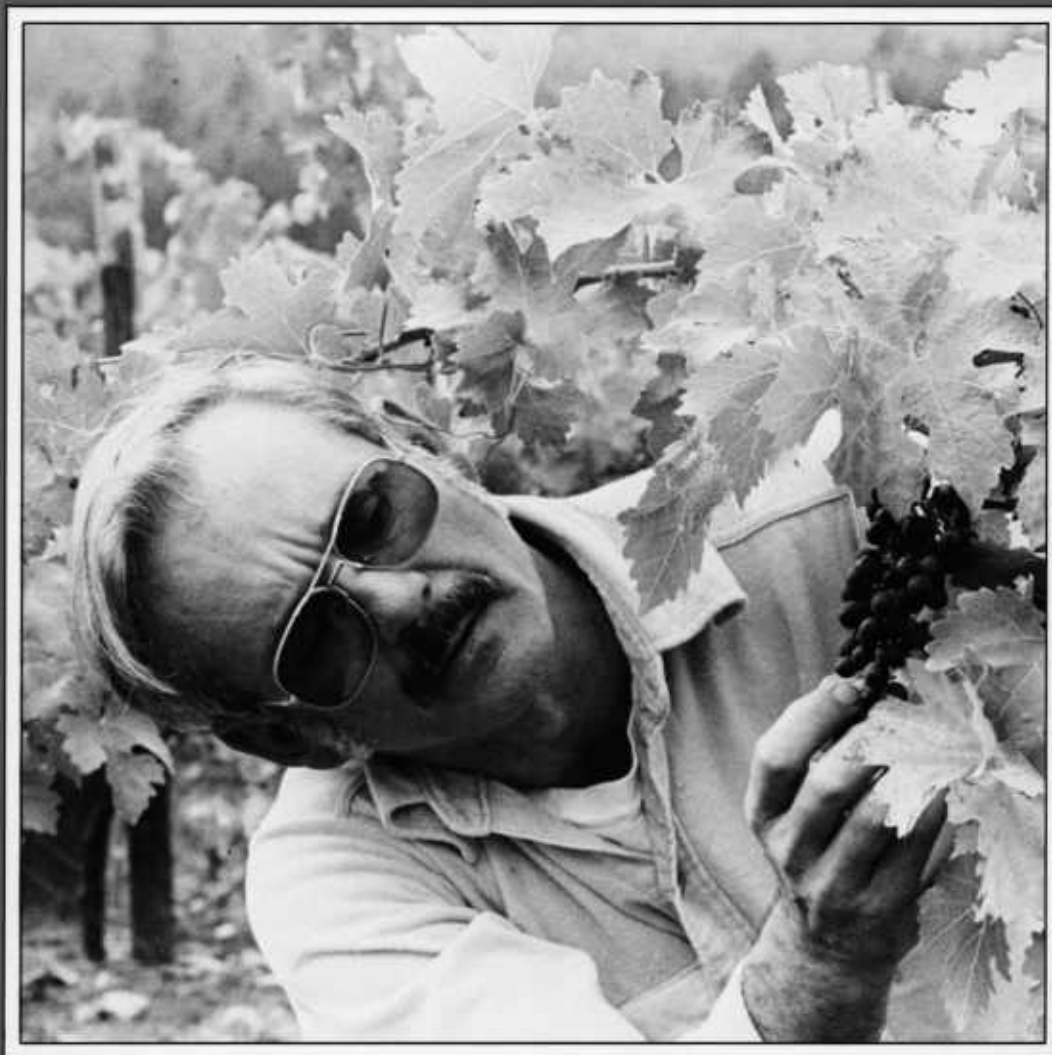


What Have We Done for You Lately?



Oregon Agricultural Experiment Station, Oregon State University, Corvallis, Oregon



Contents

What Farmers Need Are Better 'Brains'	2
Will the Super Fence Confine Hay Problems?	4
OSU Researchers Developed the Northwest's Top Wheat	6
Bacteria Adding Sparkle to Wines Made in Oregon	8
The Effect of Cholesterol Among Health Study Topics	10
Bug Scouts Protecting Some Juicy Industries	12
Test-tube Potato Plants Help Shut Out Viruses	14
Scientists Eyeing Several New Crops	16
Some Studies Go Beyond Obvious Farming Issues	18
You Can See the State by Touring the Station	20

Front cover: Oregon State University horticulturist Porter Lombard is screening grape varieties to identify types best suited for use in Oregon's growing wine industry.

