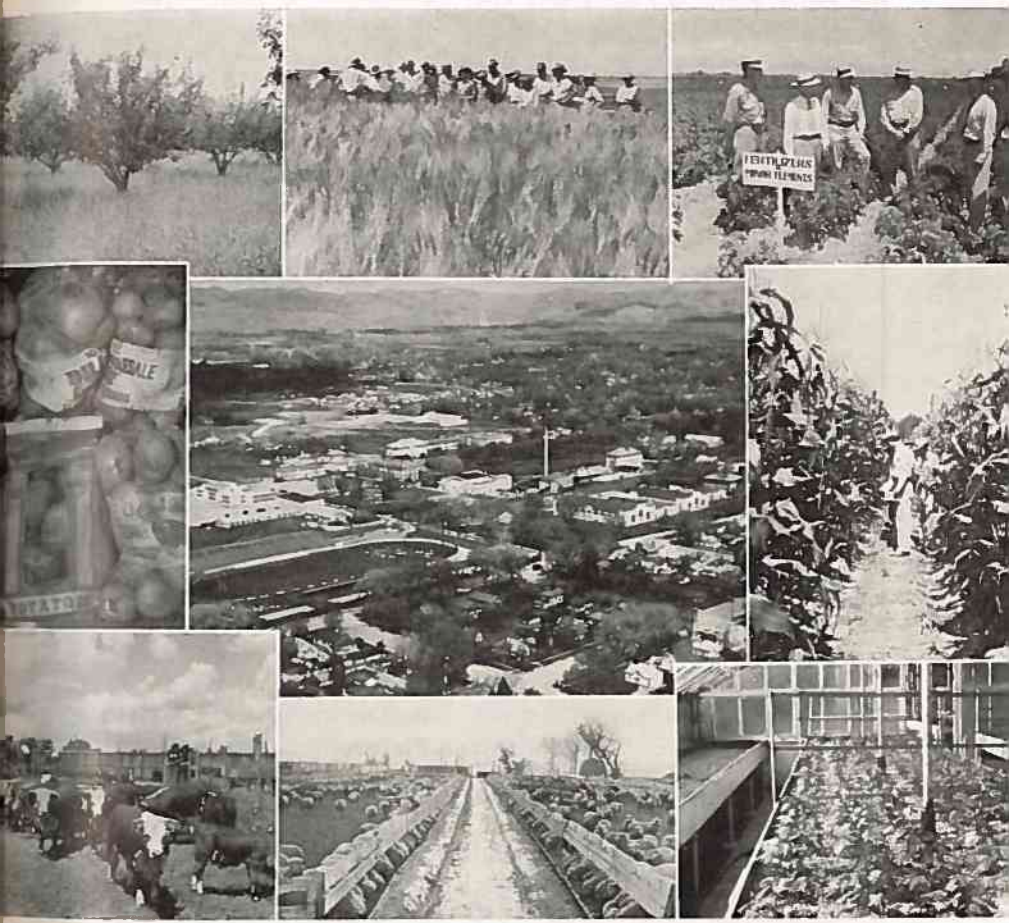
62nd Annual Report

1948-49

of the

Colorado Agricultural Experiment Station



Colorado A & M College

Fort Collins

Letter of Transmittal

Sixty-Second Annual Report

Colorado Agricultural Experiment Station

Honorable W. Lee Knous
Governor of Colorado
Denver, Colorado

Sir:

In compliance with the act of Congress, approved March 2, 1887, entitled, "An act to establish Agricultural Experiment Stations, in connection with the colleges established in the several states under the provisions of an act approved July 2, 1862, and under the acts supplementary thereto," I herewith present the Sixty-Second Annual Report of the Colorado Agricultural Experiment Station for the fiscal year of July 1, 1948, to June 30, 1949, inclusive.

Homer J. Henney

Homer J. Henney, Director

Fort Collins, Colorado
July 1, 1949

The Cover Picture

An air view of the Colorado A & M College campus (center), location of the Main Station of the Colorado Agricultural Experiment Station. Surrounding photos illustrate some of the activities carried on by the Experiment Station and eight Branch Station areas situated near Craig, Austin, Hesperus, Center, Rocky Ford, Denver, Akron and Greeley.

Director's Annual Report

Sixty-Second Fiscal Year 1948-49

Colorado Agricultural Experiment Station

General Remarks

WITH the ending of another year, the need for directing available funds toward the most demanding projects has been shown in many ways. Costs of projects have increased and several studies were made inactive during the year. There have been increased demands from farmers for answers to problems—some old and some new, some we are working on and some we have not included in our program.

Demands have increased during the year for more work on special commodities. Examples are those of the dairy interests for irrigated pasture, of the bee growers for control of foul brood, and of the park areas for soils analysis, and conservation, reseeding and irrigation practices on meadowland.

Station Program

The program for 1948-49 was, first, to administer old-line Federal funds to sections in about the same percentages as in the past, and second, to administer the new funds in such a way that we did not duplicate in one section what was being done partially in another. New earmarked funds should start research work on a cooperative basis in which several sections work together on the problem. This has been done with the new state money to study bean diseases. The new Research and Marketing fund of $50,000 was handled as a separate project, not under any one section but directed by Dr. H. S. Wilgus with a committee from four sections. The third step was to avoid spending money on problems in this state which are being answered in adjoining states with results applicable to growers in Colorado. We are now avoiding such duplication in our dairy cow disease problems, most of our bee disease problems, and some of our human nutrition problems.

In the way of adjusting future projects, the Director is convinced that we should become more specific in answering problems of immediate practical importance. As a result we may be forced to let some of the basic research answers hold a second priority. The following are some of the problems on which emphasis will be made during the next year: (1) How can wool be sheared and graded on the ranch to bring more money? (2) What are the causes in Colorado for

farm people not being healthy? (3) Why are so many potatoes not sold as No. 1's in Colorado? (4) How can peaches be marketed with more flavor? (5) Can dairy-cow manure be used industrially to provide hormones? (6) How can leak in potatoes be controlled? (7) Can inbred lines of Herefords be developed which will show increased gains per 100 pounds of feed or acres of grass? (8) Can a soils analysis machine be developed for use at county or farm levels? (9) What is the cheapest and most effective way to control weeds in beets, corn, and small grains? (10) How can radioactive materials be used to determine the kinds of fertilizer that give the greatest response in crop yields on a particular soil? (11) How can beet tops be utilized to avoid the present 50 to 70 per cent loss in value before they are consumed by animals?

Soils and Fertilizer Problems

Laboratory analysis and studies are approximately one-half completed on 120 soil profile samples collected in the fall of 1948 as a part of the detailed soil survey made on the U. S. Dry Land Field Station near Akron and the Colorado Potato Station near Greeley. Detailed soil maps of the two stations are in the process of preparation.

Soils data and land classification information has been assembled for the State Tax Commission for use in the agricultural land reappraisal program.

The scope of the radioactive fertilizer work has included field experiments to compare the relative availability of phosphate fertilizer materials when placed in different positions relative to the crop plants. The crops included wheat, barley, alfalfa, and sugar beets.

Outstanding feature of the experiment has been the use of radioactive phosphorus which has made it possible to trace the fertilizer from the soil into the plants and thus determine the amount of phosphorous the plants were able to obtain from each type of fertilizer and each position of placement.

A field plot experiment was carried on to study the effects of time and method of fertilizer placement, and fertilizer availability to sugar beets. Fertilizer plowed under and fertilizer placed on the plow sole gave the best growth early in the season, but did not give greater final yields.

