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Soybeans:

New-old crop for Oregon

Oregon is welcoming an old friend—the soybean. Interest in the possibility of producing soybeans in the state has been revived because of constantly increasing Northwest use of soybean oil and meal, an advantageous seaport location for a waiting export market—and a strong soybean price.

This time, new varieties and potent new herbicides are boosting the soybean's chances in Oregon. A Midwest crop on its way to becoming a giant, the soybean was first tried in the Ontario area in 1938 by E. N. Hoffman and Maurice Frakes on leased land. In 1944 and 1946, after the Malheur Experiment Station had been established, Hoffman tried again. In 1958 and 1959, Hoffman and Vern Neilson tried again. Results were strikingly familiar: some varieties did not mature fully but yields were fairly good.

25 years ago

In 1947, OSU agronomist Harry Schoth planted a few mid-season varieties from the Midwest in sandy loam of the OSU East Farm.

Output was small. The plants produced pods but did not fully mature. After five years of experiments, Schoth decided Oregon's growing season was too short and closed out the project. Since the late 1950s, as new varieties became available, agronomist Wheeler Calhoun has run intermittent experiments on soybeans at Hyslop Farm.

From 1960 through 1964, OSU agronomist Luther Fitch tried again, working at Malheur Experiment Station in Ontario and with Washington crop scientists to establish the soybean as a crop. (Cont. on p. 16)

The Golden Bean of Asian antiquity today is called the soybean—and sometimes the Cinderella plant. No other plant or animal can match it in converting soil and air raw materials into nutritious, high-quality protein, the leading deficit in many diets. A taprooted, summer annual legume grown for its edible seed, the soybean (Glycine max), when processed, yields two basic products: oil and protein. About 3000 B.C., a Chinese emperor described more than 300 human remedies which could be prepared from the Golden Bean. But the seed did not find its way to the United States from Manchuria until the 18th century—and then as ballast in a sailing vessel.

Today, ironically, the Golden Bean, which could go a long way toward feeding the world's hungry, is returning to the East—as a leader in U.S. agricultural exports.

Massive inoculation allows soybean plant to reach potential first season on land new to soybeans.
‘Yellow belly’ hurts cattle industry

Disease hunted in deer

Wildlife and livestock interests are getting their heads together in an attempt to learn more about anaplasmosis—a costly cattle disease.

Increasing losses and continuing spread of anaplasmosis have led to restriction of cattle movement into areas still free of the disease. They also have led to research which, hopefully, will provide clues for eventual control of the disease.

Anaplasmosis, identified in at least 40 states, is most prevalent in Southern and Western states. It was diagnosed in Oregon in 1935, Idaho in 1937, Montana in 1943 and Washington in 1952.

Oregon State University veterinarians K. J. Peterson and T. P. Kistner, working with the Department of Fisheries and Wildlife and the Oregon State Game Commission, are investigating whether mule deer—common in Eastern Oregon where incidence of anaplasmosis is high—are carriers of the disease.

Their research is part of an overall program involving several states. Idaho researchers are investigating the reservoir status of elk, and Montana scientists are doing the same with antelope. An OSU study to determine the carrier status of American bison is under consideration.

Scientists in California have shown that black-tailed deer are carriers of the disease, whereas research in the Southeastern states shows that Virginia white-tailed deer are not carriers.

**Causes anemia**

Anaplasmosis is caused by a blood parasite that attacks red blood cells, causing severe anemia in beef and dairy cattle. In the western states, ticks are believed responsible for disseminating the disease. In Oregon, the Rocky Mountain spotted fever tick appears to be the main villain, although at least two other ticks are capable of transmitting the disease. Female ticks transmit the parasite to their offspring, increasing the chances of cattle exposure.

The disease can be transmitted mechanically by bloodsucking insects such as horse flies and mosquitoes. Man can transmit it mechanically by using contaminated hypodermic needles, dehorning saws and other surgical instruments. However, if the disease is to be spread mechanically, the blood from the infected animal must be introduced into a healthy animal before it dries—usually minutes. If the blood dries, the disease organism dies.

**Death comes quickly**

Signs of the disease usually appear within six weeks after an animal is infected. From this point, the disease acts rapidly, often resulting in death within 24 to 36 hours. Animals that don’t die often take several months to...
fully recover and become lifetime carriers of the disease.

