection of swine herds with single reactors (F. A. Osorio, A. Hogg)
		21-049	Epidemiology of diseases of dry edible beans and other vegetables in Nebraska (J. R. Steadman)	14-054	Research in support of a national eradication program for pseudorabies (F. A. Osorio, A. Hogg)
				14-055	Pathogenesis of diseases due to bovine viral diarrhea virus infections in cattle (C. L. Kelling, R. O. Donis, G. E. Duhamel, M. B. Rhodes, S. Srikumaran)

- 14-056 Interaction of persistent viruses with the bovine immune system: the cellular basis of BVDV lymphotropism (F. A. Osorio)
- 14-057 Molecular bases of BVD virus cytopathology and disease (R. O. Donis)
- 14-058 Molecular characterization of bovine viral diarrhea virus and its interaction with the host (R. O. Donis)
- 14-059 Veterinary diagnostic lab system: diagnostic surveillance and disease investigation in Nebraska livestock and poultry (J. A. Schmitz, A. R. Doster, J. L. Johnson, D. M. Groteleuschen)
- 14-060 Molecular characterization of bovine herpesvirus 1-host cell receptor interactions (S. Srikumaran, C. J. Jones, R. J. Krueger)
- 14-061 Enhancement of immunity to bovine respiratory syncytial virus infections (C. L. Kelling, L. J. Perino, R. D. Oberst)
- 14-062 Integrated management practices for control of swine dysentery and salmonellosis (G. E. Duhamel, G. R. Bodman)
- 14-063 Modulation of latent pseudorabies virus infections by vaccines: a quantitative analysis (F. A. Osorio, C. Jones)
- 14-064 Development and evaluation of a parturition detection device (G. P. Rupp)
- 14-065 Is the latency related gene of BHV-1 necessary for latent infection of cattle (C. Jones, F. A. Osorio)
- 14-066 Functional analysis of the BHV-1 latency related gene (C. Jones)
- 14-067 Evaluation and modulation of bovine immune function (L. J. Perino)

Home Economics Departments

Consumer Science and Education

- 92-014 Changes in the economic well-being of Nebraska families, 1981-1986 (E. P. Davis)
- 92-015 Understanding problems and possibilities of independent living for the rural elderly (R. E. Combs)
- 92-016 Rural households at risk of serious housing problems in the North Central region (R. E. Combs)
- 92-017 Factors influencing older consumers' experience and satisfaction with health insurance (K. Prochaska-Cue)

Human Development and the Family

- 93-023 The social and psychological aftermath of serious motor vehicle accidents (J. DeFrain)
- 93-024 Nebraska's youth at risk, assessing the problem (J. C. Woodward)
- 93-025 The influence of volunteer companion programs on self competence and family relationships of children (D. A. Abbott, W. H. Meredith)
- 93-026 Assessing change in rural head start families (P. Zeece)
- 93-027 Coping and adaptation among Nebraska's farm/ranch & rural families during periods of transitions (C. W. Smith)

Nutritional Science and Hospitality Management

- 91-020 Nutrient bioavailability - a key to human nutrition (C. V. Kies)
- 91-025 Modification of human diets designed to affect lipid metabolism (C. V. Kies)
- 91-032 Assessment of vitamin B-6 requirements of adults (J. A. Driskell)

- 91-033 Nutrient composition of meats and vegetables as consumed (J. A. Driskell, J. Albrecht, F. Hamouz, N. Lewis, M. Schnepf)
- 91-034 Nutrition problems of older adults in Nebraska and methods of changing food behavior (N. M. Betts)
- 91-035 Nutrition status and family history of chronic disease in young Nebraska women (N. M. Lewis)
- 91-036 Consumption and nutrient content and retention of vegetables and their health implications (J. A. Albrecht)
- 91-037 Behavioral and health factors that influence the food consumption of young adults (N. M. Betts)
- 91-038 The use of natural antioxidants to control warmed-over flavor in meats (M. Schnepf)
- 91-039 Nutrient intake, eating behaviors, and anthropometric measurements of young children in Nebraska (K. Stanek)

Textiles, Clothing and Design

- 94-014 Textile fiber systems for performance, protection and comfort (P. Cox-Crews)
- 94-015 Reducing pesticide exposure of applicators through improved clothing design and care (J. M. Laughlin)
- 94-016 Functional topical finishes for enhancing color stability and strength retention in textiles (P. Cox-Crews)
- 94-017 Rural retailing: impact of change on consumer and community (R. C. Kean)
- 94-018 The changing structure of local labor markets in nonmetropolitan areas (A. Ziebarth)

- 94-019 Assessment of the environmental compatibility of textile and other polymeric materials (P. Cox-Crews)

Off-Campus Research Centers

Northeast Research and Extension Center

- 42-007 Feedlot management and production considerations for the cattle feeder (T. L. Mader, R. A. Britton, H. D. Jose)
- 42-010 Improving feeder pig performance (M. C. Brumm)
- 42-011 Increasing fertilizer use efficiency in northeast Nebraska (C. A. Shapiro)
- 42-012 Conservation of soil and water utilizing interrow cultivation techniques (W. L. Kranz)
- *42-013 Integrated crop production systems for northeast Nebraska (R. S. Moomaw)
- 42-014 Biology and control of the European corn borer bean leaf beetle and other selected insects in northeast Nebraska (J. F. Witkowski)
- 42-015 Interpretation of swine enterprise records for increased understanding of profitability relationships (T. A. Powell)
- 42-016 Management practices to enhance performance of weaned pigs (M. C. Brumm, D. P. Shelton)
- 42-017 Determination of crop residue cover using electronic image analysis (D. P. Shelton)
- 42-018 Integrated crop management effects on stalk-boring Lepidoptera (J. F. Witkowski)
- 42-019 Increasing fertilizer use efficiency in northeast Nebraska (C. A. Shapiro)

