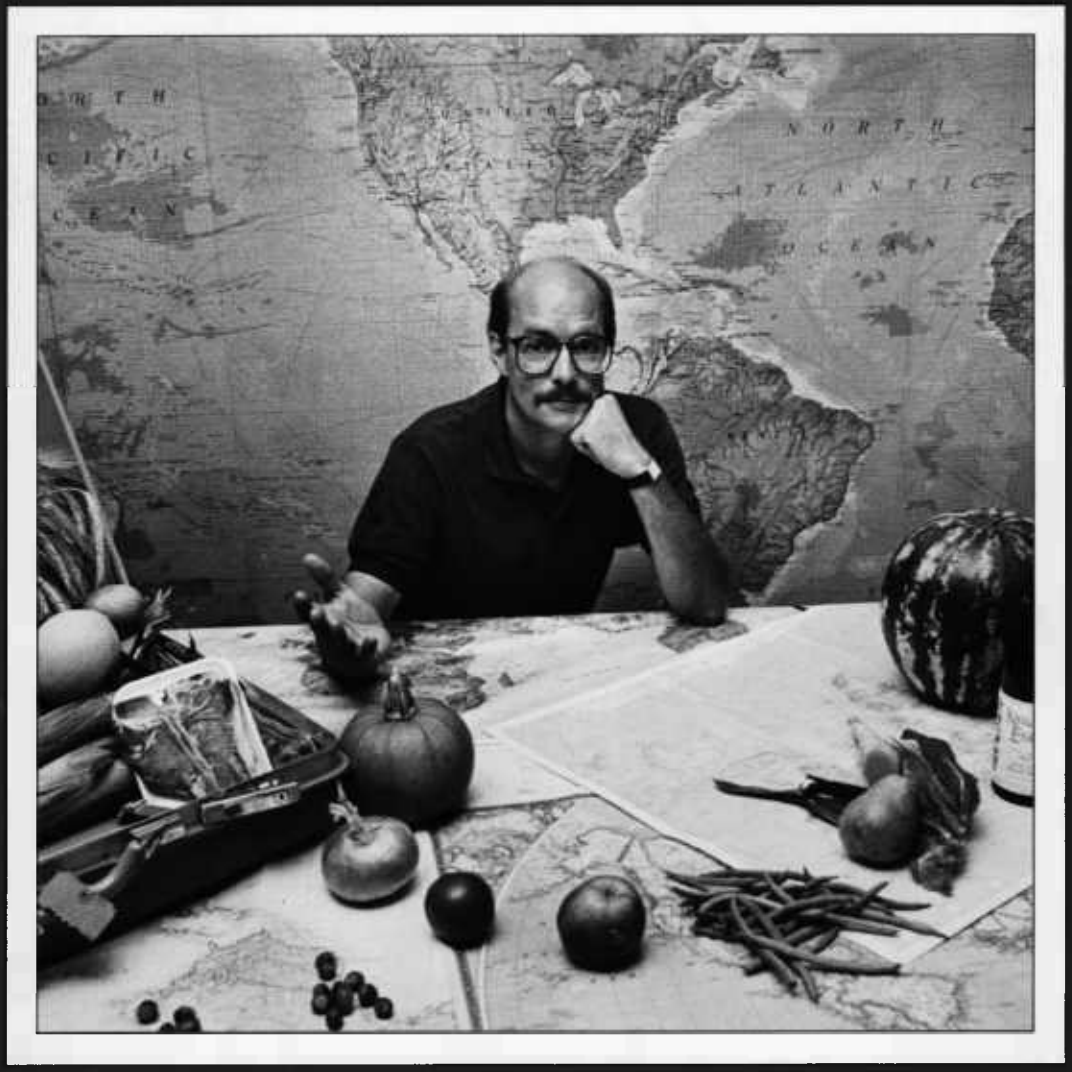
Where Is Oregon Agriculture Going?



A report to the public from the Oregon Agricultural Experiment Station,
Oregon State University, Corvallis, Oregon

Contents

Front cover: OSU agricultural economist Mike Martin is studying domestic and foreign markets for Oregon crops.