Back cover: Pamela Dealy gave birth to son Bern after she joined a study of the selenium needs of pregnant women. "We're doing studies with selenium that were done 30 years ago with iron," says Experiment Station biochemist Phil Whanger, who directed the research.

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We Can All Take Pride in Winning

People involved with Oregon State University football, the stock market and Oregon agriculture sometimes have similar goals — to minimize losses, stay in business and maintain dignity and poise. So it is with the Agricultural Experiment Station. We've had some losses from budget cuts the last four years, but we've stayed in business and maintained a quality program and strong relationships throughout Oregon's agricultural community.

We've won a few games, too. We've completed our mission successfully and made good progress in serving new needs and developing new ideas to help agriculture, the consumer and the environment in Oregon.

This publication is intended to inform Oregonians, through a few examples, that we serve Oregon with diligence and that Oregonians get a good return on their investment in agricultural research. We want to share these with you so we all can take some pride in winning.

Keep in mind the so-called multiplier effect when you're looking over the examples. Economists have found that, in Oregon, multiplying gross farm sales of a crop by 3.0 produces a fairly accurate figure for the total impact of the dollars as they move through the state economy. National studies have concluded that the economic returns to society from public investments in agricultural research are very favorable, in the range of 30 to 50 percent each year for each dollar invested. These two facts mean that an investment in agri-



*John R. Davis, director,
Oregon Agricultural Experiment Station*

cultural research will pay rich dividends to the entire economy of Oregon.

Much of the Experiment Station's research is defensive. We attempt to maintain productivity in spite of increases in operating expenses, plant and animal diseases and insects that never give up. We work to protect the environment and quality of living, while maintaining economic opportunities and wise use of Oregon's resources. Such research is not always spectacular. But just as

football games are won by the down linemen, Oregon's agriculture is sustained by good, solid research.

Some of our efforts that have scored well for Oregon are spectacular. Our programs involving wheat breeding, wine grapes and wine production, potatoes, new crop introductions, rabbits and cheese production, to name a few, contain examples of recent research successes.

Where do we go from here?

No question about it. We must improve our ability to apply some of the new biotechnology and gene research to Oregon's agriculture. At the same time, we must continue research efforts to maintain current levels of productivity. We must work to improve Oregon's markets for agricultural products. We need to expand our understanding of land and water resources conservation and management, and we must be in a position to take immediate advantage of opportunities for economic development.

The Agricultural Experiment Station *will* meet these challenges. To paraphrase and take liberties with the words of Knute Rockne: We'll win one for the shipper! . . . and the producer, and the processor, and the consumer.

John R. Davis

"Oregonians get a good return on their investment in agricultural research."



What Farmers Need Are Better 'Brains'

Oregon has been keeping pace with other states in using one of the most powerful new farming tools of the century, the computer.

It's making further gains though, thanks to AGMAN.

That's the name — short for agricultural management — OSU Agricultural Experiment Station researchers have given to a statewide, computer-based information network they are developing and already are testing in 20 of Oregon's 36 counties with the help of Extension Service personnel.

The main "brain" of AGMAN is a computer on the OSU campus. But the system draws data from across Oregon and from other parts of the country.

The idea behind AGMAN is "networking," linking information from many sources so it's available through a single access point — the computer, in this case.

Farmers and others who need agricultural information will be able to

"tie into" AGMAN through micro-computer terminals in Oregon's 36 counties, or through home- or business-based microcomputers.

The AGMAN data base contains, or will contain, up-to-date weather information, the latest price quotes for beef, soft white wheat and other commodities, the current life stage of crop pests in various parts of the state, management options for farmers faced with various situations, and a lot of other information that will help farmers, salespeople, shippers and others in agriculture make important decisions.

The overall reason for creating AGMAN, says Experiment Station entomologist Brian Croft, coordinator of the AGMAN effort, is to slow the rise of production costs for Oregon farmers. That helps them compete with farmers in other states and, in the process, slows the rise of food prices.

The overall reason for creating AGMAN . . . is to slow the rise of production costs.

Although they're not used in the field, as in this fanciful photo, microcomputers are helping Oregon farmers compete with farmers in other states and countries.



Will the Super Fence Confine Hay Problems?

Home on the range has been a shock for some cows in Eastern Oregon the last couple of winters.