Panhandle Research and Extension Center

- 44-004 Fertilizer and manure application for production of continuous corn (D. D. Baltensperger)
- 44-012 Improvement of millet, corn and sorghum production by breeding and cultural studies (D. D. Baltensperger)
- 44-016 Weed control for western Nebraska irrigated crops and rangelands (R. G. Wilson, Jr.)
- *44-032 Variety evaluation and culture of selected horticultural crops in western Nebraska (D. S. Nuland)
- 44-034 Introduction, maintenance, evaluation, and utilization of plant germplasm (D. D. Baltensperger)
- 44-035 Feed resources and beef production systems in western Nebraska to optimize total efficiency (I. G. Rush, B. Weichenthal)
- 44-036 Control of *Heterodera schachtii* and *Cercospora beticola* on sugar beet in the Nebraska panhandle (E. D. Kerr)
- 44-037 Development of dryland cropping systems for western Nebraska (D. A. Martin)
- 44-038 Cultural and nutrient investigations for crops in western Nebraska (D. D. Baltensperger)
- 44-040 Influence of grazing frequency and date on Nebraska Sandhills vegetation (P. E. Reece, J. T. Nichols)
- 44-041 Studies of perennial grass tiller, rhizome, and root dynamics designed to develop grazing management strategies (P. E. Reece)
- 44-042 Agricultural enhancement of potato production and utilization (A. D. Pavlista)



44-043 Development of integrated pest management systems for major insect pests of crops in the Nebraska panhandle (G. L. Hein)

44-044 Sugarbeet planters — plant spacing and emergence performance (J. A. Smith, C. D. Yonts, S. D. Kachman)

44-045 Resource efficient dryland cropping systems for western Nebraska (D. J. Lyon)

Roman L. Hruska U.S. Meat Animal Research Center

46-001 Development and operation of the U.S. Meat Animal Research Center (D. Laster)

46-010 Increased efficiency of lamb production (K. A. Leymaster, L. D. Young, G. E. Dickerson, R. M. Koch)

46-012 The genetics of body composition in beef cattle (R. M. Koch, L. V. Cundiff)

South Central Research and Extension Center

48-004 Occurrence of mycotoxins in feeds and the implications to animal and human health (B. L. Doupnik, Jr., N. R. Schneider)

48-012 Improvement of fertilizer use efficiency for conservation tillage crops in south central Nebraska (R. B. Ferguson)

48-013 Information and producer decisions in central Nebraska agriculture (R. A. Selley)

48-014 Biology, control and cost of shattercane and velvetleaf in south central Nebraska (F. W. Roeth)

48-016 Soybean production practices and alternative crops within resource-efficient cropping systems for south central Nebraska (R. W. Elmore)

48-017 Investigations on the epidemiology and control of maize chlorotic mottle virus (B. Doupnik, Jr., R. J. Wright, L. J. Meinke, S. Jensen, L. Lane, D. Wysong)

48-018 Blocked and open end furrow irrigation system management (J. Cahoon)

West Central Research and Extension Center

43-020 Animal disease surveillance in western Nebraska (J. L. Johnson)

43-024 Biology, ecology, economics and control of major insects affecting livestock (bovine) in Nebraska (J. B. Campbell)

43-033 Bionomics, vector capabilities and management strategies for face flies (J. B. Campbell)

*43-035 Evaluation of management practices to improve reproductive efficiency of beef cattle (G. H. Deutscher, D. C. Clanton)

*43-037 Characteristics and feed value of barley and western protein supplements for swine (D. M. Danielson)

*43-041 Methods of processing differing sources and combinations of fiber and energy for swine (D. M. Danielson)

43-042 Sorghum and corn breeding and corn, sorghum, and wheat variety evaluation under central northeast environment conditions (P. T. Nordquist)

43-043 Evaluation of complementary forage systems (J. T. Nichols)

43-044 Weed control in reduced tillage (G. A. Wicks)

43-045 Profitability and income variability of cropping and range cattle production systems (R. T. Clark)

- 43-046 Beef/range systems —integrating management practices to improve efficiency (D. D. Dearborn)
- 43-047 Selection and development of native herbaceous landscape plants (D. T. Lindgren)
- 43-048 Parasite manipulation to control flies in confined livestock operations (J. B. Campbell)
- 43-049 Increasing fertilizer nitrogen use efficiency in west-central Nebraska (G. W. Hergert)
- 43-050 Beef nutrition and production systems for Sandhills rangeland (D. C. Adams)
- 43-051 Quantifying nitrate leaching under continuous corn versus a corn-soybean rotation (G. W. Hergert, N. L. Klocke)
- 43-052 Quantifying year-around leaching losses in structured soil with percolation lysimeters (N. L. Klocke)
- 43-054 Evaluation of management practices to improve reproductive efficiency of beef heifers (G. H. Deutscher, D. C. Adams)

Interdisciplinary Activities

Administration

- 01-001 General administration of federal fund research (D. W. Nelson)
- 01-004 Regional research coordination, North Central Region (D. W. Nelson)

Agricultural Research and Development Center

- 45-001 Field laboratory development (D. Duncan)

Center for Sustainable Agriculture Systems

- 31-001 Integrated crop/livestock research for sustainable systems in Nebraska (C. A. Francis)

Food Processing Center

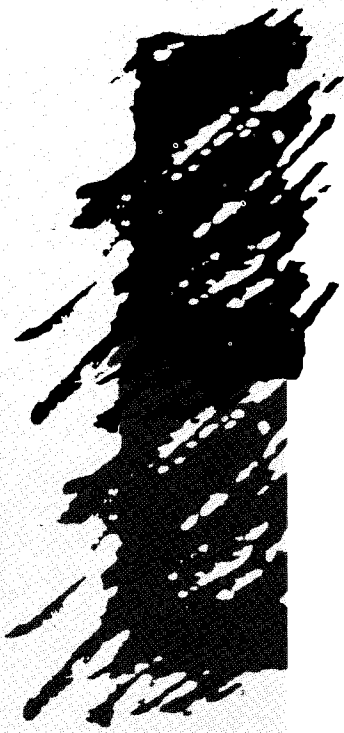
- 19-002 Development and quality/safety enhancement of specialty food products (S. L. Taylor, D. Neumeister)
- 19-003 Development and evaluation of food products, processes and markets (S. L. Taylor)