A comparison of the effects of alfalfa, grass, and alfalfa-grass mixtures on corn following these crops was made. The results showed extreme nitrogen deficiency on plots which had been in grass compared with plots which were previously in alfalfa. Yields after the alfalfa-grass mixture were not significantly different than those after alfalfa, but the corn, after grass alone, yielded only 44 bushels compared with 118 bushels after alfalfa.

The effect of alfalfa in a rotation on succeeding crops, was compared with a rotation without alfalfa or other legumes. The crops in the rotation without alfalfa and with no fertilizer showed extreme nitrogen deficiency and moderate phosphate deficiency while the crops on the rotation with alfalfa showed much less evidence of nitrogen deficiency but apparently greater phosphate deficiency.

The results of the field tests show a great difference in response of various fields to fertilizers, some giving large increases and others no measurable increase. Plant and soil samples have been collected for analysis to determine the reason for differences in response and to develop better methods of soil and plant tests to determine fertilizer needs. Radioactive tracer techniques are being used in new tentative soil tests.

During the third year of rotation the plots on leveled land were seeded to spring wheat with no further fertilizer treatments being used. A noticeable carryover effect of nitrogen, phosphorus and potash applied in previous years was indicated by a significant increase in yield over the no-treatment plots. The grain from these plots was also higher in protein content. The yields from the phosphate and manure plots were only slightly higher than the check plots and the difference was not statistically significant.

Eight out of ten fertilizer experiments in the San Luis Valley gave statistically significant increases in yield averaging eighty-five 100-pound sacks per acre, and netting to the grower slightly less than $197 increase per acre. A 1-4-½ ratio composed of 40 pounds of available nitrogen, 160 pounds of available phosphorous, and 20 pounds of available potash per acre gave the best results regardless of soil type or previous cropping history. This was true in all parts of the state.

A 1-4-1 ratio composed of 30 pounds of available nitrogen, 120 pounds of available phosphorous, and 30 pounds of available potash per acre has not only given the most economical results, but has maintained high production for 3 consecutive years. This amount is equivalent to a 6-24-6 fertilizer applied at the rate of 480 pounds per acre.

Copper, iron, manganese, sulphur, and mine tailings when applied to the same piece of ground for 3 consecutive years have not produced significant differences in yield, grade or color.

Thirty pounds of available nitrogen, 120 pounds of available phosphorous and 20 pounds of available potash per acre gave the best results. This is equivalent to a 6-24-4 fertilizer applied at the rate of 460 pounds per acre on potatoes.

When barley and cowpeas were planted (after the early potatoes were dug) and plowed

under in the fall, it was found that both barley and cowpeas reduced the yield of potatoes over that produced on ground which was left fallow. Barley depressed the yield more than cowpeas.

The best all-around orchard cover crop appears to be Hubam clover. By seeding in early spring and discing in late fall, the crop residue is incorporated into the soil and a new stand obtained without re-seeding. Hairy vetch is also a satisfactory cover crop but is better for stone fruits.

A nutrient solution for gravel culture use has been developed which is adapted to growing carnations in Colorado. High nitrogen and potash levels of nutrition for carnations so far have not produced yield differences, but lower the grade of carnations. Selenium added to nutrient solutions reduces red spider injury but there is some growth stunting at the 4 p.p.m. to 8 p.p.m. level.

Crop Improvement

Corn

On corn improvement projects seven growers produced 272 acres of hybrid corn "double cross." Several lots of single-cross seed were contracted. With the exception of the single cross W. D. 456 x K. B. 397, the supplies of foundation single-cross seed were adequate to meet the growers' demands.

In addition to the above, 160 different corn hybrids were grown in six different regional performance tests. These tests were located at Fort Collins, Rocky Ford, Fort Morgan, Akron, Haxtun and Johnstown, with both commercial and experiment station hybrids. Mimeographed reports of the tests were furnished farmers and seed dealers to aid them in selecting the best adapted hybrids.

Wheat

Germination tests were again made in 1948-49 on the old stocks. Some further reduction in viability was shown.

The hybrids were advanced one generation and some stem rust and leaf rust plants were advanced to the third generation.

Alfalfa

In the alfalfa project, maternal lines were advanced another generation. Better seed-setting lines have been obtained by this method of selection in Hardistan. Flower color studies were carried on as a part of a master's thesis.

Barley

Some 6,000 inoculations were made on many lines of barley including crosses, winter and spring barley, and Moravian malting barley. Seed from these are again planted for this season's study. Out of the vast number of tests some 25 lines were selected for further test with different collections of smut.

Potatoes

A new variety named Teton which is ring rot resistant has produced excellent yields of high quality potatoes. Some objection

to this variety has been expressed because it is slow to show ring rot symptoms.

Yampa, a new scab-resistant variety, will be introduced in cooperation with the United States Department of Agriculture this year.

Beans

Several lines of adapted pinto beans were rogued for mosaic in foundation stock of RR1, RR5. Foundation stock of San Juan and Idaho III were increased at Fort Lewis. These stocks will be furnished foundation seed growers for increase.

Eleven bean varieties were tested for disease resistance and yield. Varying degrees of resistance were shown. Certain Idaho varieties and San Juan selections gave the best performances in part of the 5-year test. In two seed-treatment plots seven chemical compounds and three antibiotics were tried against root rot. Of these "Dithane" and two of the antibiotics showed promise of controlling Fusarium root rot.

Carnations

Carnation foundation stock work is continuing on seven varieties, and elite stock is available for planting in the new greenhouses. Nearly 40,000 cuttings were distributed for increase to growers this year after all off-type and diseased plants were eliminated. Methods of propagating, maintaining, and increasing clean stock are being investigated.

Onions

Thrip-resistant Danvers tested on the Western Slope show uniformity of maturity, high keeping quality in storage, and high tolerance to thrip injury. Hybrid trials are being continued there this year.

The Sweet Spanish hybrids have shown too early maturity at Rocky Ford, although they were uniform in maturity and bulb types. Pink-root resistance testing and crossing to increase keeping qualities is now under way.

Peas

Some 400 varieties and crosses between varieties of pod peas were planted on disease-infected soil in the San Luis Valley and did not show any definite degree of resistance to root rots. Tests of varieties and foreign plant introductions in disease inoculated soil in the greenhouse are being continued.

Apples

Turley, as an apple variety, looks promising. Mallery root stock VII and XIII look promising as adapted dwarfing root stocks for apples to date.

Irrigation and Water Studies

This program results in a complete climatological record of the area and supplies valuable information for forecasting weather for the benefit of farmers and ranchers.

A number of the South Platte wells are being observed at present by the Ground Water Division of the United States Geological Survey and reported to this office.

Analyses of the data obtained in a laboratory investigation of the friction losses occurring in pipes and fittings used in irrigation pumping plants is nearing completion.

There has been a considerable expansion of the snow-survey network in some parts of the state. Nine new courses were established in the Rio Grande Basin for the purpose of forecasting the flow into proposed reservoirs at Platoro and Wagon Wheel Gap. These reservoirs are being financed in part with flood-control funds; therefore, an advanced knowledge of stream flow volume is essential. A few additional courses have been added on the Arkansas, South Platte, and North Platte to account for snow cover at low to medium elevations.

Preliminary analyses of data obtained from observation of sprinkler-irrigation systems widely scattered throughout the state indicate that the initial cost of such systems ranges from $25 to $150 per acre with an average of $73.00. Labor requirements are from ½ to ¾ man hour per acre. It was observed that many operators did not apply sufficient water for best crop maintenance. This was due primarily to a lack of experience with this type of irrigation.

Early last summer the metal forms for casting concrete ditch linings were completed and tested. The lining resulting from the use of these forms seems definitely superior to any farm ditch lining now existing in this area.

