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The mouse connection

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Director's comments

When you count up the organizations to which you belong, do you forget one?

Ray Moore
Agricultural Experiment Station

South Dakota has again lived up to its description as "The Land of Infinite Variety." It was too dry in many areas of the state, too wet in others.

What happens in a frustrating year like this is that we at the Experiment Station suffer right along with farmers and ranchers, because we're out there with you. We have six research sites well scattered throughout the state. We work with numerous farmers and ranchers all over South Dakota. Drought reduced yields of our pastures and crops in the west. Rains delayed both planting and harvest for us in the east. In many cases, the information we hope to collect may take additional time.

Such a year strains our budget and our priorities. Our budget continues to shrink while requests come in for additional research in many areas, including irrigation, minimum tillage, and prairie dogs. We must continually examine our priorities. Our problem is not that much different from the one you face: how to get more from fewer dollars.

But the Experiment Station does have an option. We can ask **you** for help.

I wouldn't turn down money, or donations of land. But that isn't what I mean. I am asking for ideas and comments on the direction the Experiment Station should take in the future. I am asking you to "join up." I do this even though I know that South Dakotans, and particularly our farmers and ranchers, are the most individualistic people in the nation. Nevertheless, we do form and join organizations that we think have the same goals as we have, and we work together to improve ourselves.

The Experiment Station works with those organizations. The Livestock Expansion Foundation and other livestock groups give us advice in our livestock programs. The Irrigation Association is very active. The Wheat Commission assists in our breeding research. The Soybean Council has shared its ideas with us. If you belong to these or other active organizations, your ideas are coming to us.

And we have advisory boards for our field stations near Centerville, Highmore, Cottonwood, and Buffalo as well as a state-wide advisory board. Would you like to serve on one of these?

Are all these boards and organizations enough? Not if you feel **your** ideas aren't getting to us and if you think we aren't meeting **your** needs.

The Experiment Station is an "organization" you already belong to. We work for you, our goal is to improve your operation, your skills in the consumer market, your standard of life. You already support us financially, so you've paid your dues. Wouldn't you like to have a say in what we do,to get some payback? Write or call, or visit at your local Extension office. We will be happy to discuss our work with you, to help you, and to receive your comments.

This coming year the Experiment Station will be undertaking another comprehensive review of its entire program. Your participation now will be a good warm-up for that review. We look forward to hearing from you.

The mouse connection

Heredity, diet, habit are intertwined with obesity. Its secret is starting to unravel

There's low-calorie this, high-energy that, meltaway whatever in magazines, commercials, and bestseller lists. It's certainly not for lack of time, energy, or money spent that we haven't a good answer to "How can I lose weight?"

Maybe that's the wrong question. The first one to ask is "Why do some people get fat when others don't?"

The time honored answer would be that some people eat more than others. Everyone knows of exceptions, though—the friends who eat like crazy and stay thin.

You've probably noticed a family connection, too. Thin people generally have thin parents, and fat people are more likely to have relatives with weight problems. There's also a food connection—rich, heavy foods are "more fattening" than lighter meals.

How much we weigh is related to who we are (genetics) and to how much of what kinds of foods we eat (dietary influence).

Mice have the same problem.

The connections between obesity, leanness, heredity, and diet are much easier to investigate in animals than in humans. Their genes have been mapped. And caged animals eat what's on the diet—they can't sneak out for a snack.

Even genetically lean mice couldn't stay slim on diet of cookies, mayo

I have been doing research at SDSU with yellow obese mice (the same type

The yellow coat on the baby behind Mama is a signal to researchers that he is destined by his genes to become obese, even on a standard, dull lab-chow diet. The little black one does not have genes for obesity; he will stay slim on the same diet. If offered tasty, high-fat food, he'll gladly eat till he is nearly his mother's size, but he will still have more muscle in proportion to fat.

studied by Nels Granholm, electron microscopist with the Animal and Range Sciences Department, and reported on earlier in *Farm & Home Research* vol 29, no 4. These mice have a genetic problem that makes them special.

The first thing you notice is that their coats are yellow, instead of black or gray. The other difference becomes obvious after you live with them for a while. Yellow and black mice may start out as youngsters of equal weight. Yet, even on the same diet, the yellow mice will end up decidedly heavier than the black mice. That means that the yellow mice are genetically obese and the black mice are genetically lean.

The gene for obesity is affecting the chemistry of the yellow mouse's body. You probably think the "workup" you receive when you enter the hospital is exhausting. That's nothing compared to the exams nutritionists give mice.

We can also look at dietary influence by changing the amounts or kinds of food available. Usually, experimental animals are given as much as they want of water and food pellets. This "lab chow" is like dog food. It's low-fat and nourishing, but not too interesting.

On this kind of bread-and-water existence, animals usually eat just enough to maintain a normal body weight. Not so with genetically obese animals. They will still get fat.

On the other hand, even animals that are genetically lean will eat more rich, tasty food than they need, and get fatter than they would on a chow diet. We fed a group of black mice cookies and a high-fat diet laced with mayonnaise and sugar and fortified with protein, vitamins, and minerals. They loved those fatty foods; they got to be about as heavy as the yellow mice eating chow.