The hungry animals were confined in small areas on flood meadows by an easy-to-move electric "super fence" designed in New Zealand, leaving them no choice but to eat meadow plants that had been mowed in the fall and raked into piles.

The cattle came through the winters in good shape, fueling OSU Agricultural Experiment Station researchers' hopes that they have found a way to help ranchers get out of the expensive annual business of cutting and baling flood meadow hay, the conventional winter feed.

Last winter, calculates OSU animal scientist Harley Turner, feeding rake-bunched hay to range cattle cost about \$18 per head less than feeding baled hay to a control group of cattle. The figure includes the cost of buying the electric fencing and moving it from spot to spot.

The research is part of an effort at OSU's Eastern Oregon Agricultural Research Center at Burns to help Oregon's \$300-million-a-year beef cattle industry. In recent years, ranchers have been squeezed between the recession, and other factors that cut beef consumption, and a steady increase in production costs.

Other challenges lie ahead.

A few examples: Experiment Station scientists on the OSU campus and at branch stations are studying warm-weather variations of "short duration, close confinement" cattle grazing that may be highly efficient; developing better livestock breeds; using computers to identify for producers better ways of selling livestock; experimenting with ways of harvesting timber without removing land from livestock use, and examining cost-efficient methods of killing undesirable plants that compete with forages for nutrients and water.

Feeding rake-bunched hay to range cattle cost about \$18 per head less.

Range cattle seem to like the taste of hay simply raked into piles as winter feed (as opposed to baled hay).



OSU Researchers Developed the Northwest's Top Wheat

Stephens wheat is a giant.

The soft white wheat, developed by OSU cereals breeder Warren Kronstad and his research team, is the major variety grown in the Pacific Northwest.

A conservative estimate shows it has contributed approximately 25 million extra dollars per year the last three years in Oregon alone.

Stephens now represents about 40 percent of the total wheat acreage in the Northwest, which includes a little more than a million acres in Oregon, 1.3 million acres in Idaho and 2.6 million acres in Washington. Yields from Stephens of more than 10 percent over other varieties are not uncommon.

"Stephens is unusual because it has the genetic potential to take advantage of favorable growing conditions while still performing well under less favorable conditions," said Kronstad. "And the last three years we have had favorable growing conditions."

Stephens, Kronstad admits, also is unusual because it has produced well in a diverse series of locations in the Northwest. As part of the never-ending race to keep up with the demands put on a variety, Kronstad is "tinkering" with the genetics of Stephens to make it more durable.

The No. 1 wheat variety also has more generalized disease tolerance so it may outlast the usual life expectancy of a wheat variety, usually about six years.

It often takes from "10 to 12 years" to develop a new wheat variety, says OSU wheat breeder Warren Kronstad, who is studying several test varieties like this one.

"It takes from 10 to 12 years to develop a new wheat variety — and about \$300,000 in research investment," said Kronstad, pointing out why researchers must constantly have new varieties in development.

Stephens, named for Dave Stephens, an early cereals breeder at OSU's Sherman Agricultural Branch Station, was introduced in 1981. The Kronstad group released Hill 81, named for D. D. Hill, former head of the OSU crop science department, in 1983. It is expected to replace some Stephens acreage, particularly in areas where winter hardiness and tolerance to certain diseases are vital.

What are some of the challenges facing Oregon's wheat industry and researchers?

"We must maintain the high quality white wheat market that Stephens and other varieties represent while acknowledging the new thrust of developing red, hard winter wheats," said Kronstad. "The red varieties are used to make bread, and housewives in other countries are more and more turning to bread products to feed their families."

In addition to working on winter white and red wheat varieties, Kronstad's team is evaluating genetic material it developed in an effort to produce better spring wheats, both soft and hard.

It has contributed approximately 25 million extra dollars per year the last three years.



Bacteria Adding Sparkle to Wines Made in Oregon

Oregon's winemakers — and there are more every year — are getting a lift from OSU Agricultural Experiment Station researchers.

The scientists are producing special bacteria that help in a second fermentation process used in about half of Oregon's wine to reduce the acid or change its quality or character. Food scientists and microbiologists found the special bacteria after a long search in Oregon wineries.

The impact is substantial.

"Nearly all of Oregon's wineries that need the special bacteria, which we still produce on campus, are using it," said Barney Watson, one of the wine researchers. "The most beneficial thing gained by the growers is time."