In July 1948, the Station completed the study sponsored by the United States Geological Survey, involving the design of a structure in the stream which will force all silt and sand moving along the streambed into suspension. If this device proves successful in the field it will be the first practical means of determining total amount of solid material being transported by a flowing stream.

Weed Control

Weed-control tests on peaches include the newer chemicals and a comparison of chemically killing all weeds with the standard method of soil cultivation. The no-cultivation block shows promising response to date.

A new type of mechanical weeder has been designed to be used for controlling early weed growth in sugar beets. Tests will be conducted this year.

Following the spectacular appearance of 2,4-D in 1944 and 1945 it now appears that the work is leveling off and that efforts are being aimed at making more efficient use of 2,4-D and related compounds. There is much to be done in this connec-

tion in order to increase the dependability of weed control through the use of these materials and at the same time decrease the net cost.

For instance, in the case of bindweed the methods of control developed have produced some excellent results, but there are examples of the treatment being entirely inadequate. On the other hand there are perennial weeds like Canada thistle, white weed, etc., which usually offer considerable resistance to 2,4-D, but which we occasionally control effectively and economically.

As yet the ten or more chemicals reported 2 years ago to give promise of being as effective as or more effective than 2,4-D have not been evaluated. Since the development and testing of these chemicals in the laboratory and the greenhouse, the research effort has been directed largely toward determining the mechanics of the action of 2,4-D.

Livestock and Poultry Improvement

At Fort Collins there are now 16 Polled Hereford cows serving to establish two lines of breeding in addition to the Real Prince line. At Fort Lewis, 84 cows are being used in the establishment of seven lines. Inbreeding coefficients of 1949 calves will be as high as 35 per cent in a few cases. At present it is difficult to evaluate what effect this inbreeding is having; however, it does seem that certain traits are becoming characteristic of some lines.

Analyses of weights, photographic measurements, and grades of approximately 600 Shorthorn cows and calves of compact and standard types are in progress. It is hoped that the average effect of the compact gene on size and type may be evaluated from this study.

An attempt is being made to evaluate carcass composition in live steers by a study of the creatinine content of the urine. In these steers the percentage of lean meat in the carcass will be correlated with the creatinine index. Should this correlation be high the creatinine index may serve to help in the selection of breeding animals with larger amounts of natural muscling.

Development of Broad Breasted White Leghorn foundation stock obtained last year has been multiplied to provide sufficient birds for seven breeding pens and the F^2 generation is now being produced. These birds are pedigreed and selected for market characteristics, as well as reproductive ability.

The introduction of oxygen and the increase of carbon dioxide in the commercial incubator on the poultry plant this last season resulted in an increase in hatchability of approximately 8 to 10 per cent in chicken eggs and in turkey eggs. Similar observations in the White Beauty Poultry Farm Hatchery at Aurora showed an increase of 8 per cent in salable chicks hatched.

On both locations there was a marked improvement in the quality of chicks.

To compare histologically thyroids, pituitaries, adrenals, gonads and accessory sex glands of comprest and conventional type beef cattle, organs were obtained from 25 animals at slaughter. Their evaluation is now under way, but preliminary observations show differences between the two types of cattle.

There is evidence that some factor is present in green feed, e.g., fresh or frozen alfalfa, that promotes the conversion of carotene to vitamin A in the animal body. A screening process is now under way to obtain information regarding the nature of the factor or factors.

Food and Feed Preservation

There is no justification for the classification of non-leguminous forages, such as meadow and prairie hays, as poorer quality with respect to provitamin A content than legumes such as alfalfa and clover. Carotene analyses show that under similar conditions of harvesting and storage the non-legume forages were equal to and in some cases much better than legumes.

One winter-feeding period has been carried out on a replicated group of 40 heifers. The feeding of this group was similar with one exception to that of the cows now dropping their first calves. The supplement for one lot of heifers is dehydrated alfalfa pellets rather than fish oil. As yet no clear-cut differences between lots of heifers have been observed. However, there is slight but definite indication of higher serum carotene in animals receiving dehydrated alfalfa pellets at a level equivalent to the alfalfa hay supplement with respect to carotene intake. There appears to be no difference, however, in the serum vitamin A levels of these two lots.

The results reported at Feeders' Day indicated that the alfalfa chopped out of the windrow gave slightly better results when fed in fattening steer rations than did the alfalfa processed in other ways. However, dehydrated alfalfa, windrow-baled alfalfa hay, and alfalfa phosphoric-acid silage followed closely in results.

An outgrowth of this study has been a consideration of the effects of non-enzymatic browning on the nutritive value of processed foods and feeds. Studies already reported have shown that this reaction is responsible for amino acid impairment in the commercial proteins, casein and soy globulin. Reprint requests for these reports have been exceedingly high.

Range and Pasture Improvement

Thirty acres of irrigated pasture seeded in 1947 were used for the first time in 1948. The three different pasture mixtures produced a total of 8,449 cow-days of grazing, equivalent to 2¼ cows per acre for 135 days. In addition, 16.1 tons of hay were cut from these pastures. The second year of this experiment is now under way and similar data will be collected.

Russian wild rye, although green and very palatable much of the year, produced only 20 per cent as much forage as intermediate wheatgrass.

The 3-year average production of the bottomland hay plots showed intermediate wheatgrass had by far the greatest yield of 2.54 tons per acre, followed by crested wheatgrass with 45 per cent less, smooth bromegrass, 53 per cent less, and western wheatgrass, 75 per cent less.

Under proper conditions, removal of big sagebrush by burning has proved to be economical and satisfactory at Great Divide. Haphazard burning is not recommended because of the danger of run-away fires and the poor results obtained.

Near Sterling, plots of sandsage sprayed with 2,4-D in 1946 indicated only a partial kill in 1947. However, a satisfactory kill in 1948 showed that weak sprouts which developed after the first spraying did not survive the second season. Early June spraying was far more effective than a later June spraying.

Livestock and Poultry Feeding

On the basis of computed normal forage intake together with observed carotenoid content only those cattle in the dryland sections consuming winter range and in some cases sorghum fodders would be likely to show vitamin A deficiency.

In almost every instance poor quality samples of forage were due to lack of care in harvesting and storage more than any other factor.

Birth weights of calves were higher in the basal cane and alfalfa supplemented lots, and lower in the fish oil supplemented and pasture lots.

A high density type of broiler mash is found to improve market grade and percentage of fat in the flesh of broilers. This approached the degree of market improvement caused by the implantation of diethylstilbestrol. The high density mash produced slightly more pounds of gain per hundred pounds of feed consumed than when diethylstilbestrol implants are made. The efficiency of feed utilization of this type mash was significantly better than the conventional type previously used. High density starting mashes for chicks and poults have been developed su-

perior to the conventional types from the viewpoint of growth, efficiency of feed utilization, and livability. Several commercial feed companies are using formulas furnished by this Station with excellent results.

Sugar beet leaves have been dehydrated in a portable commercial dryer. The excessive moisture in beet leaves makes this process highly uneconomical.

Samples of sugar beet leaves, harvested at Lexington, Nebraska, were juiced by pressing, and dried on a drum dryer. The high moisture content appears to render this method uneconomical in comparison with similar processing of alfalfa juice. Removing excess water from beet leaves by use of screw presses has not been successful, since the material is so fragile that it passes through the press screens. Batch pressing in a hydraulic press reduced moisture and retained the carotene in the press cake of blanched leaves to a highly satisfactory extent.

In field-cured tops on 10 farms, recoverable solids 1 month after harvest were about 50 per cent of the original, most of this loss being in the shattering of protein and vitamin-rich leaves. Practically all the carotene was lost in field-cured tops whereas much of it was retained in the silage.

