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South Dakota State University Agricultural
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Farm and Home Research: Celebrating 50 years of Farm and Home Research

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Farm & Home RESEARCH

South Dakota State University • College of Agriculture & Biological Sciences • Agricultural Experiment Station



**Celebrating 50 years
of Farm & Home RESEARCH**

*International agricultural exchanges
have progressed from plants to people*

Director's comments

by Kevin Kephart

For 12 years, I've had a rewarding career in agricultural research at SDSU. My major interests are in forage management, but the most valuable aspects of my work came to be the contacts with excellent scientists, outstanding students, and supportive citizens of our state.

Recently, I accepted new opportunities and challenges, serving since October as acting associate director of the South Dakota Agricultural Experiment Station. I have become more familiar with research outside my specialty. I have listened to producers from across the state offer insightful comments on our

research programs. I can report that this new job has broadened my outlook!

One of my new responsibilities is direct involvement in production of *Farm & Home Research*, our flagship publication, marking its 50th year in 1999.



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About the Cover

Yellow-flowered alfalfa, introduced from Russia by N.E. Hansen (inset) in the early 1900s, has found its niche in western South Dakota where it is extremely hardy in winter and thrives under heavy grazing. SDSU scientists expect it will serve as a one-cutting hay crop in eastern South Dakota and provide superb cover for nesting pheasants and other wildlife. See stories, pages 4 and 8.

alfalfa photo: Terry Molengraaf



To celebrate this anniversary, we have featured an article on Niels Ebbesen Hansen in this issue. N.E. was the first USDA plant explorer, taking leave from his professorship of horticulture at South Dakota State College of Agriculture and Mechanic Arts to make three extended and arduous trips to Russia, China, and other countries around the turn of the century. From these far places, he brought back plant material to especially fit the severe environmental conditions of the upper Great Plains. It speaks well for our South Dakota pioneer ancestors that they recognized the value of his work, for two more trips were sponsored and paid for by the South Dakota Legislature.

Hansen left all citizens of South Dakota many enduring legacies, from winterhardy and disease-resistant forages (now you know my interest in this man) to hardy fruit trees and roses. It wasn't enough that he was a daring explorer who faced down blizzards, bandits, and a civil war where he was in as much danger from the Czar's army as from the Bolsheviks to find and collect his plant materials. He had a vision, and he enlisted the help of South Dakota ranchers and farmers in achieving that vision.

One of the plants he brought back from Russia was yellow-flowered alfalfa, *Medicago falcata*. He enlisted South Dakota producers as "scientists on the spot," planting seeds of this new alfalfa in their backyards and reporting back on its viability. The response was greater than even this optimistic scientist envisioned, and some of today's western South Dakota ranchers can still trace thriving alfalfa stands back to the packet of seeds or rootstock their fathers and grandfathers received from Brookings.

The value of this yellow-flowered alfalfa? For western ranchers, its hardiness, its ability to increase, even under hard winters and hard grazing. And today, our scientists are grooming *falcata* for a special niche in eastern South Dakota agriculture—that of a one-cut hay crop that also serves as wildlife nesting cover. We have a story on this new venture with an old plant in this issue.

By bringing back seeds and plants, Hansen clearly positioned South Dakota in the center of international agriculture. As Dean Cholick has pointed out, if we could use only native grown plants as food, our choices would be slim—maybe blueberries from neighboring Minnesota, sunflower, some roots, some nuts, a few other

species. The fact is that agriculture has been global from the beginning. But from Hansen's introduced plants and seeds, we have progressed over the years to exchanging germplasm with other states and countries. Now, as another article describes, we are exchanging people—students and faculty—with our international partners in perhaps the most meaningful expression of South Dakota's presence in global agriculture.

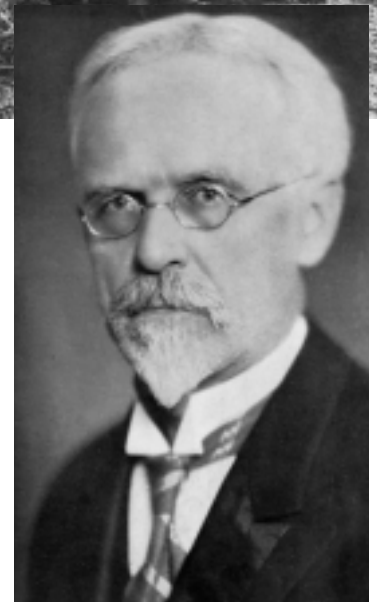
The changes that have occurred at SDSU and the Agricultural Experiment Station over the years parallel the evolution of agriculture in our state. This magazine celebrates 50 years of documenting our responsiveness to issues that concern agriculture and rural families. It celebrates our continued dedication to scientific discovery that will benefit American agriculture into the next millennium. While celebrating our history, we reaffirm our commitment to our future. ❖



‘Steppe by steppe’

‘His accomplishments are living today’

by Mary Brashier



Niels Ebbesen Hansen (1866 - 1950)

The local people told him that the temperature climbed to 110 in the summer and dropped to 50 below in the winter and that the precipitation amounted to only 10 inches a year.

“Hmm,” mused the explorer. “Seems like a plant growing here ought to have a chance of surviving in South Dakota.”

We don’t know where he was or

which plant he was referring to. It could have been an alfalfa, a pear tree, crested wheatgrass, brome grass, a melon, cabbage, or one of many other species that he brought back from Russia and China to South Dakota where, yes, most of them thrived.

The diarist was Niels Ebbesen Hansen, professor of horticulture at a little school that later grew to

be South Dakota State University. Hansen also had another title: USDA Plant Explorer # 1.

His life had all the components of a best seller—eight separate treks through Europe and Asia at the turn of the century, sometimes over roads, sometimes off into the trackless steppes of Russia and on into the Tien Shan Mountains of northern China which are even today the most remote and

unexplored mountains in the world outside of Antarctica. He encountered bandits and revolutionists. He rode in open wagons and sleds through drought and blizzards. He caught pneumonia in one of those storms—small wonder—and was carried 700 miles on a horse-drawn sled from a hospital to the nearest railroad line.

“He was a forceful, strong-willed fellow with a purpose. And I am convinced that his co-workers and superiors back at the USDA resented him,” said Kevin Kephart, SDSU forage agronomist, student of N.E. Hansen’s exploits, and acting associate director of the South Dakota Agricultural Experiment Station.

Hansen and his tremendous accomplishments have been ignored. His maps and most of his photos were consigned to trash piles, some of them rescued only after he died in 1950.

“They don’t actively resent him today,” Kephart added. “They just don’t recognize his contributions.”

That is not too farfetched to say, Kephart thinks, in light of a USDA-ARS



“Every state college should ... reach far beyond the present generation. Experimentation ... needs fields—very great fields, and .. [research] with vision, courage, and the the viking spirit.” —N.E. Hansen.

magazine, *Agricultural Research*, celebrating the “100th anniversary of USDA plant exploration” and published in September 1998. Not only was Hansen never mentioned, another plant explorer was given credit for introducing wheat germplasm to the U.S. one year after Hansen brought back his first durum seeds.

Two SDSU forage researchers have taken on responsibility for setting the record straight. First was Mel Rumbaugh, who published a 1979 scholarly bulletin on Hansen’s contributions to alfalfa breeding in North America, “the best writing to date on Hansen,” Kephart said.

“Alfalfa paid the bills” for Hansen’s first trips abroad, Kephart summarized.