Back cover: Alex Brun, left, and his brother Peter taste experimental strawberries during a public field day at OSU's North Willamette Agricultural Experiment Station at Aurora.

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Robert E. Witters
Acting Director
Oregon Agricultural Experiment Station

Our Farmers Must March Into a Brave New World

Where should Oregon agriculture be going? That's a fascinating question, especially these days. The state's economic condition demands that Oregonians pay careful attention to the health of our natural resource-based industries.

This report is intended to give you an up-to-the-moment picture, through a few examples, of what the Agricultural Experiment Station is doing for Oregon agriculture, a natural resource-based industry that is an economic mainstay.

Finding a place to sell Oregon products for a profit is the name of the game. So, as you'd expect, marketing research plays a key role in our attempt to find out where agriculture should be going. A large portion of Oregon agricultural goods is exported to other countries. Our scientists are studying how to develop new international markets for traditional, and alternative, crops.

And, while international sales are extremely important, we know we mustn't forget that the United States is the biggest buyer of them all. Opening new domestic markets for our products, say a product made from Oregon wheat, could help tremendously in reducing our current crop surplus situation. That's part of our research, too.

But the search extends beyond marketing in the narrow sense. Our research reaches into many areas intertwined with marketing.

Food processing is an example. Generally, in-state processing of crops can double or even triple their value to the economy. Our researchers are delving into new high technology that will make the processing and packaging of Oregon crops more cost-efficient and increase product quality and shelf life. Longer-lasting products we can sell cheaper and still make a profit—that will open new markets.

Another example: One of the great limitations in Oregon agriculture is inefficient, and thus uneconomical, crop production and handling. Powerful research tools such as biotechnology and computer technology offer opportunities for reducing production costs while improving the quality and handling characteristics of our crops. Those, too, will help our farmers compete in old and new markets.

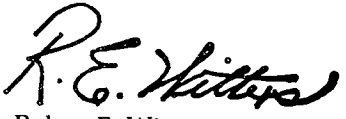
In areas like these, the Experiment Station is trying to avoid wasting money. We're trying to employ these tools in practical research areas where we think they'll have an immediate payback.

Some examples of that? Developing computer expert systems software (an article that follows explains what that is) to help farmers achieve more economical and effective crop irrigation and pest control; using tissue culturing and other biotechnological innovations to create higher-quality, disease-free crops that return more profit per acre; developing tissue culture and other genetic technology to the point where entrepreneurs in the state will be able to use it in new business enterprises.

Just over the horizon there are technologies, like the use of robots, that could make farming and food processing more cost-efficient and, thus, expand potential markets. We'll be looking at which direction Oregon agriculture should go in those areas.

> Research, if it's properly supported, will lead the way.

Like the state as a whole, our farmers have had a tough time of it recently. In key areas, there are surpluses and prices are down. Many of us agree that, to stay competitive, Oregon agriculture is going to have to march boldly into a brave new world of changing technology and global marketing. Research, if it's properly supported, will lead the way. I urge you to look at the examples in this publication and consider the excellent return Oregonians get on their investment in agricultural research.



Robert E. Witters
Acting Director
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He's Spreading His View on the Selling of Oregon

"I think you've got to market Oregon—not agriculture, or forestry, or high tech, or tourism. You've got to market it all together," says Mike Martin, warming to the topic that dominates his professional life these days.

"There's a lot to be learned from the Japanese style. Some Japanese exporters sell everything from bicycle parts to corn syrup. Maybe we can't send computer chips and apples on the same boat, at least not right away. But how about working together and sending Oregon grass seed and apples and prunes and wine? That could give a small shipper the volume you need to make the economics work out."

Martin is an agricultural economics professor at Oregon State University and a researcher for OSU's Agricultural Experiment Station. He's working on seven projects he hopes will help the state's farmers and ranchers escape from the financial vise that is squeezing in on them from several directions.

Overseas marketing and price analysis are his specialties. That's good. Oregon farmers traditionally sell about half of their crops in foreign countries.