Chick-growth trials continue to show that dehydrated beet leaves do not inhibit growth as much as certain samples of dehydrated alfalfa meal. Juices of beet leaves or alfalfa possess a growth-accelerating effect in contrast to the meals.

Animal Health Problems

There was evidence in three animals, all receiving alfalfa supplement, that maintenance of high blood carotene level during the wintering period may be responsible for the condition of "pink-eye" when animals first go on fresh spring range.

Both calves and their dams in the alfalfa-supplemented lot show definitely greater vigor, activity, and better appearance than animals in other lots. The project on the control of enterotoxemia indicates that the bacteria or toxoid treatment is slightly superior to sulphur in reducing the death loss.

In an attempt to determine the possibility of prevention of listerellosis by immunization, a bacterin was used on 500 feedlot steers. Approximately 50 cases of listerellosis had developed previously. Since the bacterin was given, no cases have developed in either the vaccinated or untreated animals.

One hundred twenty-five lambs were checked for fringed tapeworm infection and all of these were found to be negative. However, approximately 40 per cent of these lambs were autopsied and found to be infected with small numbers of Thysa-

nosoma. Five of the lambs have been placed on our experimental plot to endeavor to establish an infective area so that the fauna of this plot can be accurately studied in an attempt to determine the intermediate host. The area will also be spread with manure from the feeding lots in order to infect it heavily.

In order to determine the efficacy of low-level phenothiazine therapy in horses, an experiment is now being run. Pre-therapeutic fecal examination showed the experimental horses to be heavily infected with strongyles.

This experiment will be conducted for several months in order to determine whether or not this method of therapy will produce a parasite-free herd of horses and a parasite-free pasture.

Insect and Plant-Disease Controls

Mosaic of wheat only appeared last year in limited areas where early fall rains occurred. There is evidence that the common wheat green bug carries this disease.

We have found that apparently healthy carnations carry the fungus causing wilt and branch rot. Ten fungicides and three antibiotic substances were tested against soil-borne rots. The chemical "Dithane" and two of the antibiotics extracted from fungi were successful in checking carnation root rot. Filtrates from the fungi contained these toxic principles.

A careful study was made of the various fungi causing field and storage rots of onions. The important rots were purple blotch and bulb rot. There was a negligible loss from Botrytis rot and Aspergillus rot if the onions were not stored too long. Pink root, a field rot, reduced the yield.

After 3 months storage, diseased onions can pass the grader but after four days to a week out of storage the onions become a rotten mass.

It has been found that the X-disease of peach can be transmitted to and recovered from two varieties of apricots and two varieties of plums. Cherries are usually grafted on two standard types of root stocks. It has been found that the plants on these different root stocks show no difference in susceptibility to the rasp leaf virus.

Studies on harvesting dates at Rocky Ford, starting July 27 and continuing at weekly intervals, indicate that disease-rotting organisms enter the bulbs from soil sources early in the growing season. About 60 per cent of the total storage rots were apparently from soil-borne sources and gained entrance early in the season. Field-curing tests conducted for a varying period before storing indicated no particular differences in total storage rots, since the entrance of the organism is from soil sources at or around the base of the bulb.

Fumigating onions in storage with nitrogen tricholoride gas to reduce storage rots indicated a reduction in neck-rotting organisms but was of little value in reducing rots which were in the basal portion of the bulb at harvest time.

With evidence that the green peach aphid is a vector of peach mosaic, attention has been given to a better control of this insect in the orchards.

A 10-acre peach orchard, divided into 49 plots, was treated for the prevention of blemished peaches by the feeding of the Lygus bug. The insect populations were so low that there was no significant difference in blemished fruit due to treatments. However, the results from a similar test made in 1946-47 showed that 2 pounds of 50 per cent DDT to 100 gallons of water applied at petal fall gave highly significant control.

The following is a summary of results secured in an experimental codling-moth and mite-control program conducted in Delta county:

(1.) DDT was the most effective material for codling-moth control; (2.) Superiority of four applications of DDT over three applications was highly significant; (3.) Superiority of five applications of DDT over four applications indicated but did not establish significance; (4.) The applications of DDT failed so completely the program was abandoned; (5.) DDT was equally effective combined with DN-111, selocide sulfur or parathion; (6.) Neotran significantly reduced effectiveness of DDT; (7.) Four applications of DDT was significantly more effective than four applications of parathion (25 per cent) 1 pound, or 2 pounds to 100 gallons; (8.) Two applications of lead arsenate on first brood in combination with kerosene and soap, followed with two applications of black leaf 155 plus summer oil for the second brood, allowed four times as many worms to enter as four applications of DDT; (9.) Two and one-half ounces of parathion (25 per cent) combined with DDT did not increase codling-moth control, or give significant clover-mite control; (10.) DN-111 ¾ pound, Selocide 1 quart, parathion 1 and 2 pounds and wettable sulfur 6 pounds to 100 gallons, all gave effective and equal control of the clover mite; (11.) The lead arsenate-Black Leaf 155-summer oil treatment gave significant but unsatisfactory control of the clover mite; (12.) IN-4200, 1 pound to 100 gallons on three applications gave little clover-mite control; severe spray injury resulted to fruit and foliage; (13.) Neotran, 1 pound to 100 gallons, on three applications gave little clover-mite control. Apples showed slightly discolored blotches and shriveled in storage. (14.) Three cover applications of DDT at ¾ pound actual to 100 gallons gave control equal to four applications at the same rate on pears.

Tests in 1948 for the control of the cherry fruitworm show parathion, methoxchler, DDT and TDE (DDD) as the most promising materials to use. Parathion and TDE were tested for the first time for the control of this insect. Methoxychlor has been tested 2 years and DDT, 3 years. In the Aranci orchard, 10 treatments were significantly (1 per cent point) better than the untreated. Parathion, methoxychlor, DDT and TDE were significantly better than all other treatments, with the exception of nicotine alkaloid plus summer oil.

Onion thrips-control studies carried out the past year in cooperation with W. C. Edmundson showed all materials, except parathion, to reduce the number of thrips. Texaphene gave the greatest reduction. While the data have not been completely analyzed, it appears that several treatments have given significant increases in yield in the Mountain Danvers and no treatment has given increase in the Sweet Spanish.

Further studies were made to determine the compatability of several contact insecticides in combination with DDT for the control of aphids. Tests were also made to compare low-pressure types of equipment with the high-pressure sprayers in general use. Psyllid and aphid populations failed to develop in the 64 plots in the test. Results of the tests show good control of the tuber flea beetle with DDT. The recommended treatment will be 1 pound of the technical DDT (2 pounds of 50 per cent) wettable powder to 100 gallons of water. A dust mixture of 5 per cent DDT with sulfur is also recommended. Results from the use of low-pressure spray equipment were comparable with those from the standard high-pressure machines. Considerable attention was given to the study of the relation of insects to the spread of potato virus diseases in certified seed-growing areas. It is felt that this phase of the potato insect problem should receive major attention in the future.

Industrial Uses of Agricultural Wastes

Further progress has been made in the perfection of the uncooked frozen apple pulp which will decrease the cost of production. It has also been found that this product makes an excellent apple sherbet of very smooth texture and pronounced fresh-apple flavor. Samples of this new product and of fresh-frozen raspberry and peach sundae-topping have been sent to P. E. Yates Company of Puyallup, Washington.

Design changes were made in the John Deere No. 65 forage harvester to facilitate beet-leaf and green-alfalfa harvest. These changes resulted in definite improvements but more work should be done on this machine.

Preliminary tests were completed on beet-leaf-harvesting equipment. This work is in con-

nection with the beet-top utilization project under the Hope-Flannagan Act.