“All the justifications for his USDA-sponsored trips were for collection of forages and other plants that might be useful in the northern Great Plains.”

And when Hansen fell out of favor in Washington, the South Dakota legislature sponsored two of his trips, one to China and one to Siberia. “It was the talk of the town in Washington,” Kephart said. “Imagine pioneers and settlers financing a trip of that distance to collect alfalfa seed.”

Frank Meyer was another highly respected USDA plant explorer at the time. When he heard about South Dakota sending Hansen on another trip, he wondered, “Great Scott! What special things can he get in Siberia?”

This is what he got:

One and a half tons of *falcata* seed (yellow-flowered alfalfa). Grapes. Apples. Six fat-rumped, tailless sheep—the fat is an energy source for stressful times.

He rode with those sheep in the railroad car to Riga. His clothes smelled so bad he had to give them away and buy a new suit. The sheep went by boat to Copenhagen and to Ellis Island, where they were processed through like any other immigrants, and then they



Kevin Kephart, acting associate dean of the South Dakota Agricultural Experiment Station, is a student of Hansen’s work. The book is a 1941 biography of the plant explorer.

came to South Dakota where they were used in a sheep breeding program at SDSU.

Kephart has found the geographical and historical background and the politics surrounding plant exploration as interesting as the introductions and subsequent histories of foreign plants in South Dakota. He has prepared and presented a popular lecture on Hansen. He has done everything short of spending weeks in the national archives to research Hansen’s activities.

Hansen was born in Denmark in 1866. His father was an artist craftsman and soon a widower who brought his young family to the U.S. and eventually to Des Moines where one of his jobs was to paint murals in the new state capitol. N.E. grew up in Iowa, attended Iowa State, and in 1895 moved to South Dakota as professor of horticulture.



"Adventurers must not be too cautious You don't get very far if you keep to the sure, safe road all the time." Hansen appears sartorial here; his usual exploring outfit added a rubber billy, a dagger on his side, a revolver in his belt, and field glasses and magnifying lenses (see cover photo). He used the *tarantass*, a wagon with wooden wheels, no springs, and the bed swung from wooden poles, for some of his treks across the Russian steppes.

In South Dakota and throughout the northern Great Plains, "Hansen's accomplishments are living today," Kephart said.

His yellow-flowered alfalfas persisted through Dust Bowl and wet years. Researchers now recognize that this unique alfalfa has value as a one-cut forage and in roadside and wildlife plantings (see article this issue of *Farm & Home Research*).

Included in Hansen's mail packets from Russia back to USDA were samples from watermelons, muskmelons, and caragana. But it took boxcars to carry back the 12 tons of bromegrass seed to his overworked and somewhat underwhelmed fellow workers in the Plant Introduction Office in Washington.

Where he already wasn't too popular.

Here's why:

Hansen was a personal friend of the Secretary of Agriculture, Tama Jim Wilson, who had been Ag Experiment Station director at Iowa State while Hansen was studying there.

"When Wilson left ISU and went to Washington as Secretary of Ag, the first thing he did was hire Hansen as the first official USDA plant explorer," Kephart explained.

While Hansen was in Russia on the first of his collection trips in 1897—sent there directly by Wilson—a man named David Fairchild was assigned to direct

began to pour in on me from Russia. Hansen felt that he had been sent to collect, and he collected everything and collected it in quantity. My days, nights, and holidays were spent at my desk. There was never half enough time for correspondence, plans for exploration, handling Hansen's cold resistant seeds and plants, which were jobs within themselves."

Kephart said that Fairchild's frustration with Hansen was that instead of answering directly to Fairchild, as did other plant explorers, Hansen went over his head to Wilson. "He must have thought, 'Here's this guy's importing all this stuff, sending it to my office, but I didn't hire him and can't fire him.'"

But give Fairchild credit, Kephart added. "He was a very good plant explorer himself."

"I am well pleased with this alfalfa, and think it will be worth millions to South Dakota as soon as we can raise seed enough to supply the demand."

—Watertown area farmer, 1912

the plant introduction office, a post Hansen had already turned down because he preferred travel and field work.

Fairchild later described "the Russian deluge," writing, "Almost the moment I was settled, tons of seeds and plants

Kephart keeps things in perspective.

"Hansen wasn't the first man to bring alfalfa here. In the late 1840s, Wendelin Grimm immigrated from Germany to Minnesota with his 'everlasting clover,' a purple-flowered alfalfa. Through



Farmers were astonished by the Hansen alfalfas. These at Sansarc, S.D., got less than 5 inches of rain in the 14 months after transplanting.

natural selection it became winter hardy and adapted to this part of the country.

“And alfalfa also came east from California. To get to the Gold Rush, some folks sailed around the Horn of South America. They picked up ‘Chilean clover’ at stops along the way. This was North African alfalfa that had been brought to the New World by the Spanish. In California it became ‘California Common,’ and as it worked eastward we eventually got a ‘South Dakota Common.’ One or 2 years of widespread winterkill of the Common would be serious economic loss to settlers, and that’s what Hansen was trying to correct.”

Nor was Hansen the first to introduce bromegrass. That also came with German immigrants.

The alfalfa that would have the largest impact on future South Dakota farmers was a natural hybrid between the Turkestan blue to the south and the yellow *falcata* to the north in Siberia. Collected seed of that natural hybrid resulted in the variety ‘Cossack.’

“In 1978, this plant material was in at least 75 alfalfa varieties, and the

number’s even higher today. If breeders use Vernal to develop alfalfa varieties, they’ve used Cossack,” Kephart said.

And part of the pleasure of studying Hansen is placing him in history, Kephart concluded.

“He was born just a year after the Civil War ended. He likely heard the news about Custer and the Little Bighorn. He came to South Dakota just 5 years after the Wounded Knee massacre, just as the frontier was closing. He is truly the symbol of the opening of a new era, the expansion of agriculture across the continent.

“And today, few people outside of South Dakota know about him.

“Unless they visit with me. At every meeting I attend, somehow the topic comes up.

“He gave us flowers, fruit, and fodder that we benefit from today. And if you listen at the next SDSU football game to ‘The Yellow and the Blue,’ remember that Hansen wrote the lyrics to that school song.” ♦



U.S. Plant Explorer # 1.



Behind Hansen’s shoulder as he stands in his grass plots on campus is “the old Hort building,” and three elms—American, English, and Scotch—in an area he tended. Chances are that Hansen planted them, too.

'On the march'



*Doubling forage production or
providing pheasant cover—
Siberian native makes itself at home*

by Mary Brashier

Yellow-flowered alfalfa is acting like a native South Dakota range plant, never mind that it came from Siberia.

Arvid Boe, SDSU forage breeder, expects yellow-flowered alfalfa to catch on in eastern South Dakota also. "We think it'll be great as a hay crop and wildlife cover as soon as we can work through a few problems."

On interseeded West River rangeland, "most alfalfas stay put. Ten or 20 years later you can still see the rows of plants, even when they are good pasture types like Teton or Travois. But the yellow-flowered is showing up, in nearly pure stands, where it was never planted. And it's happening quickly. This stuff is on the march."

Yellow-flowered alfalfa was introduced back in the early 1900s. Maybe this is more a stroll in the park than a march?

Not so, Boe said. "Eighty or 90 years is nothing in the lifetime of a native prairie."

Boe has found yellow-flowered alfalfa "thriving under grazing and haying use. It grows great in combination with native grasses. Other rangeland legumes—leadplant and the purple prairie clovers—radiate out from a central area only if there's been a disturbance. But yellow-flowered alfalfa is fast becoming naturalized.