The bacteria, he said, inoculate the wine, getting fermentation done quickly so the wines are clarified, stabilized and bottled as much as six months sooner, thereby decreasing storage time.

OSU representatives are working with commercial firms interested in taking over production of the special bacteria and making them available for winemaking in Europe as well as the United States. OSU microbiologists are helping develop commercial methods of producing the bacteria.

"Working with Porter Lombard and other OSU horticulturists, we have screened 12 varieties and clones of wine grape varieties that have been released to commercial nurseries," said David Heatherbell, food scientist who directs OSU's wine research program.

"We are looking at about 5,000 acres of wine grapes in Oregon and grapes are now the No. 7 fruit crop in the state," said Lombard. "Oregon's industry got a big boost in June at an international symposium OSU helped sponsor in Eugene that brought 650 wine people from all over the world."

"Symposium participants identified two varieties — Gamay noir and Pinot gris — they thought we should focus on. We're doing research on them now. Equivalent grapes grow in Germany and France."

The OSU scientists work with a new Oregon Grape Certification and Quarantine Advisory Committee and the Wine Advisory Board, which continues to give broad support to wine research. The funds increase as revenues grow from increasing wine sales at the state's 43 bonded wineries.

The wines are clarified, stabilized and bottled as much as six months sooner.

Microbiologist Bill Sandine, left, and food scientist David Heatherbell examine experimental wine.



The Effect of Cholesterol Among Health Study Topics

What do handling instructions on food labels, taking too much vitamin C, and cholesterol have in common?

One answer is the OSU Agricultural Experiment Station. Scientists completed studies of all three topics recently as part of the Station's continuing support of human health-related research.

In the case of food labels, Margy Woodburn, head of OSU's foods and nutrition department, and graduate student Shirley Van De Riet interviewed the primary food preparers in 100 Oregon homes.

The researchers found at least one unsafe food handling practice in 98 of the homes. They also found that better safety information on the labels of perishable foods and in recipes, particularly information aimed at males and younger consumers, would cut the incidence of food poisoning.

Taking daily megadoses of vitamin C is a practice some believe combats ailments ranging from the common cold to cancer. But it is not without risks, says Florian Cerklewski, an OSU foods and nutrition professor.

Cerklewski studied volunteers who took 1,500 milligrams of vitamin C a day for about two months (25 times the recommended daily intake). He found that such large doses can reduce the body's ability to use iron, an essential nutrient.

Like other Americans, many Oregonians worry about the effect of cholesterol on their hearts. OSU nutrition researcher Suk Oh is trying to add pieces to the puzzle of why the substance seems to affect different people different ways.

Oh, director of OSU's Nutrition Research Institute, and graduate student Amy Sarver Ward have completed a study that suggests there are three kinds of people when it comes to going on a diet high in cholesterol: those who show an immediate rise in the cholesterol level in their blood, those who don't, and those who show a rise under some circumstances.

Surprisingly, people whose blood levels shoot up quickly may not be the unlucky ones. The study suggests those individuals tend to have a lower level of cholesterol to start with, and that the cholesterol tends to be distributed differently, perhaps in a healthier form.

Foods that may be "cancer inhibitors," the role of vitamin B6 in human nutrition, the toxicity of pesticide residues . . . those are examples of the focus of other studies underway. And a lot more challenges are over the horizon.

By supporting such research, the Agricultural Experiment Station is assembling information that could help its scientists develop healthier food and fiber and safer methods of farming.

The Agricultural Experiment Station is assembling information that could help its scientists develop healthier food and fiber.

OSU nutrition researchers are searching for patterns in how people react to a high-cholesterol diet.



Bug Scouts Protecting Some Juicy Industries

Lots of Oregonians want to protect the state from potentially harmful manmade chemicals. But some “bug scouts,” using techniques pioneered in Oregon by OSU Agricultural Experiment Station researchers, are doing something about it.

In the last couple of years, insect scouting services have sprung up in Medford and Hood River to serve the state’s apple and pear growers, who produce more than \$50 million worth of fruit a year.

Growers can hire a consultant through the services who will monitor pests in their orchards, regularly assessing the potential for fruit damage and outlining possible strategies for dealing with the bugs (including simply letting them alone if there aren’t too many).

Growers subscribing to the services are looking for ways to curb the skyrocketing cost of chemical pest control. By keeping tabs on orchard pests, they hope to spray their trees only when absolutely necessary. Also, they hope to avoid spraying trees when the chemicals would wipe out populations of beneficial insects that help keep pests in check.