You can arrange the diet so mice eat more. You can limit food to make them thinner. We tried that on some of our yellow mice; every time an extra ounce showed up, their diet was cut back. We fed them only as much chow as they needed to gain on a par with normal-weight black mice.

So now we had several groups of mice with different genetic and dietary backgrounds. They were all the same age—7 months, which is early middle age for a mouse.

There were fat mice, including "normally obese" yellow and dietary obese blacks. There were normal weight mice, both lean black and "dieting" yellows.

We compared a number of things between groups, including how much of their weight was due to fat, and how much was lean tissue (most of which is muscle). For our purposes here, everything that isn't fat is lean, so the higher the percentage of fat, the lower the proportion of muscle and other lean tissue.

Some of the results were obvious. Obese mice have more weight as fat. They therefore have less lean than thin mice. Anyone could have guessed that.

There were the other differences, however (Fig 1). Genetically obese mice had more fat when compared to dietary-obese black mice of the same weight. Overeating makes a black mouse overweight, but he gains more lean and comparatively less fat than an obese yellow mouse.

The yellow mice that had been on a strict diet didn't gain nearly as much fat as they would have on a normal diet. Nevertheless, they still had more fat and less muscle than naturally lean black mice.

The genetic tendencies toward fatness and leanness show up even when weight is changed with diet.

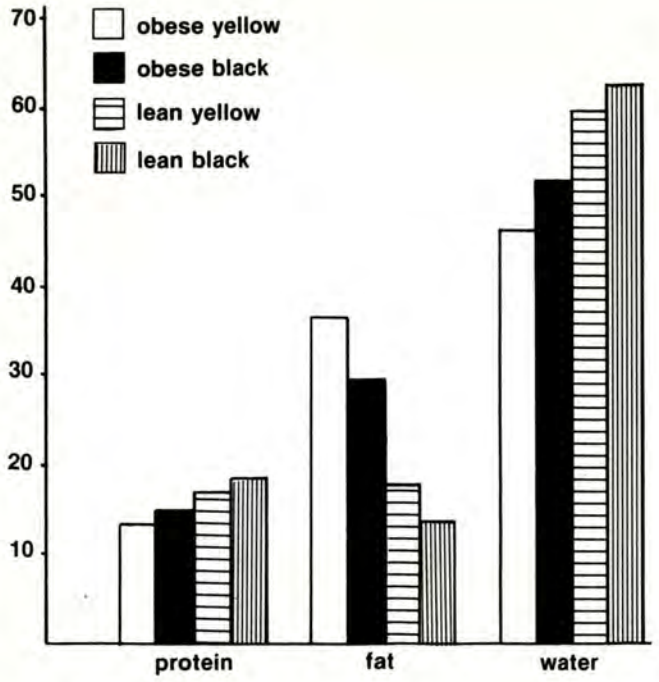


Fig. 1. Body composition of the experimental mice. The bars show the percentage of total body weight due to lean tissue (protein and water content, mostly as muscle) or from fat. Lean animals have proportionately more lean content than obese mice. Genetically lean mice are more lean than yellow mice of the same body weight. Likewise, yellow obese mice have more fat than black mice of the same weight.

It's an uphill battle if you want 'lean,' your heredity and/or appetite want 'fat'

Keep always in mind that it's often misleading to generalize about the human condition from animal experiments. We don't live on lab chow and we are all genetically very different. And the inheritance that makes animals fat can't always be compared directly to humans. For example, the gene that is defective in yellow mice is a mouse gene—it doesn't exist in people.

However, these kinds of results about body composition, genetics, and diet have been found in enough other animal and human studies that it's possible to draw some conclusions.

It's turning out to be a lot harder than anyone thought to have a smaller body weight than heredity and appetite would prefer.

Our "dieted" yellow mice were always hungry and would happily have become obese yellow mice if their chow hadn't been limited. They weren't "cured" by the diet. Likewise, dietary obese animals lose weight when they're put back on chow, but will gain again as soon as tasty, high-fat food is available.

How true is the same observation about people. Humans who lose weight on a diet often put it all back on again. Hunger, heredity, and taste—all three—still beckon. Successful dieters may find that staying slim gets easier after a while, but it can take years to make that adjustment in body, mind, and habit.

Knowing that animals stay leaner on low-fat, uninteresting food is not particularly useful.

"People chow" wouldn't find much of a market. Food is still a pleasure as well as a necessity. We can, however, aim toward a less rich diet that's lower in fat. This is healthier in many ways, and is less likely to produce obesity. You can have rich food occasionally, but mix it with lighter meals.

What tastes good may not be 'good' for us; too much 'good' food may be bad, too

There are hereditary differences that influence how much a person weighs. These tendencies are, in turn, affected by how much and what kind of food that person eats. High-fat, tasty food is likely to make people and animals fat.

Even people without a definite genetic tendency toward obesity might very well become overweight on the average American diet, which is usually high-fat, nourishing, and good tasting. And unlimited. There's fast food waiting at every corner, and most of us can afford it.

"Why do people get fat?" It's a complicated mixture of inheritance, too much good food, and too little exercise. There are no easy, magic answers yet.

"How can we lose weight?" Miracle diets come and go, leaving us with less money and patience, but usually not less weight. Any sensible diet can help a person to be thinner, but staying thinner takes real will power and a permanent change of habits.

