Oregon's Agricultural
Progress
Fall 1977

Agricultural Experiment Station
Oregon State University

Comment

Director John R. Davis

Adversity . . . an unwanted harvest

Adversity builds character.

Whenever a football team has a losing season, we say that during the year it was building character. And when there is a losing season there usually are a number of injuries so that in some positions, a player may be lost for the year or the reserves may be down to the last person.

So it is with farming, especially when weather creates adversity—as it did this year in central and eastern Oregon. The effect of the drought will be a losing season for many farmers and ranchers in many ways. For example, many ranchers were forced to sell cattle or calves early in a depressed price market because low forage production on the range would not support the usual number of animals. In some instances, water for livestock was the limiting factor, and several ranchers hauled water to the range at considerable expense.

Wheat growers had similar problems with drought and have been confronted with some tough decisions. For example, growers in low rainfall areas, where summer fallow is practiced to build up a soil moisture reserve, had to decide whether to fertilize and seed in dry soil or to summer fallow two years in succession. In addition to these problems, the drought intensified incidence of disease, and some insects were more prevalent as a result of dry weather. Even in the Willamette Valley, a new strain of stripe rust was observed in wheat, probably a result of the climate in 1977.

But this article is not intended to recount all the problems farmers and ranchers faced as a result of the drought. Nor do I intend to extol the values of research conducted by the Agricultural Experiment Station or the splendid efforts of the Extension Service, the State Department of Agriculture and other state agencies in combating effects of the drought. Instead, let's look at the question of whether adversity really builds character, and what happens to the injuries or reserves in a season like this past one.

Most experienced farmers and ranchers already have enough character. All those with whom I am acquainted are industrious, intelligent, posess great moral fiber, respect the land and their fellow beings and have a good outlook on life generally. That is character, and these people need neither more character nor more adversity.

Some of the new, younger farmers and ranchers are on the injured list, however, and some will never recover financially. Recently, several bankers advised us that about 15 percent of their operating loans will default this year—mainly owed by young ranchers who were just getting started. These are the real casualties of the drought—the bright young people who are long on ideas, time and hard work but who are short of cash and other reserves—those who have had to sell out at a loss or who have gone broke. This may build character, but in the meantime, we lose some of our wealth—young families who want to get started in agriculture and the natural attraction of agriculture as a business and a way of life.

Agriculture differs from other small businesses a great deal in that the farmer and rancher in Oregon may have no control over either production or marketing. Usually, if production is good, market price is down. This year, production is down but so is the market price. Another part of the problem unique to Oregon is that most of our lands are in range or dryland grain production, so a drought in the state affects a large land area and many farmers and ranchers simultaneously. Obviously, the economic health of the entire state is affected greatly.

Adversity builds character all right, but the attributes of that character are generally lost if we lose too many players—young people with ambition and ideas. We will lose the vitality that is needed if agriculture is to produce food at low cost, the best bargain in the world.

Somehow, we must find a way to maintain the stability of agricultural production on fragile lands greatly influenced by changes in the weather. The drought this year emphasizes the need for strong financial institutions, strong farmers and ranchers, sound decision-making and good information for making those decisions. These things will be part of the character of agriculture—not just rugged individualists or adversity. If we are smart, we'll develop a choice for building character—either winning or losing.

It's time that agriculture won a few.

Contents

Richard Floyd, Editor
Experiment Station
Communications

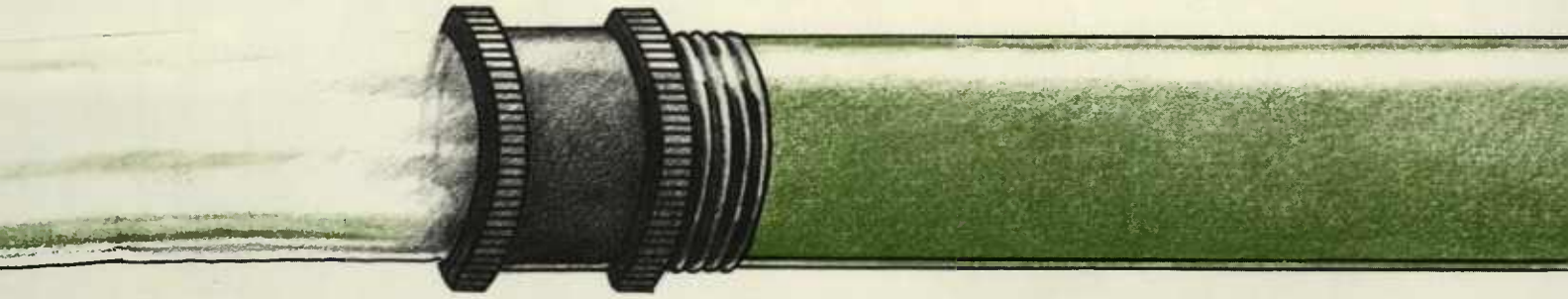
Linda McCormick, Assistant Editor
Editor, Oregon's Agricultural
Progress

David King, Assistant Editor

THE DROUGHT OF 1977 . . . and ?

DEPARTMENTS

Vol. 24, No. 2, Oregon's Agricultural Progress, a quarterly reseerch report is published by the Oregon Agricultural Experiment Station, John R. Davis, Director, and sent free to Oregon residents. Address requests to Editor, Ads 416 R, Oregon State University, Corvallis, OR 97331, or see your County Extension Agent. Written material may be reprinted provided no endorsement of a commercial product is stated or implied. Pleese credit Oregon's Agricultural Prograss and Oragon State Univarsity. To simplify technicei terminology, trada names of products or equipment sometimes will be used. No endorsement of product names is intended nor is criticism implied of products not mentioned.



Nature turns off the tap

Water.

Filling up puddles, bouncing off pavement, streaming down windows, running to the sea.

Oregon is water—our power, our recreation, our livelihood, our green.

Who would have thought the day would come when Oregon would be short of water?

Yet, for more than a year, drought has plagued the state, posing massive problems in some areas, causing slight inconvenience in others. Perhaps the segment most affected by drought has been agriculture. Farmers and ranchers approached last summer with caution and concern—uncertain whether water would be available for watering crops or livestock. Processors worried about possible shutdowns and consumers feared shortages of food and higher prices.