The approach seems to be working. Most apple and pear growers using the services believe they are saving

money and using fewer pesticides, while controlling pests adequately.

Researchers at OSU’s branch experiment stations at Medford and Hood River aren’t surprised. For more than 10 years, they’ve studied insect scouting. The research is part of Integrated Pest Management, or IPM, a program which stresses coordinated use of chemical and biological pest control strategies.

“We didn’t push. The growers knew we had been studying scouting and came to us,” says Pete Westigard, an OSU entomologist who helped set up a scouting service in Medford.

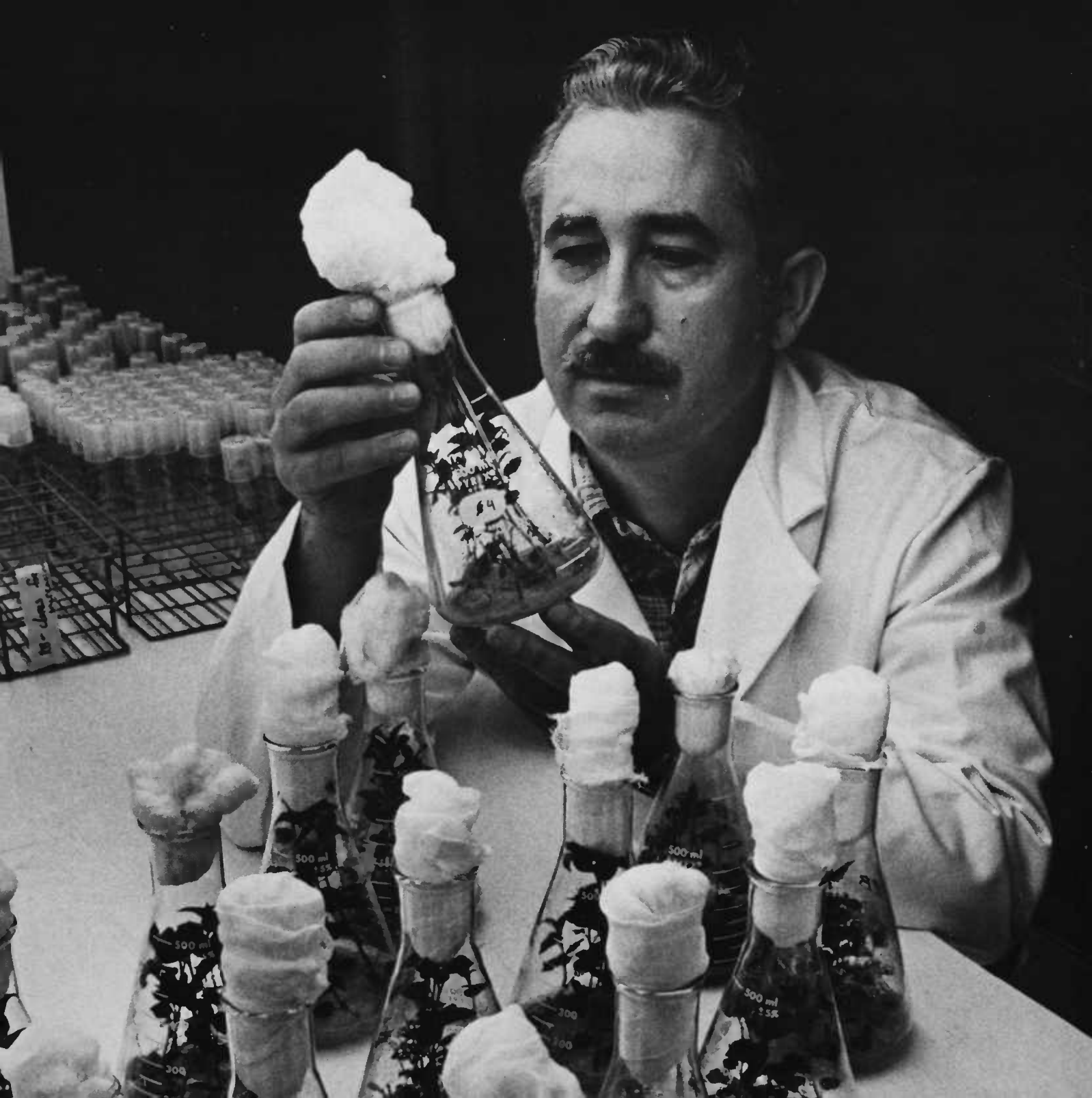
“Just a few years ago they were paying maybe \$50 an acre for pesticides. Now some are paying \$300 or \$400 an acre. You can justify hiring a consultant when you’re paying that” and have the potential of reducing costs by 50 percent, said Westigard.