The yellow mouse doesn't have to worry about that; he just chows down. But he doesn't have any choice. We do.

The author is Mary Rosholt, assistant professor in the Department of Nutrition and Food Science.

The 'Norbeck experience'

After 20 years Norbeck Station closes, interseeded pastures still going strong

The closing last February of SDSU's Pasture Research Center at Norbeck wrapped up 20 years of research on how to better manage pastures, ranges, and forage crops in central South Dakota.

The University will continue its research on how to get more profit from cattle on pasture and range, but it will be done at another site, says Dr. Ray Moore, director of the Agricultural Experiment Station.

"It is not uncommon for us to start a research station and close it 20 years later," Moore said. "We identify a

problem, find the answers in a reasonable time, and when we're done, we terminate.

"If we have the resources (money, time, and the scientists), we move on to other problem areas or tackle the next highest priority on our growing list of research needs," he said.

Pasture and forage research will continue in South Dakota, but the main emphasis will now be shifted to other areas of the state—possibly the southeast and the west-central. At least for the immediate future, the research will be done on farms and ranches of cooperators, Moore said. SDSU had leased the farm in Faulk County.

Boost from interseeding is still there for you to see

One of the primary reasons for doing research on the 2,665-acre site was to evaluate the interseeding of improved species under actual grazing conditions. "We needed such an area to evaluate the pasture-type alfalfas that had been developed at the Experiment Station in the late 50s and early 60s," Moore said.

Reflecting on the Norbeck experience, Moore, who himself was project leader for the first 10 years, said that its greatest contribution was in interseeding.

"One thing that will remain at Norbeck for years and years to come, after a lot of things are gone, is the benefit of interseeding."

The benefit he speaks of is the fertilization of the range by the pasture-type alfalfas interseeded into it. They give the native range a boost and also increase the carrying capacity by providing more forage plants.

Dale Curtis, former superintendent of the center, now a county agent at Ipswich, agrees. "Interseeding is one of the big things we've done of benefit to ranchers, because we've proven it can be done in this part of the state."

He added, "We need to keep at it so we can get better stands of alfalfa in drier parts of the state," and he cited work done with crop barriers such as sunflowers and Sudangrass, which he hopes will hold snow over the winter to help the alfalfa become established the next year.

Research ranged from fencing and bale comparisons to pasture costs

Over the 20 years scientists published bulletins, fact sheets, and articles as soon as they knew their data was valid and reliable. Most of this data is helping South Dakota agriculture right now, according to Moore. Some of the information released:

*Beef producers can get better net returns by using pasture systems other than strictly native range. Short-season pasture systems yield the highest returns, but interseeded pasture systems yield the highest returns with lesser productivity levels.

*More intensive pasture management holds the potential for raising cattle producers' net incomes by increasing carrying capacity on currently used acres, reducing the need to expand and buy more land.

*Improving pasture systems increases their carrying capacity. However, improved carrying capacity doesn't necessarily increase gains per animals or average daily gains. It relates, instead, to number of animals you turn onto the pasture.

*Interseeding into established sod significantly increased carrying capacity of native range from approximately 34 to 46 grazing days per acre, a 35% increase.

*Two kinds of grasses—cool-season and warm-season—can be fitted into season-long programs of pasture management to provide a longer grazing period. As the names suggest, one kind of grass thrives in cool weather of early spring and autumn, while the other grows mainly during summer. Producers can tack an extra week onto each end of the pasturing season by growing cool-season grasses.

*When moisture is available, that is the best time to plant grasses, except when it is very hot. Scientists studied seasons of the year—early spring, late spring, mid summer, early fall, late fall. The best season was the one that had moisture. Early spring usually is good, but planting can be done in August on summer fallow ground or whenever there is good moisture.

*A drill used for planting grass seed must do three things. It must meter out the seed uniformly. Most grass seeds are very tiny and free-flowing, or else are large and bulky and don't move through the seeder easily. The drill needs an agitator in the seed box to stir the seeds and keep them moving down. And it must have a depth band or some way of controlling depth so the seeds don't get planted too deep. You need separate boxes for legume and grass seeds because they have different shapes and weights.

*When planting grass or alfalfa, something like a nurse crop is needed to protect the seedlings from the wind and hot sun and to prevent soil erosion, but it must not rob the seedlings of nutrients, water, or space. The ideal "nurse crop" is stubble left over from a crop the year before.

*If a nurse crop of grain is planted, it is better to plant at something less than seeding rate normal for a cash crop. Examine the field as harvest approaches to see if the alfalfa and grass seedlings are surviving. If they are starting to suffer, then the cover crop must be taken off as haylage.

*For warm-season grasses, average daily gains were highest on Indiangrass, followed in order by summer switchgrass, Nebraska 28 switchgrass, sideoats grama, and big bluestem.

*Pasture and forage crops can hold their own, economically, against most other crop programs in the long term, if managed properly. The economics of land in grass production was compared with small grains and row crops. The prices of both grain and livestock had a decided effect on the results.

*Regardless of how a forage crop seed is planted, it must be shallow sown in a firm seedbed, and excessive competition from other plants must be removed from new seedlings.

*Large round bales need to be stored in a well drained location, but should not be stacked and should be spaced 18 inches apart to allow for good air circulation between the bales. If not separated, moisture is retained and they spoil.

