An attempt has been made to tell something about the Utah Agricultural Experiment Station, its organization, purposes, and activities; and to report a sampling of the results of research and their effect on the economy of the state. The research here reported is not inclusive; research in bacteriology, in zoology, in home economics, in forestry, and in sociology is not mentioned. Many of the projects in other areas have also been slighted.

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Growth through Research

Dr. R. H. Walker has directed the research program at the Utah Agricultural Experiment Station since 1938

The stupendous technological growth of this country during the past century may be laid at the feet of research. New products, more efficient methods, production know-how have completely revolutionized our modern life.

Most large, progressive industrial organizations today spend a part of their profits to sponsor research to improve the quality or reduce the costs of their products and to create new products. That is the kind of progress which results in greater opportunities to serve human needs and desires, and that is what makes jobs. Research is the great job maker.

At DuPont, the company has for many years adhered to a policy of growth through research. Research expenditures have risen steadily over the years. During 1950 these expenditures totaled $38 million. This policy of aggressive research has resulted in a number of products—laboratory curiosities in the recent past, household words today. In 1949 about 60 percent of the company’s sales resulted from products that were unknown or in their commercial infancy 20 years ago.

Why does DuPont put so much emphasis on the development of new products and the improvement of existing ones? Why did it spend $38,000,000 in 1950 on research? Because it has to. Like a man on a moving treadmill, a chemical firm or most any other business today cannot stand still without going backward. Research, in short, is good business. Furthermore, research has contributed to our standard of living by striving constantly to meet the demand of the public for something new and better. DuPont employs approximately 800 chemists, physicists, biologists, engineers, and other research workers in fundamental and applied research, and about other employees are assisting them in their work.

Unlike organized industry, agriculture is a small enterprise, usually only large enough to support the farm family. Consequently the farmer has neither the time nor the money to do the research work necessary for the benefit of his business. He cannot afford to conduct detailed experiments to find better methods of crop production, to develop new crop varieties, or find ways and means of controlling plant and animal pests and diseases, nor to solve all the myriad other problems involved in successful agriculture. And even if he could it would not economical for each farmer to duplicate the work of others. It is obvious that experiments for the improvement of agriculture can be conducted most efficiently and economically by a centralized research agency as the agricultural experiment stations and the U. S. Department of Agriculture, and supported by public funds.

Use of such funds is justified because agriculture is basic to all the people. In addition, public funds devoted to agricultural research are an investment in public welfare rather than an operating expense of government. There is ample evidence to prove that, in the aggregate, public funds devoted to agricultural research make a high return on the investment. The 1950 census shows a national population of over 150,000,000 people, 18 million more than in the 1940 count. Today the population is estimated at over 163,000,000 and it is continuing to rise. Yet American farmers, although becoming constantly fewer in number in proportion to the total population, have been able to step up production to more than meet the domestic demand. Research conducted by the agricultural experiment stations and the U. S. Department of Agriculture and other agencies has helped in great measure to make this possible. Improved varieties of crops have been produced, new chemicals have been adopted to the control of insects and plant and animal diseases, and production efficiency in both plants and animals has been increased in many ways.

To be sure, in the words of Secretary Benson, "not all of the test tubes now at work in agricultural research will produce miracles. Not all of the experimental projects now underway will develop an equivalent to hybrid corn. But the total results will dwarf the importance of governmental farm programs . . . Just one development such as hybrid corn has done more to put dollars in the pockets of farmers than all the federal farm programs ever devised."

What makes the farm bank account grow are such things as better breeds, better seeds, better feeds—along with better cultural practices and the mechanization of farm operations.

Agricultural research, by increasing productivity and cutting losses from insects and diseases, has made possible a greatly increased Utah farm income. The increased returns resulting from one or two of the best Utah Agricultural Experiment Station research projects easily make up for all state money spent on research since the founding of the station in 1888. Clearly agricultural research has never cost the people of Utah a penny. In fact, the increase in farm income that can be assigned to increased productivity from research will yield more in tax revenue than the total appropriation for agricultural research. Agricultural research creates new wealth, new industries, new jobs, and new products for consumer health and enjoyment.
The research program is centered at the USAC in Logan. There the research laboratories, greenhouses, and experimental farms make possible a wide range of investigations.

The Howell Farm for Horticultural Research is located in Weber County in the center of the fruit growing area.

The Davis County farm is devoted to investigations connected with vegetable crops and with virus diseases of stone fruits.

In the Benmore area in Tooele County, the station cooperates with the U. S. Department of Agriculture in range and livestock management problems. Other such studies are under way in western Box Elder County and in Wayne County.

The veterinary diagnostic laboratory at Provo provides laboratory service for the central part of the state. A new experimental farm is also being started in Utah County.

At the Nephi Field Station experiments in dry land agriculture have been conducted for fifty years.

At the College of Southern Utah and at Snow College as well as at the USAC in Logan, sheep breeding and management problems are being investigated.

At present the soil surveyors are working in Weber, Davis, Beaver, Daggett, and Duchesne Counties. Such surveys are essential for wise land use planning.

At the Panguitch Farm, farming practices for areas of high elevation and short growing season are studied. Since these areas are dependent on livestock as a source of income, the research is centered around an improved type of livestock and an increased feed program.
The Hows, the Wheres, and the Whyfors

Agricultural research covers a broad field. It involves not only the biological sciences including botany, zoology, bacteriology, but their applications in the areas of veterinary medicine, agronomy, plant pathology, entomology, nutrition, plant and animal physiology. It involves chemistry and physics and mathematics and geology. In fact, it rests upon all the basic sciences. In addition, many of the agricultural problems needing solution are in the realm of economics and social science.

A Trained Staff

To conduct an adequate research program requires a highly trained technical staff, with each member in each of these areas, men who have vision to see their own fields in relation to the larger field of agriculture. It is public knowledge that atomic research requires men with special technical training, that in the field of medicine, men must spend many years in preparation before they become specialists. It is not so well understood that in agricultural research, the same type of intensive training is required. A plant pathologist must have an understanding of the inheritance of a plant, its genetic makeup, the chemistry of its functioning, and what happens to its internal structure when it is attacked by bacteria, fungi, or insects. Every other specialty requires equal versatility. Such training requires many years of study, and well trained men are in great demand in industry and in experiment stations in other parts of the United States. To keep a well trained staff these men must be paid for their training and experience in competition with what they can obtain elsewhere. A large part of the appropriated funds are used for such personal services.

The Research Extends Into Many Areas

The research program of the Utah station functions through seventeen departments of the Utah State Agricultural College: Agricultural Economics and Marketing; Agronomy; Animal Husbandry; Bacteriology and Public Health; Botany and Plant Pathology; Chemistry; Dairy Industry; Forestry; Home Economics; Horticulture; Irrigation and Drainage; Poultry Husbandry; Range Management; Sociology; Veterinary Science; Wildlife Management; and Zoology, Entomology, and Physiology.