IPM techniques such as insect scouting are being applied to other Oregon fruit crops, to vegetable crops in the Willamette Valley, to alfalfa seed production in Eastern Oregon’s Treasure Valley, and to the control of tansy ragwort, a weed that poisons Oregon livestock.

Many OSU scientists think the reduction of chemical use and farming costs with IPM has just begun. Wait 10 years and see how it’s changed Oregon agriculture, they say.

“We didn’t push.
Growers . . . came to us.”

Commercial insect scout Wayne Rolles collects a leaf sample in a pear orchard near Medford.



Test-tube Potato Plants Help Shut Out Viruses

The parents of many spuds grown in Oregon's \$100-million-a-year potato industry start life in a test tube.

It's an excellent example of applying so-called "biotechnology" to agriculture.

Using a test-tube process called tissue culturing, Agricultural Experiment Station crop scientists produce tiny potato "plantlets" that are virtually free of harmful viruses. Seed potato growers sell potatoes they produce with the plantlets to other growers, who cut up those seed potatoes and plant the pieces to produce acres and acres of the top-quality baking and processing potatoes harvested each fall in areas such as the Columbia Basin and Central Oregon and around Ontario and Klamath Falls.

Having a basic seed source that is not contaminated with viruses, and testing to make sure any plants generated from the source material are not contaminated, can reduce potato grower's production costs and improve the quality and yields of their crops.

And what is good for Oregon's potato growers is usually good for Oregon's economy. About three-fourths of the potatoes grown in the state are processed here, dramatically increasing the economic impact of the annual potato crop.

The tissue culturing system also gives OSU potato researchers a way to quickly "clean up," as they put it

(rid of viruses), experimental potato varieties they test each year at branch experiment stations at Redmond, Hermiston, Klamath Falls, Ontario and elsewhere.

That's important, say the researchers, because Oregon, Idaho and Washington researchers are engaged in a potato breeding race with scientists in the Midwest and Northeast.

The goal is to produce a better potato variety. Right now, the Pacific Northwest has the upper hand because the Russet Burbank potato, America's favorite for baking and processing, grows beautifully here and not very well in other parts of the country.

But if the Midwest and Northeast, nearer population centers, develop a good baking and processing potato, Oregon and the rest of the Northwest could be in for trouble.

The future holds plenty of challenges besides breeding a better potato.

They include finding more markets for Oregon potatoes and finding less expensive methods of producing, transporting and planting tissue culture potato plantlets.

Also, although test-tube tissue culturing has given researchers a way of producing plantlets for seed potato production that are free of viruses, scientists still need to find foolproof ways of screening out numerous bacterial and fungal diseases that plague growers and consumers.

The future holds plenty of challenges besides breeding a better potato.

OSU crop scientist Al Mosley looks over potato plantlets grown in bottles in an OSU lab.



Scientists Eyeing Several New Crops

New crops are full of promise and excitement.

What they need are patience, hard work, financial and other support — and time, lots of time.

But success can be measured.

Although commercial obstacles remain, OSU researchers have domesticated meadowfoam, one of a few native plants in the United States being studied because of its oil-producing potential. This year, a small amount of its high-priced oil was sold to a Japanese cosmetic manufacturer.

OSU scientists have released a new variety, Mermaid, to growers and have signed a contract with a cooperative group that will take over production of Mermaid seed.

Experiment Station scientists also are looking at Cuphea, another oil seed crop. A native of the southern United States and South and Central America, it could become an oil source to replace coconut oil. The Philippines, the main supplier of coconut oil, is considered an unstable source because of political and economic problems there.

Cuphea oil could be used in soaps, detergents, lubricants and food and medicinal products. Researchers grew it in several parts of Oregon this year to see how it would fare, with harvested yield the main concern. It is hard to harvest Cuphea because the seeds shatter easily and fall to the ground.

Scientists from the Experiment Station, the U.S. Department of Agriculture's Agricultural Research Service and industry (through the Soap and Detergent Association) are partners in a cooperative Cuphea research program.

