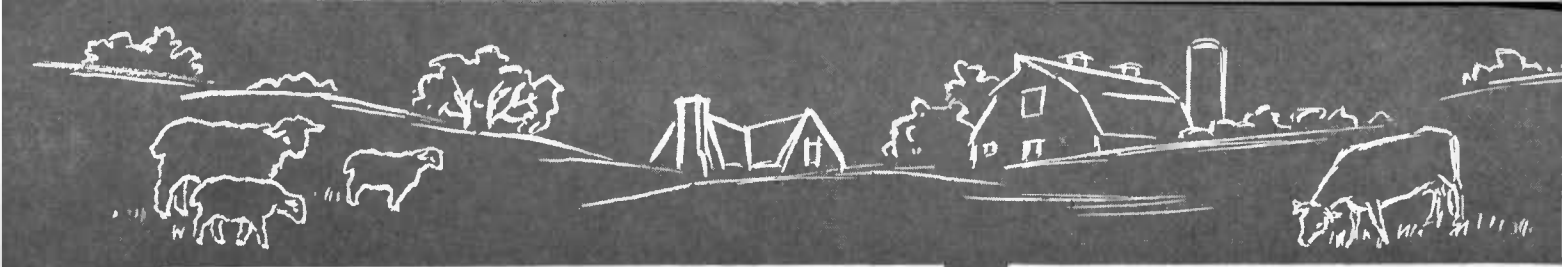
SUMMER 1965

Oregon's Agricultural PROGRESS

Pesticides and Wildlife • Proper Milking for Mastitis Control

OREGON STATE UNIVERSITY CORVALLIS



Oregon's Agricultural

PROGRESS

Vol. 12 No. 2

Published by the Agricultural Experiment Station, Oregon State University, Corvallis. F. E. Price, Director; Joyce Patterson, Acting Editor.

Features: Page

OREGON'S AGRICULTURAL PROGRESS will be sent free to Oregon residents upon request. Address requests to Bulletin Clerk, Industrial Building, Oregon State University, Corvallis, Oregon, or see your County Extension Agent.

COVER: Alfalfa-grass hay grown in Northeastern Oregon represents an important crop. In this area, alfalfa often responds to applications of sulfur, according to results of trials conducted on farmers' fields by research workers at the Eastern Oregon Experiment Station. Sulfur not only may increase yields but also may improve hay quality. Story, page 8.

Photo: Walter Klages

*THE EFFECTS OF CHEMI-*cal pesticides on fisheries and wildlife, their food and cover, and, ultimately, on man himself are continuing as a research and educational interest of the chemical industry, public agencies, and the universities. As a University spokesman at Oregon State and as an appraiser of pesticide effects on fisheries and wildlife, I find that we all play many roles. As educators we must report and interpret the facts for students and for the public; as scientists we must decide where the important unknowns lie—where our research efforts must be concentrated. And, as conservationists, we ultimately must be concerned with the wise husbandry of our fish and wildlife resources.

No conflict

These roles do not necessarily imply any inconsistency or conflict. The intelligent use of pesticides invites the contribution of wildlife biology, the science which deals primarily with the total response of subhuman organisms to their environment—even when that environment is deliberately manipulated.

To date, too much of our present information on pesticide effects is based on laboratory animals and on plants in test plots. There is some information available for the control of undesirable birds and animals. But, there is too little known about pesticide effects on animal populations in the field, on animals in a habitat altered by chemicals, or on the environment as a whole.

Chemicals helpful

So, while we do not yet know enough, we do have some information. Importantly, we find that, among other things, chemicals provide the professional biologist with a significant management tool.

Many of you know of the need to control undesirable or unwanted types of wildlife. For example, there is wide-

Pesticides and Wildlife

By Thomas G. Scott

spread concern and demand for control measures wherever wildlife damage crops badly. Also, some species of wildlife are known to carry hosts of diseases and parasites of livestock and man—rabies and Rocky Mountain spotted fever not the least among them. Chemical control of wildlife may mean 1) reducing animal numbers, 2) reducing their ability to reproduce, and 3) controlling their behavior.

Wildlife control

Wildlife numbers can be reduced and controlled in several ways. Poisoning rats and mice is a common example. In many instances this is our only effective tool. You may be familiar with the work of William Q. Wick of the OSU extension service and Lee W. Kuhn of our department who investigated mole control techniques in Tillamook County (*Oregon's Agricultural Progress,* Summer 1962). In south-central Oregon, Edward Hansen is studying control of meadow mice. Dr. Carl Bond is concerned with the control of unwanted fish in ponds and lakes. Here, he is finding it difficult to keep the chemicals from affecting other fish. Dr. Raymond Millemann, who is in charge of a new research project here, is studying the effect of the insecticide Sevin. This material has shown promise as an effective control for mud and ghost shrimp, which destroy oyster beds. But field tests have indicated that Sevin may also affect other important fishery resources, and more information will be needed before this insecticide is recommended for general use on our marine resources.

Birth control

Wildlife control through "birth control"—using chemicals to reduce or prevent an animal's ability to reproduce—promises to contain the buildup of unwanted wildlife populations. This device is a relatively new concept for wildlife biologists, and there is some evidence of promising effects on coyotes. As with the control of animal and fish numbers, there is a problem here that the chemicals employed may affect other than target animals. Research in this field is under consideration at OSU with our starling control research, conducted by Howard Wight.

Chemicals are very useful to the biologist for controlling animal behavior. Tranquilizers are often used to immobilize large animals, such as bear and elk, for handling and moving purposes.

Plant control

Chemicals are also useful in controlling plants, to bring about a desirable improvement in animal environment. Fish management, for example, may be improved after aquatic weeds are removed. Dr. Bond is studying the effects of herbicides in this domain.

Heretofore, wildlife biologists have paid little attention to the potential control of wildlife numbers through chemical control of an animal's habitat. It might be, too, that chemicals will be useful for controlling parasites and diseases of wildlife and their food and cover. Both of these possibilities must be explored thoroughly.