Industrial Agricultural Products Center

- 29-001 Nonfood agricultural products project (M. A. Hanna)

Water Resources Center

- 30-001 Management of irrigated corn and soybeans to minimize ground water contamination (D. G. Watts)



Publications

Publications in refereed scientific journals (peer reviewed) represent professional acknowledgement of the value of a research finding to the discipline. ARD scientists have published in approximately 80 different scientific journals during 1991. Faculty also have written numerous books, edited books or contributed book chapters. Another major contribution of the ARD research faculty is the education of graduate students pursuing a Master of Science (M.S.) or Doctor of Philosophy (Ph.D.) degree. One responsibility of a graduate degree is the completion of a thesis (M.S.) or a dissertation (Ph.D.). Publications in refereed journals, books, book chapters, theses and dissertations are listed for calendar year 1991.

Journals In Which Faculty Have Published In 1991

Agriculture Systems
Agri-Practice
Agronomy Journal
America Journal
American Journal of Physiology
Annals of the Entomological Society of America
Applied Engineering in Agriculture
Applied and Environmental Microbiology

Biochemistry Physiology
Biological Control
Biology of Reproduction
Bulletin of Environmental Contamination and Toxicology

Canadian Journal of Forest Research
Canadian Journal of Plant Science
Cereal Chemistry
Communications Soil Science and Plant Analysis
Comparative Biochemistry and Physiology
Crop Science
Domestic Animal Endocrinology

Environmental Entomology

Field Crops Research
Food Structure

Geoderma

HortScience
HortTechnology
Housing and Society

International Journal of Clothing Science and Technology
Insect Biochemistry
In Vitro Cellular and Developmental Biology

Journal of Agronomic Education
Journal of Animal Science
Journal of Applied Rabbit Research
Journal of Chinese Society of Animal Science
Journal of Chromatography
Journal of Consumer Education
Journal of Dairy Science
Journal of Economic Entomology
Journal of Environmental Quality
Journal of Food Composition and Analysis
Journal of Food Protection
Journal of Food Science
Journal of General Virology

Journal of Immunological Methods
Journal of Kansas Entomological Society
Journal of Medical Entomology
Journal of Nutrition Medicine
Journal of Production Agriculture
Journal of Range Management
Journal of Soil and Water Conservation
Journal of Sustainable Agriculture
Journal of the American College of Nutrition
Journal of the American Dietetic Association

Maydica

North American Journal of Fisheries Management
Nucleic Acids Research
Nutrition Research

Phytopathology
Plant Cell, Tissue and Organ Culture
Plant Foods for Human Nutrition
Plant Physiology
Plant Science
Poultry Science
Prairie Naturalist
Proceedings of National Academy of Science
Professional Animal Scientist

Revista Brasileira de Genetica

Soil Biology and Biochemistry Journal
Soil Science Society of America Journal
Starke

Textile Research Journal
Theoretical and Applied Genetics
Theriogenology
Transactions American Society of Agricultural Engineers
Tree Physiology

Virology

Water Resources Bulletin
Weed Research Volume
Weed Science
Weed Technology
Wildlife Society Bulletin

Research Publications (1991)

Agricultural Economics

Journal Articles

- Azzam, A. M. 1991.
Food subsidies and market interdependence: the case of the Moroccan soft wheat subsidy. *Agricultural Economics* 5:325-339. (J. Series No. 9297)
- Azzam, A. M. and J. Schroeter. 1991.
Implications of increased regional concentration and oligopsonistic coordination in the beef packing industry. *Western Journal of Agricultural Economics* 16:374-381. (J. Series No. 9197)
- Azzam, A. M. and M.S. Turner. 1991.
Management practices and financial performance of agricultural cooperatives: a partial adjustment model. *Journal of Agricultural Cooperatives* 6:12-21. (J. Series No. 9490)
- Azzam, S.M. and A. M. Azzam. 1991.
A Markovian decision model for beef cattle replacement that considers Spring and Fall calving. *Journal of Animal Science* 69:2329-2341. (J. Series No. 9212)
- Clark, R.T., J.T. Nichols and K.M. Eskridge. 1991.
Economic optimum fertilization rates for subirrigated meadow hay production including values for hay quality. *Journal of Production Agriculture* 4:233-240. (J. Series No. 9173)
- Loomis, J., M. Creel, and T. Park. 1991.
Comparing the benefit estimates from travel cost and contingent valuation using confidence intervals for Hicksian welfare measures. *Applied Economics* 23:1725-1733. (J. Series No. 9675)
- Massey, R.E. and J.E. Williams. 1991.
Swine breeding systems: a stochastic evaluation with implications for emerging technologies. *Southern Journal of Agricultural Economics* 23:227-236. (J. Series No. 9633)
- Park, T. 1991.
Modified Box-Cox tests using double length regressions: estimating hedge ratios. *The Review of Economics and Statistics* 73:181-185. (J. Series No. 9470)