His seven research efforts:

1. A detailed study of the impact of wheat on the Oregon economy.

2. A study of how programs that promote specific crops in overseas countries affect the total agricultural sales volume. For example, if a promotion increases Oregon wheat sales in Egypt, how will that affect the state's overall share of the agricultural sales market there?

The topic may seem high-flown to struggling farmers, says Martin, but it is very important in developing a marketing strategy that boosts total sales instead of just putting one commodity ahead of another.

3. A look at the potential for selling hard red wheat, grown in the Northwest, overseas. Most wheat grown in the area now is soft white wheat. Surpluses and shrinking markets have driven down its price.

4. A study of how the import system in the developing world matches the export system in states like Oregon.

"I believe 85 percent of the Third World ports can't handle the ships that come from Portland," says Martin. He thinks Oregon should look for innovations geared to smaller-volume sales.

5. An attempt to find the best way to use the labor force in the various regions of Oregon.

6. An examination of what he calls "erroneous assumptions" about why countries import. Martin contends that Oregonians, and others in the United States, must develop a better marketing model. In estimating sales potential, it should take into account the goods countries like Japan buy for resale to other countries, cutting demand there.

7. A study of how the entry of Spain and Portugal into the European Common Market will affect future agricultural imports to Europe, and of the "ripple effect" that will have on other areas that buy Oregon products.

Martin understands why farmers and exporters are desperate for "quick fix" solutions to their problems.

"People are always going to protect their turf, look out for their commodity," he says. "But someone needs to look at the big picture. That may not be a popular role. But it's an important one, and I think it's one the university should play. The State of Kansas, which has lived and died with wheat, is re-assessing where it wants to be in 20 years."

> "How about ... sending Oregon grass seed and apples and prunes and wine?

Martin has been giving workshops for agricultural cooperatives, sharing data with port districts and food processors, talking to commodity groups like the Oregon Wheat League and Oregon Potato Commission—spreading his views on the need to "market Oregon."

Oregon could learn some valuable marketing lessons from Japan, contends Mike Martin, OSU agricultural economist.


ATLANTIC
OCEAN

Could Plastic Put Our Crops in New Markets?

Mark Twain, of course, observed that everyone complains about the weather but no one ever does anything about it. He might give a wink of approval to some Oregon State University agricultural researchers.

They're experimenting with using special new nonwoven fabric, and plastic, row covers and black plastic mulches to protect valuable field and garden crops from weather extremes early and late in the growing season. The technique not only shields plants from light frosts. It could make them ripen sooner so Oregon farmers can compete in lucrative markets closed to them in the past.

Last spring in the Willamette Valley, the Columbia Basin, Central Oregon and other parts of the state, row crops such as cantaloupes, watermelons, cucumbers, sweet corn, tomatoes, broccoli, cabbage and Romaine lettuce grew faster and healthier while snuggled under various types of row covers.

"The covers could mean new markets, and even some new crops for this area," says Gary Reed, superintendent of OSU's branch agricultural experiment station at Hermiston.

An example: Hermiston is the leading watermelon-producing area in the Northwest. But the harvest usually doesn't start until late July. The peak of the watermelon sales season is around the Fourth of July. That means Hermiston growers must watch California competitors, whose melons ripen earlier, take the profits.

Studies suggest that the use of transplants instead of seeds, black plastic mulch and row covers may help melons ripen a month earlier in the Hermiston area, says Reed. Using black plastic mulch protects the transplants from weeds, while ventilated row covers are effective in protecting them from insects and diseases carried by insects, Reed explains.

A French company has expressed a desire to place a supply of 20-foot-wide row covers at the Hermiston experiment station next spring so the area's growers can experiment with them.

Bill Mansour, an OSU Extension Service vegetable crop specialist, brought the idea of using plastic on row crops back to Oregon from a trip to Europe, where the practice is commonplace. With some support from plastic companies, Mansour started doing research on the technique along with Delbert Hemphill, a horticulturist at OSU's North Willamette Agricultural Experiment Station at Aurora near Portland. Then the research spread to other parts of the state.

The techniques under study include: Using "floating" row covers, which involves placing a light plastic similar to a fabric directly on plants (the cover rises as the plants grow); using clear plastic row covers, suspended above the plants with wire hoops; using the black plastic mulches mentioned earlier.