"This plant is another example that agriculture is not local; it has always been international. And in this case, most of the benefits have come our direction."

Norman "Bud" Smith of Lodgepole is an enthusiastic supporter of yellow-flowered alfalfa.

"I've doubled forage production from interseeding yellow-blossomed alfalfa in native prairie grass. Once it's established, I've found out I cannot kill it by grazing."

More pluses: "Yellow-blossomed alfalfa is more nutritious than straight grass. And it probably adds some nitrogen to the soil. So that could give you more wheatgrass, too."

Smith and son Tim will interseed 200 more acres next spring. "Eventually,

seeds from N.E. Hansen, professor at the state's land-grant college at Brookings. The enclosed instructions were to scatter the seeds by the back porch where whatever happened to them would be noticed by some member of the family.

Hansen had collected the yellow-flowered alfalfa on plant exploration trips to Russia and Siberia (see story, this issue of *Farm & Home Research*). He had high hopes that Siberian alfalfas might be successfully introduced "as wild plants into the native ranges of the Prairie Northwest, where they will

*I've doubled forage production
from interseeding yellow-blossomed alfalfa
in native prairie grass*

*Eventually, we plan on yellow-blossomed alfalfa on
every bit of our ground we can get to with equipment.*

—Norman "Bud" Smith, rancher near Lodgepole

we plan on yellow-blossomed alfalfa on every bit of our ground we can get to with equipment."

Solid stands in some spots, healthy self-seeded stands on nearly 200 acres of other pastures, and interseeded yellow-flowered alfalfa elsewhere on the Smith ranch all started with one tiny packet of seed from Siberia in 1915.

In that year a number of farmers and ranchers received a packet of alfalfa

probably be able to hold their own with any plants now found there."

Boe is finding "an amazing number of yellow-flowered stands" across western South Dakota as a result. He admitted that, now that his interest is up, he's looking harder for yellow-flowered alfalfas in the field. "That may be part of why I'm seeing them more.

"But anybody with 5 minutes practice can tell the difference between *falcata*,

the yellow-flowered alfalfa, and *sativa*, the purple-flowered alfalfas. *Falcata* shows up in a narrower leaf shape and finer stems. Typically the growth habit is flatter, more bowl shaped. Then, if you see that bright yellow flower, it's a dead giveaway."

But, he warned, the alfalfa genus, *Medicago*, "is all messed up. Many species hybridize with each other. It's safe to say that any alfalfa out in the field probably has genes for yellow, purple, and the variegated flowers somewhere in its background."

Smith's *falcata* has evolved into a grazing type. Scientists are working on a hay-crop *falcata*.

The team of Boe, Kevin Kephart, and Robin Bortnem, Plant Science Department; Ken Higgins, Wildlife and Fisheries Department; and Arnold Kruse of the Fish & Wildlife Service, with funding from Fish & Wildlife, Ducks Unlimited, Pheasants Forever, the North and South Dakota Departments of Game, Fish & Parks, and the South Dakota Experiment Station, has developed a one-cut hay-crop *falcata* that will also serve as wildlife cover on refuges, farms, and roadsides.

It will be adapted for areas of South Dakota with higher precipitation where farmers usually first-cut alfalfa around early June, Boe said.



Over 100 attended an SDSU sponsored tour of the Tim and Bud Smith ranch in June 1998. Speakers included, l to r, John Berdahl, USDA plant breeder from Mandan, N.D., Kevin Kephart, "Bud Smith, Ray Moore, and Arvid Boe. Kephart and Boe are SDSU forage specialists, and Moore is retired Ag Experiment Station director.

"That's the typical peak of pheasant nesting. Normal first cutting can destroy up to 39 percent of incubating pheasant hens and 90 percent of nests."

A delayed one-cut alfalfa would "give the birds a chance," Boe said.

Stockpiling alfalfa in the field, however, means loss in quality. But yellow-flowered types, Boe explained, will provide more quantity, even if less quality, than conventional types if harvest is delayed past mid July. Flowering is continuous throughout the summer, and the leaves shatter less.

"The longer we waited into July in our experimental plots, the more the yellow outyielded the purple, up to 40 to 50 percent.

"The longer alfalfa stands in the field, the greater the risk of potato leafhopper attack. Then there's absolutely no question: you want to be growing yellow-flowered alfalfas. They are much more resistant."

Potato leafhopper infestations cannot be predicted. In the last 10 years, they've been important somewhere in the state, but if they come in early enough in the summer, they can cause significant reductions in yield and quality of susceptible purple flowered cultivars.

The research team is counting on its highly promising experimental cultivar of yellow-flowered alfalfa.

But there may be difficulty in increasing this cultivar and distributing it to producers. Like other yellow-flowered alfalfas, its sickle-shaped pods are more likely to shatter than the coiled pods of conventional cultivars.

"We're not planning to go in and change the

genetics to get coiled pods," Boe said. "All we need to do is fiddle a little with it.

"These plants come from Siberia, remember. They're wild things. They flower over the growing season, and sometime during that season some seeds will be produced. That's all they need to be around next year.

"What we need is a management practice that stimulates the plants to produce a large flush of flowers over a relatively short time. Just mowing it early might do the trick. This would set it back enough so that when regrowth comes on, the flowers would all be of similar age. This would encourage pollinators and give us a larger crop of uniform seeds to harvest and release to growers."

There's one more problem to solve before yellow-flowered alfalfa fits into the eastern South Dakota landscape. "It may not compete with introduced grasses. Out west it gets along fine with the natives," Boe said.

Smith, the older man, counsels patience.

He too has found that yellow-flowered alfalfa doesn't easily become established with crested wheatgrass and brome grass.

"But once you get it going, it'll compete. Maybe it'll take 20 to 25 years."

That length of time doesn't satisfy crop rotations or most pastures, Boe said, but it would work well on refuges and roadsides. "We know how genetically adaptable yellow-flowered alfalfa is. Maybe in only a few years we'll find another cultivar that can hold its own in eastern South Dakota prairies."

And what's 25 years in the life of a prairie? ♦

Biostress challenge:
*adapting an alfalfa to
special environmental niches*

SPA: enterprise analysis

Goal: 'to better withstand the down side of price cycle and better benefit from the up side'

by Jerry Leslie

South Dakota beef producers are finding a “SPA” is a good thing to have on their ranches. But this one improves their economic health rather than their physical health.

SPA stands for Standardized Performance Analysis, a system of record-keeping and analysis of the beef production enterprise.

But, more than that, it is a standardized information collection system creating a database that will eventually allow beef producers to compare their operations and costs of production with other producers, locally, statewide, nationwide, and into Canada.

SPA gives cattle producers an understanding of their unit cost of production, say Extension specialists from SDSU. Then they can manage their operations to keep their break-even costs below the market price for their product. The program is designed to separately analyze the cow-calf and stocker-feeder operations.

Two faculty members in the Cooperative Extension Service at SDSU are instrumental in putting SPA to work for cow-calf operators in South Dakota.

They are Eddie Hamilton, DVM and livestock production analyst in the Department of Veterinary Science, and Barry Dunn, former NDSU beef researcher and now Extension beef associate in the Department of Animal and Range Sciences.