*Large round bales were the least expensive to put up, when compared with compressed stacks, small rectangular bales with mechanical handling, and sweep and stack.

Over the years, researchers also worked on long-span fences, suspension fences, an automatic fencing machine, and racks for feeding large round bales. They fertilized and sprayed range, established crop barriers, and compared rates of seeding, times of seeding, and seeding mixtures. They evaluted established stands, supplemental pastures, seed production, and many other subjects.

'Norbeck experience' was one of best cooperative research projects we had

The Pasture Research Center was established in 1965 near Norbeck and 3 miles west of Wecota and a mile north. The location in northern Faulk County was chosen because it is typical of about a 20-county area in central South Dakota.

In 1965 a federal grant of $90,000 was received to study the efficiency of beef cattle production under various methods of land use and cattle management. The first 10 years dealt with research on the lifetime productivity of a cow herd of 300 on native, short-season tame, and full-season tame pasture.

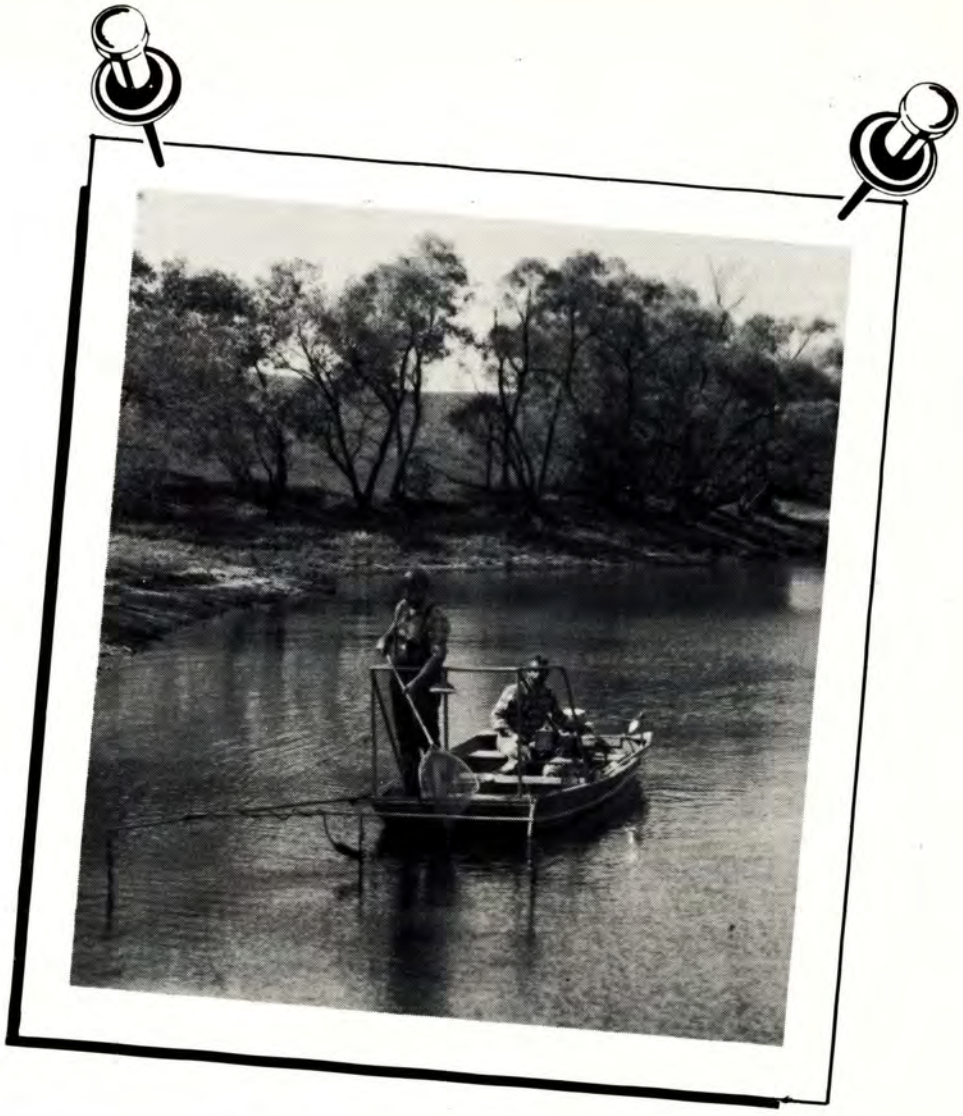
Researchers were interested in the reproductive performance of the cows as indicated by number of calves, weights of calves, and total beef produced per acre.

In 1975 an additional federal grant of $146,000 provided an opportunity to change directions and to continue the center. The new emphasis was on the most efficient way of minimizing the utilization of forages by growing and finishing beef cattle.

The scientists put yearling cattle on native and improved pastures at different levels of energy supplements and different winter rations.

Moore said that the Norbeck experience "was one of the best examples of cooperative research that I've seen." Involved in that research were both federal and state dollars, and researchers from several departments at SDSU, including Plant Science, Animal and Range Sciences, Ag Engineering, Horticulture, and Economics.

The writer is Jerry Leslie, information specialist in the Ag Communications Office.