This section of *Oregon's Agricultural Progress* takes a brief look at how researchers at the Oregon Agricultural Experiment Station viewed the drought. With 16 departments at Oregon State University and nine research facilities scattered throughout the state, Station researchers viewed the drought from many angles. Some of their reports are included.

The drought affected certain segments of Oregon's agricultural community far more severely than others. Wheat and pea production in the dryland areas of eastern Oregon was severely limited because low rainfalls last year did not provide plants with enough moisture to grow.

Yet, at the Moro Branch Experiment Station, scientists had a unique chance to see how 20 acres containing thousands of experimental wheat plants would survive drought conditions. Information gained through that research could prove very valuable in breeding new varieties for other dry parts of the world.

The beef cattle industry suffered tremendously from the drought. Researchers at the Eastern Oregon Agricultural Research Center in Burns estimated about one-third of the cattle in the state were sold early after ranchers were advised to wean calves early and to cull marginal animals. Future weather conditions will determine the future of that industry and the cost and availability of meat in coming months.

And even in areas like Hood River where glacial flows from Mt. Hood can provide water at almost any time, agricultural problems cropped up because the glacial water brought impurities. In the Willamette Valley, too, problems occurred from water shortages. OSU's Lewis-Brown Farm near Corvallis faced problems when low well water levels threatened to make researchers curtail watering of important breeding materials for experimental plants.

This short section cannot be considered a complete view of Experiment Station research related to drought. Some studies had just started when the drought began and only by comparing the drought year with future years can scientists have some view of the impact of a year with low water. Other studies are incomplete and, for some, additional testing will be needed next year to compensate for drought conditions this year.

And still other, basic questions of water and how it affects living things are only now being asked.

As you read the following section, you will understand more fully the plight of Oregon's agricultural community in a year of drought and how researchers try to apply their special knowledge and resources to solve problems.

May you be sitting inside, waiting out a rainstorm, when you read it.

Lack of water trims herds to the bone

Low meat prices last summer may have made consumers happy, but there are no more pleasant surprises in store.

Robert Raleigh, superintendent of the Eastern Oregon Agricultural Research Center in Burns, said low forage supplies this summer and high roughage costs could drive up the price of meat and may even create shortages.

"We started the summer with about half of the forage needed to feed the cattle we had," Raleigh said. "It is estimated that about one-third of the cattle were sold early. When the drought is over, there will be fewer catle on the market because they will have been sold prematurely and that means the price to the consumer should go up."

Raleigh said uncertainty about how long the drought will last has been a major factor in cut-backs on eastern Oregon cattle ranches.

"If we knew the drought would be over next year, we could have hung on to some cattle this year," he said. "But if the drought continues, any money spent on feed this year would be like pouring it down a rat hole because next year we could be in the same situation with no feed to buy."

Raleigh predicted the situation will be even worse in the next few years.

"There are going to be fewer cattle for sale when feed is available again because many producers who can stay in business will be saving their female stock to build back their herds. We should have a real beef shortage in two or three years."

During the summer, some grass seed growers baled straw to sell to ranchers in eastern Oregon for cattle feed.

"Rye grass straw was advertised at $39 a ton delivered to Burns but the actual costs were probably closer to $55 a ton for good straw delivered in Burns. It takes roughly another $20 worth of feed supplement to make the hay usable for many classes of livestock. This puts it in the $70 to $80 a ton bracket," he said. "And even if all the grass straw in the Willamette Valley had been baled, it still wouldn't be enough to satisfy the feed requirements in the drought- stricken surrounding states."

Eastern Oregon Agricultural Research Center scientists worked with ranchers all summer on drought problems. Guidelines were issued to help beef producers cope with the drought and long-term studies were reviewed carefully to see if findings could be related to drought concerns.

"We advocated early weaning of calves to move them more quickly to higher quality feed with less expense because they're small," Raleigh said. "Another tip we have been giving is to cull herds carefully. Cull out all low producers and save the feed for the best producers. If ranchers culled out every third cow, they could cut production by only one-fifth instead of one-third."

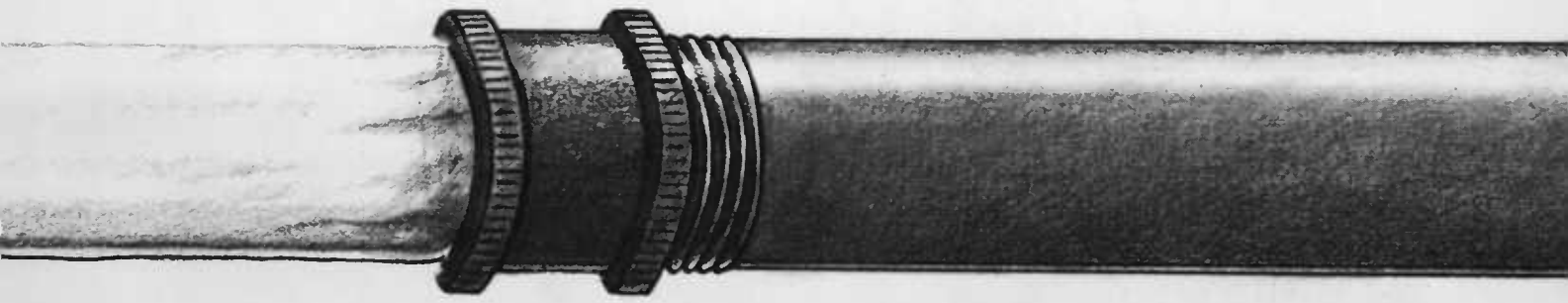
One valuable drought-related research project conducted by Forrest Sneva, USDA-Agricultural Research Service range scientist at the Burns center, involved cattle subjected to drought stress.

"It was surprising to learn that in many instances, the reduction of daily water intake by 25 to 35 percent over a summer grazing period did not have a significant effect on the performance of mature cattle," Sneva said.

Suckling calves were more susceptible to water stress, researchers learned, because one of the first effects of lack of water is for the mother cow to stop producing milk. That cuts off the food source for her nursing calf.

"In most instances during the study, the recovery weight gain once water was made available to the cattle compensated for the loss during stress," Sneva said. "However, the situation this summer with prolonged summer temperatures and little water made it difficult to manipulate the management of the cattle to take advantage of the research."