A decline in milk production in lactating cows, loss of appetite and a tendency for affected cows to lie down and not follow the herd are early signs of anaplasmosis.

As anemia progresses, temperature rises, respiration rates accelerate and mucous membranes become pale and sometimes yellowish in color. Constipation, dehydration, rapid weight loss, weakness and muscle tremors develop. Nervous cattle and those unaccustomed to confinement are prone to fight. Pregnant cows may abort.

Calves under one year of age often become infected, but develop only mild signs. Illness is often not recognized but the calves become carriers, usually for the remainder of their lives.

Livestock can be vaccinated to prevent death from anaplasmosis, but vaccinated animals cannot be differentiated from naturally infected carriers.

**Deer blood checked**

To determine if mule deer are carriers, the OSU researchers, working with the Oregon State Game Commission, collected blood from 30 deer in highly infected areas, specifically, Steens Mountain, Ironside and Silver Lake areas.

Blood from 10 deer from each area was pooled and injected into two calves. The scientists are monitoring health of the calves to see if signs of anaplasmosis develop. A portion of the deer blood also is being subjected to standard serologic tests used to determine carrier status of cattle to determine accuracy of these tests on deer blood.

Ticks from the deer were sent to the USDA laboratory at Beltsville, Maryland, for identification and attempts to isolate the anaplasmosis parasite.

If it is determined that the deer are carriers, it will mean that two of the three deer species native to North America fall into the carrier category, making control of the disease through an eradication program extremely difficult. It may then be better to direct research toward control and immunization programs, said Peterson.

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**Growth secrets rooted out in study of Douglas-fir**

Orchards of “super-trees” producing seed for high-yielding Douglas-fir forests or cuttings for better Christmas trees will be improved as OSU researchers learn how to propagate cuttings from trees showing growth, shape and other characteristics desired by these industries.

Although some tree species can be propagated from cuttings—a practice used by Japanese and German foresters—efforts to root Douglas-fir cuttings have had limited success. As a result, scions from superior trees are usually grafted to roots of chance seedlings, but this practice has drawbacks. A high percentage of the trees die because of graft incompatibility. Growth of those that survive can be influenced by the seedling rootstock which usually does not contain the same superior genetic material as the scion.

OSU horticulturist Al Roberts has spent several years applying knowledge about propagating woody fruit and ornamental trees and shrubs to propagating Douglas-fir stem cuttings. Working with other horticulturists, forestry researchers and graduate students, Roberts has established that large-scale propagation of Douglas-fir cuttings is feasible.

He found that buds on the cuttings influence rooting. They can inhibit, promote or compete with root initiation and development, depending on stage of development and treatment received before or during the propagation process.

It appears that subjecting buds to a cold treatment before attempting to root the cutting removes inhibitors in the buds and re’eases root promoters.

Rooting potential is lowest in September and October and highest in January and February. There is some shift in this pattern depending on climate in any given year, but this is usually minor because daylength controls the onset of bud dormancy, and cold temperatures break this dormancy and permit rooting.

The researchers hope to refine knowledge of the relationships between stem rootability and bud dormancy, needle development and cambial activity. He also plans to “program” parent plants in environmental growth chambers so cuttings can be taken several times a year instead of once a year. A pilot test shows cuttings can be taken at least three times a year, greatly increasing the number of descendants from a superior tree. (Cont. on p. 15)
Growing fruit one year, canes the next boosts berry crop efficiency

Annual leave

Sometimes half a crop of berries is more profitable than a whole crop.

Tests with caneberrries — blackberries, raspberries, Loganberries and Boy- senberries—by North Willamette Experiment Station horticulturalist W. A. Sheets show that yields can be increased and costs reduced by growing fruit one year and canes the next year. This means that half the acreage is out of production every year.

Yields for the total acreage are not as much with the alternate year (A-Y) cropping system. But they are up approximately 33 percent on plants that are producing. The savings on sprays, irrigation, fertilizer and labor on the other half of the crop more than offset the overall production decrease.

Alternate year cropping tests were initiated because mechanical harvesting damages large numbers of new canes and reduces their fruit-bearing potential the following year. With alternate year cropping, the damaged canes, as well as all other canes, are cut to the ground after harvesting. The following year is devoted to growing a crop of healthy canes.