- Park, T., J. Loomis, and M. Creel. 1991.
Confidence intervals for evaluating benefit estimates from dichotomous choice contingent valuation surveys. *Land Economics* 67:64-73. (J. Series No. 9469.)
- Peterson, W.R., D.T. Walters, R.J. Supalla and R.A. Olson. 1991.
Yield and economic aspects of irrigated cropping systems in Eastern Nebraska. *Journal of Production Agriculture* 4:353-360. (J. Series No. 9136)
- Royer, J.S. 1991.
A comparative financial ratio analysis of U.S. farmer cooperatives. *Journal of Agricultural Cooperation* 6:22-44. (J. Series No. 9457.)
- Schroeter, J. and A. M. Azzam. 1991.
Marketing margins, market power, and price uncertainty. *American Journal of Agricultural Economics* 73:990-999. (J. Series No. 9354)
- Wirth, L.A., S.M. Prichard, S.M. Azzam, D.A. Fiske, G.H. Pfeiffer, M.K. Nielsen, J.E. Kinder. 1991.
Evaluating net income from different durations of breeding seasons in beef production using deterministic simulation model. *Agricultural Systems* 37:275-289. (J. Series No. 9463.)
- Book Chapters**
- Cordes, S.M. 1991.
Questions of equity in health care and other amenities of the countryside, p. 221-231. *In* : Charles V. Blatz, (ed.), *Ethics in Agriculture*. University of Idaho Press, Moscow, Idaho.
- Peterson, E.W.F. 1991.
Mechanisms for achieving food self-sufficiency, p. 27-44. *In* : F. Ruppel and E. Kellogg, (eds.), *National and Regional Self-Sufficiency Goals: Implications for International Agriculture*. Lynne Rienner Publishers, Boulder, Colorado.
- Peterson, E.W.F. 1991.
Structural adjustment and food self-sufficiency in developing countries, p. 215-228. *In* : F. Ruppel and E. Kellogg, (eds.), *National and Regional Self-Sufficiency Goals: Implications for International Agriculture*. Lynne Rienner Publishers, Boulder, Colorado.

Ph.D. Dissertation

- El-Osta, Barb J. 1991.
A model of U.S. profitability, trade, and foreign direct investment with emphasis on food manufacturing industries. (G. Helmers, Advisor)

Agricultural Meteorology

Journal Articles

- Kim, J. and S. B. Verma. 1991.
Modeling canopy stomatal conductance in a temperate grassland ecosystem. *Agricultural and Forest Meteorology* 55:149-166. (J. Series No. 9200)
- Kim, J. and S. B. Verma. 1991.
Modeling canopy photosynthesis: scaling up from a leaf to canopy in a temperate grassland ecosystem. *Agricultural and Forest Meteorology* 57:187-208. (J. Series No. 9287)
- Meyer, S.J., K.G. Hubbard, and D.A. Wilhite. 1991.
The relationship of climatic indices and variables to corn (maize) yields: a principal components analysis. *Agricultural and Forest Meteorology* 55:59-84. (J. Series No. 9065)
- Murphy, R. E., P. J. Sellers, F. G. Hall, G. Asrar, B. L. Blad, E. T. Kanemasu, R. D. Kelly, B. Markham, D. Strebel, and J. R. Wang. 1991.
An overview of the FIFE-87 and FIFE-89 campaigns. *Advances in Space Research Journal* 11:143-150. (J. Series No. 9713)
- Starks, P. J., J. M. Norman, B. L. Blad, E. A. Walter-Shea, and C. L. Walthall. 1991.
Estimation of shortwave hemispherical reflectance (albedo) from bidirectionally reflected radiance data. *Remote Sensing of Environment* 38:123-134. (J. Series No. 9413)
- Walter-Shea, E. A., J. M. Norman, B. L. Blad, and B. F. Robinson. 1991.
Leaf reflectance and transmittance on soybean and corn. *Agronomy Journal* 83:631-636. (J. Series No. 9399)
- Wilhite, D. A. 1991.
Drought planning and state government: current status. *Bulletin of the American Meteorological Society* 72(10):1531-1536. (J. Series No. 9445)

Wilhite, D. A. 1991.
Drought planning: a process for state government. *Water Resources Bulletin* 27:29-38. (J. Series No. 9459)

Book Chapters

Walter-Shea, E. A. and J. M. Norman. 1991.
Leaf optical properties, p. 229-251. *In*: R. B. Myneni and J. Ross (eds.), *Photon-Vegetation Interactions: Applications in Optical Remote Sensing and Plant Ecology*. Springer-Verlag, New York.

Wilhite, D. A. 1991.
Drought. p. 81-92. *In*: W. A. Nierenberg (ed.), *Encyclopedia of Earth System Science*, 4 volumes. Academic Press, Inc., San Diego, CA.

M.S. Theses

Cornell, D. 1991.
Sun-view-target geometry effects on spectrally-derived vegetative index estimates of absorbed radiation and leaf area. (E. A. Walter-Shea, Advisor)

Klinedinst, P. L. 1991.
Potential effects of climate change on milk production and conception rate in dairy cattle in the United States and western Europe. (D. A. Wilhite, Advisor)

Ph.D. Dissertation

Garcia, R. L. 1991.
Assimilation and allocation of carbon in determinate and indeterminate soybeans. (S. B. Verma, Advisor)

Agronomy

Journal Articles

Anderson, B.E., D.N. Rice, D.J. Kubik, and R. J. Rasby. 1991.
Forage analyses for dietary diagnosis and management. *Agri-Practice* 12:29-32. (J. Series No. 9084)

Aulakh, M.S., J.W. Doran, and A.R. Mosier. 1991.
Direct in-field evaluation of four methods for measuring denitrification. *Soil Science Society of America Journal* 55:1332-1338. (J. Series No. 9548)

Aulakh, M.S., J.W. Doran, D.T. Walters, A.R. Mosier, and D.D. Francis. 1991.
Crop residue type and placement effects on denitrification and mineralization. *Soil Science Society of America Journal* 55:1020-1025. (J. Series No. 9367)

Aulakh, M.S., J.W. Doran, D.T. Walters, and J.F. Power. 1991.
Legume residue and soil water effects on denitrification in soils of varying texture. *Soil Biology and Biochemistry Journal* 23:1161-1167. (J. Series No. 9471)