Projects and Staff

The research program is organized on a project basis, each project outlined to solve a specific problem. There are 130 projects now being investigated. The staff includes 127 members, many of whom also spend a part of their time in teaching. Of these, 28 members are employed and paid by the United States Department of Agriculture. They collaborate with Utah station staff members in investigating problems affecting agriculture in Utah.

Regional Research

Many of the investigations of the Utah station are of regional interest and are being attacked cooperatively with other of the western states and the U. S. Department of Agriculture. Among these are the improvement of beef cattle; the nutritional status of population groups; respiratory diseases of poultry; introduction and study of new plant varieties; the breeding improvement of turkeys; improvement of rural housing; weed control; virus diseases of stone fruits; hay and pasture crops; range improvement; vibrionic abortion in sheep; soil, water, and plant relations; marketing of dairy products; marketing of livestock and wool.

Sponsored Research

A number of the research studies are being financed in part by private companies and special governmental agencies: the National Institutes of Health, the Atomic Energy Commission, the U. S. Steel Corporation, Swift and Company, American Cyanamid Company, American Dairy Association, Bakerlite Company, Dow Chemical Company, Reynolds Metals Company, Utah power companies, the Amalgamated Sugar Company, the Utah-Idaho Sugar Company, the Sugar Research Foundation, Kennecott Copper Corporation, and others. The station received about $210,000 during the past biennium from such agencies.

These funds made possible the investigation of a number of problems that could not otherwise have been studied. Funds from the National Institutes of Health were used to study the toxicity of the newer insecticides to farm animals. Atomic energy funds were used in studies of chlorosis and the placement of phosphate fertilizers. United States Steel has sponsored extensive air contamination studies; Swift and Company, range nutrition studies. The sugar companies have sponsored studies on the feeding of sugar to livestock prior to slaughter, also studies on plant, soil, and water relations of crops in rotation. The chemical companies have supplied funds for the testing of the effectiveness of the new insecticides and the new weed killers. The power companies are sponsoring work in farm electrification. The American Dairy Association is sponsoring milk utilization and marketing studies. A number of companies have given funds for canal lining studies. All those projects are of real concern to agriculture in Utah, and the citizens of the state will benefit from these contributions.

Where the Research is Conducted

While the research program centers in Logan and extends to the field stations in other parts of the state, station activities extend into every part of the state. Fertilizer tests, crop variety trials, and some livestock investigations, as well as investigations of increased forage production on saline soils are being studied on land belonging to farmer cooperators in various parts of the state. Many other investigations are conducted where they can best serve the agriculture of the areas where the actual problems of the farm exist. In short, some phase of the research program has a direct bearing upon the problems of the farm people of every county and every community.

FARM AND HOME SCIENCE

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Address correspondence regarding material appearing in these columns either to the editor or to the author.

More detailed information on the subjects discussed here can often be found in Station bulletins and circulars or may be had through correspondence.
The Utah Agricultural Experiment Station was established to investigate problems of concern to agriculture. It takes this means of informing you of its progress in a few areas.

Your Experiment Station Reports...

The new Elmer George Peterson Agricultural Science Building to house the offices of the Agricultural Experiment Station, the School of Agriculture, and the Extension Service, and the Departments of Agronomy and Horticulture. When the present contract on the building is completed, January 1, 1955, the building will not be ready for use. The contract does not provide for the completion of the first floor or for any equipment. Since the building is a classroom, laboratory, and office building, a large amount of equipment including chemical desks, fume hoods, and tables and chairs, must be purchased before the building can be used. The contractors estimate that it will cost about $135,000 to complete the building and $125,000 to furnish it.

New Tomato Varieties Win Immediate Acceptance

In December 1952 the Utah Agricultural Experiment Station released two new verticillium wilt-resistant tomato varieties, the Loran Blood and VR-Moscow, the result of more than twenty years of breeding and selection trials. Already in two seasons these varieties have replaced the old wilt susceptible varieties in the canning tomato growing area of the state. They helped to produce the highest average acre yield in the state's history in 1953. The increased value of the crop was worth more than $300,000 to the growers and canners of the state in one year.

New varieties have transformed Utah agriculture

Many plant diseases threatening the farmers' crops have been controlled by the development of disease resistant varieties. Cache, Wasatch, and Relief wheat, Bonneville and Velvon barley, Uton and Overland oats, Ranger and Atlantic al-
faHa, curly top resistant sugar beets are the result of breeding programs. These varieties are not only superior in their resistance to disease, they are higher yielding and they have other agronomic characteristics, such as stiff straw, early maturity, and higher nutritive value, that make them superior to the older varieties. For example, Utah grew 35,000 acres of barley in 1930. Today 180,000 acres are grown, mostly the new varieties Velvon and Bonneville, bred at the Utah station. Yields on this acreage are 20 percent higher than they were in 1930 with the same plowing, seeding, and harvesting practices. These increased yields mean more than $300,000 annually to Utah and even more to some of the other Western States.

The future is bright for many new and better crops

Many other new varieties of crops are being developed and some will be released in the near future. A new winter barley variety, a new hull-less barley, a new early maturing green cotolydon lima bean, a curly-top resistant tomato that will also combine resistance to wilt, new drought resistant grass strains for range seeding, new annual sweetclovers with low coumarin content, a new hybrid between wheatgrass and meadow foxtail—all are in various stages of development and should be released within the next few years. In addition, station scientists are testing strains of new crop varieties developed in other areas for their adaptability to this area.

Chlorosis — A Difficult Problem Nearing Solution

Fruit, berry, and many ornamental shrubs and flowers become yellow and often die on many Utah soils that are high in lime. This disease is called chlorosis. Studies on this disease at the Utah station have shown:

- Chlorosis is caused by bicarbonates dissolved in the soil moisture.
- Chlorosis is made more severe by excessive irrigation and poor drainage.
- Some new chemicals known as chelating compounds (complex organic compounds that surround iron used in the control program and prevent the soil from making it available) are effective as sprays and as soil treatments for controlling chlorosis. Chelating materials vary in effectiveness and advice should be obtained before purchasing large quantities of these materials.

The new Loran Blood tomato on the left and VR Moscow on the right. The Loran blood is named in honor of the late Dr. H. Loran Blood, who pioneered in work on verticillium wilt in the state, but who died before a satisfactory wilt-resistant variety could be developed. It was selected from a cross of Stone and a verticillium wilt-resistant hybrid developed by Dr. Blood. VR Moscow is distinguished from Moscow only by its resistance to wilt. The Loran Blood reaches peak production at least one week earlier than Stone and outyields it by 20 percent.