A-Y system offers savings

During the off year, the plants do not have to be sprayed for fruit rot, worms or any other fruit-related problems. They may not need to be irrigated and nitrogen fertilizer trials indicate that no additional nitrogen is needed during the off year and, during the bearing year, only half as much as normal is needed.

Alternate year cropping is not widely accepted by growers of Oregon's eight million dollar annual caneberry crop, but Station data and success of those who are using it are leading to increased interest and a gradual shift to the practice.

Other cultural practices for caneberrries—pruning systems, training dates and plant spacings—based on Station research also are coming into increased use by growers.

Summer training looks good

August training of canes has several advantages over traditional February training. In addition to increased yields, August training reduces cane injury by getting the canes off the ground and out of the way of equipment applying pesticides. By February, canes are often tipped into the ground, producing new plants that must be eliminated. August training eliminates this problem.

The biggest advantage of August training is that the canes produce numerous lateral branches not produced on winter-trained canes. The lateral branches, replacement wood for canes damaged during the training process,
provide several more fruiting spurs than February-trained canes.

Mid-September and mid-October training dates attempted at the Station proved inferior to both the August and February dates. It is recommended that canes be trained before September 1. If this cannot be done, the canes should be left on the ground until February.

Spacing trials comparing the standard 10 x 10-foot spacing with 10 x 5- and 10 x 2½-foot spacings show that 10 x 5-foot spacings are most profitable. Slightly higher yields in the 2½-foot spacings are offset by increased labor needed to work with twice as many plants.

In pruning, the short system—training canes only to the point where they reach the next plant and clipping the excess length—produces just as much or more fruit as the long system of pruning—training everything to the wire regardless of length. The short pruning system used in February reduces labor costs by cutting training time an average of 30 hours per acre.

A chemical pruning process developed at the Station removes growth on the bottom 18 inches of the plant and delays new cane development. Delaying cane development about two weeks permits the application of a necessary prebloom spray without mechanical damage to new canes.

Because fruit in this lower plant area is seldom picked by hand pickers and cannot be picked with mechanical harvesters, its elimination by chemical pruning also eliminates fruit rot and other diseases that originate with overripe fruit.

The loss of lower fruiting spurs does not adversely affect yields, suggesting that water and nutrients that would have been used to produce fruit on these spurs are utilized by the remaining fruit.

Goal of the Station research: improve marginal yields and decrease production costs—the most pressing problems facing caneberry growers today.

Horticulturalist W. A. Sheets points to lateral branches that will support additional fruiting spurs on summer-trained Marion blackberry canes and kneels by a plant clipped as part of the alternate-year cropping system. North Willamette Experiment Station caneberry fields (below) are site of most of Sheets' work. (Pictures taken early May.)
Sea otters come home

The sea otter, once hunted near extinction for its luxurious pel, is attempting a comeback along the Oregon Coast. Prior to recent releases, only one sea otter had been spotted along the Oregon Coast in the last 60 years. That one, seen just north of Tillamook several times during the 1961-62 winter, apparently wandered in from California or Alaska. In 1970 and 1971, otters from Amchitka Island in the Aleutians, site of the last underground nuclear test, were released along the Oregon Coast by the Oregon State Game Commission and the Alaska Department of Fish and Game. Twenty-nine otters were released at Port Orford in July, 1970. In June, 1971, 24 more were released at Port Orford and 40 were released just north of Cape Arago near Coos Bay.

A study to learn how the transplanted otters adjust to their new home is being conducted by the Oregon Cooperative Wildlife Research Unit at Oregon State University. Although other releases have been made off the coasts of Washington and British Columbia, the study, conducted by Fisheries and Wildlife graduate student Ronald J. Jameson, is the first in-depth evaluation of a relocation attempt.

Spotted takes practice

Jameson's first problem was to become a seasoned otter spotter. After seeing one animal, he spent two months searching the Oregon coastline before seeing a second one. And then the otters began appearing more frequently and in larger numbers. Whether the otters were there all the time and he just couldn't spot them, Jameson isn't sure. However, since February 20, when 19 animals were spotted, he has never seen fewer than 12 otters at one time and has seen as many as 21. All the recent observations have been at Simpson's Reef near the Cape Arago release site. Five deaths have been recorded since the second release.

The first otter pup appeared February 20 and has been seen regularly since. Since sea otters have a gestation period of approximately one year, Jameson speculates that the otter with the pup is either from the first release or was pregnant at the time of the second transplant. Jameson has seen the otters breeding and expects to see some more pups within the next year.

