Spring 1993

South Dakota Farm and Home Research

South Dakota State University

South Dakota Farm & Home
RESEARCH

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SDSU

Getting the information to you

"Today's Ag", a new weekly program on KELO-TV, is only one of many ways research information is distributed

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The latest means of disseminating information from the Agricultural Experiment Station is the exciting new television program "Today's Ag", a one-of-a-kind half-hour program of interviews, news, and features. Today's Ag airs Sunday nights at 10:35 on the four "KELO-LAND" television stations.

photo: Kevin Schmidt

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Director's Comments

Who should pay for new variety development?

R. A. Moore

One of the earliest contributions to society from agricultural research was the development of improved varieties of agronomic and horticultural crops. This has continued to be a valued contribution, especially here in South Dakota.

I remember very well my first day as head of the newly created Plant Science Department at SDSU, back in 1968. I was asked at a public meeting to defend the use of public funds to support this program. The question was spurred by a perception that, since farmers were the beneficiaries, they should pay for this work.

If I were asked that question today (and I am), my answer would be the same. I just have an additional 25 years of reasons to support my answer.

We all eat and use fiber that comes from these new crops. The consumer actually benefits more than does the producer—in ample food that is nutritious, high-quality, and affordable. The regular appearance of new varieties is the basis for this abundance.

What is wrong with the old ones?

It is very true that sometimes a new variety may yield no more than an older one. Marquis was a hard red spring wheat that could produce 40 bushels per acre in the early 1900s. Some good varieties today will do no better.

But we are looking at nearly a century of new races and strains of pests and diseases. Marquis lacks the resistance to fight off the 1990s versions of these pests and diseases; it probably wouldn't yield 5 bushels today, and might not even survive to produce a flower.

Plant breeders anticipate these changes in pest and disease levels, and new varieties are bred to meet these anticipated changes. The result is an uninterrupted flow of food from farm to table.

But simply because they have performed so well in initiating that abundance, scientists have fallen on hard times. A continuing and bountiful supply of food is taken for granted. Doesn't the breeding of new varieties have the potential to generate funds—from the farmers who benefit—to support itself? When total research funds are so thin, couldn't that money be used on other projects?

Some experiment stations are initiating moves to license (patent) new varieties and collect royalties on the sale of seed. The royalties supplement or entirely fund variety development. Producers who grow the new seed for increase to sell to farmers who produce the crop for the market are able to pass on (within reason) the added costs to the farmer.

And the farmers are stuck with another fixed cost in their higher seed bills. The buck stops with them. They can't pass on their added costs to millers, bakers, and other processors, who, if they did have to pay more for their raw product, would in turn pass on the increased costs to the consumer. But, as we well know, farmers have little or no control over the market, except in very select situations such as specialty crops. The farmers again bear the full cost. Again, the general public comes out better than the farmer.

Variety development is important to all of us. The cost should be borne by taxpayers and not just farmers.

Plant variety protection (PVP) is good, especially for private plant breeders. PVP provides a basis for identification and ownership, as a patent does for an inventor. It is a prerequisite for charging royalties or user fees. Commercial breeders can recoup costs and make money on their accomplishments.

But when public funds are the source of support and when the general public benefits from the research, the variety belongs to the public. ❑

photo: Kevin Schmidt

Plant variety protection is good, says Dr. Ray Moore, but when the money comes from all taxpayers and when they are the ones who benefit most, the new variety belongs to them.

photo: Emery Tschetter

Putting the information into your hands

Dr. Larry Tennyson

"Scientific research information that remains on the shelf isn't likely to be of much benefit to persons such as farmers, ranchers, and agribusinessmen," according to Emery Tschetter, head of the Department of Agricultural Communications at SDSU.

That's the reason why moving this information from the laboratories and field stations and placing it into the hands of those who need it is a major priority among the scientists in the South Dakota Agricultural Experiment Station at SDSU.

Disseminating this information takes many forms. The newest example is the exciting new program, "Today's Ag: It Touches Us All," that airs weekly on the four "KELO-LAND" television stations. This one-of-a-kind, half-hour program of interviews, news, and features is viewable from border to border, east to west, and north to south, throughout the entire state of South Dakota.

But we're ahead of the story. To understand the task of distributing this information, we first need some background regarding how and why it originates.

The makeup of a land-grant institution like SDSU has been likened to a milking stool with three legs.

The research "leg" is represented by the Agricultural Experiment Station, and its main function is the discovery and development of new information. The Experiment Station is the information provider in a land-grant school system.

The other two legs of the stool represent the pipelines or channels through which a large part of this information flows from the providers to the information users.

The first of these channels is classroom teaching, and it employs scientific information in the teaching of young adults who are preparing for their careers.

The second of these is the Cooperative Extension Service, and it employs scientific information in the teaching of older adults who already are engaged in their respective careers.

Thus, the mission of a land-grant institution such as SDSU is one major effort in providing new scientific information, followed by two major efforts in moving such information into the hands of the users, which include both younger and older adults.

The younger-adult group consists primarily of university students. The more mature adult group, however, breaks down into two subgroups: those in the scientific community and those in the non-scientific community.

Information users in the scientific community generally include scientists at the other land-grant universities located in each of the 50 states; those at other governmental, private, and commercial laboratories; and, finally, those who are part of the international scientific community.

Those in the non-scientific community include persons in fields such as farming, ranching, homemaking, and agribusiness.

In filling this demand for information, scientists at SDSU conduct two types of investigations: basic and applied.

Basic research generates information which leads toward further scientific understanding; it may not have any "practical" use at the time of its discovery, however.

For example, one scientist may discover that a combination of chemicals will kill a certain type of virus. A second scientist may later discover that a mysterious livestock disease is caused by a virus related to the one studied by the first scientist. Neither discovery by itself has any practical use at this point—apart from contributing toward general scientific understanding, so both are basic research projects.

But when a third scientist combines the findings of the first scientist with the findings of the second scientist and then develops a way to control the disease, this becomes applied research, and it does have a practical use.

Members of the scientific community are the primary users of the basic research information generated at SDSU.

Members of the non-scientific community are the primary users of the applied research information generated at SDSU.

photo: Larry Tennyson

Facing page: Michelle Rook anchors "Today's Ag," popular new weekly television show produced by the Department of Agricultural Communications and aired statewide on KELO-LAND televsision. Above: Brad Van Osdel and Stu Fedt, videographers,edit video and sound, bringing together the many elements necessary to produce a professional quality program.

The total amount of basic and applied scientific information produced by the South Dakota Agricultural Experiment Station in the space of one year is immense. One has to remember that this is a $14.5 million enterprise and one of far-flung and varied activities.

The 105th annual report for the Agricultural Experiment Station, issued for the 12-month period ending on June 30, 1992, listed all the projects, journal articles, and publications and other reports produced by the nearly two hundred researchers, field station personnel, graduate assistants, scientists, and others who make up the total Experiment Station work force.

The list is impressive.

The report shows 136 ongoing research projects spread among a dozen departments across the SDSU campus. Numbers of projects range from as few as one to as many as 46 among the various departments.

The departments of Animal and Range Sciences and Plant Science understandably have a large number of projects (67) between them, but other departments also have substantial amounts of ongoing research.