Hamilton helped design SPA, sponsored by the National Cattlemen’s Beef

Association (NCBA), while he was on the staff at Texas A&M University and draws on 16 years of experience as a veterinary practitioner. Dunn, a rancher of 18 years, was instrumental in forming South Dakota’s Bootstraps Program and is chair of the National Cattlemen’s Beef Association subcommittee on Integrated Resource Management (IRM) production efficiency.

Hamilton teaches farmers and ranchers and veterinarians how to use the program. Dunn’s part in SPA is to assemble the South Dakota database that will soon make comparisons meaningful.

Enterprise analysis is a step in improving the business side of ranching. The goal is for ranchers to better withstand the down side of the price cycle and better benefit from the up side.

Many can visualize a rancher trudging through snow to deliver a calf, said Hamilton. “It’s an image anyone can relate to, and ranchers feel good about themselves with a strong work ethic. But to see a producer sitting down at a desk, that’s a negative image, to them. ‘You should be outside working,’ is the way people reason.

“As a result, the bookwork, looking at records, trying to plan next year’s activities on last year’s performance—that’s the job that often doesn’t get done.

“The vast majority of producers are wonderful operational managers,” Hamilton said. “They are out feeding cows, putting up hay, repairing fences,

pulling calves, treating sick animals—all the kinds of things you do in a day to get the work done.

“But what is not happening in many of those operations is asset management. They have invested a tremendous amount of capital, about \$2,000 per cow. Who is managing those assets? Often, no one,” said Hamilton. “When they don’t, it’s because they don’t have those skills.

“Managing means sitting down, looking at income statements and balance sheets—seeing the year-end result of all that labor and what the change in equity might have been.

“It involves making some management decisions based on that financial information. In many operations, those financial decisions tend to be strictly intuitive and often don’t rely on any sound financial records,” said Hamilton.

“The most erroneous records they can use are their tax returns, and usually that’s about the only financial records they have in place.”

Producers are in a real financial crunch, Hamilton said.

“The pressure is unbelievable. We have a large segment of producers looking for higher prices to save them.

“Higher prices absolutely are not the only solution. Cost control and managing costs—again, financial management—is actually the starting place. When you do that better, then you are better able to withstand down cycles and benefit from up cycles. It’s the message many don’t want to hear.”

This is the message Hamilton is delivering, one-on-one at kitchen tables, before small groups, and before groups of veterinarians. Veterinarians have a multiplying effect, teaching their clients financial record-keeping and analysis. Hamilton has trained around 130 veterinarians.

His first priority, however, is working with individuals and with undergraduate students at SDSU. He guest lectures in several classes, and he also teaches a class by Internet for Iowa State University undergraduates.

"I hope that when these students do move back to a farm or ranch situation they have some tools and skills their fathers didn't have."

Dunn has a special perspective on SPA, from his experiences in ranching and organizing Bootstraps before he joined SDSU.

The program for cow-calf and stocker-feeder operations comes in two parts, a performance and a financial analysis.

The performance side, SPA-P, analyzes the biological part of the enterprise, which in a cow-calf operation would include weaning weights, pregnancy rates, length of the calving period, death loss, and other measurements of actual production.

The financial side, SPA-F, is an enterprise analysis similar to that of FINPACK, the whole-farm financial package of the Cooperative Extension Service, but using the SPA-P numbers as a denominator.

SPA-P and SPA-F provide information in dollars per head or dollars per pound. "It's a full analysis in which you've calculated in a standardized way a break-even cost on a per-cow and per-calf basis.

"Ford Motor Company knows what it costs to produce a car. SPA tells you the cost of a weaned calf," said Dunn.

"The resulting break-even value allows a rancher to take two really big steps. The first is to control the cost of production, because you really break down

feed per cow and fixed costs per cow to make management decisions.

"The second part," Dunn said, "allows you to do a good job marketing, since it is hard to forward contract or really market if you don't know what your break-even value is.

"So, if your cost of production is 75 cents a pound and you are offered 75 cents a pound, you'd better look for another market alternative or cut your costs," said Dunn.

Dunn and Hamilton built a database last summer. The next step is to analyze the database, enlarge it and learn costs of production, and then look for trends, problem areas, and things that might be unique to South Dakota, said Dunn.

When the database is large enough, Extension beef specialists and county agents will be able to do a better job of helping producers.

Dunn believes the data also will help animal scientists set research priorities. "Perhaps we've been correct about the needs of producers, perhaps not. We'll make better decisions when we get that database in hand and see the results of it."

Beef Researcher Dick Pruitt's work might be a place to use SPA. Last summer, county agents identified out-of-season calvers with intent to analyze their production and financial information and then coordinate those results with what Pruitt is finding at Cottonwood Range and Livestock Research Station. SPA would link research needs with results of producers' records.

The FINPACK computer program recommended by SDSU for whole-farm analysis will have in its Windows version a SPA analysis.



Eddie Hamilton, DVM, and Barry Dunn, Extension beef associate, are coordinators of the SPA program for cow-calf operators.

Don Boggs, head of SDSU's Department of Animal and Range Sciences, said the work being done by Hamilton and Dunn is needed.

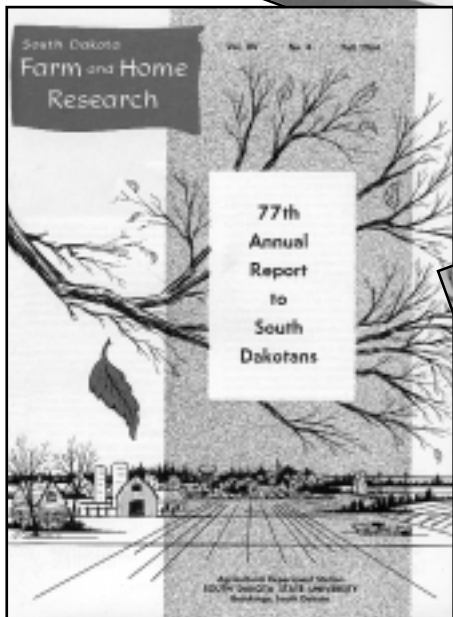
While the standardized SPA computer program isn't hard to run, it leaves room for interpretation, and that's where it's important to have one-on-one training. Boggs said that the critical outcome of SPA will be informing producers about unit costs of production and the impacts of inputs on gross and net profits.

Dunn, writing in *Beef* magazine, said some SPA users in other states have identified low-cost production systems that provide double-digit returns on assets.

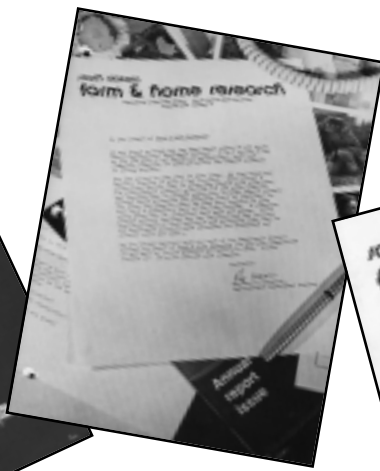
This does not mean that these producers have suffered a decline in their standard of living, he added. "On the contrary, it means that their situation has been enhanced. It also means they are willing to operate very differently than others."

Dunn said he was recently asked: "Can quality beef still be produced under low-cost production systems?" His answer was: "It will have to be." ❖

Biostress challenge:
*producing quality beef under
low-cost production systems*



Covers
from Vol. 1, No. 1
through
Vol. 50, No. 1
of
Farm & Home
RESEARCH



A small planet grows smaller

International exchanges bring global perspective to faculty and students

by Jerry Leslie

Students from South Dakota State University will have more than a cap, gown, and diploma when they graduate. They'll also have a global perspective and experiences in cultural diversity.