In addition to trying to locate and establish how many of the 93 otters in the two releases survived, Jameson is studying the habitats, diet and behavior of the otters. Observations are being made aircraft, from the shore with a high powered telescope, from offshore by boat and from underwater by scuba diving. The otters have been eating red and purple sea urchin, rock scallop, mussels, turban snails and a few crabs—principally the non-commercial kelp crab. One otter was seen eating a small octopus and another a razor clam. How the otter was able to get the clam is a mystery, but the otters are known to use rocks as a tool for obtaining food. They use rocks to break open shellfish and are suspected of pounding abalone with rocks to weaken or kill them so they can be dislodged. An otter will often keep the same "eating rock" in anticipation that he will use it again.

The otters prefer to live where there are underwater reefs, kelp beds and protection from rough seas. They originally ranged along the northern islands of Japan, around the Aleutian Island chain and down the Pacific into Baja California. Unlike many other sea mammals, the otter has no layer of blubber and depends on its fur for warmth. The fur is so thick that it traps a layer of air next to the skin so the skin never gets wet. If the fur becomes matted and allows the air layer to escape, the otter usually dies from exposure.

Estimates of the otter population in Alaskan and Russian waters, where the otters have managed to increase in population since 1911, they have been protected from commercial exploitation. This protection has allowed the survivors to reestablish the population and the sea otter is no longer threatened with extinction.

Records from 1742 until the late 1800s—sea otters were hunted for this dense fur for until only a few survived. Since 1911, they have been protected from commercial exploitation. Extinction threat eliminated

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Traps keep bees buzzing

Honeybees, too, have a sweet tooth. They are drawn to plants with a high-sugar nectar source and easy to obtain pollen while neglecting less attractive crops. The result is inefficient pollination and lower fruit or seed yields for the less desirable crops such as red clover, cranberries and blueberries. This means bees are worth less to the grower, limiting what beekeepers can earn through pollination contracts—source of much of their income.

Pollen collection increased

Attempts to increase honeybee pollen collecting efficiency are underway by OSU entomologist W. P. Stephen. He believes limiting the amount of pollen taken into a hive will stimulate pollen collecting and is using pollen traps—fine-meshed screens over the hive entrance that scrape pollen from the bees' legs as they pass through the screen to enter the hive—to test this concept.

Use of pollen traps increased pollen collection in red clover as much as 300 percent over a five-day period. Bees reacting to stress created by lack of pollen entering the hive, also went the shortest distances to get the needed pollen and sought it from plants they would normally bypass.

The research with pollen traps, in its third year, still has many questions to answer. Effect of the traps on crops other than red clover and their effect on the bee colony itself are being determined. Stephen suspects there is a critical point beyond which a shortage of pollen—used as food for worker bees, larvae and to make royal jelly for feeding future queens—will become harmful to the colony.

If the amount of pollen needed by the colony is known, use of pollen traps can be regulated to let the necessary amount into the hive and keep the surplus out to make maximum use of the bees' pollen collecting ability. Stephen also is trying to determine whether the same number of bees are working harder to collect the additional pollen or whether more bees are given the task of pollen collecting at the expense of some other function within the colony.

Bumblebee rearing tried

OSU entomologists are trying to domesticate the bumblebee as another approach to improving pollination efficiency. The bumblebee—bigger and stronger than the honeybee—can obtain pollen from sources that often frustrate the honeybee's pollen-collecting attempts. For crops such as red clover, cranberries and blueberries the bumblebee is the most efficient pollinator.
However, because the queen bumblebee is the only one to survive the winter and quits reproducing as soon as another queen—which will not be productive until the next year—emerges in her colony, a bumblebee colony makes it impractical to domesticate and utilize the bumblebee in the same manner as the honeybee.

If the sex life of the queen bee could be changed to keep her producing regardless of the presence of new, younger queens, colonies of 1,000 to 1,500 bees could be produced, making it feasible to maintain hives for pollinating certain crops. By controlling feeding, the entomologists have been able to prevent new queens from developing in laboratory colonies and have successfully kept the original queen producing to increase colony size to more than 1,000 bees. But methods for applying this concept to field conditions have not yet been developed.