The Agricultural Engineering and Economics departments are working on a total of 22 research projects between them. Dairy; Horticulture, Forestry, Landscape, and Parks; and Veterinary Science are working on a total of 25 projects. Lesser numbers of important projects are continuing among the departments of Biology/Microbiology, Home Economics, Rural Sociology, Station Biochemistry, and Wildlife and Fisheries Sciences.

photo: Larry Tennyson

Jerry Leslie, ag news and features writer, prepares a weekly "packet" of news for 66 Extension offices, 13 dailies, 20 farm magazines, and 50 radio and television stations in South Dakota.

Distribution of all this information occurs in various ways.

The task of distributing basic research information is handled primarily by the scientists themselves. Distributing applied research information also is a responsibility for SDSU staff involved in classroom teaching and Extension.

Basic research information often is distributed as articles written for professional journals and texts by SDSU scientists. The annual report lists 139 such articles published in journals during FY 1992.

Publications and other types of reports represent another major method for basic research dissemination. The annual report states that 417 publications and other kinds of reports were written about the research work during FY 1992.

Delivering scientific papers at professional meetings and seminars is yet another way this information is distributed.

Distribution of applied research information is an even larger undertaking, primarily because the user group also is much larger.

There are three major types of distribution activity at SDSU: print-based, electronic, and face-to-face.

One example of print-based distribution is the weekly news packet that the Department of Agricultural Communications writes, duplicates, and delivers to 66 local Extension offices, 13 daily newspapers, 20 farm magazines, 50 radio and television stations, and numerous agricultural commodity group publications.

This packet is unique in that it also is delivered electronically through the Extension computer bulletin board system.

Last year, about 125 Experiment Station news articles were distributed in this manner. About 200 Extension news articles also contained scientific information. Still another 50 requests for specific types of scientific news articles were filled for miscellaneous publication.

Print distribution also includes publications that range from scientific monographs to simple fact sheets.

The journal you are now reading is another way print is used to dis-

tribute scientific information. *Farm and Home Research*, produced and published in the Department of Agricultural Communications, is a good example of the "popularized" method of writing about research results. The goal of such writing is to put complex scientific findings into an easily read, easily understood language for general consumption.

Farm and Home goes to about 4,000 households and offices and is published four times each year.

The SDSU "Bulletin Room" plays yet another an important role is the distribution of printed information. During one recent year, this unit mailed or handed out about 800,000 publications that dealt in one way or another with scientific information.

Instructional video tape is a yet another method. It includes the production of documentary type programming. Most of this work is done in the studios of the Department of Agricultural Communications. About six major programs were completed during the past year. These programs then were aired on various television stations, shown to an array of large and small group audiences in various types of meetings, and also are made available for home viewing in some instances.

Radio also serves as an important tool for distributing scientific information—especially to farmers and ranchers. It remains the single-most dependable way of reaching such users during their working hours.

During one recent year, 312 episodes of the daily interview show, "Farm Forum," were produced and aired over 24 radio stations across the state by the Department of Agricultural Communications. Total listenership has been estimated at 450,000 persons.

In addition to "Today's Ag," television also is heavily used in other ways. "Midwest Market Analysis" and "Gardenline" are two weekly programs that are carried statewide on the South Dakota Public Television network. These represent a joint effort between the Department, Public Television, and the various academic departments across campus where the scientists and specialists conduct their research, development, and Extension activities.

photo: Larry Tennyson

Steve Knutson, left, is radio specialist in the Department of Agricultural Communications. Total listenership to the daily show broadcast over 24 stations across the state is estimated at 450,000 people.

The Department also maintains a news conference team that helps scientists take their discoveries to the public through radio, television, newspapers, and magazines.

News conferences and a taped news service accessible by telephone supply another 500-600 scientific news stories each year to the state's commercial radio and television stations.

Classroom teaching is an obvious example of the face-to-face type of scientific information distribution activity. Other examples include field days, "meetings," demonstrations, tours, and even roadside plots which provide opportunities for personal encounters with the research projects themselves. Still another example is the consultation that occurs between a scientist or an Extension specialist and one or more users in a setting such as the South Dakota State Fair or a farm or office visit.

Extension agent and specialist reports indicate an enormous amount of face-to-face sharing of scientific information on a daily basis. On just one rather typical day, more than 8,200 individual contacts included meetings with about 1,000 persons, 1,300 consultations, workshops with about 600 persons, and the remainder by newsletter or personal letter.

As Tschetter indicated, the information generated by the scientists in the South Dakota Agricultural Experiment Station has to be distributed if it's to benefit those who have need of it, and a great amount of effort is being expended to see that this is accomplished in the most efficient and effective ways possible. ❑

photo: Lee Sudlow

The College's Bulletin Room, under the direction of Brenda Warborg, mails close to 800,000 research and Extension publications in a year.

Dr. Larry Tennyson is communications specialist and writer in the Department of Agricultural Communications at SDSU.

photo: Jerry Leslie

Stresses on wheat attacked from many angles

Jerry Leslie

Major developments in wheat research—from new breakthroughs in the laboratory to key changes in staff—have occurred in the last 2 years at SDSU.

Among those developments:

Drs. Fedora Sutton and Don Kenefick, plant science researchers, gained headlines and TV coverage last November with a scientific breakthrough in locating and identifying genes responsible for freeze resistance in winter barley.

Dr. Fred Cholick was promoted from spring wheat breeder to head SDSU's Plant Science Department on August 1, 1991.

Dr. Jackie Rudd, a native Texan and veteran plant breeder, accepted appointment to the Cholick vacancy in March 1992 and began work as spring wheat breeder upon completion of his doctorate at Kansas State University.

Winter wheat breeder Dr. Jeff Gellner resigned in the summer of 1992, prompting a search for a successor, and Cholick hoped to have someone on board by July 1, 1993. Gellner had headed up the winter wheat research program for the last 8 years, and has gone back to Pennsylvania to work on a law degree.

The South Dakota Wheat Commission, an ally of SDSU's wheat research program, continued its support to the university, and hired a new director, Randy Englund, to fill a vacancy created by the resignation of Ben Handcock. The commission also continued its annual visits to view research on the SDSU campus and provide input and dollars to SDSU wheat research.

Cholick, who was project leader of SDSU's spring wheat breeding and genetics program, filled the department-head vacancy created by the resignation of Dr. Maurice Horton in 1990. Horton moved on to USDA's Cooperative States Research Service in Washington, D.C., as water grants administrator. Dr. Dale Reeves, oat breeder, meanwhile served as interim department head during the search process.

Cholick, a native of Oregon, with Ph.D. and M.S. degrees from Colorado State University and a bachelor's degree from Oregon State University, came to SDSU in 1981 from Oregon State University after 5 years there as a wheat breeder on an international breeding program under contract with the U.S. Agency for International Development.

Rudd, a native of Big Spring, Texas, came to SDSU with a Ph.D. in wheat breeding from Kansas State, an M.S. degree in forage breeding from the University of Arkansas, and a bachelor's degree in plant and soil science from Tarleton State University.

Rudd had attended Kansas State on a plant-breeding fellowship from Pioneer Hi-Bred International. Before that, he had served 5 years as a plant breeder for GroAgri Seed Co. at Lubbock, Texas.