'South' doesn't apply

South Dakota is far north when it comes to largemouth stocking recs; we need our own

Why is it that you can catch bigger largemouth bass in the southern states?

Why do you seem to catch more bluegills up north, and scrawny ones at that?

One major reason may be latitude, say SDSU Wildlife and Fisheries Department biologists Chuck Scalet and Tim Modde. Quite simply, the farther north you go, the smaller the largemouth bass are, while bluegills stay the same size.

This can lead to bluegill over-population.

This could happen in your pond or lake if you follow the long established largemouth bass-bluegill stocking recommendations adopted by the U.S. Fish and Wildlife Service and the Soil Conservation Service. They are good recommendations—for southern states, for which they were designed. However, despite the "South" in our name, in our state the situation is different.

But why should latitude affect largemouth-bluegill interactions?

Good question. That is why we constructed model largemouth bass and bluegill populations at SDSU. These

models were based on average growth rates of the two species in Montana and Oklahoma.

We found that largemouth bass did not grow large enough to eat many of the adult bluegills. Not only were there more surviving bluegills to spawn; the largemouths themselves did not grow large enough to spawn in the second year after stocking. The reasons for this slow growth are associated with latitude—factors such as climate (length of growing season) affect the growth rate of largemouth bass.

You need enough forage fish for food, not so many they take over

It's possible to have balanced largemouth bass-bluegill populations in South Dakota, but there's a catch.

In a balanced situation, you can't expect as many quality sized largemouths as you would in southern and mid-latitude states.

Our largemouth bass just can't grow as large or spawn as early as their southern counterparts.

With this in mind, there are three alternative stocking strategies you may wish to consider: 1) don't stock bluegills, 2) stock additional small fish, or 3) use the split-stocking method.

Not stocking bluegills with largemouth bass has been tried in the north in the past. The result is great fishing the first year or so, but then growth slows. Most bass won't reach trophy size. Largemouths need forage or else they will eat their own young. Their growth rate may also be stunted.

Stocking other forage species has also been tried in the past, with some success. Fathead minnows are a good starter forage for young largemouths. The problem with the fatheads is that they are rapidly reduced in numbers. If fatheads are used as an alternate forage species, they pretty much have to be stocked from year to year.

Other forage species that have been tried have not worked as well as bluegills. However, stocking an alternate species **and** bluegills can be effective. For instance, fathead minnows work well when combined with bluegills. The fatheads are eaten primarily by young largemouth bass, allowing some largemouths to grow large enough to spawn in the second year.

Using a split-stocking strategy avoids the problems encounted if second-year largemouths don't spawn. One strategy involves stocking adult largemouth bass the second year in addition to the young ones stocked in the previous year.

A second strategy is to stock adult largemouth bass the first year instead of fingerlings. The adults can more readily control the young bluegills and will spawn the second year.

Try stocking fathead minnows with either of these two strategies for even better results. But remember that in most cases you can't just stock fish, leave them alone, and then expect year-after-year good fishing. Sooner or later the population will become unbalanced.

Stocking is only part of the story; make hunting easier for largemouths

Stocking strategies will help initially, but you need to maintain your pond or lake.

If you don't, you risk throwing your largemouth bass-bluegill ratio out of whack again, since the growth differential between largemouths and bluegills still exists.

First of all, go easy on the largemouths. Don't try to fish the water dry. If you do hook a lot of larger bass, put some back. Keep your reputation as a fishing hotspot to yourself and a few lucky friends.

Go ahead and catch as many bluegills as you can.

You also need to maintain the fish habitat. Eliminate large areas of shallow shoreline to provide more hunting area for the larger bass. Keep that watershed under surveillance. Silt runoff is no good, for the fish or for the land.

A final suggestion is to control the growth of vegetation in your pond or lake. Removal of cover exposes small fish to larger predators, which reduces the surplus of small fish. The forage fish will have a better chance of growing, too, if you reduce their overcrowding.

Chuck and Tim want to hear from **you** if you have a real fishing hotspot. They'll keep the secret, but they may visit you. Fish may be their work, but fishing is their hobby.

The author is Kim Fryer, former journalism intern in the *Ag Communications Office.*

Trees in trouble

First year of survey shows windbreaks in sad shape. We can't afford to lose them

We've all heard the stories of how pioneers in South Dakota, hard pressed enough to merely survive, still took the time to plant trees on their claims. We've heard of how the wash water routinely was carried to the young trees and of the heart break when they shriveled in dry years.

Since then, windbreaks have provided comfort and protection to South Dakotans for 100 years. Many thousands of acres were put into trees to protect fields, farmsteads, and feedlots, many of those acres planted in the 1930s and 40s during the Prairie States Forestry Project. These tree plantings were an integral part of a broader program which helped return devasted farmland to a productive status.

Now we have a problem. Our windbreaks are in sad shape; 67% in 11 South Dakota counties are in need of renovation due to heavy grass cover and old age.

We have no reason to believe the percentage will change much after we finish a state-wide survey of South Dakota windbreaks conducted by research and Extension foresters and personnel from the State Division of Forestry, the Soil Conservation Service, and local Conservation Districts.

The survey began in the summer of 1984 with 1,130 windbreaks in 11 counties: Minnehaha, Pennington, Beadle, Codington, Brookings, Charles Mix, Hyde, McPherson, Stanley, Walworth, and Todd. By the end of 1986 we will have covered the entire prairie region of South Dakota.