Research on drought and cattle will continue and results will be passed on to ranchers as soon as possible.



Trickle irrigation drops cost

When it comes to conserving water, drip is more than a drop in the bucket.

As much as 30 percent of irrigation water used on fruit trees can be saved if growers install drip irrigation systems, Agricultural Experiment Station research at OSU and several branch stations has shown.

Drip irrigation, sometimes called trickle irrigation, is a system of pipes with small holes or emitting devices that drip measured amounts of water next to plants. It was introduced in the United States from Israel about seven years ago.

The initial OSU study was completed by Marvin Shearer, Extension irrigation specialist, and horticulturists Lloyd Martin, Walt Mellenthin and Porter Lombard, branch experiment station superintendents at Aurora, Hood River and Medford.

Their research showed drip irrigation of mature pear trees, compared to efficient furrow and sprinkler irrigation, used 10 to 30 percent less water. Compared to irrigation of new orchard plantings, it saved 90 percent of the water. In 6-year-old blackberries, the saving was 33 percent over sprinkler irrigation.

"Water can be saved in approximate relationship to the area of ground shadowed by the plant," said Shearer.

"For instance, if 75 percent of the ground area is shaded by the plant, then water savings should be about 25 percent which means about 33 percent more land can be irrigated with the same water supply."

Martin said during two years of the study, blackberry yield was up 10 to 12 percent and water consumption was down 24 percent one year and 33 percent the next.

"One big consideration with drip irrigation is the initial cost," said Shearer.

"It will vary from $400 to $1,200 per acre depending on size of installation, water quality, type of crop, degree of automation and other considerations."

A major cost is the filtering device. Emitters and holes in emitter tubing are very small. Any contaminant in the water like algae or silt can plug the holes and ultimately plug the entire system. Every area of use is slightly different so the filtration system virtually has to be customized to the area's water quality.

"We are continuing to study filtration systems in an effort to find the most effective and least expensive methods," said Shearer.

"Drip irrigation is a good, efficient method of watering plants. The question is: Does it have enough advantage in Oregon to override the cost? Until this year, water has been plentiful and there has been only limited advantage to drip irrigation. But with the current drought this relationship can change markedly," he said.

Glacial flour gives rise to problems

An unusual kind of flour thickened the plot of the drought story in Hood River last summer.

"Our stream flows were very low," said Walt Mellenthin, superintendent of the Mid-Columbia Experiment Station in Hood River. "Most of the water we were using for irrigation was coming from melting glaciers on Mt. Hood and contained a lot of 'glacial flour,' a substance finer than silt or sand."

Glacial flour plugged pores of the soil near trickle irrigation systems and caused puddles to form on the orchard floors. It also caused excessive wear in sprinklers and nozzles of other irrigation equipment.

"The glacial flour turned the water the color of skim milk," Mellenthin said.

Trickle irrigation was the subject of a five-year study scheduled for completion at the Mid-Columbia station last summer. Mellenthin said glacial flour resulted from the unusual weather conditions and complicated investigations of the new orchard irrigation systems.

"There were no problems with the systems themselves if growers did a good enough job of flushing them out and watching them. But some people didn't really understand the concept of trickle systems, so much of our summer was spent helping them learn how the new system works.

"We still don't have what we would call a real good filtering system for trickle irrigation in the Mt. Hood watershed area. We have systems we're working with, but we don't have any real foolproof system yet."

When using trickle irrigation systems, water must be filtered to remove small pieces of dirt and sand that can plug the small hoses and keep water from reaching the trees. But trickle systems were not the only ones affected by glacial flour.

"Some growers who used overhead sprinklers and solid-set ground systems thought they were getting less water than they should have had, but the glacial flour was just wearing out sprinklers and nozzles and they weren't working as well," Mellenthin said.

The drought conditions did not damage fruit size or yields in most areas, however.

"Water is only one factor influencing fruit size. Probably climate is the greatest factor," he said. "Fruit sizing came along pretty good, especially for those who were able to do a moderately good job of irrigating. Some growers could only irrigate their orchards once and that caused them some problems, but they didn't get hurt too badly."

How next year's crop will fare may depend on this fall's weather.

"One of our biggest worries is where we stand in terms of fall irrigation to get trees into good condition for winter," Mellenthin said. "If trees lack water and are dried out, then get nice warm temperatures and some good rains, you can get the trees to flower in the fall and bloom the following year will be greatly reduced."

Water management, especially with new trickle irrigation systems that can save 25 to 30 percent of the water used for orchard irrigation, will present some problems in the future, he said. Some laws even may need to be changed so growers will be able to irrigate on the more regular basis needed to keep the systems working well. But in a year of drought, researchers learned a great deal more about the limits of the new trickle systems.

Irrigation's energy use computerized

Researchers at OSU have found economics may be one of the most important tools in eliminating water waste.

Agricultural engineers Robert Wensink, John Wolfe, Kuei-Lin Chin and Michael Kizer developed a computer model to predict and evaluate the economic and energy efficiency of most forms of irrigation used in the state.