While chemicals provide an important management tool for the profes-

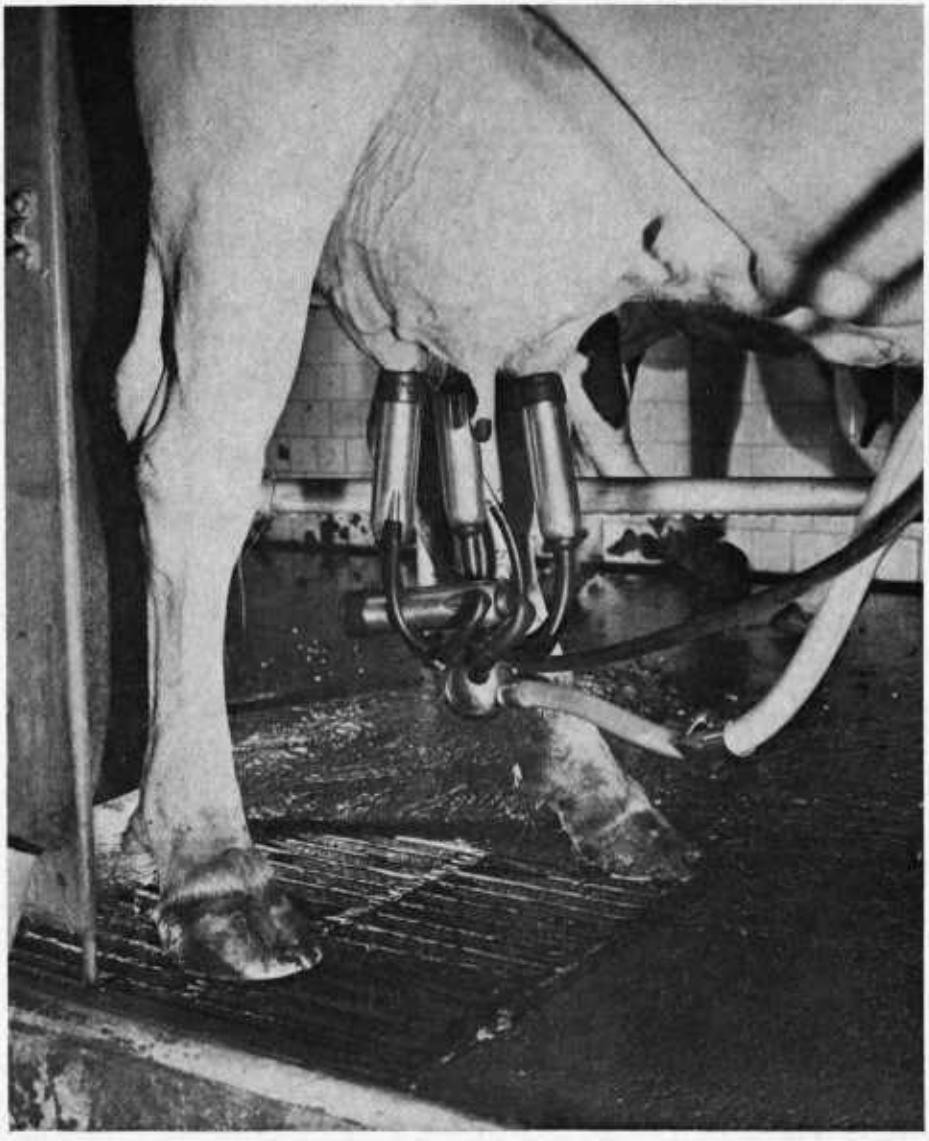
(*Continued, page 12*)

Dr. Thomas G. Scott *has been Chairman of Fisheries and Wildlife at Oregon State University since 1963. Before he came to OSU, he—for 15 years—had been head of the Wildlife Research Section of the Illinois Natural History Survey and Professor of Zoology at the University of Illinois. He has authored numerous research articles and presently is Editor of the* Journal of Wildlife Management.

Proper Milking For Mastitis Control

Milking tests at OSU demonstrate that proper milking procedures control bovine mastitis.

Quarters of the same cow may not milk out evenly. If one quarter milks more rapidly than others, remove the teat cup to prevent overmilking and udder injury.



A SET milking routine or too many milking units can actually result in reduced income for the dairyman.

However, an OSU study shows that the milking machine operator can keep mastitis pretty well under control by paying personal attention to each cow.

Kermit J. Peterson, experiment station veterinarian, who heads up OSU mastitis research, points out that mastitis is an important factor in Oregon's $100 million dairy industry, for it annually costs dairymen about 10% of their milk production.

Peterson says it is difficult to realize that a poorly working milking machine is capable of doing extensive damage to teat tissue. In a series of trials at OSU, he demonstrated that even when a milking machine is working correctly it can severely injure delicate internal teat structures if it is left on too long.

Prevent mastitis

The dairyman who wants to protect his market and his income can do much to prevent mastitis through carecul use of properly installed and maintained milking equipment, coupled with recommended sanitary practices.

Peterson explains that mastitis is an inflammation of the mammary gland. It results in lowered production, unmarketable milk, damaged udders, and frequently sends good cows to slaughter long before their productive lives should have ended.

In one OSU study, 19 cows were subjected to varying degrees of overmilking. One front and one rear teat on opposite sides of the udder were overmilked. Two quarters of each cow were milked correctly as controls. The overmilking time varied among cows from 20 minutes for 4 milkings to 3 minutes for 26 milkings. The milking machine was maintained in good repair and operated as recommended by the manufacturer.