Studies are being made in connection with sugar beet-top utilization to find the proper designs and systems to be followed in manufacturing beet-harvesting equipment.

Large amounts of dried feces were extracted in specially constructed stainless steel equipment on a semi-pilot plant basis. Four crystalline substances have been isolated and subjected to infra-red analysis at the University of Utah and at the Sloan Kettering Cancer Institute in New York. These results and those of elementary analyses indicate that three of these substances are new steroids in the rarest and most valuable class. The most convenient method of obtaining derivatives of these substances has been determined and sufficient amounts are being prepared for final identification.

The watery extract obtained from bull's testes continued to be effective in the reduction of breast tumors, prostatic hypertrophy, sexual decline, and the prevention of sexual heat in dogs.

Selling, Buying and Home Living Problems

Two bulletins contain cake recipes for altitudes of 5,000, 7,500 and 10,000 feet have been developed through the research work of the Station. The first printing of over 10,000 copies was mailed out as quickly as they came from the printers and about 12,000 more are being printed now to meet the immediate demand.

Colorado has cooperated with four other western states in a study of the housing requirements of rural farm families. Colorado has collected 123 schedules from families in the state and supervised the collection of 32 schedules from Wyoming and 40 from New Mexico.

Colorado has been designated as the key state for the Western Region Cooperative Project on the nutritional status of selected groups in the West.

The mobile laboratory and unit with about 16 people will come to Colorado, July 1, and will start field studies at 5,000- and 10,000-foot altitudes in areas to be selected. Physical examinations, blood determinations of vitamins, and detailed dietary studies will be conducted on volunteers in age groups of 14 to 16 and over 50.

The Home Economics Section has cooperated with the Horticulture and Economics Sections on the potato project being supported under Hope-Flannagan funds. Potatoes sorted according to their specific gravity have been cooked by different methods to determine acceptability.

The second phase of the study of moisture in stored wool, in which the wool will be placed in 50-per cent and 25-per cent

relative humidity environments, is under way at the present time. A report on these findings will be made soon.

Removal of bellies on 2,800 fleeces did not prove economically practical due to failure of the trade to compensate sufficiently for the improved package.

A grader for separating potatoes as to their mealiness has been developed in cooperation with the United States Department of Agriculture to grade commercial quantities of potatoes. By this method it is possible to separate potatoes which will bake best from those which will boil or fry best.

In testing peach varieties, which is a long-time project, Fisher and Vicery look promising in extending the harvesting period to avoid heavy concentration in a short 2-week period. Adaptability, yield and quality tests are conducted on many new peach varieties.

The bruising surveys on peaches indicate that more bruising occurs in bushel baskets than in box packs and more injury is indicated in the field and in packing than in other steps in harvesting and handling. Sugar content, size, color, and quality of flavor continues to increase while fruit remains on the tree, but ceases upon picking peaches and decreases during transit and storage.

Fresh flavor, color and browning of peaches were determined. In general, the varieties which had the greatest tendency to discolor were judged to be of highest quality when fresh frozen. These fresh-frozen products had been protected from enzymatic browning by the use of ascorbic acid.

Claims that DDT has a deleterious effect on the storage of apples have been explored, not only for DDT but also for Parathion and combinations of the two. The data obtained indicated no marked differences due to treatment. The samples treated with Parathion alone were somewhat higher in total solids, soluble solids and total acidity in both apples and pears.

Service Laboratories

Seed samples totaling 3,418 were received for testing as of March 31, 1949, in the seed laboratory. The necessity of hiring a full-time analyst will increase the operating cost of the laboratory between $1,000 and $1,500. The removal of seed-inspection and law-enforcement offices to Denver will not help the situation, since little money has been available for this purpose. However, the inspection samples taken by the State Department are to be analyzed by the seed laboratory and payment made for the operations.

Active Projects
1948-1949

PLANT SCIENCE

Project Numbers

7. Relation of winter hardiness and disease resistance in alfalfa
8. Genetic studies and linkage relationships in barley
9. Development, improvement, and application of methods of classifying arid and semi-arid lands
10. Inheritance studies on disease resistance of small grains
11. Factors affecting the availability of mineral nutrients in soils
12. A study of methods of restoring the productive capacity of land after the surface soil has been removed by land-leveling operations or erosion
13. Corn improvement
14. Improved seed
15. More suitable production in dry farming by adapted crops, tillage and rotation
16. High-altitude agricultural crops
17. Effect of moisture stress on plant growth
18. Effect of fertilizers on the yield and quality of crops
19. Hybrid corn
20. Longevity of farm seeds
21. Breeding disease-resistant crops
22. Effect of methods of application of fertilizers on sugar-beet production
34. Insect transmission of viruses infecting prunus species in Colorado
35. Psyllid resistance
36. Truck and garden crop insects and their control
37. An investigation of the most effective methods of codling-moth control
38. Investigation of insects causing wormy cherries in Colorado
39. An investigation of lygus bug injury and lygus bug control
40. General insect investigations
42. Control of root rot of pod peas by the development of resistant varieties and better cultural practices of pod peas
43. The detection and identification of virus diseases in potato tubers and other plants by their fluorescence in ultraviolet light

44. The development of varieties of onions that are disease and insect resistant and that will meet dehydration and storage requirements
45. The effect of various fertilizers, minor elements and soil amendments on the yield, grade, color, cooking quality and keeping quality of potatoes
46. Increasing fruit production by development of better cultural practices, new varieties, methods of storing and nutritive value of fruits
47. Floricultural investigations
48. Testing of new crop plants and vegetable types and variety in Colorado for war-time and production use
49. Potato breeding and cultural investigations
50. Potato and onion storage
51. Root rot, red stele and winter hardiness of strawberries
58. Utilization of sugar-beet tops as a feedstuff
64. Evaluation surveys of Colorado's native vegetation to determine range-land production and its proper maintenance
68. Akron field shelterbelt
69. Strength properties of native woods
70. Treatments for preservation of fence posts and structural timbers on farms
71. Native grasscover to maintain small airports
79. Virus diseases of stone fruits
80. Investigations on bacterial wilt and ring rot of potatoes
81. Weed control
82. Control of late and early blight of potatoes
83. Seed-piece rot affecting stands of potatoes
85. Root rot of beans
90. Properties and processing of Colorado fruits and vegetables
92. Studies on factors affecting stability and quality of dehydrated potatoes
93. Industrial utilization of fruits and vegetables and their waste
94. The systematic and biological and applied investigation of compounds related to DDT and synthetic plant hormones
103. High-strength wire for reinforcement of precast concrete beams
104. Meteorological observations
105. Ground-water fluctuations and their relation to pumping
106. Friction losses in pipes and fittings used in irrigation pumping plants
107. Survey of ground-water resources for irrigation in Republican River drainage in Colorado

108. Photographic methods for making snow surveys
109. Snow-course measurements and forecast analyses
110. Hydraulic sand separator
111. Measuring device and integrating instrument
112. Sandtraps and sluiceways
113. Revision of report on results of seepage investigations
114. Mineralization changes in ground and surface waters of the South Platte irrigation district of Colorado
115. Lining of farm irrigation ditches
117. Mechanized sugar-beet production and storage
118. Investigation of the economics and practicability of sprinkler irrigation in Colorado
119. Harvesting and handling costs, equipment, requirements and feed value of forage processed in different ways
120. A study of the control of the red harvester ant
121. Soils laboratory
122. Foundation seed
123. Pure-seed investigations
124. Performance tests of well screens
127. Phosphate requirements for economic crop and livestock production in the west
128. Bed-load flume
132. Potato vine killers and their use in Colorado
133. Stilling wells for metergates
135. Model studies for Bhakra Dam
136. Model studies for Hirakud Dam
137. The diffusion of vapor, heat and momentum from plane boundaries and from variously shaped objects
204. A study of the new methods of grading, packaging and shipping to improve and maintain quality of potatoes and to determine consumer acceptance for same
209. Irrigation, drainage and soil fertility in relation to alfalfa production in the upper Colorado River Basin