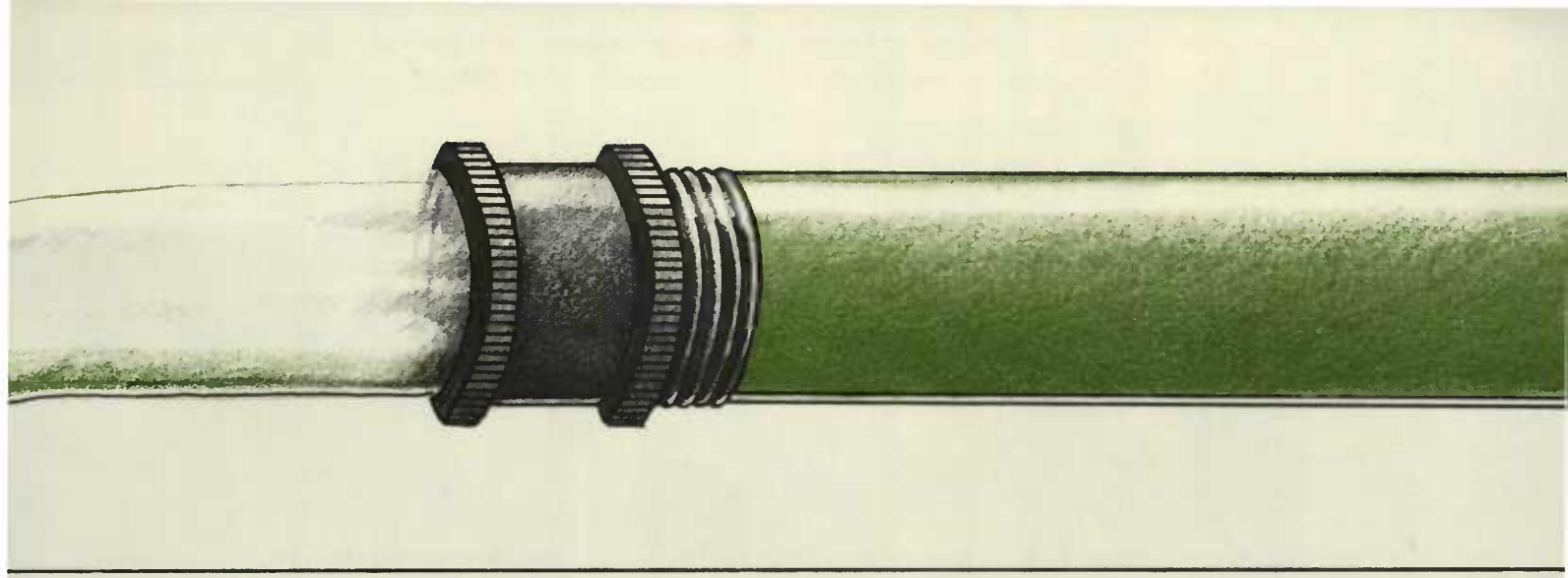
They assessed all fossil fuel energy used in the irrigation process—energy used to manufacture the pipes, install the system, operate it and transport the system in the field. The efficiency of the irrigation system—how much water at the pump source actually made it to the growing plant—also was considered. Efficiency ranged from 50 percent for surface and flood irrigation to 90 percent for drip irrigation using low pressure water emitters adjacent to the plant.

"Our model was used to evaluate hand-moved sprinklers, surface flooding, self-moving center pivot or circle irrigation, side roll, which is similar to circle but moves straight down the fields, drip emitters, permanent and solid-set systems," Wensink said. "When the annual cost difference between energy-efficient and dollar-efficient systems were averaged, the energy-efficient design had an annual cost of $7.24 per acre more than the economic design based on the present electricity cost of about two cents per kilowatt hour."

But if the average cost of electricity over the life of the irrigation system reaches 15 cents per kilowatt hour, the cost-efficient and energy-efficient systems would cost about the same, he said.

"Our study showed because of unpredictable escalation in energy prices in the future, it would be wise for farmers to consider energy-efficient designs and select an irrigation system at a slightly higher short-term cost than to try to save money now and end up with a system too costly to use 10 years from now."

Cost of irrigation was the subject of another OSU study completed just before this summer's water crisis. Agricultural economists W. Edward Schmisseur and Frank Conklin studied two methods of water pricing used by irrigation districts in central and eastern Oregon—fixed cost and variable cost pricing—and found the method made a profound difference in water conservation.



"Fixed cost pricing means the farmer pays a fixed price at the beginning of the season then is entitled to a share of the water available for that year. Variable cost pricing is like buying gasoline by the gallon—water is available by the acre-foot and you pay only for what you use," Schmisseur said.

The Agricultural Experiment Station researchers found fixed cost pricing—used by most of the state's irrigation districts—does not promote more water conservation.

"The key word is more," Schmisseur said. "Farmers already are conservation oriented, but fixed cost pricing essentially treats water as free once the initial price is paid. Our study shows one way to create still more conservation on the farm is to sell water by the unit."

Changing from fixed to variable cost pricing would increase water costs by an estimated $12 to $21 per acre, dropping crop returns in excess of cash costs by four to 67 percent depending on irrigation and crop yield efficiency.

"The smallest drop in income would be for farmers producing high income crops and operating efficient irrigation systems now. Unfortunately, this creates another problem because typically, the most efficient farmers are the large operators so water shortages will deal another terrible blow to small farmers who don't have enough capital to change to a more efficient irrigation system," Schmisseur said. "And, in general, a reduction in income will be greatest in areas that produce less intensive low profit crops like pasture. If you are making $300 an acre growing a vegetable crop and the price of water increases $15 an acre, it will not be nearly as bad as if you are making only $30 an acre growing cereal."

Calendar, too, helps save water

Water use efficiency in part of the Northwest is increasing primarily because of better tillage, weed control and other crop management techniques.

"Data from Lind, Washington, and Pendleton, Oregon, with annual precipitation ranging from 9.8 to 15.6 inches, showed an increase of water use efficiency of 99 and 66 percent during the last 20 years," said Floyd Bolton, agronomist.

"We believe that yield levels are still well below the water potential."

Bolton and his colleagues have been working on low moisture situations (not drought) but their data will be important to growers during drought years.

"We are trying to characterize the kinds of seasons farmers face most often—low rainfall, normal rainfall or wetter than normal," said Bolton.

"We found that there has been none like the current season in the last 65 years, the years we have data."

The next move is to try to simulate the seasons by adding water as if it were rain to certain plots in the Sherman County area.