Cows slaughtered

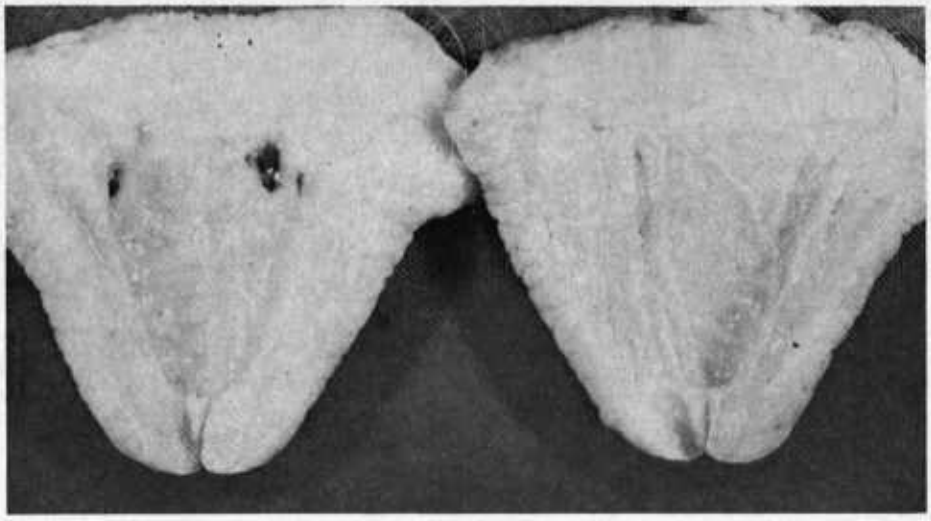
All cows in the trial were slaughtered within three hours after the final period of overmilking, and the mammary glands were removed and examined. The accompanying table shows the results.

Teats subjected to numerous short periods of overmilking suffered less injury than those subjected to fewer but longer overmilking periods. That is,

teats overmilked 5 minutes 16 times suffered less than those overmilked 20 minutes 4 times, although both trials totaled 80 minutes of overmilking.

Peterson's study also showed that the extent of injury varied among cows milked in exactly the same way. He could not pinpoint the reason for this. Some cows and some teats of the same cow just seemed more susceptible than others to the type of injury caused by overmilking.

The vacuum of prolonged milking injures the teats by irritating the teat wall when milk no longer remains to act as a cushion. The lining membrane becomes rough and thickened. Cells are injured and destroyed. Microorganisms which find their way into the teat cavity may then invade the deeper teat structures through this injured tissue and cause infection.



Typical overmilking injury is shown in this opened teat at left. Note dark spots which represent hemorrhage from overmilking. Properly milked teat, right.

Blood vessels injured

Overmilking also injures small blood vessels within the teat wall and causes hemorrhage. Ruptured vessels no longer supply necessary oxygen and nutrients to tissue.

The small opening in the end of a teat, which is called the streak canal, is especially susceptible to injury. Any irritation or damage to this important structure or the teat end can prevent the canal from functioning properly. It must close very tightly between milkings to prevent the entrance of bacteria into the teat cavity.

Peterson recommends putting the milking machine on immediately after milk letdown begins and leaving it on only long enough to get the milk. He says this will go a long way toward keeping the cow out of trouble with seemingly everpresent mastitis-causing organisms.

As a result of his study, Peterson points out two important factors which actually prevent a milking machine operator from doing a really safe job of cow milking:

1. Too many units.
2. Milking by a routine.

A dairyman who thinks he will get done faster by using too many milking units is going to do a lot of overmilking and injure a lot of teats just trying to keep up with the machines, Peterson points out.

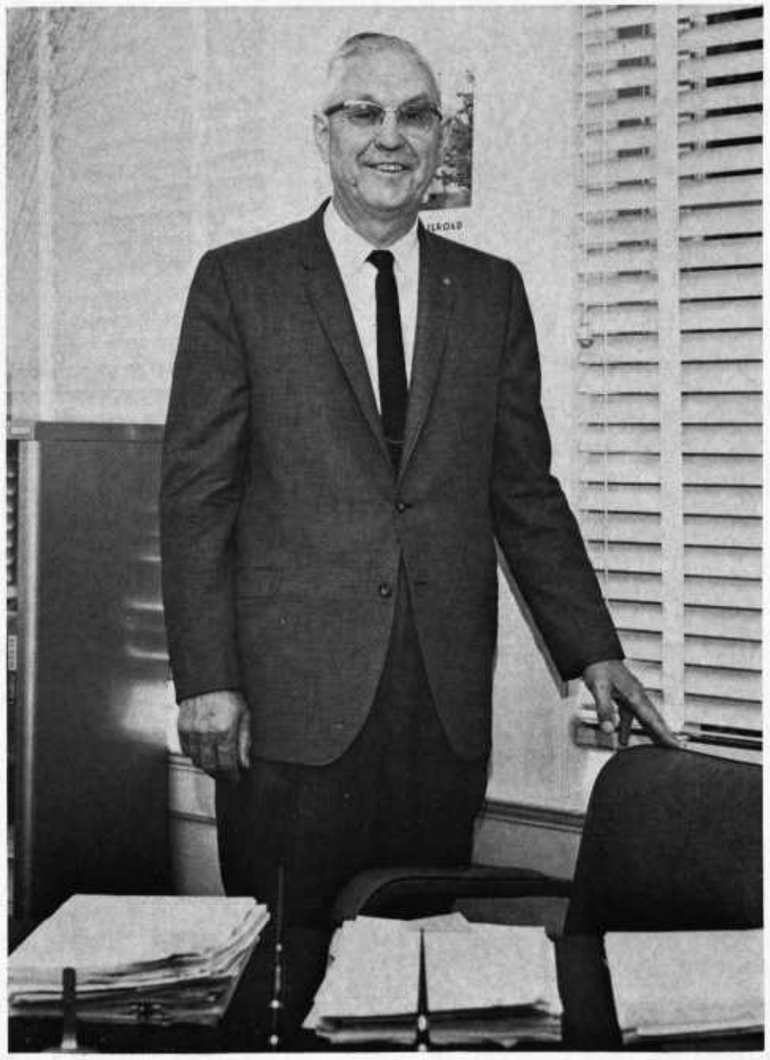
Even worse is milking by routine. A dairyman who follows a certain milking sequence which allows the same amount of time for each cow is not taking into consideration his faster milking cows or cows in different stages of lactation.