Some of them, and many of their teachers, will have been overseas to participate in one of several international programs. And they will have studied with nearly 200 international students working on SDSU degrees in campus classrooms and labs.

These student experiences are a benefit to South Dakota, agree Fred Cholick, dean of the College of Agriculture and Biological Sciences (ABS), and Harriet Swedlund, director of International Programs.

Cholick has traveled to Bolivia, China, Kazakstan, and other countries in recent years as an SDSU administrator. The ABS College leads SDSU in international travel.

"We have expanded globalization in all of three mission areas of our ABS operation—research, teaching, and Extension—and this has been done in partnership with the university as a whole," Cholick said.

"Today our agricultural markets are global, our economies are global, and our business opportunities are global.



South Korea is mostly hills and mountains; only 19% of the land is arable. Rice is started in plastic-covered beds and transplanted to paddy (above) when weather warms up. Faculty from SDSU and Chungnam University exchange classrooms, SDSU students travel and study there, and Korean students enroll here.

So whether you are in production ag or agribusiness, you've got to understand global perspectives."

Most of the crops and livestock grown here today came from other countries—corn from South America, soybeans from China, wheat from Iran and Iraq, alfalfa from Russia, Cholick added. "We no longer exchange species as much as we exchange genetics, genes, technologies, and ideas. Just one

example is the germplasm for scab resistance in wheat that we received from China."

The ABS College and SDSU have joined universities across the nation and world in this new phase of international cooperation, Cholick explained.

ABS "is certainly the leader in international affiliations at SDSU, for

obvious reasons," reports Harriet Swedlund, who administers international programs for the entire university.

"We (in the land-grant university) have the information and leadership that people in other countries want, ask for, and value, and we value the opportunity to be called upon for that," said Swedlund.

International travel and study "link our university with peoples and systems around the world.

"We can't be insular and sit here and think there is a big fence around the state and we don't have to have any knowledge of what's going on in the rest of the world. We are very closely connected. If we haven't been there, seen it, done it, we really can't begin to understand the situation," Swedlund said.

"Through this, we prepare our students to live in an increasingly integrated world that is connected instantly by e-mail no matter where they're located."

SDSU currently has the following agreements:

- Yunnan Normal University, Kunming, Peoples Republic of China, 12 SDSU and 9 YNU faculty participating since 1987.
- Autonomous University of Morelos, Cuernavaca, Mexico, 4 SDSU faculty and 4 UAEM faculty since 1992.
- Manchester Metropolitan University, Manchester, England, 16 SDSU students, 13 MMU students, 18 SDSU faculty, and 7 MMU faculty members since 1994. In addition, 6 students and a tutor from MMU Health Care toured South Dakota in 1997. Both institutions have hosted a faculty member on sabbatical.
- Chungnam National University, Taejon, Korea, 6 SDSU faculty and 7 CNU faculty exchanged semesters in the classrooms, 20 faculty and 13 students from SDSU visited Korea for travel and study,



Bill Epperson, DVM and South Dakota Extension veterinarian, teaches students at the Universidad Academica Campesina in Bolivia. A degree in veterinary science is offered at this new campus, which was set up following the model of American land-grant universities like SDSU.

9 administrators from CNU toured the SDSU campus, and 14 CNU students enrolled at SDSU since 1991.

SDSU also is involved in consulting and research exchanges with or through:

- Universidad Academica Campesina, Carmen Pampa, Bolivia, a branch of the Catholic University of Bolivia in La Paz that will be patterned after American land-grant universities like SDSU.
- International Arid Lands Consortium (IALC), in which faculty and students from SDSU and other member universities travel to Israel and other Mid-East countries to collaborate in improving farming in low-rainfall climates.
- Institute of Soil Science and Plant Cultivation, Pulawy, Poland, where research at the master's and doctoral levels is conducted.

Benefits of faculty and student foreign exchanges far outweigh the costs, say those involved. In many cases, most costs are covered by outside sources.

Deciding to travel overseas must be "a philosophical and purposeful decision" for both individual and institution, said Swedlund.

"If you are going to have a global perspective on a campus, the first thing you have to do is provide international opportunities for your faculty.

"Once you have a cadre of faculty with an international perspective based on these personal experiences, then you are in the position to infuse the curriculum with the information that they've gathered or the research work they're conducting globally with other collaborators like themselves in China, or Korea, or South America.

"And then we can begin thinking about how to get students into a travel mode."

The Bolivian project has been in place since 1994, but it was 1998 before the group felt students could participate, said Swedlund. Horticulturist John Ball found outside funding to assist four SDSU students going to Bolivia.

The IALC, explained Swedlund, has established scholarship opportunities as part of its mission so that students

could be involved in research. Students from SDSU have participated by traveling to Israel, said Swedlund.

Students and faculty returning from international exchanges say they have benefited immensely.

Denise Malo, Brookings, was one of seven SDSU students at CNU in South Korea this last summer.

"The experience was very eye-opening. I really didn't expect to be so immersed in the culture and understand so much more upon returning home." She was particularly impressed with how the Korean people have overcome many different struggles.

"My experience makes me think more globally and how the things I do affect people around the world."

She also traveled to Bolivia in 1995. "The Bolivian people have so little, yet they are very content. What resources they have, they use to the fullest," said Malo.

Howard J. Woodard, professor of plant science, reported that his trip to Kunming "has given me a fresh perspective and an appreciation of how far we have come in agriculture in this



In Poland, Darby Sanders, left, 1992 SDSU grad and now with the Iowa Shelby County Conservation District, and Russ Stubbles, SDSU horticulturist, assisted officials with a park proposal.

country over the last 50 or 100 years." He also credited his experiences as helping him better understand and work with international students in his classes.

Dale Reeves, oat breeder at SDSU, is currently serving as one of the directors of the IALC, along with Cholick and Darrell DeBoer, professor of ag engineering.

"Israel may be the world's best in dryland technology and using limited moisture," Reeves commented. "There is a lot to be learned that could be applied here."

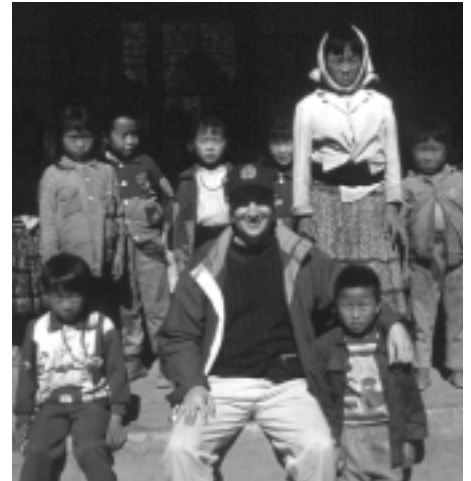
The IALC intends to be one of the major dryland agricultural reference groups in the world, said Reeves. "That gives us access and connection with dryland agriculture people around the world, and gives them opportunity to contact us, as well."

Reeves quoted Ray Moore, director emeritus of the South Dakota Ag Experiment Station, as saying the greatest benefit of IALC may be its positive efforts toward peace in the Mid-East. With U.S. scientists as a third party, these countries may be more willing to work together.

Kevin Kephart, acting associate director of the Agricultural Experiment Station and co-director of the Bolivia Project with Plant Science Professor Doug Malo, views SDSU's role at Carmen Pampa as "the crown jewel of our international activities."