Survey shows too few windbreaks are being renovated or even maintained

Although two thirds of the windbreaks already studied require renovation of

This windbreak is suffering from grass competition and old age. The shrub row is nonexistent and there are large gaps in the middle and upper canopies. In the picture at the beginning of this article, the lower (shrub) and middle (short tree) levels are continuous. The upper (tall tree) level may have a few small gaps; it still is a windbreak in excellent condition.

some sort, only 13% have received it.

This does not mean a lack of commitment by landowners to replace deteriorating windbreaks. Renovation can be very difficult and in some cases expensive. Research is needed to identify the factors involved in successful windbreak renovation, and to determine cost-efficient methods of carrying out such programs.

Windbreaks must be kept free of competing vegetation until the tree canopy completely shades the ground within the windbreak. Plantings receiving this type of care are healthier and provide better field and farmstead protection.

Eighty percent of the windbreaks had heavy grass or weed cover. Grass and weeds damage a windbreak, no matter its age. Sixty-five percent of the windbreaks that were "clean" were rated as good or excellent, while only 25% of the sodbound windbreaks received these ratings.

Old age is also beginning to tell. A tree too has a finite lifespan, like any other organism. Harsh environmental conditions, such as those found in the northern Plains, significantly reduce this lifespan. Depending on local site conditions and the care the trees have received, most hardwood species can be expected to begin declining in vigor after 30 to 50 years.

Well over half of the windbreaks in South Dakota fall into this age bracket.

Table 1. Preliminary results (1,130 windbreaks in 11 counties) of a condition survey of South Dakota windbreaks.

Windbreak condition	
Excellent	16%
Good	17%
Fair	25%
Poor	28%
No barrier	14%
80% have heavy grass or weed cover	
15% are grazed	
57% are 30+ years old	
24% rated good to excellent	
44% of windbreaks under 30 years old rated good to excellent	
13% have received some form of renovation	
34% contain conifers	
9% contain ponderosa pine	
almost 50% of the ponderosa pine has suffered severe mortality	
11-13 ft were the most common row spacings (42%), and 6 was the common number of rows (15%)	
22% of the plantings consisted of three species; 18% consisted of five	

The survey also revealed the effects of grazing on windbreak condition. Only 14% of grazed windbreaks were rated as good to excellent, compared to 36% in ungrazed windbreaks.

Another problem pointed out by the survey is the low survival rate of ponderosa pine. If this species is to be useful in windbreaks, greater efforts must be made to improve early survival and growth. One of our needs is to find superior seed sources.

That windbreak is more valuable than you think; try to save it

Our need for windbreaks remains just as critical as it was for the pioneers. A well designed, vigorous windbreak will reduce winds 70 to 80% in its lee, cut winter heating costs by about 33% during 15 mph winds, reduce winter livestock feed costs, and increase crop production significantly.

But age has a way of creeping up on both us and the trees. Many of the windbreaks are past their prime and will only decline even faster if renovation efforts are not redoubled. We can't wait any longer.

The authors are Peter R. Schaefer and Norman W. Baer, research foresters in the Department of Horticulture-Forestry.

The gee-whiz crop

Is it a wonder crop or is it a bomb? Don't plant it if you can't market it

Been looking for a specialty crop that will pay off the farm mortgage in 3 years?

Who hasn't??

Just as sure as spring follows winter there will be dozens of farmers and landlords across the state who will be tempted by a pitch like that from somebody again this year.

It feeds on that desire to get in on a bonanza of "green gold" before the rest find out about it.

You can usually count on one thing—the fast talking salesman will seldom show you data collected by a land-grant university to support his claim.

Yet helping South Dakota farmers look for specialty crops that may provide some additional income or cash flow has always been a part of Experiment Station and Extension work at South Dakota State University.

Some of those new crops were true wonders; others fizzled. Quentin Kingsley, a recently retired agronomist for our Experiment Station, recalls evaluating a wide variety of them at one time or another over the past 30 years—castor beans, crambe, sunflowers, rape, soybeans, safflower, mustard, fodder beets, millet, kochia, tyfon, sesame, lentils.

It isn't the growing; it's the marketing that can trip you up

Growing specialty crops is not difficult in South Dakota, if you have people like Kingsley and his fellow scientists working with you. Finding a market for those new crops is the problem; and it's a big one.

South Dakota has a number of specialty crops that have hit the big time—quantities of a million bushels or more.

In 1984 South Dakota farmers grew over 600,000 acres and harvested 630 million bushels of sunflowers. Only North Dakota harvested a larger crop.

Even though the state doesn't make the top ten in the soybean league, at least 15 South Dakota counties harvested a million bushels or more in 1984. Overall, South Dakotans planted about 1.4 million acres and harvested 31 million bushels.

Think of oats as also a specialty crop. Special markets exist for "race horse oats," a top grade, high test weight oat with a very white hull. About 25 million bushels of South Dakota oats are taken by the milling trade, while between 5 and 10 million bushels are marketed as premium quality oats for other uses, according to Dale Reeves, professor of plant science and an SDSU crop breeder.