The Experiment Station also is looking again at soybeans. Through the years, research has shown that our cool night temperatures limit the growth of soybeans. But it's possible that problem can be solved by using varieties from countries with similar climates. Germplasm (genetic material) from Swedish plant breeders and from a Canadian research program is being tested to see how it reacts to Oregon's climate.

OSU researchers also are continuing work on plants such as rapeseed and pyrethrum, a natural insecticide. The search for alternative crops will never end, because Oregon's farmers operate in a world where markets change constantly.

Oregon's farmers operate in a world where markets change constantly.

OSU researchers are experimenting with sunflowers, a source of cooking oil, in several parts of Oregon.



Some Studies Go Beyond Obvious Farming Issues

Does OSU's Agricultural Experiment Station study only the obvious — farm production and its economic and health impacts?

The answer is no.

The Station helps support research in a range of social and environmental areas. The goal is to compile information that will help rural and city folks lead a better life.

Examples?

Near the beginning of the recent recession, an OSU agricultural economist studied the impact on small communities when logging mills shut down.

In one project, OSU anthropologists went into a rural Oregon county and studied the lives, attitudes and needs of small-scale farmers. That led to a special program for small farmers that was carried out through the OSU Extension Service.

In another project, a sociologist and an agricultural economist are examining the attitudes of different groups of people — like homeowners, senior citizens and parents — toward topics such as security and safety. One reason is to find out what services Oregonians want and how they would prefer to pay for them (publicly or privately).

Researchers are studying the influence of agriculture in various

Oregon counties, figuring out how census information can be used to predict what impact changes in farming and land use will have on employment and the economy.

There are many other examples. Researchers are studying how rural areas can diversify their economies, developing better statistical methods of assessing community needs and examining migration trends in and out of Oregon.

Much of the social research is done through the Western Rural Development Center, headquartered at OSU. The center coordinates research in 13 western states.

Then there's the research the Experiment Station helps fund in OSU's fisheries and wildlife department. From bald eagles to rare deer and valuable fish, the work provides a steady stream of information on creatures that many Oregonians feel enrich life in the state.

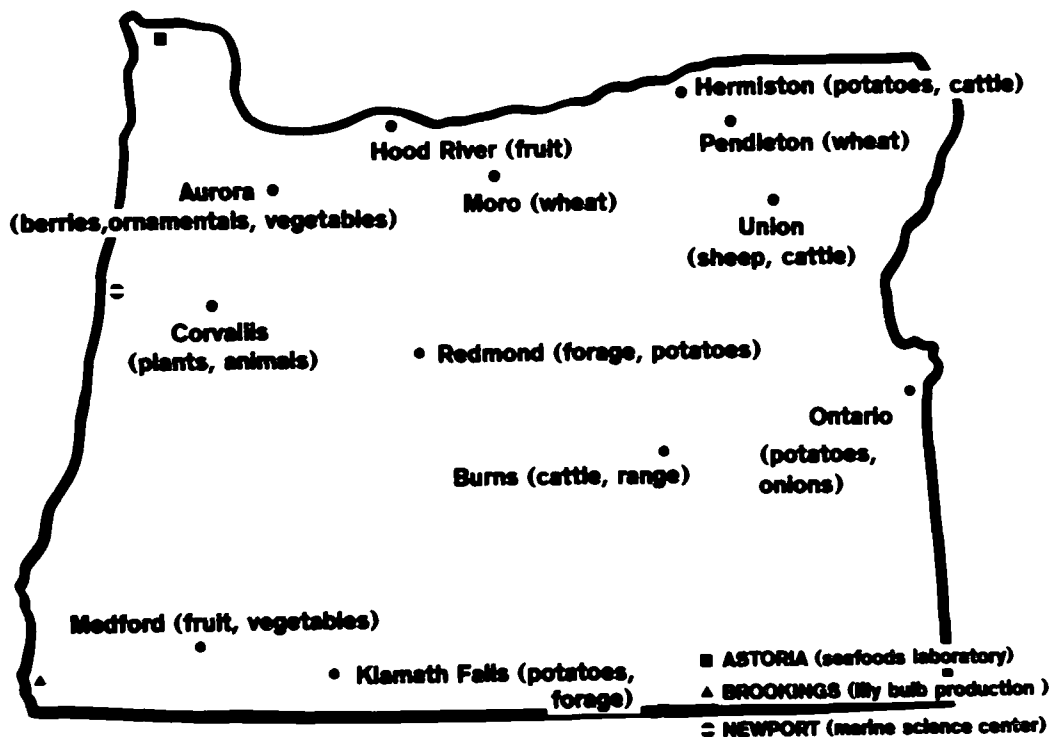
The research helps point out how valuable resources like land and timber can be used commercially without endangering priceless fish and wildlife.