Relationship of Overmilking to Interior Teat Injury

Cow No.	Breed	Age (*mo.*)	Stage of lactation	Machine vacuum (*in.*)	Minutes over-milked	No. of over-milkings	Degree of teat injury
413	Jersey	31	Nonlactating	15	20	4	Severe
371	Jersey	59	Nonlactating	15	20	4	Severe
674	Holstein	55	Nonlactating	15	20	4	Severe
662	Holstein	60	Lactating	15	15	4	Severe
G-43	Holstein	64	Nonlactating	15	15	4	Moderate
647	Holstein	74	Nonlactating	15	15	6	Severe
325	Jersey	94	Nonlactating	15	15	6	Moderate
655	Holstein	68	Lactating	15	10	6	Severe
409	Jersey	38	Lactating	15	10	6	Severe
683	Holstein	51	Lactating	15	10	6	Severe
T-18	Jersey	45	Lactating	15	5	16	Severe
332	Jersey	86	Lactating	15	5	16	Moderate
388	Jersey	48	Lactating	15	5	16	None
645	Holstein	77	Lactating	15	5	16	Moderate
423	Jersey	28	Lactating	13	3	20	Moderate
320	Jersey	100	Lactating	13	3	20	None
T-4	Jersey	57	Lactating	13	3	20	Moderate
386	Jersey	52	Lactating	13	3	26	Moderate
T-10	Guernsey	45	Lactating	13	3	26	Slight

OSU Agricultural Leader Retires

After 43 years at OSU, Earl Price leaves a distinguished record.



DURING THE CAREER of F. E. Price, retiring dean and director of agriculture at Oregon State University, Oregon's key industries of agriculture, forestry, and recreation have risen to national prominence.

Earl Price first came to OSU from California as a student in 1917. After his graduation, he went to Montana as an extension agronomist. But he liked Oregon and returned to stay.

Forty-eight years later people from all over the state gathered at a recognition dinner on the OSU campus in June to pay tribute to Dean Price and his wife.

During the dinner, Chancellor Roy E. Lieuallen mentioned that his own work with agriculturally oriented legislators had permitted him to learn of the enormous respect and high esteem which Earl Price commands. Few men, he said, are as privileged as Dean Price to leave such deep and permanent imprints on a state's economy.

Other speakers

Other speakers who told of contributions Dean Price has made to Oregon agriculture included Larry Williams, Canyon City, chairman of the Agricultural Research Council; Paul Culbertson, Medford, past president of the Oregon Horticultural Society; Allen Tom, The Dalles, vice president of the National Association of Wheat Growers; Rex Warren, OSU extension farm crops specialist; Wade Newbegin, Portland, president of the R. M. Wade Co.; and James Short, Salem, Oregon state director of agriculture.

In announcing Dean Price's September 1 retirement date, OSU President James H. Jensen praised him as a "dedicated staff member, an imaginative executive, an acknowledged leader, and a key figure in the growth and development of agriculture in Oregon and the Northwest."

Irrigation work

Early in his career at OSU, Price started work on sprinkler irrigation. One of his first tasks was to demonstrate to western Oregon farmers that irrigation, as a supplement to natural rainfall, was their key to high production and high value agriculture.

His pioneering work in sprinkler irrigation has been recognized throughout the United States and in many other countries. He served as consultant on sprinkler irrigation to the state of Sao Paulo, Brazil, in 1952. In that same year he received the national "Water is Wealth" award from the Association of Sprinkler Irrigation Manufacturers.

Then in 1958 he served as a consultant in experiment station administration with the OSU advisory staff at Kasetsart University in Thailand.

During his years at OSU, Dean Price has contributed significantly to the management and use of Oregon's natural resources based largely on research and extension programs by his staff.

A glance at what has happened in key Oregon industries during Dean Price's tenure shows extensive development in four areas: agricultural production, food processing, forestry and forest industries, and fisheries and wildlife.

In agricultural production, Dean Price has helped to foster rapid development of specialty crops that provide Oregon growers with a competitive advantage over other areas and added payrolls that benefit the state's total economy. Since he became associated with Oregon agriculture, seed crops have grown from a $2 million industry to a $28 million industry. Irrigated acreage in western Oregon has increased from less than 5,000 acres in 1922 to more than 170,000 acres today.

Growth in the food-processing field is an example of economic development in the agri-business area. The food processing industry, for example, added over $225 million last year to the value of Oregon's crop and animal food products.

Forest research

Much of the credit for OSU's becoming a recognized center for forest research can go to Dean Price. He has encouraged extensive research to serve forestry—the state's major industry with a gross annual income of $1,300,000,000 when initial processing value is included.

Several years ago the state Forest Experiment Station came into OSU's Agricultural Experiment Station as its Forest Research Division. Price immediately recognized the need for increased research in this vital area and worked with experiment station directors in other states and members of Congress to secure passage of the McIntire-Stennis Act in 1962. This act provided $1,000,000 annually to support forestry research in the 50 states and Puerto Rico. This year, chances are good that Congress will double the fund. As a consultant and personal friend, he is highly valued by Oregon foresters, remarked OSU's Dean of Forestry W. F. McCulloch. Price has also promoted forest extension for the benefit of small landholders, McCulloch pointed out.

Fishery and wildlife

OSU has long been noted for outstanding teaching in fisheries and wildlife, and in recent years has begun a tremendous expansion of research in these fields. Significant contributions to serve Oregon's rapidly expanding tourism-recreation industry have been made. Other research has guided industrial and other economic development in ways most compatible with resources of value to sportsmen.

For the past 15 years, Price has been Dean of the School of Agriculture, Director of the Agricultural Experiment Station with its 13 branch stations across Oregon, and Director of the Cooperative Extension Service, which includes county agricultural, home economics, and 4-H club programs.