Baenziger, P.S. and J.W. Schmidt. 1991.
Registration of 'Newcale' winter triticale. *Crop Science* 31:489-490. (J. Series No. 9127)

Bauer, T.A., D.A. Mortensen, G.A. Wicks, T.A. Hayden, and A.R. Martin. 1991.
Environmental variability associated with economic thresholds for soybeans. *Weed Science* 39:564-569. (J. Series No. 9384)

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West Central Research And Extension Center

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Book Chapters

Bock, B.R. and G.W. Hergert. 1991. Fertilizer Nitrogen Management, p. 140-164. *In: R.F. Follett (ed.) Managing Nitrogen for Ground Water Quality and Farm Profitability.*

Bock, B.R., F.J. Sikova, and G.W. Hergert. 1991. Approach for Estimating Yield Response to Nitrogen Based on Nitrogen-Rate Requirement Parameters, p. 323-332. *In: R.F. Follett (ed.) Managing Nitrogen for Ground Water Quality and Farm Profitability.*

M.S. Theses

Saner, R. D. 1991. Effects on live pig performance and carcass quality when fed diets supplemented with varying ratios of soybean meal and roasted soybeans. (D. M. Danielson, Advisor)

Wenninghoff, J. R. 1991. Feeding value of roasted corn and roasted soybeans for weanling, growing and finishing pigs. (D. M. Danielson, Advisor)

Wiseman, S. L. 1991. Effect of supplemental riboflavin on reproductive performance of gilts. (D. M. Danielson, Advisor)



Patents

The research of ARD scientists can often lead to a patent. Most of the patents that have been awarded to ARD scientists have been for equipment developments or specialized processes. These patents are often licensed by private industry with royalties being reinvested in future ARD research. The following patents were awarded in 1991-1992.

Animal Science

Patent Title: Method of making and using a ruminant feed.

Patent Number: 5,064,665

Scientists: Terry Klopfenstein, Lowell Satterlee, Robert Britton, and Ralph Cleale

Description: A novel method of treating soybean meal to increase protein bypass for ruminants was discovered. Soybean meal is mixed with xylose or sulfite liquor (a commercial source of xylose and byproduct of wood pulping) and heated to produce non-enzymatic browning. The resulting product has 2 1/2 times the bypass protein of untreated soybean meal.

Biochemistry

Patent Title: Separation and Purification of Sugar Esters.

Patent Number: 4,983,731. (Nebraska Department of Economic Development; patent held in other countries as well)

Scientists: Fred W. Wagner (Professor of Biochemistry, University of Nebraska Agricultural Research Division) Maria A. Dean (Graduate Student at University of Nebraska Agricultural Research Division) Rebecca S. de la Motte (Graduate Student, University of Nebraska Agricultural Research Division) Virginia H. Stryker (Chemist for University of Nebraska Agricultural Research Division).

Description: The process uses two steps to separate the sugar ester from

the crude sugar ester reaction product. The first step entails forming a precipitate of sugar ester from a mixture of alcohol, water and crude sugar ester reaction product. In a second subsequent step, the recovered sugar ester precipitate is washed with an organic solvent.

Patent Title: Sequential Peptide and Oligonucleotide Synthesis Using Immunoaffinity Techniques.

Patent Number: 5,049,656. (Board of Regents of the University of Nebraska; patent held in other countries as well)

Scientists: William Lewis (Scientist with Diagnostics Products Corporation) Jay S. Stout (Research Director, BioNebraska, Inc.) Gino Van Heeke (Visiting Assistant Scientist, University of Florida, ICBR) Dwane E. Wylie (Associate Professor, University of Nebraska, School of Biological Sciences) Sheldon M. Schuster (Director of ICBR, University of Florida) Fred W. Wagner (Professor, University of Nebraska Agricultural Research Division).

Description: The invention is directed to a method for purifying sequentially synthesized peptides and oligonucleotides by immunoaffinity techniques. Selected products are lapped with an antigenic capping agent and are conjugated with antibodies that are specific for the capping agent.

Variety And Germplasm Releases

ARD faculty involved in plant breeding and genetics research make important contributions to the improvement and development of agricultural and horticultural crops. Public breeding programs such as ARD's are essential to the continued enhancement of plant germplasm. These programs provide the resources and flexibility to pursue long-term breeding programs in crops that may not have a current commercial interest. They can also address genetic cultural and management interactions characteristic of today's agriculture as well as the future. Germplasm releases provide improved genetic material that is integrated into private and public plant breeding programs. Other releases occur as new cultivars (varieties) which are increased through the Foundation Seed Division and then provided to seed companies for production of certified seed. The following releases were made in 1991-1992.

Department of Agronomy

Crop: Dent Corn (*Zea mays* L.)

Germplasm Release: NCLNAC1 and 5 NCLNA S2 lines derived from dent corn population NCLNA

Scientists: M.A. Thomas-Compton, N. D'Croz-Mason, L.C. Lane, B. Doupnik, Jr., The Nebraska Corn Breeders Association

Characteristics: This release is an improved version of NCLNA, an elite dent corn population developed from a diallel cross of 7 lines and 3 single crosses possessing some degree of tolerance or resistance to Corn Lethal Necrosis disease (CLN), which was identified and contributed by the seed corn industry. Non-stiff stalk germplasm was used in synthesizing NCLNA. One cycle of combined

selection based on ratings of reaction to CLN inoculation of families at different stages of inbreeding (full-sib, S1 and S2) and agronomic performance (primarily yield and standability), of full-sib families and S1 testcrosses with FR1128 (B73 derivative) in absence of the disease was completed in NCLNA to give NCLNAC1. The five S2 lines were identified as superior for reduced reaction to CLN inoculation and for good agronomic performance of their corresponding S1 testcrosses during the first cycle of selection in NCLNA. NCLNAC1 and the five S2 lines are recommended for breeding purposes as sources of desirable agronomic performance combined with low reaction to field inoculation with CLN.