The challenges of growing food and fiber for people will never go away. Neither will the need to evaluate the attitudes and needs of the Oregonians who do the growing and consuming, or the need to preserve Oregon's bountiful natural gifts.

The Station helps support research in a range of social and environmental areas.

No one seems to know much about the tiny flammulated owls OSU graduate student researcher Rebecca Goggans is studying in Oregon's Blue Mountains.

AGRICULTURAL EXPERIMENT STATION RESEARCH FACILITIES



Malheur
Oregon Avenue
Route 1, Box 620
Ontario, Oregon 97914
889-2174

Central Oregon
Sisters Avenue
Box 246
Redmond, Oregon 97756
548-3340

Klamath
6941 Washburn Way
Box 399
Klamath Falls, Oregon 97601
882-2501 (Ext. 400)

Eastern Oregon
Star Route 1, 451 Hwy 205
Burns, Oregon 97720
573-2064
Tenth Street
Box E
Union, Oregon 97883
562-5129

Southern Oregon
569 Hanley Road
Medford, Oregon 97502
772-5165

Branch stations:

North Willamette
15210 NE Miley Road
Aurora, Oregon 97002
678-1264

Mid-Columbia
3005 Experiment Station Drive
Hood River, Oregon 97031
386-2030

Columbia Basin
Highway 11/
Experiment Station Road
Box 370
Pendleton, Oregon 97801
276-5721
Experiment Station Road
Box 105
Hermiston, Oregon 97838
567-6337
Lone Rock Road
Star Route, Box 1A
Moro, Oregon 97039
565-3522

Station main office:
127 Agriculture Hall
Oregon State University
Corvallis, Oregon 97331
754-4251

You Can See the State by Touring the Station

Absence may make the human heart grow fonder, as the saying goes. But it doesn't have much effect on plants and animals.

That's one reason for the structure of OSU's Agricultural Experiment Station.

Headquarters for the Station are on the OSU campus. But scientists and other personnel are permanently assigned to facilities around Oregon.

Here is a quick tour of the branch stations:

At the North Willamette station, at Aurora just south of Portland, researchers are studying ornamental and nursery crops and small fruits, berries and vegetables.

On to the northeast, up the Columbia river, scientists at the Mid-Columbia station at Hood River are focusing their work on Oregon's high-value pear and cherry crops, as well as fruits like apples and peaches.

Farther east is the Columbia Basin Agricultural Research Center, which has headquarters at Pendleton and branches at Hermiston and Moro. Researchers at the facility are studying irrigated and dryland wheat, barley and other grains and irrigated crops like peas, potatoes and alfalfa.

Southeast, at the Idaho border, is the Malheur station at Ontario. The station, in one of Oregon's most intensively farmed areas, is providing support for farmers producing onions, potatoes, sugar beets and other crops on irrigated land.

Almost due west, in the heart of Oregon's cattle country, is the Eastern Oregon Agricultural Research Center at Burns (there's a branch at Union, near La Grande, too). Scientists are focusing on rangeland management and animal production.

Farther west is the Central Oregon station at Redmond. At the main station and branches in Madras and Powell Butte, researchers are studying mint, grasses, alfalfa and seed and other crops that grow well in the high desert conditions. Potential new potato varieties for the state are tested at Powell Butte.

Swinging south, the Klamath station is on the California border. Researchers there are working mostly with potatoes, forages and livestock and problems linked to the area's unique soils and climatic conditions.

Farther west, at Medford, is the Southern Oregon station. A major research focus there is pest management in pears. Scientists are also studying grapes, vegetables, blueberries and other crops that grow well in the area.

The Agricultural Experiment Station operates a facility at Harbor on the Southern Oregon coast that specializes in lily bulb research and the OSU Seafoods Laboratory at Astoria, which serves the state's fishing industry. It also supports fisheries research at OSU's Hatfield Marine Science Center at Newport.

Scientists and other personnel are permanently assigned to facilities around Oregon.