Research Finds Better Practices

Farmers of Utah should change many of their irrigation and soil management practices. Studies on plant, soils, and water relations at the Utah Station have shown that:

- For potatoes, furrow irrigation requires 30 to 50 percent more water than sprinkle when soil is maintained in a moist condition. Russet Burbank potatoes yielded 20 percent higher under sprinkle irrigation than under furrow. The percent of US 1 and 2 was higher, but the quality index was better under furrow irrigation than under sprinkle. More frequent light irrigations alone should increase yields of potatoes in Utah by at least 100 bushels an acre. Harvested acreage of potatoes in Utah is around 14,500. At $1 a bushel, an increase of 100 bushels would add to the farm income of Utah nearly $2,000,000 annually.

- Average yields of peas could be increased about 800 pounds an acre by use of nitrogen fertilizer and another 500 pounds by more frequent irrigation. If farmers adopted both these practices, they could expect at least a 1,000 pound increase an acre. Such an increase would add $370,000 to the farm income of the state.
The northern Utah and southern Idaho areas grow more than a million acres of winter wheat annually. This acreage produces over 20 million bushels of wheat, most of which is marketed through Ogden. The chart shows the percentage of car loads of winter wheat moving into the Ogden market that graded smutty by years. In 1925 when the smut became serious the Utah station began an investigation of the problem. Scientists found that the organism causing the disease was soil borne and that seed treatments were of little value. Resistant varieties seemed to be the only solution and a breeding program was started. Relief was released in 1931, Cache in 1935, and Wasatch in 1942. The great value of these varieties is shown by the fact that in 1929-30 nearly 75 percent of the wheat graded smutty and in 1953 only .3 percent was smutty. The money saved by this research alone in one year would more than pay for the entire research program.

Irrigation furrows should be no farther apart than twice the depth of the principal plant roots, hence furrows should be closer in shallow rooted than in deep rooted crops. With closer spaced furrows the water will move laterally and wet the soil in the middle of the row while it is moving vertically to the moist soil below.

The use of soil additives such as Krilium and detergents offers possibilities for increasing water entry into slowly penetrable soils such as those with high amounts of alkali.

Both corn and alfalfa utilize phosphorus fertilizer near the surface soil more than that placed in the lower soil zone. When the surface is allowed to become dry, even though there is sufficient moisture at a lower depth, the phosphorus applied in the dry soil is of little value to the plant.

Phosphate Fertilizers Profitable on Alfalfa

Alfalfa hay yields have been increased more than 300 percent by the use of phosphate fertilizers in experiments conducted by the Utah station on soils low in available phosphorus and high in lime. Over a five year period in Emery County on irrigated land total yields were increased from 8.57 tons on the unfertilized plots to 26.48 tons per acre on plots fertilized with 216 pounds of phosphate (P₂O₅). In Cache County on dry land, over a four year period yields were increased from 3.71 tons to 12.06 tons per acre. Here 168 pounds of phosphate and 8 to 10 tons of manure were applied per acre. These fertilizers were applied only once dur-

This new grass has been derived from a sterile hybrid between slender wheatgrass (Agropyron trachycaulum) and meadow foxtail (Hordeum jubatum.) The sterile hybrid was chemically treated to double the chromosome number and induce fertility. Tests are in progress to determine the suitability of the grass for a wide variety of habitats.
Closer spacing than is normally practiced combined with satisfactory soil moisture is the key to greater profits in carrot seed production. Low soil moisture is preferable to high ing the period. With hay at $20 a ton, which is the average price since 1948, this means that a farmer in Emery County could increase his profits by $165 per acre over a five year period after paying for his fertilizer, or $33 a year. On dry land in Cache County profits amounted to $150 an acre for a four year period, or $37.50 a year.

Quality of hay was improved by the addition of minor elements

Cobalt content of alfalfa was increased by addition of cobaltous chloride to the soil, the manganese content increased by the addition of manganese sulfate, and copper content increased by the application of copper sulfate. The effect, however, lasted for only two years. None of these trace elements increased the yield of alfalfa hay.

Seed a Profitable Cash Crop

Farmers wanting to take some of their dry land out of wheat or to raise a cash crop on irrigated land should consider growing a seed crop. Studies have been made by Utah scientists on the adaptability of certain seed crops to this area and management practices investigated to find the ones producing highest yields.

In some areas of the state, especially in Millard County and the Uinta Basin, alfalfa seed production is again coming into its own since the station has perfected methods to control lygus bugs and to assure adequate pollination by honey or wild bees. Alfalfa yields in Utah in 1952 were 60 percent above the 1940-50 average and acreage had increased from 40,100 to 59,000. Even on some dry lands where moisture is not too limited alfalfa seed may prove profitable.

In these same dry land areas grass seed is profitable. The nationwide emphasis on grassland agriculture, the ever expanding program of reseeding on western range lands, and the relatively recent realization that farm pastures can profitably enter into rotation on the best land on the farm are all contributing to increased demand for seed. Seed of such grasses as tall, intermediate, and crested wheatgrass, Russian wild-rye, smooth bromegrass, orchard grass, tall oatgrass, and tall fescue will find ready sale with prices varying from $17.50 to $30.00 per 100 pounds. Yields of these same seeds are higher on irrigated land than on dry land.

For irrigated areas seed of a number of the vegetable crops may also be raised profitably by following practices developed by the experiment station, provided a contract can be obtained from a seed company. Carrot, onion, and lettuce seed have all been profitable in Utah. Carrot seed requires the least irrigation water. Yet a seed crop of either lettuce or onions can be raised with less irrigation water than many other crops. In raising carrot and onion seed the highest yields are obtained with the closest spacing. With lettuce, the head must be given room to spread.

The careful grower should be able to clear from $300 to $400 an acre from onion seed. Some growers have cleared as much as $1000. The grower of lettuce seed and carrot seed should clear from $150 to $200 an acre.

If the seed crop is grown as part of a rotation, it is not necessary to use fertilizer on the seed crop, the residual ef-
fects from that applied to earlier crops will usually be sufficient. Onion seed gives the best response to fertilizer.

More Milk from Pastures
During 1938, 16 acres of pasture on the dairy experimental farm produced an average of 3922 pounds of milk containing 131 pounds of butterfat to the acre. During 1953, 20 acres of improved pasture on the same farm averaged 9007 pounds of milk containing 332 pounds of butterfat to the acre. This is an increase in production of 5085 pounds of milk and 201 pounds of butterfat to the acre or an increase of 155 and 153 percent, respectively. This increase is the result of higher producing, more palatable pasture mixtures developed by the station, use of fertilizer, and rotation grazing.