Some of the coverings can be 40 feet wide and two to four thousand feet long. The cost per acre of buying and installing them is high, the researchers point out. But it appears the potential payoff from sale of the high-value crops may make the investment worthwhile.

That means Hermiston growers must watch California competitors, whose melons ripen earlier, take the profits.

"One of the benefits we think growers will be able to capitalize on is the higher prices usually available earlier in the marketing season or out of our usual marketing season," says Mansour.

Also, he adds, the cost of the covers may go down as more and more farmers use them.

Delbert Hemphill, horticulturist at OSU's North Willamette Agricultural Experiment Station, checks broccoli growing at the facility under a row cover.

Savage Feeds Them What Oregon Grows

Tom's looking for a turkey.

Actually, Tom Savage, Oregon State University poultry scientist, is looking for several types of turkeys.

If he finds them, the result will be a boon to Oregon's poultry producers and grain farmers. It'll also be good for the consumers who eat millions of the birds at Thanksgiving and Christmas and, increasingly, all through the year in specialty products like turkey ham and turkey bologna.

One goal of Savage's genetic research with different breeding lines of turkeys is to develop a strain of birds that producers can raise cheaper. He particularly wants a turkey that will put on weight quickly eating a diet of less-expensive, Oregon-grown feed grains.

"It comes down to trying to looking for another marketing avenue for Oregon farmers," says Savage. "My philosophy is, let's evaluate any grain grown in Oregon and see how it does as a poultry feed. Maybe we can reach the point where Oregon-grown turkey means not only grown here but on feed grown in Oregon. It's using turkeys as a vehicle for marketing other Oregon agricultural products."

The state's turkeys, Savage explains, are fed corn and soybeans, expensive items shipped mostly from the Midwest. So far he's tested triticale, a wheat-rye combination that can be grown in eastern Oregon, yellow peas introduced to the Willamette Valley, and fababeans, an experimental crop also under study in the Willamette Valley.

"Fababeans turned out not to be suitable for turkeys. They create leg problems," says Savage. But triticale and yellow peas are potential alternatives to out-of-state turkey feeds.

A variety of triticale called Flora, developed by researcher Matt Kolding at OSU's branch agricultural experiment station at Pendleton for production in the northeastern corner of Oregon, was particularly promising. Turkeys fed the grain did well. And in cooperation with Savage, OSU foods and nutrition researcher Zoe Ann Holmes studied the cooking traits of birds fed the grain. They cooked well and tasted good.

"Now," says Savage, "our growers have to start getting the yields that will make the price of triticale and yellow peas go down."

Savage also is studying breeding lines of turkeys to try and help Oregon producers solve a costly problem with infertile eggs, eggs that take up space in the incubator but don't hatch.

In related research, one of his graduate students is using new molecular biology techniques to examine turkey genes and identify the ones that cause some male turkeys to be high-volume sperm producers, a desirable trait.

Also, Savage is studying a muscle disease that affects the quality of turkeys, and he and his graduate students are studying use of the birds as an animal model that could be used in human disease research.

The turkey industry in Oregon has a history of success but has tailed off in recent years. But it is on the rise again, as it is across the country, Savage points out. A key reason is the birds' adaptable meat is going into new products such as turkey ham.

"It comes down to looking for another marketing avenue for Oregon farmers."

"The gross farm-gate value of turkeys was up 61 percent in 1985 over the previous year, to $12.1 million," he says.; "And this year poultry consumption (chickens and turkeys) exceeded that of pork nationally."

Turkey consumption is headed up. The $12.1 million farm-gate value of Oregon birds in 1985 represents a 61 percent rise over the previous year.

Milk Stays Beautiful Longer Thanks to Bodyfelt's Research

Ever take a cold carton of milk out of the refrigerator, pour yourself a big glass, then spit out the first mouthful because it tasted bad?

The main culprits were time and little creatures called psychrotrophic, or spoilage, bacteria.

Floyd Bodyfelt, an Oregon State University Extension Service dairy processing specialist, and some of his OSU colleagues have found a way to keep many Oregon consumers from having that miserable experience. They've also helped Oregon's $184-million-a-year dairy industry save money and produce some of the highest-quality milk in the country.