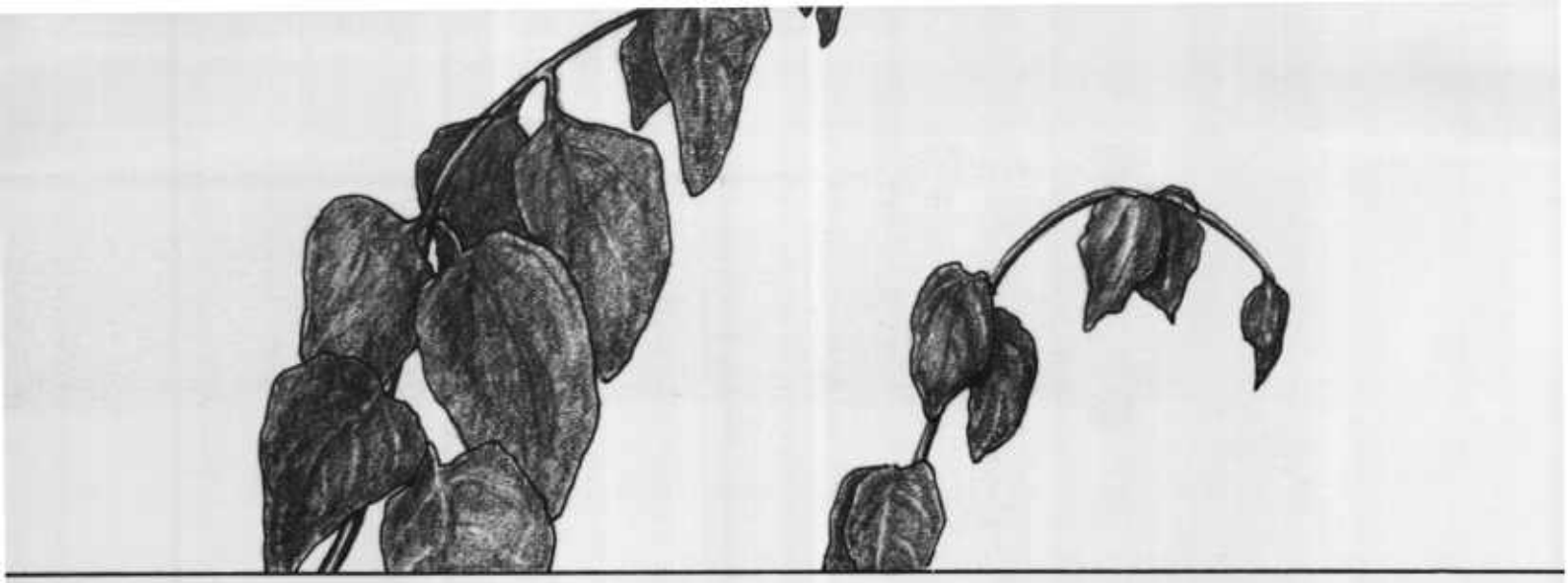
Other research at the Sherman Experiment Station at Moro seeks to find out more about moisture movement patterns that seem to change. In focusing on moisture at planting time, the scientists have found that there is adequate moisture usually from mid-August to September 1, which is too early to plant wheat. The optimum planting time is September 15 to October 4, when moisture loss seems to accelerate, perhaps because of warm days and cool nights.

If the reason for the loss of moisture can be pinned down perhaps the relationship of moisture to soil temperature can be changed to save some of the moisture.

"We also are taking a look at stand establishment as one of the major criteria of dryland areas because we feel it is the key to maintaining or increasing yield level," said Bolton.

"One new process we will investigate is the injection of water in the seed row at seeding time, to improve germination and emergence."

Results of the dryland research will be shared not only with Oregon growers but with growers from all over the world who combat low moisture to raise crops.



Bright spot of drought: free testing

Regardless of variety, wheat still needs water.

But some varieties do not need as much as others, said Warren Kronstad, head of Oregon State University's cereal breeding program, and the 1976-77 drought gave breeders a chance to find out which ones were more efficient.

"If we can find a bright spot under such adverse weather conditions, it is that large populations resulting from crosses between different wheats could be evaluated for drought tolerance," he said.

At the Sherman Branch Experiment Station in Moro, 20 acres containing thousands of genetically different individual wheat plants were observed for their ability to produce grain under very low moisture conditions.

"It was encouraging that a number of crosses did appear promising, particularly those with the cultivar Yamhill as one of the parents," said Kronstad. "Those that did well also were from the winter and spring crossing program."

In one series of experiments on the Kaseberg Ranch near Wasco in Sherman County, several cultivars and experimental lines were tested under both drought conditions and irrigated conditions with enough water added to simulate normal rainfall.

"This year's crop was reduced by about half or less than what normally would be expected," Kronstad said. "The cultivar McDermid did best under the simulated normal rainfall conditions, yielding 61.5 bushels per acre, while the new cultivar, Stephens, appeared somewhat better under limited rainfall, yielding 32.6 bushels.

"The important message is that regardless of the cultivar, wheat requires some moisture to produce a crop. So, despite a very poor year for total production, it may well have helped us develop varieties capable of withstanding greater drought stress."

Fall rains brighten future of peas

Pea production proved poor in Oregon's dryland areas this summer.

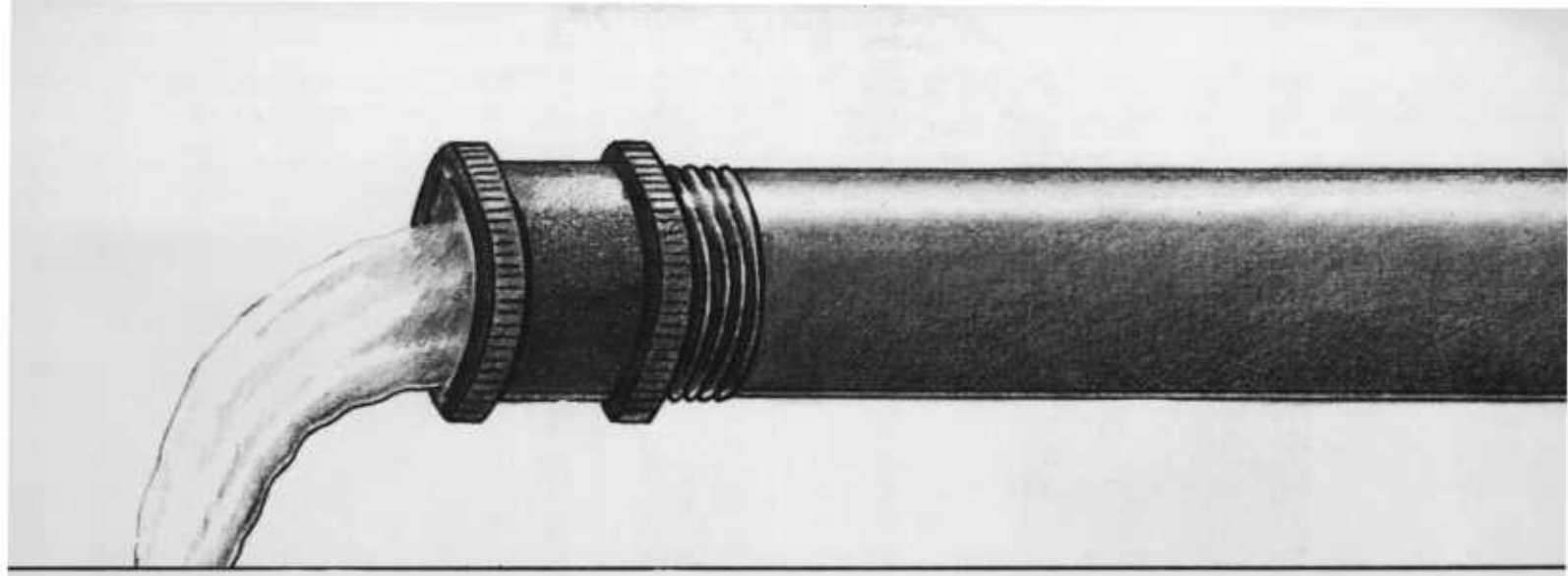
But with a little luck—and water—it could be much better next year.