The new university now has more than 200 students working toward degrees in agronomy, animal and veterinary science, nursing, and general education.

"On the surface, all the benefits seem to be on the Bolivian side. But every time I go there I bring back in experience more than what I take with me," Kephart said. "None of us has known about tropical agriculture before this project, so we can use this knowledge in teaching programs and to give us new perspectives in research."



Howard Woodard, SDSU plant scientist, here with Chinese children, says family farms are often 2 acres or less. While upgrading is occurring, "the way ag is done hasn't changed much in 4,000 years."

Eventually, Bolivia may be a source of germplasm for potatoes and small grains to test in South Dakota, Kephart said.

"Our activities have been completely funded by the Larson Foundation and SDSU provides release time for faculty to go there," said Kephart.

Russ Stubbles, SDSU associate professor of horticulture, traveled to Poland last summer to write a site application for a national park and to help privatize the park's apple production.

Upon return, he said, "We saw a lot of poverty, especially among the elderly and children, and that was really disturbing to me. But on a personal level, it was the best thing that happened to me in a long time, because it helped put my life into perspective."

For him, and all faculty members and students who have traveled abroad, a small planet is becoming even smaller. ❖

Biostress challenge:

*South Dakota agriculture
from a global perspective*

Potential danger in dugouts

*If not replenished by annual runoff,
water quality can drop into danger zone*

by Larry Tennyson

Talk about a sneak attack from Mother Nature!

Extension Beef Specialist Doug Zalesky and Extension Range Management Specialist Jim Johnson—both stationed at the West River Ag Center in Rapid City—had a call for help from a ranch couple east of Olerichs.

The cattle in one pasture on the Rueben and Connee Quinn ranch were doing poorly. Some had died, in fact.

“At the time that the call came in, they had just lost three cows in a pasture that they moved into shortly before,” Zalesky related. “Jim and I spent the next day looking for whatever might have contributed to those fairly sudden deaths.”

Tests of dugout water indicated a potential water quality problem as the cause of the cattle deaths.

“For the most part, we don’t have many problems with our surface waters that cattle use as a water source in western South Dakota, but this was different,” Zalesky said.

Usually, snow runoff and rain each year freshens dugouts and stock dams. “What happened on the Quinn ranch over the last 2 years was that they didn’t get a lot of runoff or rainfall to keep their dams fresh. So there was a lowering of the water levels because of evaporation, resulting in a concentration of nutrients.”

Stock dams act as a sink in such cases. Nutrient concentrations rise as the nutrients wash off the watershed into the dam or stock pond over time.

“We were mostly concerned with the levels of salts—nitrates and sulfates specifically,” Zalesky said. The team was also interested in the possibility of bacteria or pesticides.

Salinity levels in the range of 7,000 to 10,000 parts per million are considered bad quality water. The tests showed in excess of 10,000 PPM.

With high levels of salts and sulfates, animals actually dehydrate themselves. They can drink all they can hold and still get dehydrated.

Zalesky said this is a type of reverse osmosis. Generally there’s a balance in the amount of water that goes into and out of an animal’s tissues. In this case, the salts combine with the water molecules to make a bigger molecule. This new molecule has a difficult time getting into the tissues because of its size, but the water molecules already in the tissues, being smaller, have no problem flowing out of the tissues. Once out, they also combine with the larger molecules and can’t get back.

Over time, tissues dry out somewhat because of this process.

“Sulfates also have an effect on the animal’s nervous system,” Zalesky added. “This fits with the behavior we saw among the cattle in that pasture. Some were staggering and appeared partly blind as they grew weaker.”

The remaining cattle were pulled from the pasture immediately and put



Doug Zalesky, Extension beef specialist at the West River Center, says drought can drop water quality of surface waters to levels lethal to cattle.

with good quality water and feed. Some of the affected cattle eventually recovered, but some were just too far gone.

“I understand the ranch finally ended up losing about 12 cows,” Zalesky said.

“They’d been using those water sources in that pasture for a number of years and had never had a problem.

“Dugouts and dams are the most cost-effective ways to provide water for livestock in this part of the country, but there always is the potential danger that nutrients may concentrate in those same water sources—especially in a dry year.”

After searching for information on the impact of water quality on performance, Zalesky found very little about its effect on range or grazing cattle. The studies that did come to light did not show the drastic consequences of what he’d seen on the Quinn ranch.

“Even so, we did learn that cattle drinking better quality water tended to perform better. It also has been reported that cattle drank less water and had less weight gain when water supplies were substandard—such as those contaminated with feces and urine.”

Water intake is strongly associated with forage intake, Zalesky said. Lower water intake goes with lower forage intake, so that's one explanation for poor performance when the water source goes bad.

"We continued to sample those water sources during the summer, and we found that at least one of them actually got worse—going from about 13,000 PPM to over 18,000 PPM."

This gave rise to the question: can a dam or dugout get so fouled up that the

rancher would be better off just to abandon it?

It's possible, Zalesky said. The Quinns are considering scrapping one dam that needs some work done to it anyway.

"All this serves not only as a warning to ranchers, but also as a research opportunity for animal scientists.

"And when a rancher even suspects a water source, it would be wise to test it. Most county Extension offices now have water quality testing kits that the

rancher can take out and get a ballpark idea of whether there needs to be some more in-depth testing work.

"You can't always control your water quality, but you can control whether you let your cattle drink it," he concluded. ❖

Biostress challenge:
*do not take dugout water
quality for granted*



“**T**iming is everything,” they say.

This is never more true than when applied to grazing the rangelands of western South Dakota.

Dr. Patricia “Pat” Johnson, SDSU range scientist stationed at the West River Ag Center in Rapid City, has been investigating improvements in South Dakota rangeland management for 9 years at the SDSU Cottonwood research station.

The timing of grazing is proving to be one of the most critical elements in rangeland grazing management, according to a research project under Johnson’s guidance just completed by graduate student Taralyn Fisher, who

finished her M.S. degree in October and has now joined the Extension Service at Montana State University, Bozeman.

“Rangeland dominated by midgrasses like western wheatgrass and bluestems loses less water to runoff during a heavy storm than rangeland dominated by shortgrasses like buffalograss, blue grama, and sedges,” Johnson said.

“Reducing runoff is important to the livestock operator because water that does not go into the soil will not produce forage. Rangeland runoff also tends to erode land downslope, putting sediments into the rivers that may end up as silt in our lakes,” she explained.

Having a good mixture of cool-season and warm-season grasses also means

there are always growing plants to utilize rainfall throughout the season.

The question the researchers sought to answer: How to keep that mixture of shorter and taller grasses in the plant populations of rangelands in western South Dakota.

Johnson started by examining older research conducted at Cottonwood by now-retired animal science professor “Tex” Lewis.

“He generally showed that rangeland with western wheatgrass produced more forage, offering greater management flexibility to the operator,” said Johnson.

“What we’re shooting for, then, is rangeland that is dominated by mid-

grasses with some shortgrasses rather than the reverse with only a few western wheatgrass tillers stuck in.”

Over the past 9 years, Johnson has documented how animals actually graze these various types of pastures. “We looked at individual tillers or stems to determine which ones were grazed, how often they were grazed, how severely, and when it occurred.”

This occurred in three kinds of systems: continuous grazing throughout the season, spring deferment, and a short-duration system that quickly moved cattle through the pastures.

Johnson, her grad students, and research associates learned that Cottonwood cattle and grasses don’t necessarily follow “patterns-of-grazing” theory.