And at the South Dakota Wheat Commission offices in Pierre, Englund, from the state's Department of Agriculture, was appointed executive director to fill a vacancy. The vacancy was created when former director Handcock moved up to executive vice president of the U.S. Wheat Quality Council, a national industry-supported organization to ensure quality and provide information about wheat. Both retain offices in Pierre.

photo: Jerry Leslie

Previous page: Jim Gaffney, plant science graduate student, relates the effects of herbicide injury when winter wheat followed soybeans at the annual crops tour at the Highmore station. Above: South Dakota Wheat Commissioners and wheat growers hear Jim Koepke, research technician at right, tell about freeze resistance during a lab tour at SDSU. Others, from left, are Dale Reeves and Fred Cholick, SDSU; Milo Schanzenbach, Selby; Charles Howe, McLaughlin; Ben Handcock, Pierre, Gayle Kocer, Martin; Brad Farber, SDSU; Don Jarrett, Britton; Clair Stymiest and Jeff Gellner, SDSU; and Jerry Hawkins, Pierre.

Rudd, in talks to producers during his first year at SDSU, said he does not plan to make major changes in the spring wheat breeding program, and he will continue to share ideas with Cholick who still maintains a strong interest in the program.

The spring wheat program will have a laboratory in the Northern Plains Biostress Laboratory, now nearing completion.

The spring wheat breeding program receives funding from the Agricultural Experiment Station, the South Dakota Wheat Commission, the South Dakota Crop Improvement Association, and the USDA Agricultural Research Service.

The most elite breeding lines of wheat emerging from the program go on to the advanced yield trials maintained at nine locations across the state before they are tested in regional trials. Here they are tested for yield potential and yield stability against the most popular varieties raised in the state. Then they are considered for increase and release.

Rudd considers the multiple-site testing as the "meat of the program."

Most recent releases from the SDSU spring wheat program have been the varieties Prospect, Sharp, and Shield.

An illustration of progress in the spring wheat breeding program is that SDSU experimental lines took the top five rankings in the 1991 Uniform Regional Hard Red Spring Wheat Nursery. One line completed its third year there and is being increased with intent to release, and three are in their second year at the regional nursery.

Potential releases also are screened for their mixing and baking qualities, including protein quality and quantity done with mixograms and an NIR analysis.

Meanwhile, research on other facets of South Dakota wheat production continues in the laboratory and in the field.

An overview of that research indicates that it spans several departments and disciplines.

Dr. George Buchenau is the wheat disease researcher. He works with both the spring and winter wheat breeding programs, screening varieties and breeding lines for disease resistance.

He studies the epidemiology of tanspot, other leaf spots, and scab—where it is, in what amounts, and what conditions allow it to reach economic proportions. When it does occur, he will develop an advisory system and economic thresholds for scheduling a fungicide application.

A part of this research is an attempt to relate weather to infection periods.

Dr. Marie Langham is researching the viral diseases, with principal interest in wheat streak mosaic and

photo: Jerry Leslie

The South Dakota Wheat Commissioners and wheat growers also toured the soil fertility plots at the Plant Science research farm at Aurora. Howard Woodard, SDSU researcher, is at right foreground. The Commission approved $130,000 in grants for wheat research during the current year.

barley yellow dwarf, which also affects wheat. She is surveying wheat fields in the spring and fall in the state's wheat producing area, trying to find which native grasses serve as over-wintering reservoirs to recontaminate wheat fields.

Langham is using a technique called ELISA, an antibody-based method of detecting a virus without going through elaborate host studies. Here a plant virus produces an antigen-antibody reaction, a technique which may detect a virus in a plant that doesn't show symptoms.

Dr. Dale Gallenberg, Extension plant pathologist, also has been doing some survey work as a part of APHIS plant survey detection program. He, Buchenau, and Langham have been cooperating in their survey work so they all can receive useful data from a single trip to the field.

Gallenberg also is doing some seed treatment work and has some foliar fungicide demonstration projects.

Microbiologist Dr. Bruce Bleakley has a Wheat Commission project to study biological control of tanspot and scab, looking at other microorganisms to see if they will compete for space on the straw that tanspot- and scab-causing organisms use to over-winter or on living leaves during the growing season.

SDSU's West River Extension agronomist Clair Stymiest, stationed at Rapid City, continues to do research and demonstration work with programs that fit in the Farm Program's Conservation Compliance. This work involves conservation tillage, residues, and rotations to find practices that are most profitable, easy on the environment, and within ASCS compliance.

Dr. Dwayne Beck, manager of the Dakota Lakes Research Farm near Pierre, also is doing tillage work for wheat, but his focus is on no-till, residues, rotations, and profit.

Dr. Howard Woodard is doing work with nitrogen fertilizer and its relation to environmental stresses. He and Buchenau also are cooperating on how chloride influences leaf rust and tanspot.

Dr. Sharon Clay, a weeds researcher with funds from a Wheat Commission grant, is looking at effects of Treflan carryover on wheat following soybeans and possible interaction with wheat herbicides.

Dr. Tom Schumacher is working with Kenefick and Sutton on a project examining the process of dehydration and rehydration—raising and lowering the "anti-freeze concentration" when wheat goes dormant in the cold weather and breaks dormancy as it warms.

Dr. Padmanaban Krishnan in SDSU's Home Economics Department is examining vitamin content of wheat-based foods. This is also funded with Wheat Commission dollars.

Dr. Chen Ho Chen in Biology/Microbiology and a graduate student are working with Rudd and Buchenau on tissue culture, attempting to develop germ plasm resistant to the toxins produced by tanspot.

Researchers from the USDA Northern Grain Insects Research Laboratory at Brookings also are cooperating with SDSU researchers in the study of insects affecting wheat.

The South Dakota Wheat Commission continued its visits and input to the wheat research program in 1992, touring laboratories, listening to researchers, and visiting research plots on June 11.

The Commission approved about $130,000 in grants for the current fiscal year at SDSU, and saw textbook cases of winterkill at SDSU winter wheat plots near Aurora. It was a timely trip for wheat commissioners after a late frost damaged wheat across the state.

The Wheat Commission funding source through grants are critical to the SDSU wheat research since they enhance the research efforts and are combined with other appropriated funding, Cholick said. "The Wheat Commission funds are 'do' dollars, increasing research efforts at SDSU." ❑

Jerry Leslie is news and features writer in the Department of Agricultural Communications, SDSU.

Wheat research team in spotlight for freeze-resistance breakthrough

Jerry Leslie

Plant Science researchers at SDSU made headlines and received radio and television coverage across the nation's breadbasket last November.

The occasion was a major breakthrough in efforts to unlock the secrets of freeze resistance in winter cereals.

SDSU has contributed to and become a world leader in isolation, identification, and evaluation of genes that may be related to freeze resistance.

The whole body of current research on gene manipulation represents a "quantum leap" over the slower, more traditional selection and cross-breeding methods of genetic improvement of plants practiced for centuries, and SDSU is a part of the new research.

The breakthrough in molecular and cellular biology may well turn out to be groundwork needed for transferring genes to new and more freeze-resistant winter wheat varieties for South Dakota wheat producers.

The advancements were made by a team of scientists headed by Dr. Don Kenefick and Dr. Fedora Sutton. They isolated from winter barley five clones representing genes that are cold regulated, meaning they send or stop messages within the plant when the temperature drops.

The research has continued to make headway since the November 9 news conference. Since then, the team has gone a couple of steps farther and sequenced one of the barley genes to confirm that it is indeed unique, never before discovered. They are on the edge of doing the same with two other genes, and will soon know if the same genes are found in winter wheat.