The key is a test for predicting milk shelf life the OSU food scientists developed for the state's dairy processors. They did it while working on an Oregon Agricultural Experiment Station project.

"We call it the Rapid Dye Reduction Test and everybody benefits from it—consumers, dairy farmers and processors," says Bodyfelt.

He explains that 10 years ago, when the OSU effort got underway, the best test for determining the potential shelf life of milk took 10 to 12 days.

"We did a survey and found that only about 20 percent of the processors were satisfied with their products' shelf life," says Bodyfelt.

The test they developed allows processors to check milk for spoilage bacteria in 24 hours or less. If necessary, they then can check raw milk or processing facilities for sources of contamination and make corrections in sanitation and temperature control. With the old test, they'd keep processing contaminated milk for days while waiting for the results.

Spoilage bacteria are not a health hazard, Bodyfelt points out. But they do cause off flavors.

Only about 20 percent of Oregon processors actually use the test, he says. The most important thing it has done is "focus a lot of attention on the only two sources of spoilage bacteria, the raw milk supply and post-pasteurization facilities and equipment," says Bodyfelt.

"We used to say only 10 percent of the fault for early spoilage was due to raw milk and 90 percent came from post-pasteurization contamination. Now, because of what we learned developing the test, processors say 25 percent of the keeping quality problem is due to raw milk. There's a lot of emphasis on sanitation and temperature control of raw milk, and more awareness of how to prevent contamination after pasteurization."

The result of the microbiological research is a longer shelf life not only for milk but for other high-value Oregon dairy products like cottage cheese and yogurt. Also, when processors know that the potential "pull date" for a batch of milk-based products is going to be earlier than normal, they can ship those products, which are perfectly safe, to a market where they will be consumed quickly.

The OSU food scientists aren't finished.

"We call it the Rapid Dye Reduction Test and everybody benefits from it—consumers, dairy farmers and processors."

"We're not completely satisfied with the test," says Bodyfelt. "It is simple, very sensitive and relatively economical to run. But we're working on a way of making it easier to do."

Even so, "now about 75 to 80 percent of the processors are satisfied with the shelf life of their products," he says, adding that Oregon is now known for producing some of the finest milk in the nation.

Oregon is known across the nation for high-quality milk, say OSU scientists who helped the dairy industry combat bacteria that cause off flavors.


SUNNY BROOK
VITAMIN A AND D
LOWFAT MILK
2% MILKFAT
PUSH UP HERE
SUNNY BROOK
2% MILKFAT
VITAMIN A AND D
LOWFAT MILK
HALF PINT
OSH
GOSH

They Want To Keep Oregon in the Red

Strawberry varieties are like cars: Even the great ones wear out eventually and have to be replaced.

So if you like lush Oregon strawberries, you'll like one of the research programs at Oregon State University's North Willamette Agricultural Experiment Station at Aurora, just south of Portland.

Lloyd Martin, the Station's superintendent, maintains a development pipeline for new strawberry varieties for Oregon growers. He does it in cooperation with Francis Lawrence, a U.S. Department of Agriculture scientist stationed in the horticulture department at OSU.

"It's like wheat," says Martin. "You get a good one and it's widely planted. But with time the weaknesses seem to come to the forefront. Growers say a strawberry variety just 'runs out'. Because of diseases or pest problems, they become less vigorous and don't look the way they remember them."

Martin's and Lawrence's job is to make sure a replacement is waiting in the wings.

"It usually takes eight to 10 years from the initial cross for a variety to move through the development system," says Martin. Plants are evaluated at every step along the way and thrown out if found wanting in quality or performance.

Martin, Lawrence and others at the North Willamette station planted about 6,000 strawberry seedlings at the station this year. They study them to find the ones with desirable characteristics.

Potentially, six variety selections are within a year of being released as commercial strawberry varieties, says Martin. But after additional screening, probably no more than two of the six will actually be released, he adds.

"The best-looking one may be one we call 4930," he says. "It has a little bit of a sharp taste when eaten fresh, but it has a good deep, dark color and a high processed quality."