"Unlike wheat in a wheat-fallow rotation where weather conditions the preceding year greatly influence what will happen the following year, peas are dependent upon rainfall from the fall and winter immediately preceding planting," said Vance Pumphrey, agronomist at the Columbia Basin Agricultural Research Center in Pendleton.

Peas are grown mainly in a wheat-pea rotation along the foothills of the Blue Mountains where the annual rainfall is 15 inches or more. They are canned or frozen for human consumption.

Pumphrey and Robert Ramig, USDA-Agricultural Research Service soil scientist in Pendleton, studied drought conditions and their effects on pea production during the last year. A publication reporting their findings is being prepared.

"Conditions were some of the poorest—if not the poorest—ever. Many farmers who anticipated the dry conditions didn't plant the usual numbers of acres of peas and peas planted were severely decreased in yields," Ramig said.



Yields of 1,500 to 1,800 pounds per acre are normal for peas in the Columbia Basin, but this year, good fields produced only 800 to 900 pounds per acre and poor fields had yields of only 200 to 400 pounds per acre. Some fields were not harvested.

However, the situation still was not as disastrous as it might have been. "Luckily, June temperatures were fairly favorable and growers were helped some by rainfall in May," Pumphrey said. "If farmers have to suffer another dry year, they will be discouraged, but the long-term potential for peas still is good."

Drought finds an ally in stripe rust

Rust can be a big problem in a drought year.

Stripe rust in wheat, that is.

"We saw more stripe rust this year in the Willamette Valley than we had ever seen before," said Robert Powelson, OSU plant pathologist. "What suppresses its spread under normal conditions is the high amount of rainfall. The disease depends on dry conditions for air-borne dispersal of spores and a 'wash-out' of spores usually occurs when it rains and which keeps it from spreading."

In wheat, rust causes small, poorly filled heads and shriveled grain.

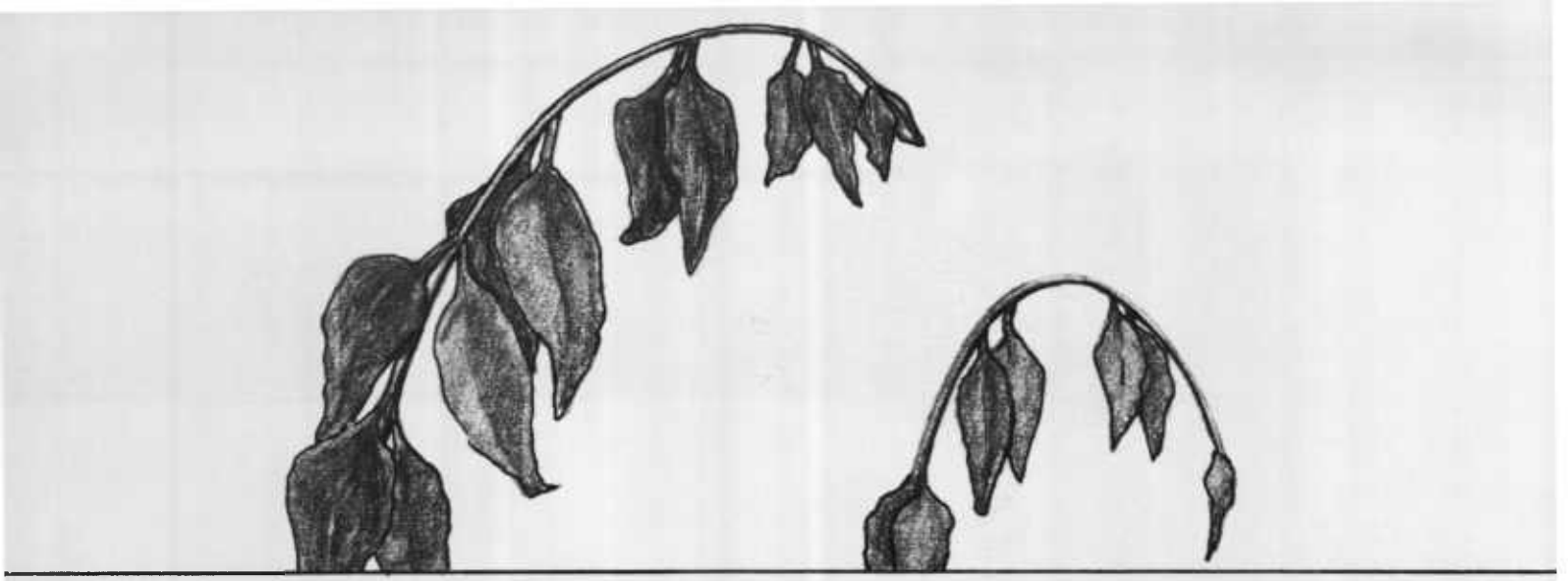
"Under the circumstances, Hyslop and Yamhill performed quite well," Powelson said. "Yield decreases from stripe rust were not more than 10 to 15 percent for Yamhill and 15 to 25 percent for Hyslop."