With milk selling at 75 cents per pound of butterfat, the increased gross returns are worth $150 dollars an acre.

Intermediate wheatgrass on dry land. At left, the plot in the foreground was mowed and the fodder removed shortly after the seed harvest in the fall. This is a desirable practice as it materially increases hay yields and leaves less trash on the ground to encourage rodents which sometimes become a real problem in seed fields.

High economic milk production is only part of the long time return which is reflected in increased yields of crops when planted on pasture land that has been plowed and put into the rotation.

The Killer is Chained
About three years ago the headlines recounted enormous destruction to sheep in the Intermountain Area from a new weed, halogeton. This weed, according to reports, had wiped out entire herds in parts of Idaho and Nevada. There was clamor for funds to eradicate the weed which had already spread throughout many of the Great Basin grazing areas.

While halogeton was first reported in 1935 from Nevada, it was not until much later, in 1950, that Life Magazine dramatized its destructive, poisonous nature. These qualities of the weed had already been pointed out in an article in Farm and Home Science in December of 1943, again in 1944, and again in 1950. In 1951 a study was begun by the Utah station to find methods to enable livestock to live with the plant, since by now it had spread so far that scientists found it impractical to eradicate it. Results of this study were published during the past year and are here summarized.

Hungry animals are more susceptible to halogeton poisoning than animals receiving adequate forage because (1) they are more likely to eat the plant, and (2) it requires less of the plant to cause death.

Animals that are, by necessity, trailed through heavily infested halogeton ranges may be protected against halogeton poisoning to a large degree by feeding once a
When grazed by high producing dairy herds, irrigated pastures produce more feed than any other crop. Over a seven-year period pastures at the Dairy Experimental Farm averaged 7.967 pounds of milk an acre. In order to get an equivalent production of milk an acre it would be necessary to have a yield of 6.3 tons of alfalfa hay, 1817 tons of cured corn silage, or 186 bushels of barley.

Halogen poisoning is more dangerous in the fall than late winter because the toxic material is leached out as the season progresses. Losses of any magnitude during the past five years in northwestern Utah have been observed only while trailing animals on heavily infested driveways. Ranges with small to moderate amounts of halogen can be grazed safely by avoiding areas of pure halogen when trailing or bedding, by moderate use and open herding, and by supplementing animals during stormy weather. Consumption of small to moderate amounts of halogen over extended periods of time does not appear to have harmful effects on breeding ewes.

Thus the experiment station comes to the aid of the stockman when he is faced with problems beyond his resources to solve. The money savings involved in this research are difficult to estimate. The loss of a thousand sheep at one time can put a rancher out of business. The loss of even a few animals may be disastrous over a period of time.

**New Weed Threatens Alfalfa Seed Area**

Study has begun on control of a new weed, identified as squarros knapweed (Centaurea squarrosa), first found within the last year south and west of Eureka. It appears to be a deep rooted perennial, difficult to kill since new shoots will grow from any part of an old root. It is a prolific seeder and can be spread easily by wind, livestock, and farm machinery.

Little is known of the weed’s habits of growth and how serious it might become. It has been reported only once before from California. If the weed should spread into Millard County it could easily destroy that area as a seed producing center and result in the loss of thousands of dollars to the state each year.

**Weed Pests Yielding to Chemical Control**

Weeds are another pest that take from the farmers’ profits in the form of lowered crop yields. Their toll amounts to thousands of dollars each year. The use of herbicides for weed control is steadily increasing, both alone and in combination with tillage practices.

Recent weed control experiments at the Utah station have shown that:

- **Quackgrass and canary grass** in non-cultivated areas may be controlled by plowing or spading land in the fall, applying TCA at one pound per square rod in water with a sprayer or sprinkling can. Cultivate again in the spring and gather up fragments of quackgrass rootstocks left alive by the chemical.

For quackgrass and canary grass in fence rows, road sides, and small ditches apply CMU at 1/4 to 1/2 pound per square rod. Burn dead vegetation before making chemical applications. Apply retreatments...
Halogen poisoning is more dangerous in fall than late winter because the toxic material is leached out as the season progresses. Sheep trailed through halogen areas should be supplemented once a day. High calcium pellets are especially effective.

Upper right, new weed, squarros knapweed, found south and west of Eureka. The weed appears to be a deep rooted perennial, difficult to kill, since new shoots and roots will grow from any part of an old root. It is a prolific seeder and can be spread easily by wind, livestock, and farm machinery.

a year later as necessary to eradicate any surviving grass.

- *Bisutroot* in dry land areas can be eliminated in 2 years with 2,4-D at the rate of 2 pounds acid equivalent per acre, with one treatment each year applied before the weed comes into bloom.

- *Wheatia* or *mule ear* on mountain ranges may be controlled by spraying with 2,4-D. The ethyl and butyl esters of this chemical have been found most effective. The minimum dosage for satisfactory control is 2 pounds of 2,4-D acid per acre applied before the plants come into bloom. This treatment can be done by airplane for from $2.50 to $4.00 and acre. Yield responses of desirable forage plants where mule ear was eradicated were impressive. In one case, 5 years after treatments were made, a series of untreated plots infested

CMU applied in the spring (right foreground) gave much better control of canary grass than the same treatment applied in December (left foreground)
with mule ear yielded 280 pounds of desirable forage an acre, and where the weed had been eliminated, the yield was 1,353 pounds an acre. Bunch wheatgrass, Kentucky bluegrass, and needle-and-thread grass increased in direct proportion to the extent of mule-ear eradication.

- Early season applications of CIPC give excellent control of dodder in alfalfa and increased alfalfa seed yield 75 to 100 percent.
- Pre-emergence applications of CMU at 1 pound per acre immediately after planting onion bulbs for seed production and placement applications at the same rate early in the summer between rows of seed onions give good weed control with no damage to onions.
- Spray combinations of 2, 4-D at 4 to 8 pounds per acre with diesel oil at 10 gallons per acre or TCA at 30 pounds per acre are effective in controlling cattail in irrigation drainage canals.
- Repeated applications of 2,4,5-T on wild rose at early stages of growth are effective in killing the top growth and greatly reducing the stand.

Repeated foliage or dormant spray applications of 2,4-D and 2,4,5-T are effective in reducing or eliminating chokecherry infestations.

New research on weed control is designed to select food plants with ability to compete with weeds.

Insect Prognostication

To know when not to spray for the control of insect pests is as valuable to the farmer as to know when to spray. If no corn earworms are around to destroy sweet corn and tomatoes, it is a waste of time and money to spray, but if these insects are plentiful, not to spray means great economic loss from an unmarketable crop. During the last few years entomologists at the Utah station have developed methods to predict with a high degree of accuracy whether there will be destructive numbers of many insects. This information is given to the farmers through the press and through the county agents. Entomologists are now predicting numbers of beet leafhoppers, corn earworms, grasshoppers, and Mormon crickets. Studies of the life histories and prevalence of other insects are being made to establish a basis on which it will be possible to make predictions of expected abundance.