ANIMAL SCIENCE

24. Vitamin A nutrition of beef cattle in Colorado
25. A richatic condition shown by heavily fed cattle receiving adequate calcium, phosphorus and Vitamin D
26. Improvement of beef cattle through breeding
27. Protein supplements with corn for feeding hogs
28. Colorado grains and roughages in lamb feeding

29. Commercial wool shrinkage
30. Fineness and variability of wool
31. Irrigated pastures for dairy cattle
32. Dehydrated alfalfa, dehydrated beet leaves and other concentrates in rations for fattening lambs
55. Iodine requirements for poultry
56. Poultry laying houses
57. Cow manure as a source of hormones
62. The seasonal and annual trends in nutritive value of native forage plants in relation to range livestock production
63. Improved range practices for increased cattle production
65. Improving sagebrush lands to obtain maximum range livestock production
66. Induced revegetation of depleted range and abandoned croplands to increase cattle and sheep production
67. Nutrient utilization by cattle of certain native meadow hays showing a history of toxic properties
73. Relationship of telangiectasis to abscesses in livers of beef cattle
74. Overeating (entertoxemia) of feedlot lambs
75. Problems affecting the fur-bearing animal industry in Colorado
76. Contagious ecthyma (soremouth) of sheep
77. Fringed tapeworm
84. Poisonous plants causing losses in livestock
87. Utilization of carotene in the animal body
88. Preparation of pyridoxine derivatives and evaluation of their antianemic activity in chicks
89. The chemical composition of eggs in relation to their inter quality
91. The relation of nutrition to reproduction in the cow and bull
130. Iodinated Thiouracil derivatives
134. A comparison of expellar process and extraction process of linseed meal for fattening steers
138. Listerellosis in farm animals
207. The relation of iodine and hormone metabolism to causes and prevention of breeding failure in cattle

HUMANITIES

96. Farm business analysis studies
97. Marketing Colorado fruits and vegetables
98. Improvement on marketing of eggs in Colorado
99. The effect of recent changes upon the economic relationship between Colorado ranch and range properties

100. Colorado community organization as a basis for more effective utilization of natural and human resources
101. Farm simplification studies in Colorado
125. Nutritional value and culinary quality of distiller's dry solubles
126. Farm and ranch field analysis
201. Marketing of peaches
202. Marketing livestock, both feeder and slaughter, in Colorado
203. Preparation and processing of Colorado wools to enhance their market value and increase returns to the wool grower
206. Improvement of rural housing in the Western Region

Cooperation

The state benefits financially and materially from both Federal and industrial cooperation. During the 1948-1949 fiscal year, 19 private and industrial organizations donated a total of $71,729.95 to the Station research program. There are 18 full-time Federal employees with a budget of about $450,000 to work on problems in cooperation with the Station.

Editorial Service

Scientific journals published 20 manuscripts bearing the Station scientific journal series numbers; 17 papers were published in semi-technical journals or mimeographed form under the miscellaneous series numbers. There were about 200 news stories released to newspapers and the same number sent to radio stations. Special feature and information stories were sent periodically to the regional farm magazines.

Monthly Publications

Twelve issues of the Colorado A & M News made up Volume II and were published monthly during the fiscal year 1948-1949.

Technical Bulletins

No. 40 "Mile-High Cakes" by Elizabeth Dyar, Elizabeth Cassel, Miriam Hummel, Elizabeth Twomey, and Elsie Slayton

Popular Bulletins

No. 403-A "Pasture and Forage Crops for Irrigated Areas in Colorado" by D. W. Robertson, Ralph Weihing, and Rodney Tucker

Annual Report

Sixty-First Annual Report, Colorado Agricultural Experiment Station 1947-1948.

Scientific Journal Series

Barmington, R. D. Temperature Reduction Problems in Sugar Beet Storage. Trans. Amer. Soc. Mech. Engineers 70(6):685. Aug. 1948. Sci. Series 245

Barmington, R. D. A Press Wheel Study to Improve Beet Seedling Emergence. Amer. Soc. Sugar Beet Tech. pp. 225. 1948. Sci. Series 261

Barmington, R. D. The Relationship of Seed and Cell Size to Planter Performance. Agricultural Engineering 29(12):530-532. Dec. 1948. also Amer. Soc. Sugar Beet Tech. pp. 240. 1948. Sci. Series 268

Beach, George, and Mussenbrock, August. Nitrogen and Potash Fertilization of Patrician Carnation in Soil—Progress Report Proc. Amer. Soc. Hort. Sci. 52 pp. 487-9. 1948. Sci. Series 262

Beach, George, and Mussenbrock, August. Cost Comparisons—Soil and Gravel-Grown Carnations. Proc. Amer. Soc. Hort. Sci. 51 pp. 623-6. 1948. Sci. Series 257

Bertone, Eugene, and Landblom, Nellie. Fineness and Variability of Corriedale Lamb Wool. Jour. Animal Sci. 8(2):256-64. May 1949. Sci. Series 281

Connell, W. E., Wheeler, S. S., and Tom, R. C. The Effect of Winter Supplementation on Subsequent Gains of Beef Steers on Grass and in the Fattening Lot. Jour. Animal Sci. 7(4):430-33. Nov. 1948. Sci. Series 265

Deming, G. W. Breeding Sugar Beets with Root Conformation Adapted to Machine Harvest. Amer. Soc. Sugar Beet Tech. 1948. Sci. Series 260

Deming, G. W. Effect of Different Row Widths on Yield and Quality of Sugar Beets. Amer. Soc. Sugar Beet Tech. 1948. Sci. Series 259

Deming, G. W. Progress Report on Weed Control Studies at Fort Collins, Colorado. Amer. Soc. Sugar Beet Tech. 1948. Sci. Series 258.

Fults, Jess L., and Schaal, L. A. Red Skin Color of Bliss Triumph Potatoes Increased by Use of Synthetic Plant Hormones. Science 108(2807):441. Oct. 15, 1948. Sci. Series 284

Nelson, R. T., Gardner, Robert, Rhoades, H. F., Dunnewald, T. J., Hide, J. C., Wood, R. R., Asleson, J. A., Mellor, J. L., and Pumphrey, F. V. Harvest Results of Inorganic Fertilizer Tests on Sugar Beets Conducted in Four States. 1947. Proc. Amer. Soc. Sugar Beet Tech. 1948. Sci. Series 274

Hoerner, J. L. The Bean Cutworm **Loxagrotis alicosta** (Sm.) Jour. Econ. Ent. 41(4):631-5 Jan. 3, 1949. Sci. Series 264

Jensen, Rue, Tobiska, J. W., and Ward, J. C. Sodium Fluoroacetate (Compound 1080) Poisoning in Sheep. Am. Jour. Vet. Research 9(33):370-2. Oct. 1948. Sci. Series 275

Jensen, Rue and (Mackey, D. R.) Listerellosis in Cattle and Sheep. Jour. AVMA. 114(867):420 June 1949. Sci. Series 291

Kelley, Omer J. Fertilization of Sugar Beets. Proc. Amer. Soc. Sugar Beet Tech. 1948. Sci. Series 299

Kunkel, Robert, Schaal, L. A., and Binkley, A. M. The Relationship Between Maturity, Yield, Color, and Cooking Quality of Early Crop Triumph Potatoes. Amer. Potato Jour. 26(4):132-37 April 1949. Sci. Series 273