Crop: Dent Corn (*Zea mays* L.)

Germplasm Release: NCLNBC1 and 5 NCLNB S2 lines derived from dent corn population NCLNB.

Scientists: M.A. Thomas-Compton, N. D'Croz-Mason, L.C. Lane, B. Doupnik, Jr., The Nebraska Corn Breeders Association

Characteristics: This release (NCLNBC1) is an improved version of NCLNB, an elite dent corn population developed from a diallel cross of 18 lines possessing some degree of tolerance or resistance to Corn Lethal Necrosis disease (CLN), identified and contributed by the seed corn industry. Most of the lines used to synthesize NCLNB are related to B68. One cycle of combined selection based on ratings of reaction to CLN inoculation of families at different stages of inbreeding (full-sib, S1 and S2) and agronomic performance (primarily yield and standability), of full-sib families and S1 testcrosses with LH51 in absence of the disease was completed in NCLNB to give NCLNBC1. The five S2 lines were identified as superior for reduced reaction to CLN inoculation and for good agronomic performance of their corresponding S1 testcrosses during the first cycle of selection in NCLNB. NCLNBC1 and the five S2 lines are recommended for breeding purposes as sources of desirable agronomic

performance combined with low reaction to field inoculation with CLN.

Crop: Hard Red Winter Wheat [*Triticum aestivum* (L.) em Thell]

Germplasm Release: NE82438, NE82533, and NE84557

Scientist: P.S. Baenziger

Released By: University of Nebraska Agricultural Research Division, Northern Plains Area, Agricultural Research Service, United States Department of Agriculture

Characteristics: NE82438 in Nebraska is a late, semi-dwarf wheat with good straw strength and winterhardiness. It is resistant to stem rust. It expresses the heterogeneous reaction to Hessian fly (Great Plains biotype) which is believed to indicate the Marquillo-Kawvale genes for resistance. It is moderately susceptible to leaf rust, and is susceptible to wheat streak mosaic virus and to wheat soilborne mosaic virus. It has good baking and milling quality and has less than average thousand kernel weight and an average test weight. When compared to 'Arapahoe', it has yielded 2% less in regional trials and 11% less in Nebraska. It is a high yielding semi-dwarf line with good quality, but is too late for release in Nebraska.

NE82533 in Nebraska is a medium-early, semi-dwarf wheat with good straw strength and winterhardiness. It is resistant to stem rust and moderately resistant to soilborne mosaic virus. It is susceptible to leaf rust and wheat streak mosaic virus. It expresses the heterogeneous reaction with most plant being susceptible to Hessian fly (Great Plains biotype) which is believed to indicate that some plants contain the Marquillo-Kawvale genes for resistance. It has good baking and milling quality, and has an average thousand kernel weight and test weight. It yielded 8% less when compared to 'TAM105', and 6% less than 'Arapahoe'. While having good yield characteristics in parts of Nebraska where earliness and resistance to soilborne mosaic virus

are important, its overall performance did not warrant release as a variety.

NE84557 in Nebraska is a medium-late, medium-tall (not a semi-dwarf) wheat with good straw strength and winterhardness. It is resistant to stem rust and moderately resistant to moderately susceptible to wheat soilborne mosaic virus. It expresses the heterogeneous reaction with most plant being susceptible to Hessian fly (Great Plains biotype) which is believed to indicate that some plants contain the Marquillo-Kawvale genes for resistance. Is very susceptible to wheat streak mosaic virus, and moderately susceptible to leaf rust. It has excellent milling and baking quality, and has an average thousand kernel weight and good test weight. Yielded 2% less when compared to 'TAM105' and 5% less than 'Arapahoe'. It has a good yield record for a high quality, conventional height wheat, but was not considered for cultivar release due to wheat streak mosaic virus susceptibility. An alternative use would be as an indicator line for the presence of wheat streak mosaic virus.

Crop: Sweetclover [*Melilotus officinalis* (L.) Lam.]

Germplasm Release: N27, N28, and N29

Scientists: H.J. Gorz, F.A. Haskins

Released By: United States Department of Agriculture and the University of Nebraska Agricultural Research Division

Characteristics: N27 is a biennial, yellow-flowered, high coumarin strain selected for large seed size and for resistance to the pea aphid (*Acyrtosiphon pisum* Harris) and the sweetclover aphid [*Therioaphis riehmii* (Börner)]. It is susceptible to blackstem disease (*Cercospora davisii* Ell. & Ev.) and to attack by leafhoppers [*Empoasca fabae* (Harris)]. Nevertheless, the large seed size and associated gains in seedling emergence and vigor, the early maturity, and the aphid resistance of N27

should be useful in sweetclover improvement programs.

N28 is an improved strain of biennial, yellow-flowered sweetclover selected for low coumarin content and resistance to the sweetclover aphid (*Therioaphis riehmii* Börner). N28 has not been evaluated in field trials with other sweetclover strains, but because of the preponderance of germplasm from the cultivar, Goldtop, it should be similar to that cultivar in general appearance. N28 differs from Goldtop in having low coumarin content and resistance to the sweetclover aphid. The low coumarin content enhances the value of this strain for use as a forage crop and for use in sweetclover improvement programs.

N29 is an improved strain of biennial, yellow-flowered sweetclover that was selected for low coumarin content, large seed size, and sweetclover aphid (*Therioaphis riehmii* Börner) resistance. N29 has not been evaluated in field trials, but because it was derived from crosses involving the same germplasm used in the development of both N27 and N28 sweetclover germplasm, it is not surprising that N29 is generally intermediate between these two parental types but is highly variable, with many plants approaching the parental extremes for specific traits, except for coumarin content which is uniformly low. Reduced coumarin enhances the value of sweetclover for use as a forage crop and for potential use in sweetclover improvement programs.

Crop: Grain Amaranth [*Amaranthus hypochondriacus* (L.)]