Three of these gene clones never before have been isolated from plants. The researchers have also deduced functions for the two other genes, one already reported elsewhere in barley, but never assigned a function.

These five genes together are believed to control the plant's response to a drop in temperature that enables it to change its chemical composition so it can survive freezing temperatures of winter.

Another critical survival period when an appropriate plant response is needed is the winter-to-spring transition when false weather signals may "confuse" plant sensing mechanisms. Thus, a diversity of climatic challenges require complex biological response just now being understood.

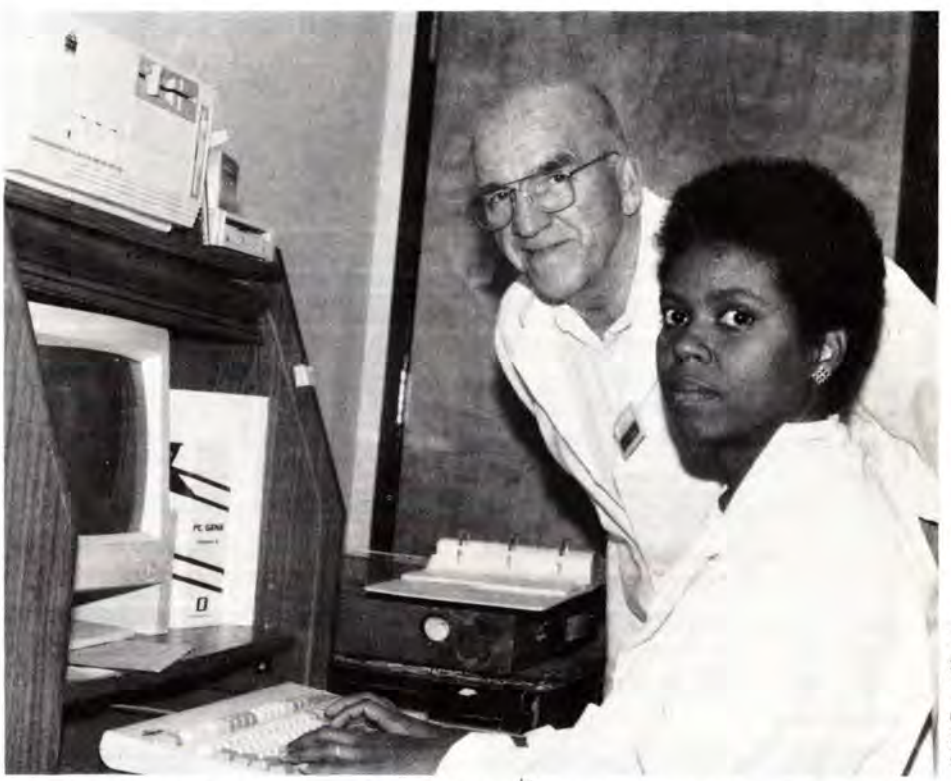


photo: Duane Hanson

Don Kenefick and Fedora Sutton tap into the international gene bank, a computer-stored listing of all known genes in the world. Three of their gene clones had never before been isolated from plants and were not listed. These are cold-regulated genes and may contribute to improved freeze resistance in future winter wheat varieties.

SDSU's research team is in the process of determining functions for each gene to further their understanding of the cold acclimation process.

They are using the world "gene bank" to figure out possible functions for these genes. They are among the first in the scientific community to link functions with isolated cold-regulated genes.

These discoveries took place in the test tube on genetic material from the cell. Discoveries such as this involving heredity will, in several years, allow scientists to transplant a gene or genes for winter hardiness into a plant not previously winter hardy.

That means a wheat variety that is in other ways agronomically superior, but not freeze-resistant, could be transformed into a superior winter wheat variety. The goal is an extra-freeze-resistant winter wheat variety tailored for South Dakota's harsh and diverse climate. The ultimate objective is to improve competitiveness and profitability for South Dakota farmers.

A gene transfer involving freeze-resistance may be 10 to 15 years down the road, since scientists are in the early stages of understanding the process. But once the technique is perfected, new varieties should come quickly.

The economic impact to South Dakota's wheat farmers and the state's overall economy should be significant. High quality hard red winter wheats grown in South Dakota are used for flour and human consumption.

A winter wheat variety with improved freeze-resistance would give a financial boost to South Dakota wheat growers, since about one year in 5, South Dakota loses half of its winter wheat yield to winterkill. In an average year it loses 15 to 20 percent. A more freeze-resistant variety would reduce or eliminate this problem. The impact would be in the millions of dollars.

Another positive impact is the educational benefits received by SDSU students being exposed to this kind of contemporary scientific exploration in the laboratory at SDSU.

The team is supported by a competitive National Science Foundation EPSCoR grant matched by a grant from the Governor's Future Fund, plus contributions from the South Dakota Wheat Commission, the South Dakota Crop Improvement Association, and ongoing funding from the South Dakota Agricultural Experiment Station.

SDSU researchers, with this breakthrough, moved out in front with the other top researchers around the globe in pursuit of understanding the genetics of freeze resistance in cereals.

The winter barley variety on which Sutton and associates are working is named "Dicktoo." It is a commercial variety developed at Dickinson, N.D. Dicktoo is an old-time, highly freeze-resistant winter barley that has been in Kenefick's seed stock since the early 1960s.

Although their end objective is winter wheat, SDSU researchers are working with winter barley, since winter barley is "genetically simple," Kenefick explained. Barley has only seven pairs of chromosomes, while hard red winter wheat has 21 pairs, he said.

"You start with the simple stuff," Kenefick said. "We believe we can take the information we learn from barley, track those same genes and explore others in winter wheat.

"Cereal crops are closely enough related for this purpose," he added.

The new technology employed in this research enables researchers to probe inside the cell nucleus and learn what plant breeders tried to accomplish for nearly two centuries through cross-breeding, Kenefick said.

That technology includes computers and a software program that contains listings of the genes reported in the world, as well as all the proteins that have been sequenced. This software is, in fact, the "international gene bank" used by researchers to categorize genes they isolate.

This software is updated quarterly, so researchers like Sutton or Kenefick can feed a nucleic acid sequence into the computer and see if that particular sequence has been reported elsewhere in the world and learn what is known about a gene function. "Within an hour you can find out if your work is unique," said Sutton.

Kenefick, professor of plant science and chemistry at SDSU, is project director and co-principal investigator. He is a plant physiologist and cellular biologist and has been on the SDSU faculty since 1959, doing research primarily on the physiology of winter cereals. He has a B.S., from the University of Wisconsin and a Ph.D. from Michigan State University. He wrote the original grant application and recruited Fedora Sutton.

Sutton, co-principal investigator, is an assistant professor in the departments of Plant Science and Biology/Microbiology. The neuromolecular biologist joined SDSU on this grant in February 1990.

Sutton has a B.A. from the University of Maryland and a Ph.D. from Howard University, Washington, D.C. She did post-doctoral work in neuro-molecular biology at California Institute of Technology and National Institutes of Health. In this last position, she worked in the laboratory of 1968 Nobel Prize Winner Dr. Marshall Nirenberg, who received the prize in molecular biology for being first to reveal the genetic code for amino acid identification. She is from the Republic of Trinidad-Tobago.