**Bees bring dollars**

In addition to their importance to growers in making possible good crop yields, about 40,000 honeybee colonies are registered in Oregon and represent a source of income for a few full-time and many part-time apiarists. A full-time beekeeper may manage as many as 1,500 colonies, whereas most part-time beekeepers maintain fewer than 50 colonies. Most apiarists live in the Willamette Valley, Medford area and Malheur and Umatilla counties.

In Oregon, up to 70 percent of some beekeepers' incomes is derived from pollination contracts, rather than honey sales. Successful attempts to increase the pollination efficiency of bees should mean that the apiarist can boost this earnings through pollination contracts.

However, the future is far from bright for the beekeeper—or his bees. The shift from weaker, residual-type pesticides to extremely toxic organophosphates that have no residual effect is causing numerous poisoning problems.

Many of the crops that depend on bee pollinators are low in cash value, requiring the grower to go to the cheapest pesticides—ones usually most detrimental to the bees.

Stephen does not see an immediate answer to the pesticide problem. If a solution is not found, it may mean the end of bees, beekeeping and certain crops for Oregon.
Pesticide problem grounded

Alkali soils in Southwestern Oregon, supporters of greasewood, sagebrush, a few cattle and little else, have a new job.

They are breaking down waste products from manufacture of 2,4-D, the most commonly used weed killer in the United States, and MCPA, another related herbicide.

The process possibly may be applied to other herbicides and can be duplicated where there are suitable alkali soils, said OSU entomologist Robert G. Goulding, head of the team studying waste pesticide problems.

Container decontamination, another part of the study, is being investigated to reduce the amount of leftover pesticides and herbicides in containers so they can be used as scrap metal or deposited safely in a sanitary landfill.

In Lake County, good rates of degradation were recorded after leftover slurry (manufacturing waste from a Portland chemical company) was injected about 10 inches underground in Alkali Lake soils.

"After a period of 500 to 750 days, tests indicate, herbicides are no longer poisonous to plants in alkaline soil," said Goulding.

"It is a distinct possibility that grass can be planted over the area within six months after injection. The shallow grass roots would not be affected since breakdown of the herbicide is partially completed."

The slurry, which averaged from 1 to 5 percent 2,4-D or MCP, was applied at the equivalent of 500 to 600 pounds of 2,4-D per acre. The same degradation rate was recorded in heavy applications as in light applications.
Northwest variety lags behind in push for berry harvester

Northwest, the popular strawberry variety, may be on its way out because growers do not feel it is suitable for large-scale mechanical harvesting.

“The feeling among some growers and processors is that mechanical developments have outpaced the plant breeder’s ability to develop new varieties to take full advantage of these developments. They feel that more of the present resources should be channeled into breeding varieties more suitable for mechanical harvesting,” said Dale Kirk, OSU agricultural engineer.

Growers, through the Oregon Strawberry Commission, contribute one dollar a ton to support mechanical harvesting research.

One of the main problems with the Northwest strawberry is that it has a cap (calyx) that tightly grips the fruit, making mechanical capping and stemming impossible on available commercial equipment. Hand pickers cap and stem the fruit as it is harvested.

Kirk and food scientist Bob Cain have shown that the Northwest strawberry can be capped and stemmed by a freezing and tumbling process. The berries are frozen to -20 to -30 degrees Fahrenheit and rotated in a four-foot-diameter tumbler. The free fall in the tumbler breaks off the frozen stem and shatters the cap. The drawback is that such a process requires significant in-plant changes for the processors.

The strawberries must be washed and dried before tumbling. Left unwashed, dirt becomes imbedded in the fruit during tumbling. If they are not dried, water re-enforces the cap when the berries are frozen and prevents it from shattering. Then, after tumbling, the berries have to be warmed to a soft-frozen stage for slicing. If sliced at the tumbling temperature, the berries will shatter.

Although changes are necessary, Kirk and Cain have demonstrated in two processing plants that their tumbling procedure will work and produce a satisfactory product for the frozen strawberry market which utilizes about 90 percent of Oregon-grown strawberries.

Kirk points out that the Northwest variety may not be replaced soon, taking into consideration all the disease and plant characteristic variables with which the breeders must contend.

If that is the case, the freezing and tumbling method for capping berries might provide the boost mechanical harvesting needs for immediate widespread use.

If success of mechanical harvesting hinges on an intensified effort to develop a new strawberry with desirable harvesting characteristics, Kirk proposes to work with the breeders and refine field methods for breaking berry clusters and separating small green berries, leaves and other trash resulting from use of the mower-type harvester.