Earlier this year, researchers were concerned that a new race of the disease found in the Skagit Valley of Washington could have moved into the Willamette Valley. Yields in that area were cut in half because of the disease and early symptoms of stripe rust in Yamhill wheat—a variety that normally rusts very late—made scientists worry about the possibility of finding the new strain here.

Tests conducted by the Agricultural Experiment Station put an end to the concern for the present time. "We feel confident we don't have the same Skagit Valley race of stripe rust," Powelson said.

Several other diseases also were more abundant in this drought year and reduced the potential for high wheat yields.

"Septoria leaf spot, yellow dwarf virus and powdery mildew all were more abundant this year," Powelson said.



Push-button irrigation a push away

Computers soon may give farmers a new kind of turn-on.

James Vomocil, Extension irrigation specialist at OSU, said tomorrow's farmer may wake up in the morning, look at his own custom-printed eight-day weather forecast and feed it into a computer. Miles away, when the time is right, irrigation systems will respond to the computer's signal, adding just the right amount of moisture to the soil, then stopping until signaled to begin again.

"This system holds a great deal of promise for saving water," said Vomocil, whose research has been cooperative with the Agricultural Experiment Station. "The computer can take the date of last irrigation, assuming it was an adequate irrigation, then calculate when the next irrigation should occur and how much water should be used."

Last year, six commercial farmers used experimental computerized plans for irrigating their fields. Researchers devised a system to calculate on a farm-by-farm basis the amount of water used by the crop and contrasted that figure with the amount of water stored in the soil. When the two figures were the same, it was time to irrigate.

"We used a computer for the calculations because the problem is so complex," Vomocil said. "As the plant grows, it uses more water because the leaf surface is greater. But, also, as the plant grows, the root systems grow and more water becomes available. To complicate it even more, the roots encounter different soil layers with varying moisture content and that must be taken into consideration."

But the OSU researcher said there still was need for the human touch and room for human error.

"This plan gives farmers some latitude," Vomocil said. "If irrigation is missed on an optimum day, computers will tell them how much more or less water to apply.

"Basically, this is just another tool to assist farmers, it is not intended to do their work for them."

Experiments go on short water rations

The drought changed irrigation schedules at the Lewis-Brown Horticulture Farm southeast of Corvallis as wells produced less water.

Mel Westwood, Farm Committee chairman and OSU horticulturist, said late summer irrigation schedules had to be cut back because irrigation well pumps began losing prime as well output decreased.

"Plots with yield records were No. 1 in line to get water," said Westwood. "The rest were put on survival-only rations of water."

The Lewis-Brown Farm contains a valuable pear genetic collection, which includes pear species from around the world. In addition, the farm has a berry fruit breeding material collection, a rootstock collection for stone fruit and an ornamental apple arboretum. All these collections were placed on the survival-only list.

"The ornamental apple arboretum was in the most trouble," said Westwood. "We decided during the first week in August to irrigate it once so that it would make it through the summer. A final decision on the future of the arboretum will have to come later this winter.

"The wells didn't dry up, they just put out less water," said Westwood. "We had to increase the irrigation interval on the tree plots from three weeks to one month and finally to 35 days. Ultimately, we just played it by ear and watered at lower levels for more hours."

Historically speaking, the drought

If history is any indicator, Oregonians need not worry about another year of drought.

Earl Bates, U.S. Weather Service agricultural meteorologist at Oregon State University, said a survey of 75 years of weather data showed that two consecutive years of drought have occurred only at a few scattered locations east of the Cascade Mountains.

"Probability of a second dry year is low, based on evidence from past years," said Bates.

Working with Lyle Calvin, head of OSU's statistics department, and Ralph Shay, assistant dean of research and professor of plant pathology, Bates used computer technology to study long-term (1900-1976) rainfall between Oct. 1 and Sept. 30. The 1977 water year rainfall amount was compared with recorded rainfalls from the driest years ever reported for selected stations both east and west of Oregon's Cascade range.

"We looked at records from about 30 Oregon stations," he said. "In some areas, this proved to be the driest year on record, but in other areas, it wasn't the worst."

Bates selected six stations—Portland, Eugene, Medford, Madras, Klamath Falls and Pendleton—for a small sample to compare the 1977 water year to previous dry years. Of the six, only Portland recorded its driest year ever in 1977, with a rainfall total of 23.84 inches which was 63 percent of average for the period of record.

"What we have been discussing is the water year which begins on Oct. 1 and ends Sept. 30," Bates said. "However, crop year rainfall is usually recorded beginning on Sept. 1 and ending the following Aug. 31. As of Oct. 31 of this crop year, rainfall in Corvallis is 1.07 inches above normal, and in Eugene, the rainfall has been exactly normal for the period Sept. 1 to Oct. 31.

"We seem to be off to a relatively good start," he concluded.

Water table adds leg from drought

Believe it or not, Oregon's drought had at least one positive aspect, according to OSU agricultural engineer Royal Brooks.

"We had absolutely no water table and drainage problems this year," said Brooks. "We were able to gather some field data we never had before."

During a normal year, rainfall causes high water tables and drainage problems in the Willamette Valley. Brooks' work has been centered at the Jackson Farm between Corvallis and Lebanon where studies have been conducted to analyze the effect of high water tables and drainage on grasses, some legumes and cereal crops.

"Since high water table conditions were non-existent last winter, we now have a reference to what crop growth is under adverse conditions. It has given us a whole new frame of reference we would never have been able to get in any other fashion."

Maternal instinct gets nudge

Mark one up for maternity—maybe.

Researchers at Oregon State University, investigating the use of hormonally induced milk production in barren cows, decided to carry the experiment one step further.

Lloyd Swanson, associate professor of dairy physiology, and Dennis Bel Isle, graduate student in the animal science department, exposed a group of cows given hormone treatments to calves to see whether the exposure would increase the maternal reaction in the cows—and increase milk production.

Fourteen cows (nonpregnant and non-milk producing) were brought to OSU from commercial dairies in Oregon. Seven cows were used as a control group and given hormone injections but not exposed to calves. The other seven cows, however, were inndividually placed in pens with a bull calf less than 14 days old. An open wire fence separated cows from calves until after the seven days of hormone injections ended. Then the fence was taken down and calves were allowed to nurse.