It was authoritatively estimated that such predictions on the corn earworm last spring saved farmers $60,000 in cost of insecticide and an equal amount in cost of labor to apply the insecticide.

Industrialization Brings its Problems

As Utah becomes more industrialized, the problems of air carried industrial wastes become more pressing to agriculture. Sulfur, arsenic, and fluorine are given off into the air as wastes in certain manufacturing processes. Fluorine intoxication among cattle and sheep in Utah County was first diagnosed by experiment station scientists in 1951. A survey showed that hundreds of animals in the county were affected. Later surveys have shown that the same condition exists among many animals in Salt Lake County. However, since these surveys were made, a number of companies are applying procedures to reduce the concentrations of fluorine in affected areas.

Station scientists are still continuing extensive control studies with dairy cows and sheep, including detailed metabolism tests, to find methods of minimizing the effects of fluorine. These studies have already shown the amounts of fluorine necessary to cause toxic conditions in animals.

Samples of alfalfa and grasses consumed by livestock have been collected, fluorine content determined, and maps made to show the areas of fluorine concentration.

When these studies are completed, the Utah station will have some of the most reliable and extensive information on the effects of fluorine toxicity to be found anywhere in the country.

Sugar Feeding Found to Improve Dressing Percentage of Slaughter Animals

Feeding sugar (sucrose) to beef, swine, sheep, chickens, and turkeys for short periods prior to slaughter has been found by station scientists to increase gain in the feed lot, to produce slight increase in dressing percentage, improvement in color, and increase in sugar content of the meat. The livers of the sucrose-fed animals were larger, contained more sugar, and had a better flavor and texture when cooked than livers of animals that were not fed sugar. However, when sugar was fed at high level, it caused diarrhea, resulting in decreased gain and dressing percentage.

When details as to amounts of sucrose to be fed to obtain optimum gains are worked out through further research, this research will mean a great deal of money...
to both packers and growers because of the large numbers of animals involved.

Carp — the Basis of a New Industry

Utah is looking for new industry. It means more employment and better living conditions for the people. The Utah Station is exploring the possibilities of one such industry, that of a fish meal plant, with the meal made from carp. Utah has the resources. Scientists in wildlife management estimate that there are approximately 100,000 acres of warm water in Utah which would produce carp, and they maintain that carp will produce more protein per acre than any other form of life. They are also studying the life history of the fish and methods of harvesting it.

The value of carp as a poultry feed has been investigated by members of the Poultry Department. Their results indicate that carp meal prepared from local fish is equivalent to herring fish meal, and superior to menhaden and tuna. The proteins in carp meal and soybean oil meal supplement each other.

Metabolism cages are being used in the fluorine studies to check its effect on dairy animals. Nine cages similar to the one pictured will be installed in the new large-animal nutrition building now under construction

Since fish meal sells for approximately $180 per ton there is a large potential income from the production of a local fish meal.

More Profits From Sheep

Experimental data obtained from sheep studies conducted at Cedar City indicate that through the use of improved breeding and management practices lamb production of range sheep may be greatly increased.

Lambing percentages of the experimental range flock during the past five years have averaged 130 lambs weighing 70 pounds each for every 100 ewes bred. The average production of range flocks in that area is estimated to be about 85 lambs weighing 75 pounds for each 100 ewes bred. This is an increase of 45 per-

A typical case of fluorine poisoning in cattle showing a rough dry coat with a tight skin and emaciated appearance. The knee, hock, and pastern joints are greatly enlarged and cannon bones are thickened

Prof. Harold Nielsen, in charge of the biochemical laboratory, checks plant samples for fluorine content with a laboratory technician. Such tests have permitted the station to draw a fluorine map designating the amounts of fluorine to be found on the plant cover in various areas of Salt Lake and Utah Counties.

More Profits From Sheep

Experimental data obtained from sheep studies conducted at Cedar City
Feeding of small amounts of sucrose to livestock prior to slaughter has been found to increase gain, to produce slight increase in dressing percentage, to improve color of meat. The livers of these animals were larger and had a better flavor when cooked. This was also true with turkeys and chickens.

cent in the experimental group over the average of the range operators in that area. The average lamb production per ewe was 91 pounds for the experimental group and 64 pounds for the range operators or a difference of 27 pounds per ewe.

At present market prices of 16 cents per pound of lamb this would amount to a difference of $4,320 per flock of 1000 breeding ewes. Assuming that there are 1 million ewes of breeding age this would amount to an increase in gross return to the Utah sheep industry of $4,320,000.

The major factors responsible for this increase are the use of farm pastures for fall grazing and during the breeding season, proper supplementing of winter range forage when necessary, use of lambing sheds on the farm to save more lambs, careful selection of ewes, maintaining a larger percentage of sound mature ewes in the flock, and the use of superior Rambouillet, Columbia, and Targhee rams.

More Productive Range Lands Assure Greater Livestock Profits

Present knowledge from experimental studies has shown that at least 5 million acres of deteriorated range land or about 10 percent of the state of Utah can be successfully seeded for spring and fall grazing. Since spring range in Utah is woefully inadequate for balanced seasonal grazing, it is frequently considered the limiting factor to a successful livestock enterprise. Research data have shown that grazing capacities on deteriorated foothill range can be increased about 10 times more than their present stocking limits. In addition, increased returns are received in better animal gains, larger calf and lamb crops, and greater land values.

This is of great value to Utah since livestock forage is the only crop that can be grown on 85 percent of the land of the state and can be harvested and marketed only through the sale of livestock. Thus the knowledge leading to a more stabilized livestock industry through increased income and balanced seasonal use of forage might be assessed back to the potential of seeded grazing lands at several million dollars additional income to the livestock producers of the state annually.

A Farmer Must Market His Products

As farm production increases, the problems of better market outlets and improved marketing efficiency are of increasing importance to farmers. The station is studying a number of problems connected with the marketing of Utah farm products.

Auctions handle large portion of western livestock

Auctions are becoming increasingly important in disposing of livestock in the West. More than 7 million head of cattle and calves, or 30 percent of all animals sold, are sold annually in the auction markets, more than by any other single method. Auction marketing performs useful services in concentration, selling, and disbursement of livestock to ultimate users. Such functions contribute to increased marketing efficiency in several ways:

- They facilitate the local exchange of stocker, feeder, and breeding animals between farmers and ranchers.
- They expedite feeding operations of the small producer.
- They provide a year-round supply of slaughter livestock for an expanding number of local packers, butchers, and locker plant operators.
- They serve as an educational medium whereby producers learn more about the market value of their livestock in relation to other consignments.
- They provide the means whereby animals are moved from local deficit to local surplus feed areas, and, therefore, livestock and feed resources are combined more effectively, resulting in greater total output.