“Only about 20 percent of the volume hauled to the processing plant after harvesting is fruit; the other 80 percent is material that must be sorted out and disposed of,” said Kirk.

He added that a method of disposing of the unwanted material before the fruit leaves the field would save transportation costs and give the processor a better product.
Platform harvesting leans on one vital part—the picker.

Ladder vs. mechanical platform.

The apple-picking winner? Sometimes it is a standoff.

USDA agricultural engineers A. G. Berlage and G. E. Yost and OSU agricultural economist R. D. Langmo studied the limitations of single and multi-man platform harvesting aids. Findings, published in Experiment Station Bulletin 609, showed that harvesting from a platform aid provided experienced ladder pickers with overall reductions in harvesting time ranging from 0 to 26 percent.

But they found the European method of lowering fruit to the ground-based picker (by planting and maintaining smaller trees) resulted in the most consistent decrease in harvesting time for all pickers.

Used in the one-man platform study were four machine-assisted harvesting methods, all the self-propelled type, and the conventional ladder/bag system. The apples were Golden Delicious and Red Delicious.

In studying multi-man harvesting aids, fruit was picked into a conveyor from a continuously moving platform aid, some with bags, and by pickers on the ground with a bag.

Major limitation in use of platform harvesting aids is the picker. His physical ability to remove fruit from the tree and place it in a receiver—combined with his endurance limit—determines the minimum possible harvesting time.

Multi-picker platforms require uniform fruit distribution if maximum efficiency is to be maintained by each crew member.

Cost of commercial platform harvesting aids ranges from $700 for a tractor-mounted, one-man platform to $20,000 for a nine-man (eight pickers plus machine operator), self-propelled, multi-level platform with fruit and bin handling system. Tree fruit catching frames with limb or trunk shakers vary from $12,000 for a tractor-mounted, wrap-around machine, to $40,000 for a two-unit system with bin storage on the frames.

Future expectations for platform aids are less than encouraging, the investigators said. When human labor removes and collects individual fruit, maximum automation of all non-picking operations cannot increase the harvesting rate enough to justify current machine costs.

An aspect that must be considered, said the investigators, is the eventuality that no labor willing or able to adequately utilize the ladder bag system will be available. If so, supplying the labor force with mechanical aids may present the only acceptable method to harvest fresh-market tree fruits. Such a situation will only increase the cost per hundredweight of fruit harvested.

Rx for sick alfalfa: good farming methods

OSU research on sick alfalfa—one productive alfalfa that takes on a yellowish-green color and produces spindly, short growth—suggests that poor nitrogen fixation is causing the problem and that it can be overcome by following good farming practices.

Agronomist F. V. Pumphrey and soil scientist D. P. Moore observed that nitrogen-fixing nodules on sick plants are few and ineffective while roots of healthy alfalfa plants and other legumes growing among the sick ones have good nodulation.

Poorly nodulated plants grow normally until they exhaust soil nitrogen. Then, because of their failure to fix nitrogen symbiotically, they exhibit symptoms of nitrogen deficiency.

Stands of sick alfalfa do not appear to respond to any fertilizer except nitrogen. However, applying nitrogen fertilizer to alfalfa is not economical and does not increase the number of nodules on the roots.

Three attempts were made to establish nodules on sick plants. Soil from a field producing healthy alfalfa...
Trees in pumice soils like sulfur in diet

A greenhouse study by New Zealand Forest Research Institute scientist Graham Will confirms preliminary field results suggesting that insufficient sulfur in the volcanic pumice soils of Central Oregon limits tree growth.

Working with the OSU Department of Soil Science since last fall as a National Science Foundation fellow, Will took four layers of pumice soil from five sites between Bend and Crater Lake and planted Monterey pine seedlings in each of the samples. The seedlings were fertilized with nitrogen and phosphorous. Some were also fertilized with sulfur.

The first soil layer consisted of the upper two to six inches of the soil profile containing the greatest amount of organic matter. The second and third layers were distinguished by differences in coarseness of the pumice, and layer four, where possible, consisted of the old soil buried under the pumice.

In all layers, seedlings fertilized with sulfur outgrew those that had only nitrogen and phosphorous added.

Will said that although high elevation and lack of rainfall are the primary restrictions on tree growth in Central Oregon, proper fertilization can maximize growth within limits of these restrictions.