Kunkel, Robert, Edmundson, W. C., and Binkley, A. M. The Effect of Chemical Vine Killers on Yield and Quality of Red McClure and Triumph Potatoes. Amer. Pot. Jour. 25(10):371-76. Oct. 1948. Sci. Series 271

Lane, C. H., Kunkel, R., and Kreutzer, W. A. Tests of Cutting Knife Disinfectants and Cutting Techniques in the Control of Ring Rot of Potatoes. Amer. Pot. Jour. 25(12):446-54. Dec. 1948. Sci. Series 278

Leonard, W. H. Rice as a Crop in Japan. Jour. Amer. Soc. Agron. 40(7): 580-602 July 1948. Sci. Series 267

McBirney, S. W. Improvement of Sugar Beet Seedling Emergence by Planter Development. Proc. Amer. Sugar Beet Tech. pp. 229-39. 1948. Sci. Series 300

McBirney, S. W. Weed Control Studies on Sugar Beets Using Pre-Emergence Treatments. Proc. Amer. Soc. Sugar Beet. Tech. pp. 453-63. 1948. Sci. Series 301

Patton, A. R., and Foreman, E. M. Glycine Reagent for Paper Chromatograms. Science 109 pp. 339. 1949. Sci. Series 305

Patton, A. R., Hill, E. G., and Foreman, E. M. The Effect of Browning on the Essential Amino Acid Content of Soy Globulin. Science 108(2815): 659-60. 1948. Sci. Series 279

Simonds, A. O. Apricots and Plums as Hosts of Western "X" Disease. Science 109(2826):199. Feb. 25, 1949. Sci. Series 287

Thomas, W. D., and Mussenbrock, August. Selection of Virus-free Carnations by Fluorescence. Flor. Rev. 102(2648):41. Aug. 26, 1948. Sci. Series 276

Thomas, W. D. Reaction of Different Bean Varieties to the Colorado Red Node Virus. Plant Disease Reporter 33(6). June 15, 1949. Sci. Series 293

Whitney, R. S., Robertson, D. W., and Gardner, Robert. Sugar Beet Fertilizer Experiments on Recently Leveled Land. Proc. Amer. Soc. Sugar Beet Tech. 1948. Sci. Series 270

Weihing, Ralph. Flower Color Inheritance in Alfalfa. Jour. Amer. Soc. Agron. 40(8):746-50 Aug. 1948. Sci. Series 272

Wilgus, H. S., Johnson, H. P. H., Esplin, A. L., and Smith, P. B. Dehydrated Sugar Beet Leaves as a Feedstuff. Amer. Soc. Sugar Beet Tech. 1948. Sci. Series 289

Miscellaneous Series

Deen, J. Lee, Robertson, J. C. H. Colorado Forest Resource Appraisal 1944. Sta. mimeo. July 1948. Misc. Series 420

Division of Irrigation. Summary of Federal-State Cooperative Snow Surveys and Irrigation Water Forecasts for the Missouri-Arkansas Rivers Drainage Basins. 1936-1947. Sta. mimeo. August 1948. Misc. Series 418

Division of Irrigation. Federal-State Cooperative Snow Surveys and Irrigation Water Forecasts for the Colorado River, Rio Grande River, and Missouri-Arkansas Drainage Basins for February, March, April, and May, 1949. Sta. mimeo. Misc. Series 426, 427, 428, 432, 433, 434, 436, 437, 438, 442, 443, and 444

Economics Section. Prices Received by Farmers in Each County of Colorado for Principal Crops. Sta. mimeo. July 1948. Misc. Series 419

Editorial Section. Titles of Miscellaneous Series Papers Published by Staff Members. Sta. mimeo. April 1949. Misc. Series 440

Editorial Section. Titles of Papers Published in Scientific Journals by Staff Members. Sta. mimeo. April 1949. Misc. Series 439

Fauber, Herman, Binkley, A. M., and Kreutzer, W. A. Field Trials with Fungicides for the control of Purple Blotch and Storage Rots of Onions. Sta. mimeo. July 1948. Misc. Series 415

Gausman, G. J., and Fauber, Herman. Tests of Hybrid Corn Under Irrigation in Colorado, 1948. Sta. mimeo. Feb. 1949. Misc. Series 429

Gausman, G. J., Brandon, J. F., Gausman, C. E. Tests of Hybrid Corn on Dry-Land in Colorado in 1948. Sta. mimeo. Feb. 1949. Misc. Series 423

Johnson, Gestur. New Frozen Fresh Fruit Pie-mixes, Quick Frozen Foods. Aug. 1948. Misc. Series 416

Jorgensen, Carl. The Proper Method of Picking Cherries. Sta. mimeo. July 1948. Misc. Series 412

List, G. M., Binkley, A. M., Henderson, W. J., Mickle, Gordon T. Spray Schedules for 1949. Proc. West. Colo. Hort. Soc. 1949. Misc. Series 424

List, G. M. New Insect Problems and New Insecticides. Presented at Second Rocky Mtn. Hort. Conf., Denver, Feb. 8, 1949. Misc. Series 430

List, G. M. The Drosophila or Vinegar Flies and Their Control. Proc. West. Colo. Hort. Soc. 1949. Misc. Series 422

Mussenbrock, A., and Ferguson, A. C. The Results of Spacing and Pruning Tests in the Production of Pompom Mums. Sta. mimeo. 1949. Misc. Series 431

Staff. Branch Station Reports on Experimental Work. Sta. mimeo. Feb. 1949. Misc. Series 441

Thomas, W. D., Robertson, D. W., Daniels, Leslie B., Ensign, R. D., Graham, R. W., Henderson, W. J., and Tucker, Rodney. General Report on Pinto Bean Investigation, 1948. Sta. mimeo. Misc. Series 435

Wilgus, H. S. Trace Minerals in Animal Nutrition. Feedstuffs. March 12, 1949. Misc. Series 445

FINANCIAL REPORT, COLORADO AGRICULTURAL EXPERIMENT STATION

For the year ending June 30, 1949

	Hatch Fund	Adams Fund	Purnell Fund	Bankhead-Jones	Hope-Flannagan	State Mill Levy	Special	TOTAL
Receipts	$	$	$	$	$	$	$	$
Balance July 1, 1948					7,673.98	10,961.90	11,038.03	29,673.91
From the Treasurer of the United States	15,000.00	15,000.00	60,000.00	26,055.98	27,132.69			143,188.67
Other sources than the United States						140,251.40[1]	179,199.11[3]	319,450.51
Total Receipts	15,000.00	15,000.00	60,000.00	26,055.98	34,806.67	151,213.30	190,237.14	492,313.09
Expenditures								
Personal Services	12,102.42	12,048.30	48,426.41	20,766.35	22,224.45	95,391.00	72,554.67	283,513.60
Travel	636.48	250.74	1,292.08	751.84	673.01	2,067.90	6,068.80	11,740.85
Transportation of Things		336.48	3.16		52.25	593.82	1,407.65	2,393.36
Communication Service	43.47	6.25	105.00	18.16	79.73	2,918.51	350.18	3,521.30
Rents and Utility Service		394.81	561.16	63.28	76.21	5,588.02	7,076.97	13,760.45
Printing and Binding	412.22		123.54		15.25	2,600.54	119.75	3,271.30
Other Contractual Services	1,187.65	80.11	1,625.46	333.98	950.36	4,079.82	4,255.30	12,512.68
Supplies and Material	201.26	1,128.49	3,930.74	1,381.18	1,068.05	12,713.73	44,936.26	65,359.71
Equipment	15.00	557.86	1,378.05	2,287.17	807.30	11,628.19	39,549.04	56,222.61
Lands and Structures			1,268.71			6,844.40	2,398.60	10,511.71
Contributions to Retirement	401.50	196.96	1,285.69	454.02	602.21	2,109.93	2,689.01	7,739.32
Total Expenditures	15,000.00	15,000.00	60,000.00	26,055.98	26,548.82	146,535.86[2]	181,406.23[4]	470,546.89
Balance on hand June 30, 1949	0	0	0	0	8,257.85	4,677.44	8,830.91	21,766.20
Grand Total	15,000.00	15,000.00	60,000.00	26,055.98	34,806.67	151,213.30	190,237.14	492,313.09

[1]Includes 32,500.00 HB No. 74.