Although Oregon strawberries sold fresh are exceptionally sweet and colorful, most of the state's berries are processed, either quick-frozen or sliced and frozen. Oregon is second in the country in the production of processed strawberries, behind California.

"The thing that makes the competition so strong," says Martin, "is that California grows strawberries for fresh market in huge quantities. But if they get rain, and the quality goes down, they just shunt those off into processing. They have a dual system of marketing, whereas we rely almost entirely on processing. Our quality here in Oregon— flavor and color—is what keeps us in the business.

"But," he adds, "California is getting new varieties that yield higher and have better quality. The competition keeps getting stiffer. We've done surveys of growers and they believe the most important thing we can do for them is develop new varieties. The Oregon Strawberry Commission provides research support, and most of that support is earmarked for variety development."

Those growers are still asking Martin and Lawrence for a variety as high-yielding and easy to grow as Benton, one of the popular ones grown these days, and as good-tasting as Hood, a variety released in the 1960s, says Martin.

"We're getting virus-free breeding material ...and propagating hundreds of plants from it by tissue culture."

The state of Washington is third behind Oregon and California in producing strawberries for processing.

"I think it's important," Martin says, "that we're now cooperating closely with researchers in Washington to develop varieties for the Northwest. We're getting virus-free breeding material from them and propagating hundreds of plants from it by tissue-culture and sharing the plants so both states can get a quick look at them."

The farm-gate value of Oregon strawberries was about $15.5 million last year. But in-state processing adds greatly to the economic impact of that figure.

A steady stream of new varieties is essential to Oregon's $15.5-million-a-year strawberry industry, says OSU researcher Lloyd Martin.

Big Trouble in Pear Country; Better 'Talk' to the Expert

There's no brain at the other end, but it sure is smart.

A doctor who calls the right number at Stanford University, in California, can describe the symptoms of a disease and get a quick diagnosis that draws on the knowledge and logic of physicians around the world.

The doctor is "talking" to a computer loaded with software that "learns" something every time a call comes in—and can use that knowledge if a similar call comes in later.

The process is an example of the products coming out of so-called "expert systems" research, a powerful new field OSU researcher Brian Croft believes could shake Oregon agriculture down to its roots.

"I think it could be as big on campus as biotechnology in three or four years," says Croft. "Eventually, it's going to have an impact on every aspect of human management."

"The push in Oregon is not to produce more," he adds. "It is to produce crops better, for less, and to sustain yields year after year without unwanted fluctuations. Expert systems are going to help farmers do that, and they're going to give them the ability to adjust their management knobs more finely in response to changing market conditions."

Fine knob adjustments?

"Say the world's rice crop was greatly reduced," says Crofts, "an expert system could analyze the situation and tell a grain farmer it's worth spending a lot more money on fertilizer, irrigation and weed control to get yields up as high as possible. And it might explain how that could be done."

Expert systems software that did that probably would draw on the wisdom of a number of agronomists, economists, farmers and others. The system also would extract facts and figures from data bases it "knows" how to communicate with, explains Kevin Currans, a graduate student in OSU's computer science department who's working with Croft on expert systems software for Oregon pear and apple growers.

If you think all this sounds like the computer modeling research agricultural scientists have done for years, you're right—and wrong.

That's part of it. But a computer model usually is the product of one or two people and changes only when they insert new information. In a way, an expert system has a mind of its own. One part of the system is the "artificial intelligence" computer researchers are always talking about.

"The expert systems we're working on for Oregon crops have elements of artificial intelligence," says Croft. "The computer simulates the way a human thinks. It can build new information by applying rules of logic to the knowledge it already has. From this new information it will generate one or more options and list their probability of success. That's really all artificial intelligence is."

Graduate students of Walter Rudd, chairman of the OSU computer science department, are working on expert systems aimed specifically at solving agricultural problems. Some of them are working with Croft. They're trying to develop expert systems in five areas linked directly to Oregon: pear orchard management, apple orchard management, filbert orchard management, control of the corn earworm, and estimating the side effects of pesticides on "good" bugs and wildlife.