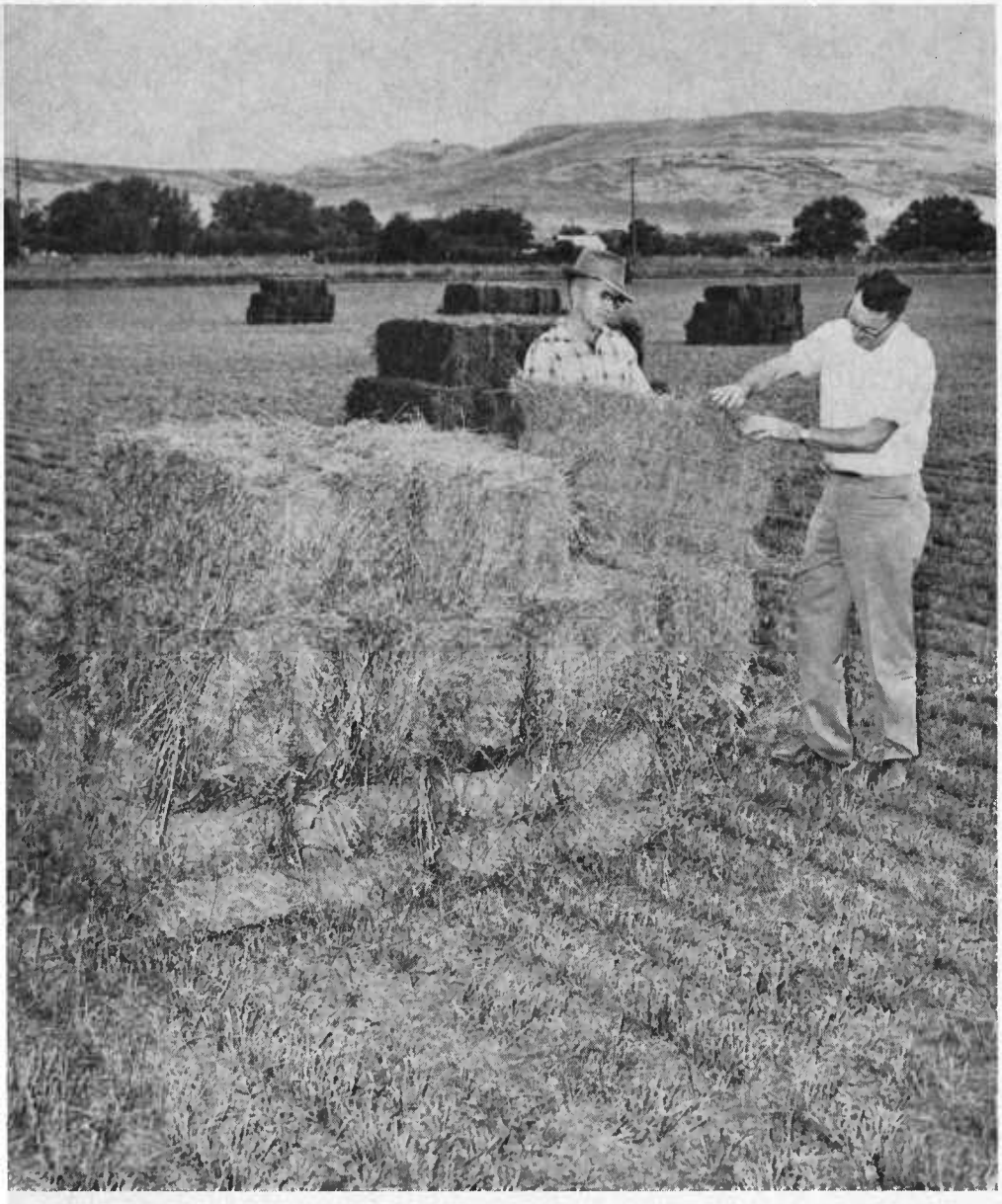
His philosophy has been to emphasize the team approach—with the extension service reporting and interpreting research findings to the public.

Under Price's leadership, one of the most significant changes at OSU has been the reorganization of the curriculum of the School of Agriculture into three separate options in technology, business, and science to better educate today's agricultural graduates and thereby meet the needs of Oregon's rapidly growing agri-business.

Sulfur Increases Alfalfa Yields

Nearly three-fourths of the alfalfa grown in Northeastern Oregon suffers from a sulfur deficiency, according to an OSU survey. Sulfur applications may increase yields, improve hay quality.

Vance Pumphrey, left, and J. A. B. MacArthur, Eastern Oregon Experiment Station, examine alfalfa hay from test plots of farmers' fields throughout area.



GROWERS in northeast Oregon need to take a new look at their current sulfur fertilizer practices for alfalfa production.

That is the conclusion reached by OSU agronomist F. V. Pumphrey, based upon results of a three-year study conducted in Baker, Union, and Wallowa counties. Pumphrey is stationed at the Eastern Oregon Experiment Station.

Sulfur fertilization has been recommended for over 50 years in this area, yet Pumphrey found that almost 75% of the alfalfa fields included in his study were suffering from lack of sulfur. What is more, his research showed that supplying adequate sulfur improved the quality of feed produced as well as increased the quantity. Both aspects are very important to a livestock program.

Pumphrey's results were obtained in 28 experiments conducted in farmers' fields throughout the area. In each experiment, yields of alfalfa from plots receiving 50 pounds of sulfur per acre were compared with plots not given additional sulfur.

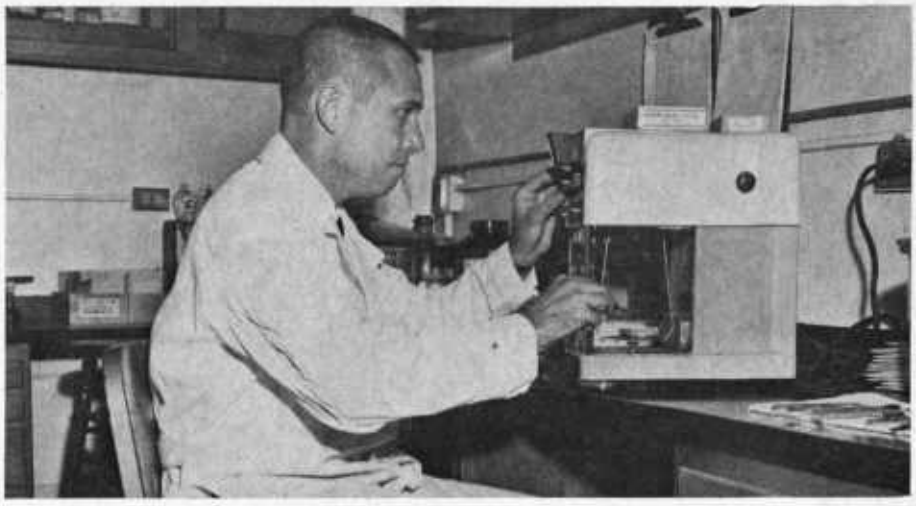
Yields increased

In 20 of the 28 experiments, significant yield increases were obtained from the applied sulfur. In fields where the alfalfa was deficient in sulfur, the yield averaged 2,580 pounds of dry hay per acre from the first cutting. Where sulfur fertilizer was applied, these same fields averaged over 3,800 pounds per acre—an increase in yield of over 45%. Second cutting yields were increased nearly 1,300 pounds per acre by sulfur fertilization where soil mois-

ture was adequate for the growth of a second cutting.