Farm and Home Science
Trade barriers hinder marketing of milk

A prosperous dairy industry needs more markets. Studies of varying state regulations for the production of grade A milk show that many of them prevent its transportation interstate to deficit areas and serve no useful purpose other than that of protecting a given market from outside competition. Removal of many of these restrictions would materially benefit consumers.

Automatic venders create new sales

Automatic venders create new sales for fluid milk and milk products. Vending machines in factories, schools, and stores have been shown by a Utah station study to stimulate milk sales.

Pricing of milk hinders sales

In Salt Lake City schools during the last 10 years from 1 to 5.7 bottles of pop were sold to each 1/2 pint of milk. The sale is currently 2 to 1. Pricing milk higher than pop and odd cent pricing of milk were found to be the principal reasons for the larger amount of pop sold.

Present methods of grading chickens on farms inequitable

Selling chickens on the basis of buyers’ live grades as is presently done in Utah does not assure equality among producers as there is little relation between grading and quality of dressed product. This is the conclusion of a study made by the Utah station. The practice of selling on a flock-run basis may be as equitable for growers as selling on buyers’ grades. This would permit competition among buyers to be registered through paying price rather than grade-out. There may be justification to consider paying for chickens on a dressed grade and yield basis in order to compensate producers equitably for the quality of chickens they sell.

The Decision is the Farmers’, But Research Provides Some of the Facts on Which to Base it

Often a farmer asks himself such questions as: "Shall I change my cropping practices to grow peas rather than beans, to raise turkeys rather than chickens? How can I use my land most efficiently? How can I plan my farm program to make the most money?" There are many factors to be considered in making any decision for a change. The Utah station through its economic studies of local enterprises is constantly providing valuable information to help farmers in making such decisions. Here are a few samples:

A study of broiler production shows that this enterprise will reward the efficient producer liberally. Among 78 producers in Utah the labor income from broiler production amounted to $84.00 per thousand broilers. One man can handle about 46,000 broilers in a year or about 12,500 birds in a season of three months.

Turkey fryers returned about 20 cents per bird, and a labor profit of more than $2.00 an hour to the average producer in Sanpete County in 1953 according to a study of the industry. Such an enterprise offers turkey growers a way to reduce costs, to utilize brooder coops and equipment during a greater part of the year, and a way to increase their farm income.

Search for Canal Lining Materials

Water for irrigation, industrial, and domestic use is the limiting factor in the development of the Western States, and yet approximately one third of all the water diverted for irrigation purposes is lost in conveyance. Lining of canals and ditches would result in the conservation of much of this water. The need for lining is widely recognized and the fact that only about 5 percent of the canal mileage is lined is owing to the need of better and cheaper linings.

The experiment station has been studying this problem and testing various types of materials for their suitability as linings. It has found that seepage from earth linings continues to increase with time. Seepage from buried asphaltic membrane linings has not increased materially in the three or four years they have been in use.

(Continued on page 96)

Improved breeding and management practices will greatly increase production in range sheep. Use of farm pastures for fall grazing and during the breeding season, proper supplementing of winter range forage when necessary, use of lambing sheds to save more lambs, careful selection of ewes, maintaining a larger percentage of sound mature ewes in the flock, and the use of purebred rams result in increased lamb production.
Additional Funds Requested for Research

The USAC Board of Trustees is asking the next Legislature for an increase in the appropriation for the Agricultural Experiment Station of $145,900 over the past biennium. It is planned to use this money as follows:

For salary adjustments — $70,000. This is to provide necessary adjustments in salaries on a merit basis to bring up the salary level more nearly comparable to that paid by other institutions in Utah and in other states. There is strong demand for highly trained technical personnel and the station is confronted with serious competition to maintain its research staff.

For social security — $30,000. The 1953 special session of the last Legislature revised the state teachers’ retirement program and made all station staff members eligible for social security. This automatically places a charge on the station in the amount of $15,000 a year. This will necessitate an increase in the appropriations or a reduction in the research program.

New research work — $45,900. The station has received many requests for investigations of new problems in the areas of plant and animal diseases, noxious weed and insect pest control; air pollution; marketing, distribution, and use of agricultural products and the utilization of crop surpluses; nutritional deficiency studies of livestock and poultry. Adjustments have been made in the research program to permit new studies on several of these problems. Twenty-nine projects were closed and thirty-two new or revised projects started during the last biennium. There are certain phases of the work, however, that cannot be undertaken without an increase in the appropriation. Consequently an increase of $45,900 is being requested for new research. It is planned to break this down as follows:

Plant disease research — $21,200. Production of virus-free nursery stock for stone fruits will take $6000 of this amount. Progress in the virus disease study is at the point where virus-free nursery stock can be provided. This will serve as parent material from which commercial nurseries can obtain disease-free budwood for propagating. This is one of the urgent needs of the fruit growers of the state.

Two tragic examples of this need may be cited: Six years ago a fruit grower planted a 15 acre orchard with 600 trees, reputed to be of the Bing variety of cherries. He purchased the stock from a mid-western nursery. Last summer when the trees began to fruit for the first time, he found that the cherries were not Bings, but Orbs, a variety of low value that is practically impossible to market in Utah. He decided to top work the trees and bud to the Bing variety. He then discovered that all the trees were infected with ring spot virus. This is a latent virus which could not be detected until the fruiting of the trees. His only course was to pull up the trees and start over. Six years’ use of the land and his labor were wasted.

Several years ago a Davis County fruit grower planted a 23 acre orchard to Lamberts and Bings. He was not aware at the time of the necessity of planting

Much of the basic research on virus diseases of stone fruits has been done at the Utah station in cooperation with the U. S. Department of Agriculture. It was first discovered that western x-disease was transmitted from chokecherry to peach and to sweet and sour cherries. It was also here that scientists discovered that the geminate leafhopper was the transmitting agent.

The geminate leafhopper, Colladonus geminatus. Mr. Kaloostian was the scientist who discovered that the insect was the transmitter of western x-disease.

George H. Kaloostian, federal collaborator, checks cherry trees infected with western x-disease virus transmitted by the geminate leafhopper (center three) and healthy control trees at each end. Tree on mahaleb rootstock (second from left) has wilted and will die. Trees on mazzard rootstock (third and fourth from left) will remain stunted, produce worthless “little cherry,” and are the most dangerous source of the virus for the insects to pick up and transmit to healthy trees.