A third member of the team, Li-Yun Chang of Taiwan, has just received her Ph.D. at SDSU with research relating to this project. ❑

Jerry Leslie is news and features writer in the Department of Agricultural Communications, SDSU.

photo: Jerry Leslie

Northern Plains Biostress Lab on track; dedication September 17

Jerry Leslie

Construction of the Northern Plains Biostress Laboratory on the campus of SDSU is right on schedule and within budget, according to Dr. David Bryant, dean of the College of Agriculture and Biological Sciences.

The building should be ready for occupancy in August in time for the start of the 1993-94 school year.

Meanwhile, committees are at work gearing up for the September 17 dedication and events building up to it. Preparation activities have already begun with a series of scientific symposia on biostress in April and May.

Over the winter, workers were finishing up sheetrocking in some portions of the building and were installing ceiling grids, lights, cabinets, and casework throughout the building, said Ken Schmidt, utilities engineer and project coordinator for SDSU.

"All the prime contractors are doing an excellent job and should be done with their work before July 4 on schedule, allowing for some equipment installation in July and a gradual move-in during August," Schmidt continued.

The project, including all furnishings and research equipment to meet program needs defined by the departments, is within the budget, Schmidt said.

This spring, as the construction site becomes safer for onlookers, the chain-link fence which surrounds the construction site, comes down. Landscaping and planting will take place in August.

All the plantings are being donated by businesses that are members of the South Dakota Nurserymen's Association. Most of the plantings are releases from SDSU's Department of Horticulture, Forestry, Landscape and Parks.

The entire landscaping system was designed as a student project in the landscaping laboratory of the HFL&P Department.

Committees are developing the dedication activities scheduled for Friday, September 17. The timing means the building will be furnished, occupied, and in use by students, teachers, and researchers.

The dedication will start at 9:15 a.m. with a program on "This is Biostress Research," followed by ribbon-cutting on the steps of the new building about 10:45 a.m. The ceremony will involve numerous platform guests and speakers, all presided over by SDSU President Robert Wagner, said Dr. Ray Moore, director of the South Dakota Agricultural Experiment Station and co-chairman of the dedication program committee.

A free noon luncheon will feature South Dakota products, much as did the May 31, 1991, ground-breaking ceremonies.

Open-house and tours of the building will follow, from 1:30 to 5 p.m.

photo: Jerry Leslie

Facing page: The atrium entrance of the Northern Plains Biostress Lab has not been enclosed at date of this photo. The atrium looks west. Above: Ken Schmidt, utilities engineer and project coordinator, examines the main electrical distribution panel in the basement of the lab.

For the week preceding the dedication, a number of activities are emerging from the planning stages. Dr. Duane Acker, former SDSU dean of agriculture and most recently assistant secretary of Science and Education for USDA, will speak September 16 on the importance of the biostress concept.

On the 15th, Dr. Gary Evans of USDA's Agricultural Research Service, Beltsville, Md., will keynote a special program on global climate and its effect on many disciplines. Other high-profile speakers are also planned for dedication week.

All public activities of SDSU's College of Agriculture and Biological Sciences during 1993 will have or have had a portion of their program relating to biostress activities.

A part of the year-long observance included three 2-day scientific symposia on biostress-related topics. The symposia, targeted to scientists, were on stress mechanisms, stress responses, and on stress management.

photo: Jerry Leslie

Schmidt turns a valve on a pipe leading from a heating circulation pump. At right is the heating, ventilation, and air conditioning unit for the building.

The new Biostress Laboratory, a two-story brick structure with a full basement, will provide 126,017 total gross square feet of space for five SDSU academic departments engaging in research and teaching on how various stresses affect plants, animals, and humans.

That's from Dr. Eugene Arnold, associate dean of academic programs, who is coordinator of program planning for the building.

The five departments include part of Plant Science; Biology/Microbiology; the range area of Animal and Range Sciences; and the Horticulture, Forestry, Landscape and Parks and the Wildlife and Fisheries Sciences departments, both of which will locate their headquarters in the building.

The building, located toward the north end of the campus proper, will be readily identified by its gabled glass atrium—a two-story court—at the entrance which looks into the setting sun.

Some unique features will be laboratories designed to meet federal guidelines for working with biological materials. Some laboratories will be designed to handle radioactive isotopes. Some labs will be set up to study ground-water quality.

Two climate-control laboratories, equipped beyond routine heating and air-conditioning, will maintain a steady, given temperature for research that controls temperature as a variable.

The regional research center is being constructed with a combination of state and federal dollars approved after it was first presented to the Board of Regents in 1988 and received broad political, farm group, and commodity group support statewide, regionally, and nationally.

The laboratory will give SDSU the "tools of improved laboratory facilities and equipment to continue the legacy of the last 105 years of research at SDSU," said Dean Bryant.

"The idea of emphasizing biological and environmental stresses and building on our capabilities to deal with them is nothing new when you look at our record over 105 years as an ag experiment station here," Bryant said.

"The facility will allow SDSU to build for the future, to build for the next 100 years. It takes us into the next century," Bryant added.

The university has been a national leader in biostress research because of the environmental extremes that are second nature to the state, whether it be drought, or floods, or scorching summers or chilling winters, or insects, diseases, and other stresses that weigh on productivity of crops, livestock, and humans. ❑

Jerry Leslie is news and features writer in the Department of Agricultural Communications, SDSU.

photo: Ag Communications

Ag land values holding strong

Dr. Larry Tennyson

U.S. farm land values may have suffered overall from the effects of an uncertain agricultural economy, but South Dakota's farm land values have held their own—and then some.

The factors that account for South Dakota's agricultural land values are studied annually through surveys of farm appraisers, lenders, and Extension agents. The work is being done by Dr. Burton Pflueger and Dr. Larry Janssen, both of the SDSU Department of Economics.

The surveys estimate ag land values and cash rental rates by type of land among the various regions of South Dakota.

The second annual survey, completed by the two economists in 1992, shows that South Dakota agricultural land values increased 3.4% overall during 1991. The gain was led by strong increases in ag lands located in the north-central part of the state.

By February 1992, average values of ag lands in the state had reached $245 per acre. This figure excluded the value of farm buildings. By contrast, USDA estimates average South Dakota farm land values at $365 per acre, but this includes buildings.

Janssen and Pflueger found large changes in the value of ag land in certain areas of the state between 1991 and 1992. Agricultural lands in the north-central part of the state increased by almost 14% during that period. Lands in the western part of the state rose by about 6.5%, less than half that amount.

Largest percentage increases in land values overall occurred in the areas that produce wheat and cattle, the survey revealed. Agents, lenders, and appraisers felt this was caused by strong wheat and cattle prices and the recovery from recent drought conditions in some of these areas.

The least percentage increases in ag land values were in the central, northeastern, and southeastern regions of the state. Average increases for these areas varied from a loss of 1.1% to a gain of 1.9%.

The southeastern region was the only part of the state where ag land values actually fell. Again, according to the agents, lenders, and appraisers who were surveyed, this was due to 1991 drought conditions, relatively poor prices for crops—especially for corn and hay, and reduced government payments.

Still, the southeastern part of the state continues to have the highest priced ag lands, followed by those in the east-central and northeastern regions of the state. Lowest ag land values are still found in western South Dakota.

No matter what the region, highest cost ag lands are those that are irrigated. Next highest is non-irrigated crop lands, followed by hay land, tame pasture, and native range lands—in that order, according to survey results.