Variety Name: Plainsman

Scientists: D.D. Baltensperger, L.E. Weber, and L.A. Nelson

Released By: University of Nebraska Agricultural Research Division and the Rodale Research Center

Characteristics: Plainsman originated from a cross between RRC1024 and RRC1004, and was selected for its earlier maturity, lighter seed color,

and shorter plant height. It is one of the earliest maturing grain amaranth lines, requiring about 110 days to mature. When moisture conditions are not limiting, Plainsman reaches an intermediate plant height of 1.6m. During the juvenile state, Plainsman has a red leaf marking in the center of its leaves which fades as the plant approaches its reproductive phase. It develops a red upright flower and produces white seed. Plainsman maintains a better stem strength after frost. Yields have averaged more than 600 kgs/ha.

Crop: Soybean [*Glycine max* (L.) Merr.]

Germplasm Release: 10 germplasm lines possessing dense (Pd1Pd1) pubescence

Scientists: J.E. Specht and G.L. Graef
Characteristics: Each germplasm line traces to a single F3 plant. Each F3 plant originated from a mating of a high-yielding, recently released cultivar (serving as a female parent), to a backcross-derived, near-isogenic Pd1 line of either the "Clark" (L62-1686) or "Harosoy" (L62-801) cultivar. The ten lines were selected from a larger sample of 160 lines that consisted of 4 dense and 4 normal lines from each of 20 crosses. The ten Pd1 germplasm lines are higher yielding than the Pd1 near-isogenic lines of Clark and Harosoy, and effectively enhance the number (and genetic diversity) of germplasm that can be used as Pd1-donor parents in subsequent crosses. These lines should be useful to breeders who wish to utilize the gene for dense pubescence in their cultivar development programs.

Crop: Soybean [*Glycine max* (L.) Merr.]

Variety Name: Dunbar

Scientists: G.L. Graef

Characteristics: Dunbar is a Maturity Group III cultivar, with indeterminate growth habit, purple flowers, gray pubescence, brown pods, and shiny yellow seeds with imperfect black hila. Dunbar averaged 8% higher yields than Resnik in Nebraska tests during 1990. It is resis-

tant to races 1 and 4 of *Phytophthora* rot [*Phytophthora megasperma* f. sp. *glycinea* (Drechs.) Kuan & Erwin], pod and stem blight, and soybean mosaic virus. It has good tolerance to iron-deficiency chlorosis on calcareous soil. Dunbar is susceptible to purple stain, brown stem rot, and bacterial tan spot.

Crop: Soybean [*Glycine max* (L.) Merr.]

Germplasm Release: Population SG1E6

Scientists: J.W. Specht and G.L. Graef
Released By: University of Nebraska Agricultural Research Division

Characteristics: SG1E6 was derived by repetitively mating elite germplasm to an existing population known as SG1. The latter was a thrice random-mated population created from the 156 matings of 39 female "ancestral" germplasm strains to four male "adapted" strains that were heterozygous for the ms2 form of genetic male-sterility. Because of its elite germplasm base and ms2 form of genetic male-sterility, SG1E6 will be of interest to any soybean breeder desiring to use a male-sterile-facilitated, cyclic-mating (MSFCM) system in a cultivar development program. An MSFCM system can produce large quantities (e.g. thousands) of F1 seed. SG1E6 is predominantly a Maturity Group (MG) II and III population, but it does have a maturity distribution extending from MG O to MG V.

Biochemistry

Germplasm: *Aspergillus niger*

Strain: LGF-14 (NRRL 18927)

Scientist: John Markwell

Released By: United States Department of Agriculture Northern Regional Research Laboratory.

Characteristics: A mutant strain with constitutive production of glucose oxidase enzyme (EC 1.1.3.4) in substantially greater amounts than the parental organism NRRL 3). The strain forms white or yellow colonies which may be identified by surrounding reddish zones when grown

on diagnostic solid medium containing methyl red and exhibit black conidia on aerial conidiophores. This strain may be useful in increasing the industrial production of glucose oxidase.

Horticulture

Crop: Buffalograss [*Buchloe dactyloides* (Nutt.) Engelm.]

Variety Release: '609'

Scientists: T. P. Riordan, S. A. deShazer, E. J. Kinbacher, J. F. Svoboda, F. P. Baxendale, M. E. Engelke and L. A. Wit, Jr.

Released By: University of Nebraska Agricultural Research Division

Characteristics: '609' is a female clone of buffalograss with excellent turfgrass color, rapid rate of establishment, high density and drought resistance. Vegetative establishment permits maintenance of a stable genotype, with no genetic variation.

Report of Research Expenditures
The University of Nebraska
Agricultural Research Division
July 1, 1991 through June 30, 1992

FEDERAL FORMULA FUNDS:

Hatch Formula	\$ 2,144,732
Regional Research	\$ 839,107
McIntire-Stennis	\$ 141,605
Animal Health	\$ 177,271
Total Federal Formula Funds	\$ 3,302,715

STATE APPROPRIATED FUNDS \$23,474,270¹

CONTRACTS AND GRANTS:

USDA Coop Agreements	\$ 2,138,600
USDA Special & Competitive	\$ 1,736,344
Federal Grants - (NSF, NIH, HEW, AID)	\$ 3,188,423 ²
Industry Grants	\$ 3,646,075
Total Grants and Contracts	\$10,709,442
Sub-Total	\$37,486,427

PRODUCT SALES \$ 6,456,634

TOTAL EXPENDITURES \$43,943,061

¹Includes \$2,655,662 of Nebraska Research Initiative funds expended by ARD affiliated units.

²\$384,400 was included to show actual Agricultural Research Division expenditures reflecting transfers from International Programs.



Research Expenditures

ARD receives funding from federal formula funds, industry grants, federal grants and state appropriations.