"The ... systems we're working on for Oregon crops have elements of artificial intelligence."

"We hope to have an expert system available for the corn earworm in two to three years," says Croft. Corn processors, who are funding the research, say they need help with the pest quickly, he adds.

Some of the expert systems developed may be stand-alone computer software on laser discs, according to Currans. Others may be part of agricultural data bases that farmers will be able to communicate with via computer.

OSU graduate students and researchers are developing computer expert systems software for Oregon's pear, apple, filbert and corn industries.


CIT-101

Kronstad Is Making New Wheat To Meet New Marketing Demands

A couple of decades after Lewis and Clark explored Oregon, settlers here started growing soft white wheat, a type that's good for making pastry and noodles. It did well, and other types of wheat didn't. So for 160 years production generally rose, shooting up dramatically at times and making the Northwest the nation's white wheat capital.

Now an Oregon State University research team, led by crop scientist Warren Kronstad, has launched an attempt to develop a variety of hard red wheat that Oregon farmers can grow. That's the kind of wheat that covers the Great Plains.

Heresy?

Dollars and cents.

"We've put all our eggs in one basket, and the basket has sprung a leak," says Kronstad. "We certainly don't want to give up our soft white wheat. We grow it better than anyone, and it has tremendous economic impact on the Oregon economy, about $325 million a year. The state has a natural resource of about a million acres that won't grow much else."

But, he adds, a huge surplus of soft white wheat, plummeting prices and sluggish markets overseas, where Oregon sells 85 percent of its crop, have delivered a message:

"We need to diversify so we can meet market demands and take advantage of our strategic position here on the Columbia River, close to the Asian market," says Kronstad. "As the standard of living rises in the developing world, they're going to eat more bread, and you make bread with hard red wheat."

Besides working with hard red wheat, Kronstad's team is working with durum wheat, a type good for making pasta. The problems with growing those wheats in Oregon have been low yields and a protein content too low for making good bread and pasta. A potential problem is competition with hard red wheat growers in other parts of the country.

"But we think if we can get varieties with the yield and the milling and baking qualities that go with a high protein content our growers can make some money," says Kronstad. "An exporter in Portland pays the same for wheat from Oregon as for wheat from Montana or Colorado, but it doesn't cost our growers as much to ship. We have to take advantage of that."

His team is testing potential new hard red and durum wheat varieties around the state. That's in cooperation with researchers at branch agricultural experiment stations in the Columbia Basin, the Treasure Valley and the Klamath Falls and Medford areas.

Developing a wheat variety can take 10 to 12 years. But the researchers are speeding up the process by using new molecular biology techniques to identify wheat genes with desirable traits. They put those genes into wheat plants with traditional cross-breeding methods. In three years, they hope to release a hard red wheat variety to Oregon growers that has adequate yield and protein content.

"They're going to eat more bread, and you make bread with hard red wheat."

"We think we have better ones in the pipeline and hope to release a series of them over the next five to 10 years," says Kronstad. "I don't know if it's realistic. But our goal is to have 20 to 30 percent of Oregon's wheat acreage in hard red wheat 10 years from now."

Cereals breeder Warren Kronstad is developing hard red wheat for Oregon. His research team is speeding up the process with new genetic technology.

The Experiment Station Is a Statewide Network

The headquarters for the Oregon Agricultural Experiment Station are on the Oregon State University campus in Corvallis. But the Station operates a network of branch research facilities that covers the state. Scientists permanently assigned to the branch stations do on-the-spot research to solve problems tied to the soils, climates and other characteristics of various regions. Campus scientists do field experiments at the branch stations, too.

The branch agricultural experiment stations have a strong influence on the economies of their surrounding regions. Here is a brief tour of the branch facilities:

At the North Willamette Agricultural Experiment Station at Aurora, just south of Portland, researchers study ornamental and nursery crops, small fruits, berries and vegetables.

To the northeast, up the Columbia River at Hood River, scientists at the Mid-Columbia Agricultural Research and Extension Center focus their work on Oregon's high-value pear and cherry crops, as well as fruits like apples and peaches.