Values of non-irrigated crop lands varied from $616 in the southeast to

$300 in the central and $167 in the northwest. There also were a few counties in eastern South Dakota where crop lands exceeded $800 an acre.

Range lands varied in value from about $270 per acre in the southeast and east-central parts of the state to about $74-80 per acre in western South Dakota.

The survey also yielded information on the cash rental market for the ag lands of the state.

This is a substantial source of income, according to the researchers. About 75% of all renters and 60% of all landlords are involved in one or more cash leases for crop land, hay land, pasture, or range land, and a majority of cash leases are annually renewable agreements.

There's a lot of variation in rental rates within each region of the state, and the rates can be highly variable from one region to another.

Overall, rent is highest for irrigated land, followed by crop land, hay land, and pasture or range land. Rates generally are highest in the southeast and east-central and lowest in the northwest and southwest parts of the state.

The survey found that crop land cash rental rates ranged from a low of $15.10-17.70 in the western region to a high of $48 an acre in the southeastern region. Range land went from a low of $4.90-5.30 per acre in western South Dakota to a high of $19.10 in the east-central region.

Cash rental rates for crop land and range lands increased by more than 10% from 1991 to 1992 in some areas of the western region of the state. In other regions, the rates changed very little over the same period.

Range land rental rates per animal unit during 1992 were fairly consistent across the state, with an average that varied from $12.50 in the northeast to $15.90 in the south-central.

Hay land rental rates varied from $11.40-12.10 in the western region to $33 per acre in the southeastern region. Hay land rental rates declined in most parts of the state—a reflection of lower prices for hay.

Pflueger and Janssen found two major reasons for the increase in ag land values across the state. Agents, appraisers, and lenders cited favorable prices for livestock and crops—especially wheat—and lower interest rates.

photo: Larry Tennyson

Larry Janssen, SDSU Department of Economics, says that South Dakota's farm land values have held their own and that land values even rose an overall 3% during 1991, the gain led by strong increases in the north-central part of the state.

Expansion of farm size, competitive bidding, and buyers recognizing that farm land is a good long-term investment were three other reasons believed responsible for increased ag land values in the state.

In cases where ag land values had fallen or stagnated, reasons included poor commodity prices, drought, reduced government payments, higher real estate taxes, and a general uncertainty over the economy.

The survey also found that the major reason for ag land purchases was farm expansion. About half of all those surveyed mentioned this factor. About 15% cited investment. Other major reasons included livestock profits, lower interest rates, and tract location. More minor reasons included buying land to start a farm or ranch operation, buying land that was previously leased from a landlord, and establishing a hunting reserve.

The survey also found that major reasons for landowners deciding to sell are retirement, settling an estate, financial pressures, and favorable market conditions.

The researchers noted that the most major factor for buying (farm expansion) or selling (retirement) really haven't changed much since the mid-1950s.

So, what was the outlook?

Most of those surveyed expected stability or modest increases in ag land values in the near term. Many looked to lower long-term interest rates and reduced yields on other kinds of investment to stabilize or even increase land values during the remainder of the year.

Should cow-calf profits continue, some increases in range and pasture values also were expected, and persons from wheat regions generally expected increases to continue in crop land values in their areas of the state. Stability or slight declines were estimated for the crop lands of the remainder of the state.

Overall, these projections were lower than the inflation rates forecast for the year, and this indicates that most think inflation wouldn't have so much an effect on ag land values. This would represent a major change over the effect inflation has had on ag land values over the past 5 years.

Janssen and Pflueger already have begun work on the third annual survey of South Dakota ag land values and rental rates, and results will be collected, analyzed, and made available to the public in mid-1993. ❑

Dr. Larry Tennyson is writer and communications specialist in the Department of Agricultural Communications. This article was compiled from information contained in Issue 310 of the Economics Commentator newsletter as published by the SDSU Department of Economics and edited by Dr. Don Peterson.

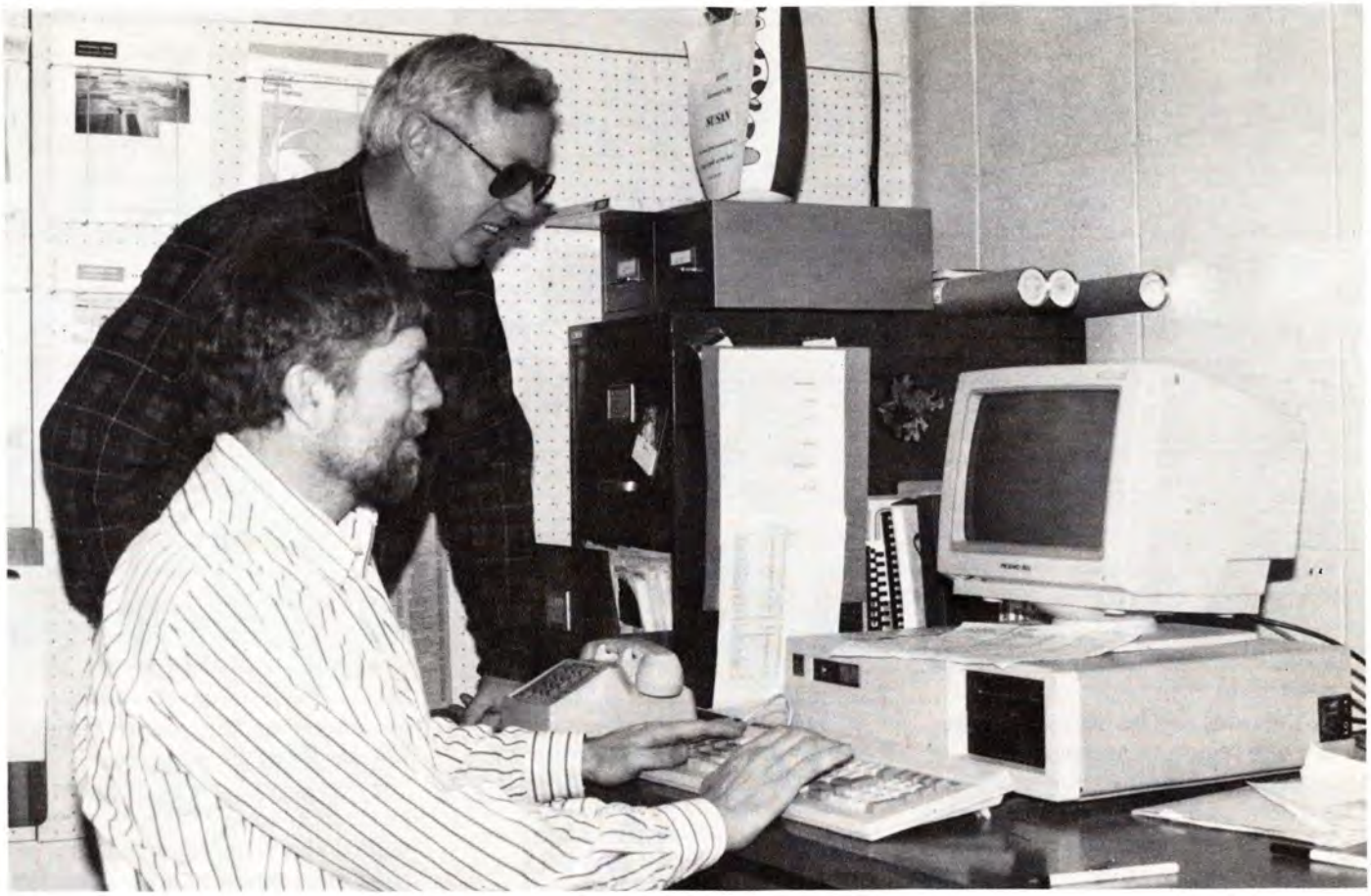


photo: Larry Tennyson

What's the weather today?