Farm and Home Science
Leaffoppers are caged in western x-disease virus infected cherry trees in the greenhouse for use in virus transmission tests. It requires about two months for the insects to be able to transmit the virus after feeding on a diseased tree, and from two months to two years for the symptoms to appear on a test tree.

Prof. George W. Cochran, left, and Thomas Denman operate chromatographic cabinet. This cabinet is used to develop a new method of isolating plant viruses. The Atomic Energy Commission is cooperating in this research.

Plant pathologists inspect a virus infected plant growing in radioactive cultures. The objective is to make a radioactive virus which can be followed through several necessary purification tests.

For December 1954
Dr. Royal Bagley makes a routine bacteriological analysis of disease found in turkeys brought in for diagnosis. The modern laboratory takes the guesswork out of diagnostic work. In addition to the veterinary diagnostic laboratory on the USAC campus at Logan, the Utah Agricultural Experiment Station operates a branch laboratory in Provo. Veterinarians handle hundreds of cases each year involving livestock and poultry.

The Experiment Station Serves The State in Many Ways

Veterinary Diagnostic Service

In addition to its strictly research activities, the Utah Agricultural Experiment Station performs many public services. The two veterinary laboratories at Logan and Provo diagnose livestock and poultry diseases. This diagnostic service is performed to assist practicing veterinarians, state and federal animal disease regulatory officials, farmers, and county agents in determining causes of disease outbreaks and developing means of control. Dead and live animals, blood and tissue specimens are received at the laboratories from the owners and from veterinarians of the state for examination. Last year 1976 consignments were received and 80,134 individual tests made in these laboratories. In addition, 3638 bovine blood samples were tested for brucellosis. Through these services many outbreaks of disease are stopped before heavy losses have occurred or the disease spread to other areas. For instance, during the summer of 1952 a disease of sheep, blue tongue, new to the United States, was diagnosed in several counties of the state for the first time.

Soil Testing Service

The soil testing laboratory at Logan during the past two years analyzed 5,931 samples of soil, water, and plant materials and made 29,100 determinations for farmers and various governmental agencies throughout the state. These tests provide basic information to farmers on fertilizer needs and cropping practices.

Seed Certification Program

The seed certification program of the state is administered by the experiment station through the Crop Improvement Association. The Utah station produces foundation seedstocks, seeds grown on small acreages where every precaution is used to produce seed of genetic purity. This seed is distributed to certified growers for increase. Then seed produced by these growers is sold to the farmers. New varieties as well as the older varieties of various crops would eventually lose their identity and purity through cross pollination, volunteer plants, and mechanical mixtures if some program and methods were not employed to maintain their purity. During the last two years seed of alfalfa, clover, onions, barley, oats, wheat, potatoes, and corn was certified in Utah.

Plant Identification Service

The Intermountain Herbarium, which has a collection of more than 10,000 plant species, 6000 from the Inter-
The soil testing laboratory, conducted cooperatively by the Utah station and the Soil Conservation Service, makes it possible for farmers to have their soil tested as a basis for deciding cropping practices and fertilizer requirements. There is a small charge for these services.

mountain Area, maintains an identification service for farmers, ranchers, county agents, governmental agencies, and other institutions. Many times a rancher through this means may identify a poisonous plant on his range and eradicate it before he suffers losses in his livestock.

Other Services

Project leaders cooperate with the Extension Service by talking with farm groups in various parts of the state, conducting short courses on the campus, giving demonstrations, holding field days on the experimental plots, writing extension circulars, answering letters for information, preparing informative articles for newspapers, farm magazines, and for station publications. Many farmers are given direct assistance on their farms with their management problems. Much time of staff members is spent in meetings with other farm agencies in discussion and formulation of agricultural plans and policies.

Publications Make Results of Research Known

Results of the research program are made available to farmers and others in the bulletins and other publications released when a research project is finished. Progress reports on the research are published from time to time in Farm and Home Science. Station publications are available free on request. They not only are sent to citizens of Utah, but to libraries and scientists throughout the world.

The Intermountain Herbarium's collection of 6000 plant species from this area makes possible the identification of nearly any native plant the farmer may be interested in. It is particularly valuable for livestockmen as a means of identifying poisonous range plants.

Dr. Wayne Binns, former head of the Department of Veterinary Science and now working for the U. S. Department of Agriculture, but still stationed on the USAC campus, examines a case of footrot on a prize Holstein heifer belonging to Cache County 4-H club member. Any Utah citizen can submit livestock and poultry for diagnostic purposes. Routine diagnostic work is free although some laboratory tests involve some expense to the owner.

Golden Stoker, secretary of the Utah Crop Improvement Association and associate professor of agronomy, and Prof. William H. Bennett, examine a bag of certified seed. The seed certification program, under direction of the Experiment Station, makes it possible for farmers to get weed-free, genetically pure seed of many crop varieties. Look for the certification tag on the bag.
Farmers and livestock men keep abreast the research program of the experiment station through field day activities. Cereal crops hold the interest here as current research on the Evans Farm gets the once-over by field day visitors. Events such as these promote better understanding between the farmer and the research worker.

Whether it's halogeton control, Rambouillet improvement, or a new crop variety

**Seeing is Believing**

Seeing is believing. That's why the station sponsors field days so that the farmer or other interested person can see first hand the results of research: the design of the new dairy set-up, the results of the range seeding and grazing management tests at Benmore, the halogeton tests in western Box Elder, canal lining tests at the river laboratory in Logan, forage crops tests at the Evans Farm, sheep management studies at Cedar City, and many others.

Experiment station field days require sound planning. Laying the groundwork for pasture management field day are station scientists George Q. Bateman and William H. Bennett with Bliss H. Crandall, assistant director.

Field days are information days. Here a group of Utah Young Farmers learn the advantages of open-shed housing of dairy cows. These field day visitors will carry research findings back home to assist others with farm building construction problems.
New Unit On Dairy Experimental Farm Stresses Efficiency, Sanitation, and Latest Methods of Handling Milk

For several years members of the dairy department at Utah State Agricultural College have planned the construction of a modern milking unit that would serve as a practical demonstration in approved milking practices.

This fall such plans became a reality. Now in operation on the Dairy Experimental Farm north of the campus in Logan is a milking unit that leaves nothing to be desired in up-to-date milking practices.

The plan is built around the use of open shed housing and a central milking unit. The farm plan has an open shed for resting, a hard surfaced yard, and feed mangers for both hay and silage as part of the yard fence. The yards and sheds are adjusted to hold from 20 to 50 cows. Each animal will get 50 to 75 square feet of space under the shed and up to 150 square feet in the yards.