Researchers recorded the amount of milk produced by cows in both groups. Compared to previous lactations, milk production during the first 90 days of testing registered 52 percent for the control group and 63 percent for the group exposed to the calves. Six cows were allowed to continue on the experiment for the full 305-day milk cycle and produced 80 percent of their normal amount.

"Overall response indicated improvement when compared with other reported hormonal induction work using this technique but without exposure to a calf," Swanson said. "But it should be remembered that this is experimental at this point because hormones have not been approved for use in commercial dairy herds."

The OSU study will be helpful if such approval is granted, Swanson said, to provide dairy farmers an alternative to culling high producing but infertile dairy cows.

Tripe by any other name may be tasty

Americans soon may be eating more tripe—and liking it.

Allen F. Anglemier, Oregon State University food scientist, said protein extracted from tripe, the rumen tissues of slaughtered beef animals, could be a valuable new source of protein for the future.

"Tripe is currently underutilized as a source of protein," Anglemier said. "In the U.S., it is used mainly in pet foods and occasionally for things like soup stocks. By extracting the protein, it could be used in a wide variety of processed and formulated foods."

The Agricultural Experiment Station researcher obtained animal tissue from the OSU slaughtering facility managed by animal scientist Walter Kennick. The rumen tissue was cleaned, coarsely ground and homogenized under alkaline conditions to make the proteins soluble. From there, the protein was collected by acid precipitation and dried into a white powder.

"We found we could remove 80 to 90 percent of the protein just by macerating the cleaned tissue in water adjusted to the proper alkalinity," Anglemier said.

Powdered tripe tested by Allen Anglemier may one day be used as a protein supplement in food products.

The new protein material then was compared with similar protein material taken from beef skeletal muscle. Some differences in protein composition were found. Tripe protein yielded 30 percent less than skeletal muscle of a particular type of protein that is essential for forming and stabilizing meat emulsions.

"Nutrition and microbial research still needs to be done," he said. "But it could be readily used in the production of sausage and processed meats in a couple years to lower consumer prices for these products."

Anglemier said as much as 60,000 tons of pure protein could be obtained from tripe every year in the United States. Approximately 35 million head of cattle are slaughtered annually in the U.S. and each mature animal contains about 50 pounds of rumen tissue, which is comprised of 10 to 15 percent protein. At a 70 percent protein recovery rate, 120 million pounds—60,000 tons—of pure protein would be available.

"It would be especially important in time of shortages, and may prove useful at other times, too," he said.

work in Progress

Fat's fine to check up on energy

A wildlife researcher at Oregon State University may have made a fat find.

Bruce Coblentz, assistant professor of fisheries and wildlife, said a new method of determining the fat content in the bone marrow of wild ungulate (hoofed) animals may save researchers time while providing a more accurate estimate of the animal's energy reserves.

Until now, scientists, using ether, have removed fat from the bone marrow in a time-consuming process. Other methods of determining fat concentration have been developed, but they are less accurate, Coblentz said.

The OSU researcher, after reading other scientists' reports, wanted to see if the amount of water in the bone marrow of black-tailed deer could be directly correlated to the amount of fat. He theorized that if the levels could be determined with enough precision, fat content might be predicted accurately by water content.

Previous researchers had discovered that the marrow system in deer and caribou was comprised mainly of water and fat, and that as fat was deposited in the marrow, water was driven off. Conversely, as fat was used during time of nutritional stress, its space in the bone marrow was filled with water, the least costly element in the animal's body.

Coblentz took samples of bone marrow from 27 black-tailed deer collected from three locations in the state. Marrow tissue was dried and loss of water was calculated. Then a second test to remove fat was conducted, and these measurements were recorded.

The OSU research indicated that, in the black-tailed deer at least, the relationship between fat and water in the femur was close enough to predict fat based on water content.

Whether the theory will hold up for other ungulate animals including white-tailed deer, mule deer and caribou, still must be determined, Coblentz said.

First, get your salmon then . . .

How do you reheat home-canned salmon before serving so it is safe?

Margy J. Woodburn, head of the Department of Foods and Nutrition in the School of Home Economics at Oregon State University, has found a way.

"Unless you know a pressure cooker was used for canning, the gauge was accurate and the timing was adequate, salmon offers a potential for spoilage and development of botulinum toxin," she said. "Heating destroys the toxin."

Don't taste or use the salmon before heating.

The Agricultural Experiment Station researcher, during a leave at the Food Research Institute at the University of Wisconsin, a center of botulism (food poisoning) research, worked out an answer for cooks who want to serve home-canned salmon without losing its quality.

Here's how: After opening the can or jar, put in a meat thermometer.

Heat the can or jar of salmon in the oven at 350 degrees Fahrenheit (177 degrees Celsius) until the center of the salmon reaches 185 degrees Fahrenheit (85 degrees Celsius). This requires 30 to 35 minutes for glass and 3½-ounce metal cans and 50 minutes for 15½-ounce cans. Wash the lid before discarding or using it to cover the cooked fish.

Remove the open can or jar from the oven and let it remain at room temperature for 30 minutes to complete the heating before serving hot or chilling to serve later.

"The recommended method to can any fish is to process it 100 minutes at 10 pounds pressure in a pressure cooker, following directions issued with the cooker," said Woodburn.

This method, she explained, applies to canning any fish or meat but the time required varies with the product.

"All other methods of canning fish (open kettle or boiling water bath) are like playing Russian roulette because you cannot get the temperature high enough without pressure."

She has other advice about canned salmon.

"If the jar or can top of the salmon is bulging, there are gas bubbles or the fish has an off-odor, discard the contents out of reach of animals and without tasting," Woodburn said.

King of the hills

Ed Landa, OSU soil scientist, was hiking on the William L. Finley National Wildlife Refuge south of Corvallis last year when he found some unusual looking mounds. After examining them more closely, he discovered they may be the ant world's equivalent of the great pyramids. This was the largest of the 106 mounds Landa found in a 1,200 square yard area. He has theorized the hard mounds keep ants from drowning when soil in the area becomes flooded during the winter.

Director
Agricultural Experiment Station
Oregon State University
Corvallis, OR 97331

Publication
Penalty for Private Use
$300

POSTAGE PAID
U.S. DEPARTMENT OF
AGRICULTURE
AGR 101

Third Class
BULK RATE

Samuel H. Bailey
Department of Information