Dr. Larry Tennyson

"Oh, what a blamed uncertain thing this pesky weather is; it blew and snew, and then it thew, and now, by jing, it's friz," according to Poet Philander Johnson.

The collection and analysis of information about the weather at SDSU is not one of the uncertain sciences, however. It's precise and up-to-the-minute, thanks to the work of persons like Alan Bender and Hal Werner.

They lead the effort to provide critical weather information to biostress researchers. Bender is state climatologist and Werner is Extension soil and water engineering specialist. Both have academic rank in the Department of Agricultural Engineering at South Dakota State University.

"Weather information is critically important to most biostress research," according to Werner. "In fact, it's almost absurd to think you can conduct this type research without such information."

A large portion of the information is gathered through a system of automatic weather reporting stations and by a network of about 150 volunteer observers.

Of these, 56 observers use a keypad to report weather conditions on a daily basis.

These reports then are fed through a telephone modem to a weather center such as Sioux Falls, where it is compiled and distributed in forms such as the Weekly Crop Report by the South Dakota Crop and Livestock Reporting Service.

The remaining observers send in their reports on a monthly basis.

In addition to the observer network, SDSU operates 10 automatic weather stations. Locations include all of the agricultural research field stations except Antelope near Buffalo, S.D.

These stations take readings every minute and report every hour. The stations can be programmed to report every minute, should a researcher need a readout that often, Bender said.

Automatic stations transmit their information through a telephone modem directly into a computer located in the Department of Agricul-

tural Engineering. Presently, all this information is downloaded to the Department's computer at night.

By 7 a.m., computer programs have generated the needed reports from the data, and the information is ready for distribution to scientists, farmers, and agribusiness persons.

These automatic stations provide a much more complete set of data, Werner said. "For instance, other types of stations can tell you how much precipitation fell over a given amount of time, but they can't tell you the intensity of that rainfall. For many types of biostress research projects, it's important that you have information such as this."

Bender explained that 42 of the non-automated stations do measure precipitation amounts in 15-minute intervals, and even this is better than daily readings. The trouble is, this information is not readily available because of the remote locations of the stations, he said.

Data generated by the automatic stations makes it possible to produce livestock and crop stress warnings as well as reports on soil moisture, heating degree days, growing degree days, pest management, crop water use, and rainfall.

"Even the 'Class A' national weather stations at Rapid City, Huron, Aberdeen, and Sioux Falls don't provide information such as solar radiation measures or soil temperature like these automatic stations do," Bender continued. "Class A stations provide information primarily for aviation, not agriculture."

Whereas Class A stations do report precipitation, it's done only on an hourly basis.

photo: Duane Hanson

Facing page: First thing in the morning, Hal Werner, Extension soil and water engineer, and Al Bender, state climatologist, check the computer for weather reports from the Experiment Station's field stations. Above: Werner wires an automatic weather station at the Southeast Farm. Such installations can pass information such as solar radiation and soil temperatures directly to the SDSU "weather central."

What's ahead for the weather data collection and reporting program at SDSU?

"By growing season, we will be able to upload the information we collect into our own weather reporting system on the Extension Computer Bulletin Board," according to Bender.

This requires writing an extensive program for the Department's computer, work that already is in progress.

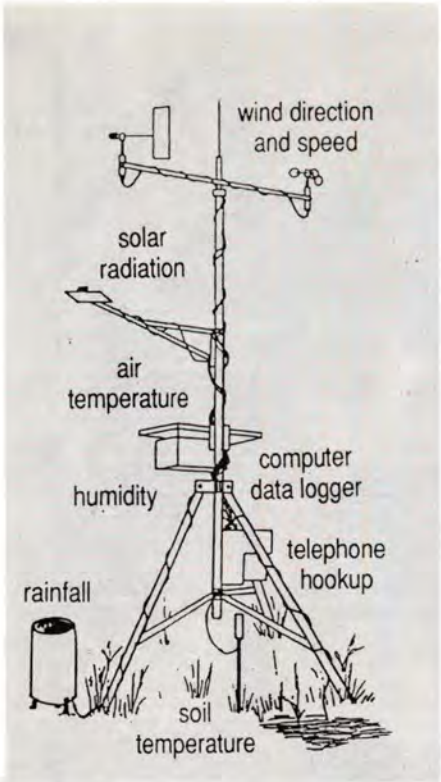
"This will make our weather data available instantly to farmers and Extension agents across the state.

"Farmers and agents then can access the information through their own personal computers and telephone modems, download it, and be able to take the time to study it," Bender explained.

The bulletin board menu will allow the user to access information for each of the 10 stations. Such information will include current conditions, a report of conditions over the past 7 days, a 24-hour report, and even an hourly report for each station.

"Having information like this will allow farmers to make better management decisions which, in turn, can't help but improve South Dakota's overall economic picture," Bender added.

Regarding the system itself, Bender said the program could use 20-25 stations instead of just 10. "Even four additional stations would be a great help."



Automatic Weather Station

By comparison, states like Oklahoma have two automatic stations per county. Nebraska has 45 stations. Washington has 60. Annual budgets for weather data collection are as much as a $2 million in some other midwestern states, Bender said.

Stations cost about $6,000 each to buy and install. Maintenance and the cost of a full-time commercial telephone line result in annual operating costs of about $1,500 per station.

"However, we're proud of what we've accomplished on the available funds. Just acquiring the computer we use in this work was something of a financial feat," Bender continued.

"Despite not having all the equipment we could use, our turnaround time for our reports is even less than some regional weather information centers, so ours is a data system that does pretty well in serving biostress researchers, farmers, and agribusiness persons alike," Bender concluded. ❑

Dr. Larry Tennyson is writer and communications specialist in the Department of Agricultural Communications, SDSU.

A goofy year

Dr. Larry Tennyson

Talk about being a land of infinite variety. That's South Dakota. But one also sees it in the weather, not just in the terrain. Take 1992, for instance. Please.

Al Bender says 1992 had the coldest summer on record, and records go back 103 years. On average, we were 6.8° F colder during those months.

But wait. It also had the second warmest January, February, and March on record. Only 1915 topped it. On average, these months were 9.4° F warmer than they should have been.

So 1992 was a year that was too hot when it should have been cold, and too cold when it should have been hot. Whatta year.

What caused these goofy conditions? Bender explains that the upper air currents stayed well south of us for most of the summer. Ordinarily, their west-to-east pathway moves toward Canada as the growing season approaches.

Then there was the eruption of the Mount Pinatubo volcano in the Philippines. It spewed dust particles worldwide and is credited with increasing overall cloud cover throughout the world and also with lowering overall temperatures by .8 of a degree.

Regional effects from such a drop in temperature can be two or three times this amount, so this may account for as much as 2.4 degrees of our temperature loss during those summer months.

But that's still not all. We also had El Niño winds over the Pacific. These winds normally do not affect temperature as much as precipitation, but they do cause weather conditions to become more erratic overall.

The topper was the oil fires in Kuwait, which also filled literally cubic miles of air with smoke particles.