**Agricultural Research Division
Selected Research Program Information**

Category	FY 1991	FY 1992
Project information:		
Projects at beginning of year	259	293
Projects terminating	45	29
Projects revised	5	5
New projects	79	71
Projects at the end of the year	293	335
Faculty full time equivalents (FTE)	144.5	139.4
Support for budgeted research faculty:		
Federal formula & state approp. /FTE ¹	\$178,901	\$192,087
Grant & contract expenditures/FTE	\$ 65,857	\$ 76,825
Product sale expenditures/FTE	\$ 41,919	\$ 46,317
Outputs from research program:²		
Refereed journal articles	255	272
Research bulletins	4	6
Books & book chapters	48	44
M.S. & Ph.D. theses	109	114
Cultivars & germplasm released	17	11
Patents obtained	1	3

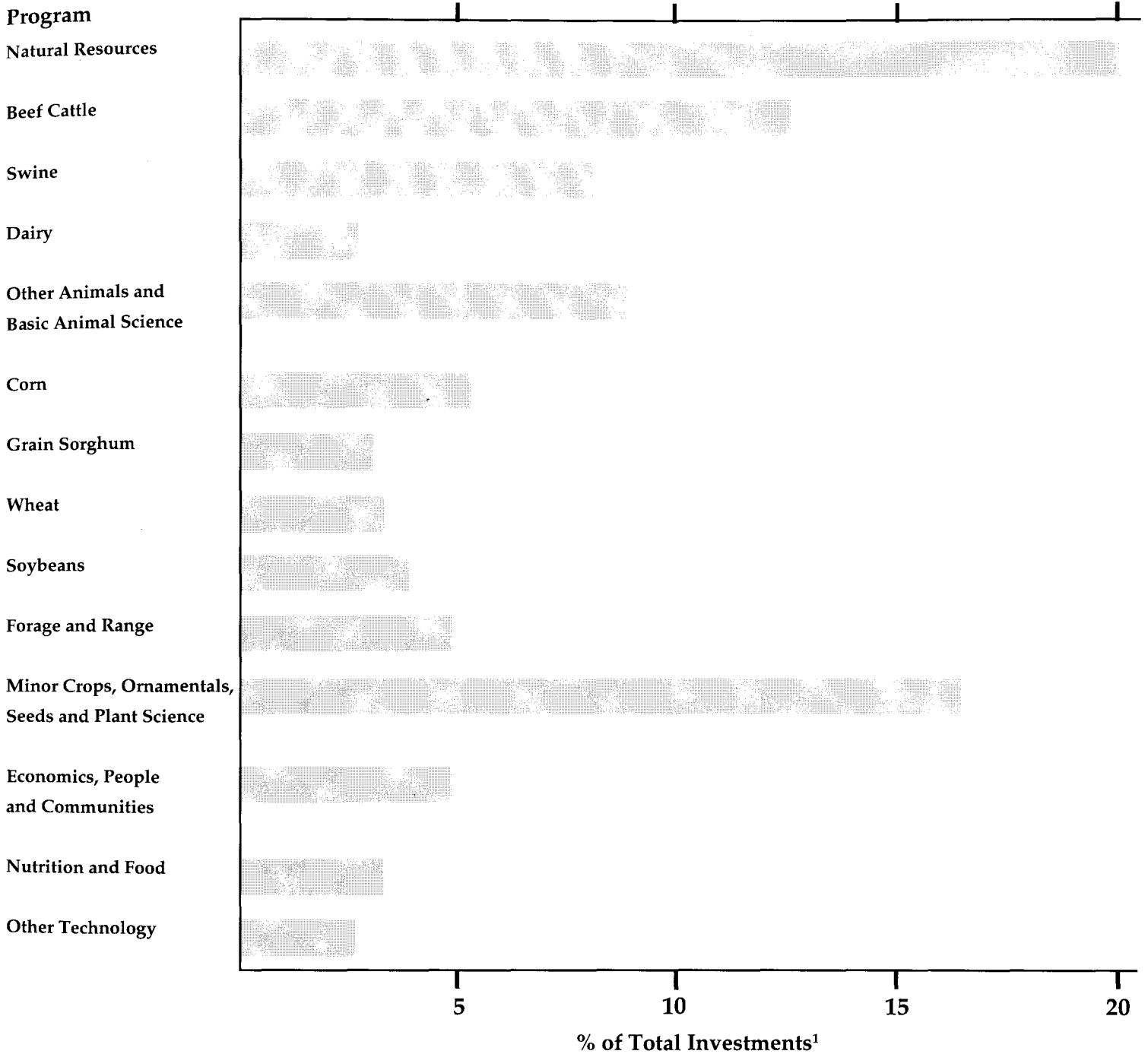
¹ Includes cost of administration.

² A large number of abstracts, technical reports, and other non-refereed articles are also published by faculty each year.

Agricultural Research Division
Research Investments By Category And Funding Source FY (1992)

Category	Formula & State Approp.	Federal Grants & Contracts	Industry Grants	Product Sales
—————% of total within source—————				
Salaries, Wages & Benefits:				
Faculty/Admin. Salaries	39.9	3.9	3.7	0.7
Managerial/Prof Sal	11.7	8.1	5.2	4.1
Office/Service Salaries	14.7	7.6	14.8	20.3
Student Wages	0.8	5.2	9.3	3.7
GRA Stipends	5.2	15.9	14.9	0.6
Benefits	13.8	6.3	7.4	6.1
	—	—	—	—
Subtotal:	86.1	46.9	55.4	35.5
Operating:				
Supplies & Expenses	9.3	42.1	29.7	55.5
Travel	0.9	4.8	7.4	2.7
Equipment	3.7	6.2	7.5	6.3
	—	—	—	—
Subtotal:	13.9	53.1	44.6	64.5
Total:	100.0	100.0	100.0	100.0

Agricultural Research Division Programmatic Distribution Of Investments



¹Product sale income is not included in total