Farther east, in the Columbia Basin, are the Hermiston Agricultural Research and Extension Center and the Columbia Basin Agricultural Research Center, which is headquartered at Pendleton and has a branch at Moro. Researchers at the facilities study irrigated and dryland grains like wheat and barley, irrigated crops like peas, potatoes, alfalfa and melons, and other new and traditional crops.

Southeast of Pendleton, on the Idaho border, is the Malheur Agricultural Experiment Station at Ontario. It provides research support for farmers growing onions, potatoes, sugar beets and other crops on irrigated land.

Almost due west from there, at Burns in the heart of Oregon's cattle country, are the headquarters for the Eastern Oregon Agricultural Research Center. Its scientists work on rangeland management and animal production. The center maintains a research station at Union, near La Grande, to serve the ranchers of northeastern Oregon.

Farther west is the Central Oregon Agricultural Experiment Station at Redmond. At the main station, and facilities at Madras and Powell Butte, researchers study mint, grasses, alfalfa, seed and other crops that grow well in the high desert conditions. At Powell Butte they produce seed for potato variety trials done around the state.

South of there, at Klamath Falls, is the Klamath Agricultural Experiment Station. Its researchers work mostly with potatoes, forages, cereal grains and pasture management for the livestock in the area.

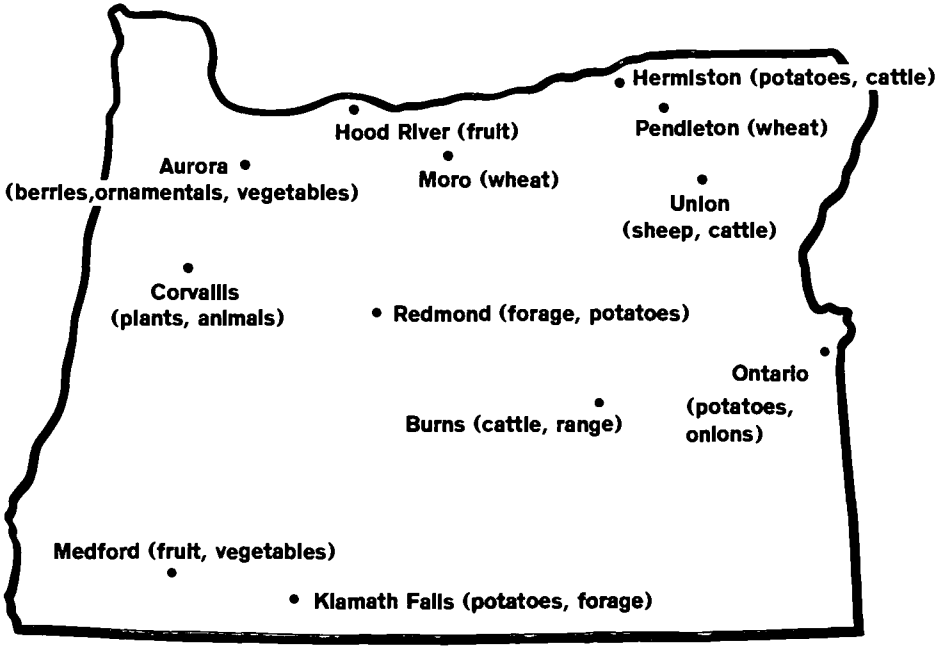
Farther west, at Medford, is the Southern Oregon Agricultural Experiment Station. Scientists do research with pears, grapes, vegetables, small fruits and other crops.

Those aren't all the off-campus facilities. Experimental farms in the Corvallis area serve as sort of a branch station for the Willamette Valley. A facility at Brookings on the Southern Oregon coast specializes in lily bulb research. Also, the Station serves the state's fishing industry by operating the OSU Seafoods Laboratory at Astoria and supporting research at the OSU Hatfield Marine Science Center at Newport.

The branch agricultural experiment stations have a strong influence on the economies of their surrounding regions.

Research isn't the only way the branch experiment station network contributes to the state. The branch stations play an important role in the graduate education of OSU students who go on to make important contributions to Oregon agriculture.

AGRICULTURAL EXPERIMENT STATION RESEARCH FACILITIES



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