Properly managed forests in New Zealand, where the major tree is the Monterey pine, can reach maturity in 25 years. This compares to the 100 to 125 years it takes the lodgepole and ponderosa pines to mature in Central Oregon.

OSU soil scientist C. T. Youngberg is continuing research on tree growth in pumice soils.

(Cont. from p. 5)

Identification of easy- and hard-to-root trees is another important aspect of the research. Some cuttings can be rooted almost anytime. Others are difficult to root, making timing a critical factor.

Even with new information, there are still limitations on what can be done. The older the parent tree, the harder it is to propagate a cutting from it. And a tree is usually at least 25 years old before foresters can determine whether it will make a good parent tree.

Growth habits of the rooted cuttings vary, depending where they were taken on the parent tree. Those from side branches tend to act like branches, growing in one plane and displaying horizontal rather than vertical growth. Cuttings from the top of the parent tree appear to develop a more normal growth pattern. Rooted cuttings from the lower branches eventually straighten and assume a vertical growth habit with normal whorls of branches, but this can take up to nine years. Reasons why these cuttings will not grow vertically when first rooted are being studied.

Continued research on Douglas-fir rooting problems should lead to more efficient timber management and an improved understanding of rooting physiology that can be used both by foresters and horticulturalists.
Again the motivation was to circumvent the high cost of freighting soybean products from the Midwest to the Northwest consumer.

Said Fitch:

"Research results during this period supplemented by commercial-scale trial plantings indicated that soybeans could not be expected to bring economically attractive net cash returns to Northwest growers—at least no more attractive returns than those produced by other crops they were growing which probably fit better into management schemes and crop rotation than did soybeans. So the major effort died for lack of potential economic advantage to the grower."

Problems solved

Since then, both Northwest uses of soybean products and world markets for soybeans and soybean products have continued to expand. So has an awareness of the potential of the soybean as an Oregon crop. Problems in field trial plantings a decade ago have been solved by OSU crop researchers and now the major research focus is on economic returns.

One of the surprises that occurred in 1962 soybean field plants was the lack of effective nodulation, vital because the soybean fixes its own nitrogen and, if handled properly, does not need nitrogen supplement. Too late in the season it became evident that Midwest procedures did not produce effective nodulation on soils new to soybeans, with resultant nitrogen starvation of the crop.

A simple but effective “massive inoculation” technique was devised (graph) which allowed the plant to reach maximum production potential the first season on “new-to-soybeans land.”

The other serious production problem facing the few commercial growers in both 1962 and 1964, said Fitch, was lack of a suitable herbicide for effective weed control. Since then, a number of excellent soybean herbicides have been registered for use.

Still to be solved is the most difficult problem: low economic returns.

Since price is decided by large Midwest and Southern production areas, the most logical approach toward finding a solution to this problem is to increase yields. High yields—by Midwest standards—have been demonstrated in OSU test plots, but still higher yields are needed to assure a competitive economic return.

Some answers

Whether higher yields are possible may be answered this year. The OSU crops staff has 33 varieties and numbered selections of soybeans under test at the Malheur Station. Also being evaluated are several plant types specifically selected for adaptation to high plant population plantings, high fertility and narrow-row, high-density plantings.

In Corvallis, agronomist David Stamp has three soybean tests going at the East Farm. One is a soybean variety trial; another is an experiment on date of planting and row spacing. The third test uses a particular variety to get some feel for how soybeans respond to different management factors.

"The only thing I have to go on are soybean varieties developed in the Midwest and I want to see how they will do under Willamette Valley environmental conditions," said Stamp.

"I am suspicious that cool nights—not common in Midwest summers—are the biggest disadvantage in soybean production. Indications are that during flowering and reproductive phases of the plant it is critical to have warm night temperatures."

Irrigation tests

Stamp also is testing eight varieties under irrigation at Umatilla Experiment Station at Hermiston.

Fitch pointed out some drawbacks of the soybean in the Ontario area: less adaptability than grains to sloping land, shallow soils and high soil alkalinity frequently encountered. Also, the soybean does not fit as well into the cropping rotation primarily because it competes more directly with high cash value row crops for management time, equipment and water than does grain.

So whether the soybean stays this time to become an Oregon crop depends on the grower. For success, the research-improved soybean must fit into his farm management scheme as well as his present crops—and must bring him a greater profit than some other crop he is growing.