Other grain crops that easily qualify for the specialty crop category include durum wheat, rye (South Dakota led the nation with 10.8 million bushels produced in 1984), flaxseed (we rank second in the nation), barley, and sorghum.

So much for the old-timers; now for the newcomers. They are . . .

. . .chickpeas

One that is catching the imagination of crop scientists as possibly suited to western South Dakota is the chickpea. Sometimes called "garbanzo bean" this high protein pulse (grain legume) ranks as the third most important legume crop in the world, according to Arvid Boe, assistant professor of plant science at SDSU. Only dry beans and peas outrank it.

Chickpeas are the primary food of India and other Asian countries and are planted in Africa, the Far and Middle East, Central and South America, and Mexico.

Research on chickpeas began here in 1981 after Solomon Tuwafe of Ethiopia enrolled as a graduate student at SDSU. Tuwafe saw that the climate and soils of western South Dakota were well suited to chickpea production. He was also familiar with germplasm collections at the International Center for Agricultural Research in Dry Areas (ICARDA), located in Syria.

Tuwafe selected several varieties and planted them in experimental plots across South Dakota. Preliminary data suggest that chickpeas may be well suited to the drier areas of our state. Plots near Highmore, Wall, and Rapid City yielded over 1,000 pounds per acre over the 3-year period.

Chickpeas do not do well in high humidity areas. In fact, a drought in August appeared to help the crop mature, Tuwafe says.

Larger seeded varieties of chickpeas are grown in California for the salad bar market. Over 90% of the world production is from small seeded varieties, however. Although more research is necessary, scientists believe chickpeas can be used in livestock rations and perhaps can be fed without cooking.

The present research project is under a special contract with a company that wants to develop new markets for this specialty crop.

Finding the varieties best suited to South Dakota and those that resist potential blight and other disease problems will be among the highest research priorities.

. . . horticultural crops

In the horticulture area South Dakotans have tried many specialty crops. Success is based almost entirely on markets available.

For example, dry edible beans can be grown successfully in an area between Interstate 29 and the Missouri, but markets have not yet been developed to sell the product. Growers in western South Dakota have also found that they can grow beans. The three popular varieties are navy or pea bean, pinto, and red kidney, according to Paul Prashar, professor of horticulture at SDSU.

The potato acreage expanded in South Dakota from about 4500 acres during the 1960s to over 18,000 in 1983. Clark County producers grow and harvest 85-90% of the state's potatoes, according to County Agent Chuck Langner. The bulk is raw product for a local plant that supplies the french fry market. A significant share of the Clark County crop is shipped out of state to a potato chip firm.

Langner says almost the entire crop is produced under contract for those two major outlets. Yields average between 140 and 150 cwt per acre.

Currently there is a lot of interest in the possibility of growing potatoes under irrigation along the Missouri River. Prashar believes the venture will be a solid one if a company can be convinced that it should locate a processing plant near the production sites.

Prashar feels that the southeast corner of the state has the growing conditions and the location for more commercial vegetable production. Truck garden operations have flourished but on a

Solomon Tuwafe brought chickpeas to our attention. Since it is indifferent to—or even prefers—a little drought, the crop seems a natural for our state. But we need more research into how chickpeas will fit into livestock rations, and we particularly need markets. Undeveloped markets are the roadblocks for most specialty crops that we know we can grow in South Dakota.

sporadic basis because of the problems in market development. There is a large melon industry in the Sanborn County area.

. . . Christmas trees

As sure as December 25 is the demand for Christmas trees. Here's a market that already exists; people don't have to be persuaded that Christmas trees are "good for them."

With the demand here, why not the supply here? A hauled-in Christmas tree is only part branches and needles. The rest is transportation cost.

Foresters such as Larry Helwig on the Cooperative Extension Service staff feel that there is a potential, although limited, market in the state for about 120,000 locally grown trees.

Scotch pine can be grown to market size within 6-8 years. Recent developments in drip irrigation have improved crop success and make it possible to grow this tree in almost every area.

"They don't require a large acreage and almost every town is a potential market for locally grown trees," Helwig says. "At present there are not more than 25 plantings of trees being grown for this market in South Dakota, although we hope to organize a Christmas Tree Growers Association within the next year."

. . . trees for fuelwood

A new idea for specialty crops is growing trees for fuelwood. A firewood plantation was established at the SE Experiment Station farm located near Beresford in 1984 as a joint project between SDSU and the State Division of Forestry.

Pete Schaefer, assistant professor of horticulture-forestry says the plantings include honey locust, Siberian elm, green ash, and a hybrid poplar.

While most research in the U.S. has been on large-scale plantings suited for fueling electrical power plants, very little has been done on smaller plantings harvested by the individual for the home stove or fireplace. The primary objective of the South Dakota study is to determine the economics of growing wood as an alternative home heating fuel.

Schaefer says plantings will be established in other areas of the state as soon as resources become available.

. . . bedding plants

Although the idea for plastic greenhouses was developed at the University of Kentucky in the early 1950s, the structures were never evaluated in a climate this far north until 1956 when a research project was initiated at SDSU.

Encouraged by that study and the suggestions for modifying the plan to make plastic greenhouses more suited to a northern environment, growers have specialized in growing bedding plants and now provide started vegetable plants such as cabbage, tomatoes, and peppers for a local market.