In these experiments the sulfur fertilizers had very good residual value the second year following application. Forage yield increases were nearly as large the second year as the first year. Accumulated value of benefits derived from fertilizing the sulfur deficient fields has greatly exceeded the cost of the fertilizer and its application.

Samples of the alfalfa were taken at harvest time and analyzed for sulfur and nitrogen in the laboratory of OSU soil scientist D. P. Moore. The sulfur content of the forage was found to range from 0.10% to 0.40%.



OSU soil scientist David P. Moore weighs a sample of alfalfa to determine its sulfur content. Amount of sulfur in alfalfa will change during plant growth.

Deficiency diagnosed

When sulfur content of the alfalfa was compared with yield data, an interesting relationship emerged. In fields where the unfertilized alfalfa contained more than 0.22% sulfur, there were no increases in yield from sulfur fertilization. On the other hand, where the sulfur content was less than 0.22%, over 90% of the fields responded to the applied sulfur fertilizer.

Pumphrey and Moore feel that this relationship is potentially useful as a means of diagnosing sulfur deficiency of alfalfa; but they point out that it applied only to samples taken at early bloom stage of growth.

Other work by Pumphrey and Moore indicates that sulfur content of alfalfa changes during growth. This change in sulfur content of the forage as it grows complicates forage analysis as a method of diagnosing sulfur deficiency; therefore, sulfur content of the forage must be related to a definite stage of maturity.

Hay quality improved

Increasing the yield was not the only benefit Pumphrey obtained from sulfur fertilization. Plants lacking in sulfur also were found to contain less nitrogen and therefore less protein.

Sulfur fertilization increased the nitrogen content of the plant, and the largest increases were noted where the sulfur deficiency was most severe. Other benefits observed from proper fertilization were longer life of the alfalfa stand and less invasion by weeds and grasses.

Pumphrey and Moore also found a close relationship between the nitrogen to sulfur ratio in the plant and the response to sulfur fertilization in the field. When the N:S ratio in the plant was less than 11 (11 parts of N to 1 part of S), sulfur was adequate for the plant's needs and no response to sulfur fertilization was obtained. However, when the N:S ratio was greater than 11, a sulfur deficiency was indicated and significant yield increases were noted in over 95% of the fields studied. Thus, the N:S ratio was a slightly better measure of sulfur deficiency than was the sulfur content alone. In addition, the N:S ratio was less dependent on the stage of maturity, and time of sampling was less critical.

Pumphrey emphasizes the need for growers to follow sound management practices to produce the maximum return from alfalfa. Fertilization is one aspect of management and is no substitute for insect, disease, and weed control, the establishment of a good stand of a recommended variety, proper water control when irrigation water is applied, and timely harvesting operations.

The following sulfur fertilization practices for alfalfa production in northeast Oregon are recommended:

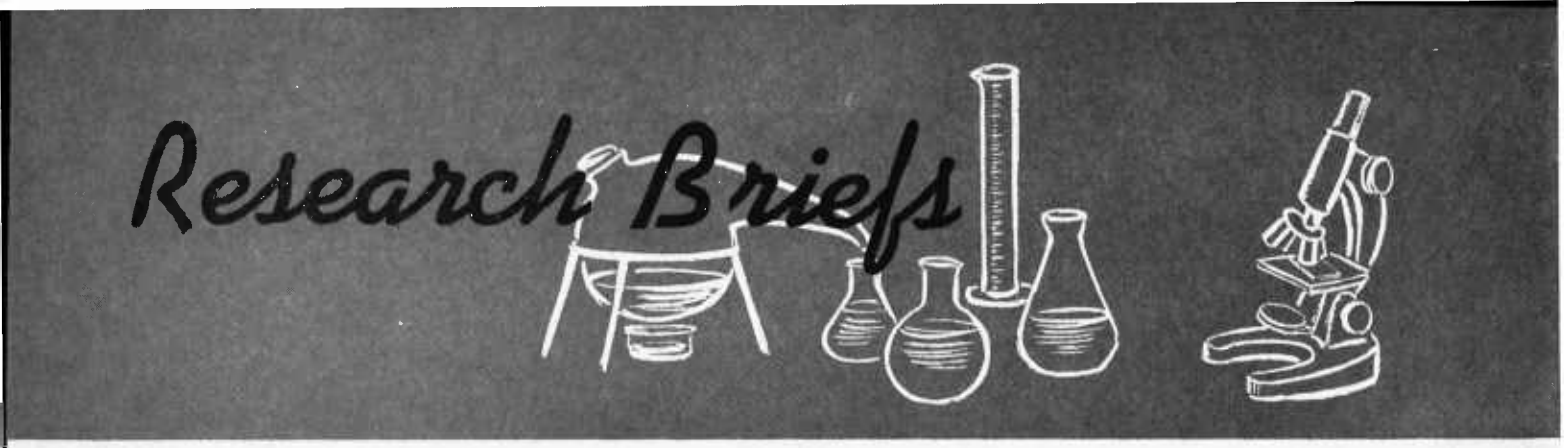
1. Alfalfa fields need sulfur fertilization when the forage in the early bloom stage of growth contains less than 0.22% sulfur or the N:S ratio is greater than 11.