The sheds and yards are so arranged that each unit leads into a central lane connected to the milking unit. The cows can be released from the barn or any shed unit where most of the experimental feed-
In the four tandem-stall milking parlor a cow is milked in three minutes. Milk is collected in pyrex jar and weighed automatically. It is then vacuumed into a main line made of transparent glass tubing and carried to a 1000 gallon tank in the milk room. Milk never touches human hands.

Cows first enter the preparation and cleaning barn pictured here with a 12-cow capacity. In this area the cows are brushed, fed their grain ration, and their teats are wiped clean for the milking process. Heat, light, and ventilation are scientifically regulated.

Tandem stall is operated from pit by attendant. With the 4-stall arrangement three cows are milked at the same time with one cow leaving and one entering the parlor.

Stalls in preparation room are easy to clean, simple to operate. Two attendants keep milking herd moving into milking parlor with a minimum loss of time. Cows are released from stalls by easy operated, handy controls shown in picture. The cows will be done. They will go directly to the milking parlor and return immediately to their housing unit. All yards are arranged with a driveway around the feed mangers. This cuts down on the amount of hand labor.

The central milking unit has a holding area adjacent to the preparation barn. The preparation barn accommodates 12 cows with individual walk-through stalls. Each stall is equipped with a feed manger on the front gate. The cows are held in their stalls long enough to eat their grain properly, be cleaned, and prepared for the milking stalls. High producing cows that

George Caine checks newly installed teat-cup washer. Made of stainless steel, the washers provide both a hot and cold rinse for teat cups.
The second floor of the milking parlor is a storage area for grains and other concentrates. Four bins similar to the one shown hold a total of 80 tons of grain. An additional 20 tons of sacked material including dried beet pulp, whey powder, salt, and other minerals, can also be stored here.

Methods of reclaiming the large areas of saline and alkali land in the state are being investigated. A phase of this work is to find a plant that is salt tolerant and at the same time palatable to livestock. Kochia is one of the plants being investigated. This plant is extremely variable in type and it is hoped that the better types such as those shown (66, 67, 359) can be selected and improved. That such selections of kochia are palatable to cattle is shown by the picture at lower right of the plots after cattle broke through the fence. Below left, a less desirable forage type of kochia. Lower center, Malcolm Benson, graduate fellow, inspects plants caged to prevent cross pollination.

Absent from the USAC campus this year are the dairy barns and corrals. In their place is a large parking area. All that remains are the sheep barns, corrals, and the horse barn.

get a larger ration of grain thus have time to consume their grain ration.

Cows move from the preparation barn into the milking parlor, a four-cow tandem type unit. A trained attendant can attach the milking unit, extract the milk, and release the cow in three minutes.

The milk is vacuumed from the cow's udder into a pyrex jar hanging at the cow's side. It is automatically weighed and returned to a sanitary glass pipe which carries it directly into a 1000 gallon holding tank in another room. The tank is mounted on a four-wheel chassis. Every other day the tank will be transported to the animal industry building on the USAC campus where the milk will be processed.

The milkers work in a pit which enables them to move about with a minimum of bending over during the milking process. After each cow is milked, the teat cups are rinsed in a cold solution, then washed in a hot solution before being placed on the next cow.

After the milking process, the attendant opens another gate near the head of the cow and the cow moves to an outside holding pen, then directly to the barn or shed area.

According to Prof. George Q. Beelman, superintendent of the Dairy Experimental Farm, the new unit can efficiently handle from 50 to 150 cows. He emphasizes that the open shed system of housing is superior under Utah conditions. He adds that the new unit will take care of the needs of the USAC dairy department for many years.
CONTRIBUTIONS TO RESEARCH
August 15 to November 15, 1954

American Dairy Association $6500 for study on effects on metabolism of feeding various edible fats to rats and humans
$800 for study of merchandising milk through automatic dispensers
Sharp and Dohne $2500 for study of coccidiosis in cattle, sheep, and poultry
Utah Canning Crops Association $500 for the study of fertility, soil moisture, and cultural practices in the production of lima beans
E. I. duPont de Nemours & Company $499.50 for canal lining studies
Douglas Fir Plywood Association 13 panels of exterior type fir plywood for use in new calf-maternity building
American Cyanamid Company 100 pounds Malathion for insect control studies
California Spray-Chemical Corp. 50 pounds lindane for insect control studies
Chipman Chemical Company 50 pounds DDT for insect control studies
Dow Chemical Company 2 gallons Dow General Weed Killer for experimentation of defoliation of alfalfas
Geigy Chemical Corporation Diazinon insecticide for control studies Sequestrene NA.Mn for minor element deficiency studies
B. F. Goodrich Chemical Company Strobane insecticide for control studies
Dan Kamphausen Company 100 pounds osmosalts for treating fence posts
Charles Pfizer & Company 50 gms dihydrostreptomycin, 25 gms procaine penicillin, 25 gms potassium penicillin G for study of chronic respiratory diseases of poultry
Shell Chemical Corporation 1 gallon ½ percent Dieldrin fly spray Aldrin, Dieldrin, Endrin, Aldrex. Isodrin for insect control studies
Velsicol Corporation 50 pounds Chlordane and 100 pounds Heptachlor for insect control studies

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Report on Research
(Continued from page 87)
have been tested. Plants have become established in the cover material above the water surface, however, and the roots have penetrated the linings. The one exception is asbestos-coated asphaltic membrane. Butyl liners are even more resistant to root penetration. After five years of exposure and burial in a soil compost, they exhibit little deterioration. However, concrete continues to be the most satisfactory material for canal linings.

Research Farm in Utah County

Farmers of Utah County have purchased a 24-acre farm to be used by the Utah Agricultural Experiment Station for research purposes. Sheds and a milking parlor for dairy animals are now under construction on the farm. Next summer the land will be planted to pasture mixtures and the following summer these pastures will be grazed by dairy cattle. Initial use of fluorine and pasture studies will be conducted on the farm. Part of the funds for construction of the buildings are from a grant by the United States Steel Corporation.

New Publications


This bulletin records the results of the various dry land experiments over the fifty years since the field station was established. It contains a discussion of climate as it influences dry land agriculture; cropping tests with wheat, barley, oats, forage crops, and grass seed; tillage investigations; fertility experiments; cropping experiments, rotations, seeding experiments, and soil moisture studies.


This publication contains analyses of range plants for their nutritive content. In general, browse plants meet recommended standards for protein and are exceptionally high in carotene. They are, however, slightly deficient in phosphorus and decidedly low in energy furnishing constituents. Grasses are markedly deficient in protein, phosphorus, and carotene but are good sources of energy. Therefore, a mixture of browse and grass in the diet more nearly balances the ration than either forage class alone.

Either of these publications may be obtained free by writing the Utah Agricultural Experiment Station, Logan.