As a final insult to persons attempting to grow crops, gardens, fruit, and flowers, the year presented us with a hard frost on May 26. That wasn't a record, but it was awfully late. Furthermore, it came at the end of a hot, dry spell. The soil still hadn't warmed up completely, and it also had no moisture reserve to speak of. All that intensified the harmful effect of the frost.

Bender likened these weather conditions to those of the 18-inch downpour over the Black Hills that caused the 1972 Rapid City flood: a once-in-a-lifetime occurrence.

With all these factors operating at once, no wonder it was a strange year," Bender said.

In terms of variance from average weather conditions, only 1936 can compare with 1992—but for the opposite reasons. That year had the coldest January, February, and March and the hottest June, July, and August.

"There are a lot of things we can learn from studying a year such as 1992," says Hal Werner, "but we have to bear in mind that a year like this is not apt to happen again in our lifetimes, so we don't change our farming methods because of it."

And what did happen to agriculture as a result of 1992 weather conditions? Plenty.

Bender said the crop loss alone was in the $25-40 million range. ❑

research funding briefs

The SDSU College of Agriculture and Biological Sciences receives grants and contracts for research and service projects. Funds received in the last reporting period:

• $4,956 from South Dakota Department of Agriculture to produce video tape on pesticide application safety. *Emery Tschetter, Ag Communications, project director.*

• An additional $750 from Gehl Company for Skidsteer performance evaluation. *Martin Schipull, Agricultural Engineering, project director.*

• $29,700 from Lilly Research Laboratories to find optimum monensin levels for controlling coccidiosis. *Robbi Pritchard, Animal and Range Sciences, project director.*

• $24,950 through South Dakota Department of Education and Cultural Affairs for staff development to improve K-16 science and mathematics instruction. *Gary Peterson, Biology/Microbiology, project director.*

• $77,166 from Minnesota Mining and Manufacturing Company to develop endospores for biological indicators. *Carl Westby, Biology/Microbiology, project director.*

• $29,677 and $23,503, respectively, from Governor's Office of Economic Development and Sterling Technology, Inc., for CITE project. *David Hurley, Biology/Microbiology, project director.*

• $256,650 from U.S. Environmental Protection Agency for global warming and prairie wetlands study. *W.C. Johnson, Horticulture, Forestry, Landscape and Parks, project director.*

• An additional $23,960 from South Dakota Department of Agriculture for technical assistance, arboriculture, and urban forestry. *W.C. Johnson, Horticulture, Forestry, Landscape and Parks, project director.*

• An additional $37,000 from South Dakota Weed and Pest Commission for noxious weed promotion/education program. *Leon Wrage, Plant Science, project director.*

• An additional $39,000 from South Dakota Weed and Pest Commission for noxious weed field control. *Leon Wrage, Plant Science, project director.*

• $12,000 from South Dakota Weed and Pest Commission for noxious weed correspondence program. *Leon Wrage, Plant Science, project director.*

• $75,000 from South Dakota Weed and Pest Commission for integrated alternative controls for noxious weeds. *Leon Wrage, Plant Science, project director.*

• $25,500 from USDA, APHIS, for cooperative national plant pest survey and detection program. *Dale Gallenberg, Plant Science, project director.*

• $101,400 through South Dakota Department of Environment and Natural Resources for groundwater research and public education program. *David Clay, Sharon Clay, Thomas Schumacher, Plant Science, project directors.*

• $103,277 from USDA, APHIS, for FY 93 grasshopper integrated pest management. *Billy Fuller, Plant Science, project director.*

• An additional $10,000 from Tennessee Valley Authority for fertilizer tests and demonstrations. *Howard Woodard, Plant Science, project director.*

• An additional $128,300 from South Dakota Soybean Research and Promotion Council for FY 93 soybean projects. *Catherine Carter, Thomas Chase, Roy Scott, Leon Wrage, Howard Woodard, Plant Science; Thomas Cheesbrough, Neil Reese, Biology/Microbiology, project directors.*

• An additional $4,250 from U.S. Department of the Interior, Fish and Wildlife Service, for distribution of carp in the Heron Lake Basin. *Charles Berry, Wildlife and Fisheries Sciences, project director.*

• $25,354 from Lilly Research Laboratories to study influence of ractopamine on cultured turkey satellite cells. *Douglas McFarland, Animal and Range Sciences, project director.*

• $77,770 from South Dakota Department of Environment and Natural Resources for groundwater quality study, economic impacts of farm practices in wetland areas. *Larry Janssen, Economics; Dianne Rickerl, Plant Science, project directors.*

• $4,000 from Cenex/Land O'Lakes to examine the influence of seed-placed fertilizer on corn and soybean emergence and yield. *Ronald Gelderman, James Gerwing, Howard Woodard, Plant Science, project directors.*

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Calendar of Events

Date	Event	Person to Contact
May		
6	National Land, Range & Pasture Judging Contest, Oklahoma City	Jim Johnson, West River Research & Extension Center
8, 9	South Dakota Horse Fair, Sioux Falls	Larry Insley, Animal & Range Sciences, SDSU
24, 25	NPBL Stress Management Symposium, SDSU	Dr. Ray Moore, Director, AES, SDSU
June		
8-11	Range Camp, Sturgis	Jim Johnson, West River Research & Extension Center
10	Sheep Day, SDSU	Lowell Slyter, Animal & Range Sciences, SDSU
23	Spring Tour, SESD Research Farm, Beresford	Bob Berg, SESD Research Farm
23	Reduced Tillage Crop Rotation Tour, Hayes	Clair Stymiest, West River Research & Extension Center
24	Spring Tour, Central Crops & Soils Research Farm, Highmore	Brad Farber, Farm Manager, Plant Science, SDSU
24	Spring Field Day, Dakota Lakes Research Farm, Pierre	Dwayne Beck, Farm Manager, Plant Science, SDSU
30	Twilight Tour, Agronomy Farm, SDSU	Bob Hall, Plant Science, SDSU
July		
7, 8	Rangeland Days, Faith	Jim Johnson, West River Research & Extension Center
8	Northeast Research Station Tour	Jim Smolik, Farm Manager, Plant Science, SDSU
9	McCrory Gardens Plant Sale	Norm Evers, Horticulture, Forestry, Landscape & Parks, SDSU
14-16	State 4-H Horse Show, Huron	Rich Howard, 4-H, SDSU
August		
19	No-Till Day, Dakota Lakes Research Farm, Pierre	Dwayne Beck, Farm Manager, Plant Science, SDSU
20	McCrory Gardens Garden Party	Norm Evers, Horticulture, Forestry, Landscape & Parks, SDSU
31 -Sept 6	South Dakota State Fair, Huron	Mary E. Aamot, 4-H, SDSU
September		
8	Antelope Field Day	Don Marshall, Animal & Range Sciences, SDSU
9	Cottonwood Field Day	Dick Pruitt, Animal & Range Sciences, SDSU
9	Faill Field Day, Northeast Research Station	Jim Smolik, Plant Science, SDSU
14	Fall Tour, SESD Research Farm, Beresford	Bob Berg, SESD Research Farm
17	Northern Plains Biostress Lab Dedication, SDSU	Dr. Ray Moore, College of Ag & Bio Science, SDSU
23	Fall Tour, Dakota Lakes Research Farm, Pierre	Dwayne Beck, Farm Manager, Plant Science, SDSU