2. Five to eight pounds of sulfur should be applied for each ton of dry legume forage expected to be produced.

3. More than one year's needs of sulfur can be applied in one application.

4. Sulfur fertilizers can be applied either in the fall or early spring. Fall application is recommended for non-irrigated fields.

First-cutting hay yields increased 45% after sulfur had been applied to deficient alfalfa. Hay lacking in sulfur also contained less nitrogen, less protein.



IBA Dip Increases Strawberry Plant Survival

THE OREGON strawberry industry may be able to save as much as $100,000 a year if all growers adopt an OSU-developed method of helping strawberries develop better roots.

In a recent field test at the North Willamette Experiment Station, 1 ton per acre more strawberries was harvested from treated plants than from untreated ones.

Plants dipped

The treatment simply consists of dipping plants in a solution of kinetin and indolebutyric acid (IBA) for 15 minutes before planting. OSU horticulturist Ralph Garren, who developed the method, points out that it is a fairly easy procedure. Growers can dip a crate (1,000 plants) at a time.

Main purpose of the dip is to get new plants off to a good start. It helps them develop a sound, extensive root system before insects, disease, and other enemies attack the young, tender plant.

Top growth is normally responsible for producing root growth. However, weather and other factors sometimes do not promote good top growth. This means that roots do not develop as they should, and the plant may be lost or weakened.

Root growth stimulated

Kinetin and IBA supply roots with chemicals similar to those normally provided by leafy plant tops—thus underground development can continue regardless of unfavorable conditions above ground.

In OSU tests, there were 17.3% fewer plant losses from plants dipped for 15 minutes in the kinetin-IBA solution than from untreated plants.

During the research, many different combinations of the chemicals were tried. Incidentally, all combinations produced better roots than no chemicals. However, by actual root count, a solution of 4 parts per million (ppm) kinetin and 40 ppm IBA was best. Plants treated with this solution produced 330% more roots than untreated plants.

Actually, IBA used alone produced even more roots; but they were stubby and whiskery. The addition of kinetin produced a more natural root. Kinetin is also a safety factor. IBA alone can be harmful to a plant if the plant is left in it for too long. Tests showed that kinetin counteracts IBA's detrimental effects.

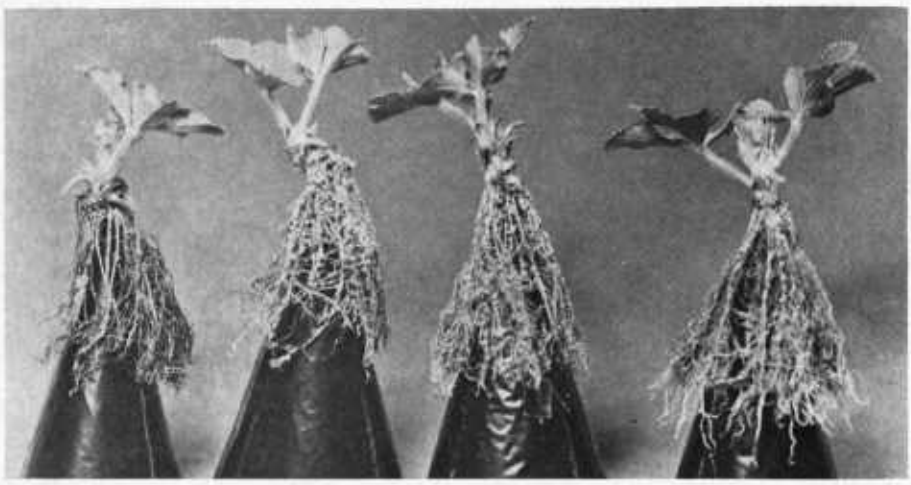
Kinetin is expensive—about $23 per gram. However, one pound of it would treat all the strawberry acreage in Oregon. For about $6, a grower can buy enough of the commercial IBA and kinetin formulation to treat 10,000 plants (an acre's worth). All that has to be added is water.

Growers replant

Oregon has the largest strawberry acreage in the United States. Although strawberry plants are perennials, diseases, insects, and mechanical injuries all take their toll and most strawberry plants produce economically for only about three years. So about one-third of the state's 15,000 acres have to be replanted every year.

During the course of Garren's continuing research, just this past spring he discovered that strawberry plants dipped in distilled water for 24 hours developed more and better roots than plants not dipped in anything or dipped in distilled water for only 15 minutes.

He says he will be doing more work on this to see if perhaps the distilled water is removing something from the plant that inhibits rooting. If so, perhaps ordinary undistilled water would do the same thing.



Effects of plant dip on strawberry root development is shown above. From left, no chemical, IBA, Kinetin-IBA, and Kinetin. Kinetin-IBA dip is recommended.

Root nodules on snowbrush are found from three to nine inches under a forest soil surface. Organic nitrogen released helps stimulate growth of new conifers.

Forest Plants Fix Nitrogen

FOREST managers might well take a tip from farmers who regularly use legumes in crop rotations for soil improvement, suggests OSU soil scientist Arthur Wollum.

At least 11 woody shrubs and other nitrogen-fixing plants are commonly found in Pacific Northwest forests. Although these often are considered obnoxious weeds, Wollum says with proper management they could play an important role in the economy of soil nitrogen.

Actually, these plants are not leguminous; however, they possess root nodules similar in function to those found on legumes. *Ceanothus* is one such genus common in Oregon. Among its family members is snowbrush.

Soil nitrogen improved

Wollum explains how snowbrush, for example, might improve soil nitrogen:

Following logging, branches and limbs of harvested trees are piled together and burned with other debris. If snowbrush seeds happen to be present, they are stimulated by heating and germinate the following spring. In some areas as many as 100,000 snowbrush seedlings per acre can be found, but 10,000 to 20,000 is more common.

Many of the seedlings become richly nodulated the first year and nitrogen fixation begins. Much of the nitrogen fixed in the nodules goes to the tops where it helps produce new foliage. Small quantities of organic nitrogen are released during this phase through litter fall and sloughing of the old roots. This material decomposes and the nitrogen becomes available for conifers.

Within a few years the conifers begin to dominate the area and the intolerant snowbrush plants begin to deteriorate.