Nearly every South Dakota town of 1,000 or more now has at least one plastic greenhouse, according to Dean Martin, Extension horticulturist at SDSU.

. . . apples, berries

A strong advocate of fruit growing in South Dakota is Ron Peterson, professor and former head of the Horticulture-Forestry Department. He believes that small communities also provide a market for strawberries, raspberries, and similar crops. An acre of strawberries will provide fruit on a pick-your-own basis to a community of 1,000, he says. Yet only about 40 acres of strawberries are now grown in the state.

Peterson sees a growing interest in large fruit plantings. At least 65 acres of apples have been planted in eastern South Dakota during the last 3 years.

Some of the varieties that he would recommend for South Dakota include Harolson, Courtland, Spartan, Redwell, and Red Baron.

. . . mushrooms

Another crop catching the imagination this year is mushrooms. Although fresh mushroom prices are depressed on the east and west coasts, Midwest growers were getting about $1.00 per pound in mid-summer 1985, according to Robert Todd, head of the Microbiology Department.

Growing mushrooms is a far cry from conventional gardening. Most growers convert an old building and equip it with temperature and humidity controls. Air movement is important. For the compost they use a variety of things, but a mixture of wheat straw and horse manure is a common choice. Old hay, cobs, and similar materials can also be used.

The grower must have some way of pasteurizing (steam heating) the compost to kill insects, nematodes, pest fungi, and other pests. It takes between 3 and 4 months to complete a production cycle.

A small operator could hand harvest between 4 and 6 pounds of mushrooms from a square foot of properly prepared compost depending on how well he controls production factors.

. . . and a potpourri of others

One crop that SDSU researchers are working on could be a support crop for a mushroom industry.

Rye is considered to be an excellent base for growing mushrooms. Rye is especially adapted to South Dakota's soil and climate. The grain can be fed. The plants can provide both fall and early spring grazing for livestock. Lodging has been a problem with some varieties, but if a straw market can be developed, this could be another way to utilize this crop.

Reeves is selecting shorter stiff-strawed varieties that will stand up under local conditions.

Boe is lookings at another crop that was called to his attention by Tuwafe. Teff is a warm-season annual that could supplement cool-season grasses because it likes the heat of mid-summer.

Beckmannia grass, native to the U.S., often grows in sloughs and potholes or on lowland areas. It can be planted in the fall, can produce up to 2½ tons of 18% protein forage per acre, and is a short-lived perennial. Boe says it does not produce the permanent sod that is commonly associated with reed canarygrass, for example. It is now being evaluated for quality and palatability.

American licorice grows throughout South Dakota. It does well when seeded or transplanted into spoilbank areas. The forage value has never been determined but it is eaten by livestock. It is shunned by the sheep grower, however, because the spiny seedpods often become lodged in the wool of sheep. If selections could be obtained that eliminate this problem and increase tonnage, licorice could become another important legume crop.

So simple we overlook it: If you can't market it, then don't grow it

What should you do before you try a specialty crop?

Research and Extension at SDSU agree that the first and most important thing to consider is market.

Once it is determined that a market either exists or can be developed, the second most important factor would be growing site and its relationship to that market. Availability and cost of water is the third thing to think about.

There may be many other specialty crops and income opportunities for that enterprising individual who is willing to seek out potential markets and work with that outlet to produce according to the market needs. That's the key to successful crop production of any kind, but it is even more critical with a specialty crop.

The golden rule for those who want to venture into specialty crop growing: "Start small and learn from your experiences with that crop."

An equally important one may be: "Don't be afraid to work with your county agent or someone else on the Extension or research staff at SDSU." They are willing to work on a confidential basis with anyone interested in trying a specialty crop.

That expertise may be able to prevent you from making the same mistakes others have made in their search for "green gold."

The writer is John Pates, head of the Ag Communications Office.

Ping-pong piglets

Ping-pong balls were stand-ins for piglets in prize-winning (and marketable) student research

You may be comfortable. The sow may be comfortable. How are the piglets doing?

A good farrowing house manager can read the signs. Little pigs lying in a heap on top of each other are too cold. If they're separate, sprawled out over the creep, they're comfortable—or too hot.

It's cold that most concerns us. That's why we put supplemental heat (usually as electric heat lamps, but sometimes as gas or electric radiant heaters, heating pads, or concrete-embedded hot water pipes or electric cables) in the creep area.

Although there are a variety of radiant pig brooders (the most common type) on the market, most of them have never been tested for effectiveness.

Five SDSU engineering students, all from farms and with considerable background in swine operations, have found that they could design and build a better radiant brooder than anything now on the market.

The design team included Paul Davis, Rosholt; Rod Korthals, George, IA; Barb Wiersma, Beaver Creek, MN; Jerry Zackman, St. Michael, MN; and Brent Jorgenson, Montevideo, MN.

All were enrolled in the "concept and design" class of Dr. Les Christianson, associate professor of agricultural engineering. The idea for their project came directly from the manufacturers the team talked to.

Before they were done, the students had built not only a prototype heat lamp, but model farrowing crates, had estimated wholesale and retail costs—right down to the cost of labor to stamp, trim, notch, and rivet the product, and figured annual operating costs for the farmer. They won a regional collegiate design contest, entered national

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