In that theory, under continuous grazing a few plants will be grazed severely and often. But with concentrated stocking densities over the long term, selectivity is reduced and grazing is more uniform and less severe.

“We found with continuous grazing that less than half of the plants get grazed, but the expected level of use just wasn’t occurring,” Johnson said. “The frequency of use also was not a critical factor. Most plants that are grazed at all are grazed only once—and we didn’t see just a few plants just getting hammered as theory indicated.”

“When we went to short-duration grazing, which has the highest concentration of livestock at any given stocking rate, we found that a few more plants got grazed, but not a lot. Plants were grazed more severely, however. Clearly, if short-duration grazing is working, it is not because it evens out the grazing across these plant populations.

“So what is it about grazing that eliminates these plants? Because clearly, if you overstock in a continuous grazing system, you will lose certain plants out of your system. Tex Lewis showed this very nicely in his work.”



Rob Self, former research associate, and Pat Johnson measure individual grass tillers. Delayed grazing is beneficial to western wheatgrass.

Fisher studied how plants respond to grazing in terms of survival, production, and persistence. “If a plant is grazed during the growing season, does it survive, how much does it produce as a result of grazing, and will it produce growth next year or not?”

Her data had to be qualified a bit, because her research occurred in a period of above-average precipitation. Some of her conclusions may not apply to a dry year, Johnson cautioned.

Fisher monitored 1,400 individual tillers or stems of western wheatgrass and found that about half were ungrazed in both continuous and short-duration systems. She found the lowest survival rate when the plant was grazed heavily or early and the greatest production when the plant was either ungrazed or grazed late in the season.

“This research did not support the theory that grazing a plant results in more production. The same basic production occurs in either ungrazed or late (July) grazed plants. If you graze in May and June, you get reduced production, but not if you graze late in the season,” Johnson said.

Fisher found that if a tiller appeared dead after being grazed, it didn’t mean that it might not produce daughter tillers the next growing season. In fact, 62 percent of “dead” parent tillers

produced daughter tillers in the next season, compared to 77 percent of the “live” parent tillers.

“So the conclusion from Fisher’s study was that timing was the most important factor in the grazing system. Even the level of use was not that important. In fact, it often was unimportant,” Johnson commented.

Early grazing led to reduced survival and reduced production, and late season grazing gave production as good as ungrazed and also had the best survival rate.

“This showed that delaying grazing until later in the season was beneficial to western wheatgrass populations. Even with the spring deferment plan where we’d keep the stock off the pasture until June, we saw some increase in western wheatgrass population.

“If you really want to increase your western wheatgrass, wait until July to graze it. Go ahead and use a higher stocking density and get your production benefits out of it.” ❖

Biostress challenge:

*timing grazing against
stocking density*

Turfgrass research is new at SDSU

South Dakota needs its own turf; research from other states doesn't match our climate, soils, and management needs

by Jaimi Reimer

South Dakota has 120 golf courses, more per person than most other states in the U.S. A thousand-plus South Dakota jobs are directly related to turfgrass, and many more people are employed in allied sectors—lawn equipment, fertilizers, irrigation, and landscape and design, just to name a few.

Yet, with over 70,000 acres of maintained turf in South Dakota, turfgrass research has traditionally been left to the University of Nebraska at Lincoln or the University of Minnesota in St. Paul.

That has changed. Leo Schleicher, Extension turfgrass specialist, is looking forward to great things in the future with SDSU's new turf program.

"This (research) capability for the state is something that hasn't been here before," said Schleicher. "It should improve the turf in the state rapidly."

Finding the "right" turfgrasses is especially critical in South Dakota "due to our diversity in soil type, climate, and topography," said Schleicher.

Mike Smith, superintendent at Central Valley Golf Course in Hartford and president of the South Dakota Turf Research Foundation, agrees. "Climatically, we're quite different from Iowa or Nebraska."

Schleicher has divided his general research plan into three parts.

His first goal is to evaluate and determine the turfgrass species and cultivars that are best for South Dakota's environment by region. Then he will select within the best species for specific desirable traits such as resistance to freezing stress, desiccation, and drought. Finally, he will identify proper cultural practices to maximize turfgrass quality, including establishing, fertilizing, mowing, irrigating, and cultivating.

Stage one of the research plan is well underway. During the first full year of turf research at SDSU, Schleicher has established nearly 3 acres of turf at the N.E. Hansen Research Center east of Brookings. Five additional research sites on golf courses throughout South Dakota add much needed regional differences to turf evaluations in a state with such a diverse climate and topography.

Schleicher currently has a group of ongoing experiments.

The first, the North Central Region Low-Input Sustainable Turf study established at Brookings in 1997, is designed to identify utility turf for low-input sites such as roadsides, parks, and airports. The only treatment in this 4-year evaluation is a biweekly mowing at 3 1/2 inches. The SDSU Agricultural

Experiment Station provided the funding.

One such utility grass Schleicher is pleased with is buffalograss.

Buffalograss is the most energy-efficient turfgrass available and is native to the state. It endures both heat and drought stress as well as or better than any other turfgrass. Seven cultivars established from seed and nine vegetatively propagated cultivars are currently being evaluated at Brookings, Hillsview Golf Course in Pierre, and Rocky Knolls Golf Course in Custer.

"Improved buffalograss selections with dark green color, high plant density, short dormancy, and low mortality during establishment have tremendous potential for golf course roughs or even fairways, particularly in the central and western regions of South Dakota," commented Schleicher.

Some of the cultivars are commercially available, whereas some are experimental.

"In greenhouse studies during winter, we will be evaluating buffalograss and blue grama seeding ratios for optimum establishment of the turfgrass mixture."

One difficulty Schleicher has found in buffalograss establishment has been competition with weeds and the long period of time needed for turf establishment. "We will soon be looking at screening commercially available



Leo Schleicher, Extension turfgrass specialist, has experiments in progress at SDSU and across the state.

products that may decrease these establishment difficulties," he said.

Researchers are also evaluating a selection of zoysiagrass which has been growing for 25 years at a location in the state for use as a turf possibility for South Dakota. Zoysiagrass is usually used in hot, humid, and tropical climates, although it can also thrive in arid regions. It has the best overall cold tolerance of any tropical grass.

Two 5-year studies were initiated with support from the National Turfgrass Evaluation Program. The first, the 1998 Bentgrass Trial, includes 27 cultivar entries. Protocol consists of a 5/8-inch mowing height, three times per week mowing frequency, 4 pounds of nitrogen per 1,000 square feet applied per growing season, irrigating to prevent visual drought stress, core cultivating at a minimum of once per year, and thatch management, said Schleicher.

The 1998 Fineleaf Fescue Trial, the second 5-year study, includes 80 cultivar entries. Protocol is the same except the fescue cultivars receive between a fourth and a half pound of nitrogen

per 1,000 square foot per growing month. In addition to the plots at N.E. Hansen Research Center, this research is also being conducted at Arrowhead Golf Course in Rapid City and at Moccasin Creek Golf Course in Aberdeen.

"Cultivars of both studies will be rated for establishment, genetic color, spring green-up, turf density, winter color and injury, and turf quality," Schleicher explained.

In a 3-year perennial ryegrass experiment, Schleicher is evaluating 22 cultivars for winter injury, snow mold, and, specifically, freezing stress resistance. Field sites are the N.E. Hansen Research Center, Central Valley Golf Course in Hartford, and Hillside Golf Course in Pierre. Two mowing heights and two fertility programs are included in this turfgrass study. A laboratory component will measure minimum non-lethal temperatures for turfgrass recovery based on cultivar, fertility, and mowing height.