More and more foliage drops and decomposes to release more nitrogen which can be utilized for improved conifer growth. Meanwhile, roots of the snowbrush plants also are deteriorating and undergoing a similar decomposition.

Wollum and forest soils scientist C. T. Youngberg recently made a greenhouse study which suggests how much nitrogen becomes available through this process. In a period of 9 months the root systems of two snowbrush plants accumulated an equivalent of 70 pounds per acre of nitrogen which became available for the growth of some pine seedlings.

N fixation higher

This did not take into account the nitrogen that had accumulated in the tops of the vigorously growing snowbrush plants. It is apparent, therefore, that the total amount of nitrogen fixed was much higher.

Wollum says that, with proper management, nitrogen fixing genera such as *Ceanothus* could become important in stimulating forest growth, especially in areas of low fertility.

Pigs Grow Fast On New Hulless Barley

SWINE FED a new variety of hulless barley in OSU tests grew faster than swine fed regular Hannchen barley (hulled). The new variety of hulless barley was developed in Utah.

OSU animal scientists Donald R. Gill and J. E. Oldfield point out that barley hull is relatively indigestible by swine and is the main drawback in feeding pigs rations high in barley. In the past, hulless varieties which would solve this problem have not been widely grown due to their lower yields and other agronomic weaknesses.

Gill and Oldfield report an experiment comparing feeding values of Hannchen barley, Utah hulless barley, Gaines wheat, and yellow dent corn, in which it was found that both hulless barley and wheat were superior to regular hulled barley.

Rate of gain of the pigs was apparently best when corn was fed, but performance differences between corn, hulless barley, and wheat rations were not significant statistically. What was significant was that pigs fed regular Hannchen barley (hulled) grew more slowly than pigs fed the other grains.

Of equal importance is the efficiency at which the four grains tested were converted to pork. Efficiencies of conversion of the rations (pounds of feed per pound of gain) on test were as follows: corn 3.24; hulless barley 3.29; Gaines wheat 3.49; and Hannchen barley 3.97.

In previous tests it has been established that regular barley has a feeding value of 80 to 85% of corn in swine rations. In this test regular barley's feeding value was 83% that of Utah hulless barley.

The Utah hulless barley used in feeding tests at Oregon State University was grown by Earl Mack and Arnold Brandt, Klamath Falls ranchers. Information on the availability of seed may be obtained by writing Ray O. Petersen, county Extension agent, Klamath Falls, or the Utah Agricultural Experiment Station at Logan, Utah.

In field tests last summer on the Mack farm, the hulless barley variety yielded 4,250 pounds per acre, compared to Hannchen's 3,450 pounds per acre.

We will want to know where pesticides are going to predict their ultimate effects.

(*Continued from page 3*)

sional wildlife biologist, we are also concerned with undesirable or unwanted effects. Often, these effects occur as subtle, complex processes and we are only beginning to understand them.

Rates low?

It is often asserted—quite accurately—that rates of application are too low to directly cause wildlife mortality. But valuable wildlife may be forced to contend with a reduction of their primary food sources. It has also been shown that chemical residues can be concentrated through food chains. Insects and other food organisms may either develop a resistance to a chemical or naturally tolerate high levels. Thus, birds, mammals, and fish which feed upon these organisms find that their feeding represents an exposure to pesticides at higher concentrations than otherwise available in their environment. Contaminated food chains hold the added danger of exposure to more than one kind of pesticide and combinations of pesticides may be more toxic than the sum of the toxic potential of each component. Thus, as a consequence, persistent pesticides applied at low levels may produce delayed effects on many forms of wildlife. Dr. Charles Warren and his associates are investigating this problem further at OSU.

Area limited?

While there may be some comfort in the fact that pesticides are being applied to limited land areas (about 5 to 10% of the total area of the United States, for example), we may be indulging ourselves with a false sense of security if we acept this assertion at face value. Recent investigations indicate that some of the chlorinated hydrocarbons—such as long-lasting DDT—are more widespread than has been commonly believed. Some of these pesticides have been detected in the upper atmosphere in remote areas, and residues have been found in wildlife in wilderness areas with no known history of pesticide application. Traces of these chemicals have been detected by the United States Public Health Service in virtually every major river system in the United States. To the wildlife biologist, this indicates that chlorinated hydrocarbons and perhaps other persistent chemicals may constitute an aspect of the environment which must be measured just as faithfully as is temperature, precipitation, or any other important environmental element. For it is conceivable that, while chemical pesticides are here to stay, we will want to know more precisely where they are going in order to predict more precisely their ultimate effects in our environment. Further research on this aspect of pesticides is in the planning stage by Dr. B. J. Verts, in cooperation with the Department of Agricultural Chemistry.

Sportsman affected

It is perhaps inevitable that our knowledge of pesticide effects on wildlife will have implications for the sportsman. And, as our knowledge increases, these implications will become clearer and more specific. But there already is some evidence that should be of interest. Recently, hunters in Montana were advised by their Director of Fish and Game to trim away fat of grouse, especially blue grouse, because excess quantities of DDT were found in these tissues. Closure of the pheasant season in parts of California and on woodcocks in New Brunswick has come under serious consideration because of residues found in the tissues of these fowls.

Need intelligent control

We have seen, in this brief article, that chemical pesticides already play an important role in the environment of our wildlife resources. We have seen that, with understanding, maturity of judgment, and skill, many pesticides represent an effective tool that can do much good. We have also seen that these chemicals can be harmful. Whether they bring injury or good depends on how they are used—rashly or prudently. For if we fail to keep these powerful tools under our intelligent control and if we work against—rather than with—natural law, inevitably we will bring about great harm to ourselves and our resources.

PENALTY FOR PRIVATE USE
TO AVOID PAYMENT OF
POSTAGE, $300

AGRICULTURAL
EXPERIMENT STATION
of the
Oregon State University

F. E. Price
Director

FREE: Annual Report of Bulletin or Circular or Report of Progress.

Permit 1115

POSTMASTER: Please return free if unclaimed. See Postal Laws and Regulations.

Oregon's Agricultural
PROGRESS