Funding for the ryegrass study was provided by entry fees from seed producers for each cultivar evaluated.

SDSU does not currently have a turfgrass breeding program. Scientists obtain seed from the commercial market, seed companies, and larger universities.

Other donations to the program include: Northstar Turf in Sioux Falls, turf maintenance equipment for the N.E. Hansen Research Center; O.M. Scott's distributor, fertilizer; and the South Dakota Golf Course Superintendents Association, equipment.

SDSU turf scientists also evaluate pesticides and fertilizers for manufacturers. "We evaluate products under specific management schemes, then transfer those results to the turf professionals in the state," reported Schleicher.

The idea for a turf program came when the Horticulture, Forestry, Landscape and Parks Department wanted a new project that had economic importance for the state along with a lot of growth potential, said Schleicher. The new program has the traditional land-grant components of teaching, research, and Extension. Schleicher filled all three positions when he came to South Dakota in July 1997.

"This research will benefit the public tremendously," said Smith. "Initially, turfgrass managers will be the first to gain. They will use the knowledge and research data in their own situations, then the public will benefit from more desirable turf with less maintenance."

The first annual turfgrass field day is planned for the summer of 2000 with tours of all research projects and a trade show. "We are hoping that people can give us feedback and ideas to keep the program going," Schleicher remarked. ❖

Biostress challenge:

*new research project
with an economic impact
that benefits the public*

To specialize or diversify?

Risks are waiting either way the farmer turns. Which direction is more sustainable in the future?

by Mary Brashier

Back in 1949, in the very first *Farm & Home Research* published, two South Dakota State College agricultural economists forecast a serious downturn in farm income if farmers continued to specialize in the crops that had brought them such gratifying returns during the war years.

On the national scene, wheat production continued to increase steadily while war needs dropped off. In 1949, production was nearly twice the level that could be consumed domestically. And nations still in recovery from the conflict couldn't buy the wheat at a price that covered costs to grow the crop.

To be eligible for price supports in 1950, South Dakotans had to reduce wheat production by 18 percent. Complying meant "major changes in organization, investment, and type of farming," which the economists admitted would be especially painful for the highly specialized and efficient wheat growing farms of South Dakota.

"Nevertheless, such shifts toward more diversified production are desirable adjustments to both the physical environment and the economic conditions," the economists urged.

Fifty years later, Tom Dobbs, SDSU agricultural economist, is also urging farmers to consider more diversity. But, with the historical record behind him and new data from the last few years, he's not too optimistic.



The 1996 Farm Bill encourages farmers to respond more directly to market signals, "and we had hoped we'd see a side benefit of diversity and flexibility in individual farming systems," says Tom Dobbs, SDSU economist.

"If we let the farm bill run its course for a number of years, there's some chance of seeing more diversity. That's only if, at the first sign of problems, we don't go back to crop-specific price supports high enough to signal what to grow and to acreage allotments that say how much we can grow."

Dobbs and Linda Dumke, economics graduate research assistant, examined how farmers are responding—or not—to the much greater flexibility built into the 1996 Farm Bill. Part of their study included talking to "focus groups" of farmers in Codington and Moody counties.

"As of right now, these farmers are not going to diversify. They are, naturally, profit motivated, meaning corn-soybean rotations in Moody County, and corn-beans-wheat in Codington County," Dumke said.

The recent record backs that up. Two cropping years after the 1996 Farm

Bill was signed, corn acreage in South Dakota was up 14 percent in 1996 and 9 percent in 1997 over the 1991-95 average. Soybean acreage was up by 19 percent in 1996 and 54 percent in 1997 over the same period. Oats, barley, and flax acreages hit the skids, down 42, 61, and 33 percent, respectively, in 1997 from the base years.

However, the farm bill was never aimed primarily at encouraging diversity, Dobbs said.

"We had hoped that in encouraging farmers to respond more directly to market signals—the true intent of the bill—we'd see a side benefit of diversity and flexibility in individual farming systems."

Studies over the last 10 years show "a pretty strong consensus" that in the long run ecological sustainability depends to a great extent on diverse crop systems, Dobbs said. Continued specialization and short rotations mean

“we’ll lose ground in fighting disease, soil erosion, and poor water quality.

“Some people may still argue the case, but hardly anybody thinks that a monocrop system is sustainable—good for the pocketbook or the land—in the long term. More people are coming to think that a two-crop rotation isn’t sustainable without expensive inputs, either.”

But it's hard to buck the trend.

“What’s very clear to us is that there are powerful forces working toward specialization,” Dobbs said.

Farmers in the focus groups would like to become more diverse, and talked of adding alfalfa to the rotation, “but every time we asked, ‘well, is it likely to happen?’ they’d list their current machinery lines and the need for additional labor, the lack of easily accessible hay markets, and other factors that would keep them planting corn and soybeans.”

In addition, they reminded the researchers of the soybeans that have been genetically adapted to produce higher yields and to resist herbicides. Of no-till drills that help conserve soil moisture, boosting yields. Of equipment that doubles for both corn and beans, allowing farmers to limit their machinery lines.

It is apparent that to diversify is to take some economic risk, Dobbs said.

“The tables have turned in some respects. Fifty years ago, diversity was how you limited risk.”

Fifty years ago, diversity might have been easier. Most members of the farm family were available to work at various chores, equipment was run by power takeoff on a general utility tractor, chickens swarmed in the barnyard, and pigs ate the kitchen slop.

Today’s farmers comment, half seriously, that diversity means, in addition to the farm operation, the wife works in town, the farmer runs a trucking business on the side, does custom work, and is a seed dealer.



Dobbs and Linda Dumke, economics graduate research assistant, interviewed “focus farmers” in Codington and Moody counties, finding “there are powerful forces working toward specialization,” according to Dobbs.

“That’s bound to generate extreme stress on the family,” Dumke said. Another source of stress is concern about the environment. Some of the focus farmers cropped above or near the Big Sioux Aquifer, which provides drinking water for a third, roughly 225,000 persons, of the state’s population, according to Chuck Ullery, water resources specialist at SDSU.

“Overall, the Big Sioux is still in pretty good shape,” Ullery said. “But there are hot spots in the aquifer with high concentrations of nitrate-nitrogen. “Along with septic tank and feedlot sources, some of this is contributed by chemicals and farming practices on cropland. We can’t be complacent.”

However, the focus farmers generally felt that federal environmental programs probably would not have much impact on their selection of crops to grow. These programs focus more on filter strips, chemicals, and choice of tillage practices than on crop mix, “and the crop mix—or lack of it—strongly influences farm profit,” Dobbs added.

TTrue diversity could involve some specialty crops, niche markets, small-scale technology, and forward contracting, Dobbs said. “But if anything can nudge South Dakota agriculture toward more diversity, it will be corn and soybean prices.

“They hadn’t dropped too much at the time of our focus meetings,” Dobbs said. “The mood was not as bleak as now.

“If we are truly concerned about the risks farmers face in choosing between diversity and specialization, we will have to work with them on several fronts. Federal farm policy, research policy, and markets are three general areas. Whatever we do, we must help farmers select rotations that are profitable, consistent with the constraints they face, and manageable from a risk standpoint.” ♦

Biostress challenge:
*risk management from policy,
research, and market approaches*



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