[2]Includes disbursements 32,500.00 HB No. 74.

[3]Includes receipts 120,449.11 Station Special, 10,000.00 Bindweed, 19,000.00 Plant Disease, 6,000.00 Pure Seed, 23,750.00 IDR.

[4]Includes disbursements 122,656.23 Station Special, 10,000.00 Bindweed, 19,000.00 Plant Disease, 6,000.00 Pure Seed, 23,750.00 IDR.

Under provisions of Section 9 (b) (3) of the Hope-Flannagan Act $24,575.00 was received. $5,114.35 was carried over from the previous fiscal year. This money is available only for certain projects worked on in cooperation with other State Experiment Stations. Of this amount $26,807.65 was spent during this fiscal year. In addition the Colorado Station spent $842.90 of Hope-Flannagan 9 (b) (3) regional travel funds and $13,175.27 of Hope-Flannagan 10 (a) funds.

Personnel Changes

Joining the staff during the fiscal year were:

W. R. Schmehl	Associate Agronomist (Soils)
Walter R. Heald	Associate Agronomist (Soils)
K. G. Brown	Assistant Agronomist
James Ingalls	Assistant Animal Husbandman
Maxine Benjamin	Assistant Veterinary Pathologist
Norman R. Gerhold	Assistant Botanist
Madeline Ferrigan	Laboratory Assistant, Chemistry
Adeline Kano	Research Assistant, Chemistry
Theodore O. Thatcher	Assistant Entomologist
Lowell K. Halls	Assistant Range Conservationist
Marianne Kulas	Assistant Home Economist
Kathryn C. Colmey	Research Assistant, Home Economics
W. D. Holley	Associate Horticulturist
J. S. Gregory	Assistant Horticulturist
R. F. Farmer	Assistant Horticulturist
Lore Sulzberger	Research Assistant, Poultry
H. Prentiss Gazaway	Assistant Rural Economist
R. D. Lennox	Assistant Sociologist
C. W. McLain	Director, San Juan Basin Branch Station

Resignations from the staff during the year were:

R. E. Carlyle	Associate Agronomist (Soils)
M. E. Michaelson	Assistant Botanist
Dale M. Griffin	Assistant Chemist
Eldon G. Hill	Research Assistant, Chemistry
A. R. Ronzio	Associate Chemist
Robert Hedblom	Research Assistant, Chemistry
R. V. Seaman	Research Assistant, Chemistry
Lowell K. Halls	Assistant Range Conservationist
Flora L. Slocum	Home Economist
August Mussenbrock	Assistant Horticulturist
R. H. Adolph	Assistant Poultry Husbandman
J. L. Paschal	Associate Rural Economist
H. E. Thomas	Associate Sociologist
R. D. Lennox	Assistant Sociologist
R. S. Claycomb	Assistant Mechanical Engineer

COLORADO A & M COLLEGE

COLORADO AGRICULTURAL EXPERIMENT STATION

Fort Collins, Colorado

STATE BOARD OF AGRICULTURE

EXPERIMENT STATION STAFF

Administration

AGRICULTURAL DIVISION

Agronomy

Cooperators:

Animal Investigations

1Resigned April, 1949.
2Resigned April, 1949.
3Term expired February, 1949.
4Term expired February, 1949.
5Appointed February, 1949.
6Appointed February, 1949.
7Appointed to serve unexpired term of E. G. Hartner.
8Appointed to serve unexpired term of R. C. Eaton.

Animal Pathology and Veterinary Medicine

A. W. Deem, D.V.M., M.S.	Chief Veterinary Pathologist
Floyd Cross, D.V.M.	Veterinary Pathologist
Rue Jensen, D.V.M., M.S.	Veterinary Pathologist
J. W. Tobiska, M.S.	Chemist
R. Scott Jackson, B.A., D.V.M.	Assistant Veterinary Pathologist
Frank K. Bracken, D.V.M.	Assistant Veterinary Pathologist
Maxine M. Benjamin, D.V.M., B.S.	Assistant Veterinary Pathologist

Botany and Plant Pathology

L. W. Durrell, Ph.D.	Chief Botanist and Plant Pathologist
Jess L. Fults, Ph.D.	Botanist
Bruce J. Thornton, M.S.	Associate Botanist in Charge of Seed Laboratory
A. O. Simonds, Ph.D.	Associate Botanist
H. D. Harrington, Ph.D.	Associate Botanist
George H. Lane, M.S.	Associate Botanist
Walter D. Thomas, Jr., Ph.D.	Associate Plant Pathologist
R. E. Atkinson, M.S.	Associate Plant Pathologist
M. E. Michaelson, M.S.	Assistant Botanist
R. L. Skiles, B.S.	Assistant Botanist
Norman R. Gerhold, M.S.	Assistant Botanist

Cooperators:

J. O. Gaskill, M.S.	Plant Pathologist (USDA)
L. A. Schaal, Ph.D.	Associate Plant Pathologist (USDA)
E. A. Lungren, M.S.	Associate Plant Pathologist (USDA)

Chemistry

W. E. Pyke, Ph.D.	Chief Chemist
Lowell W. Charkey, Ph.D.	Associate Chemist
Paul R. Frey, Ph.D.	Associate Chemist
A. R. Patton, Ph.D.	Associate Chemist
A. R. Ronzio, Ph.D.	Associate Chemist
H. E. Barrett, Ph.D.	Assistant Chemist
Raymond E. Carlson, Ph.D.	Assistant Chemist
Edwin B. Crone, Ph.D.	Assistant Chemist
H. A. Durham, M.S.	Assistant Chemist
M. S. Hopwood, B.S.	Assistant Chemist
Gestur Johnson, M.S.	Assistant Chemist
Patricia Wilson, B.S.	Assistant Chemist
Dale M. Griffin, M.S.	Assistant Chemist
Elsie Foreman, B.S.	Research Assistant
Duane Johnson, B.S.	Research Assistant
Marjorie Mayer, M.A.	Research Assistant
Madalen Rey, M.S.	Research Assistant
Adeline Kano, B.S.	Research Assistant
Eldon G. Hill, B.S.	Research Assistant
Robert Hedblom, B.S.	Research Assistant
R. V. Seaman, M.S.	Research Assistant
Madeline Ferrigan, B.S.	Laboratory Assistant

Entomology

George M. List, Ph.D.	Chief Entomologist
John L. Hoerner, M.S.	Associate Entomologist
Leslie B. Daniels, M.S.	Associate Entomologist
J. H. Newton, B.S.	Associate Entomologist
Theodore O. Thatcher, Ph.D.	Assistant Entomologist

Forestry and Range Management

E. W. Nelson, M.A. — Acting Chief Range Conservationist
C. H. Wasser, M.S. — Range Conservationist
Donald F. Hervey, M.S. — Assistant Range Conservationist
Lowell K. Halls, M.S. — Assistant Range Conservationist
Charles W. Barney, D.F. — Assistant Forester
Walter H. Schaeffer, M.F. — Assistant Forester
H. E. Troxell, M.F. — Assistant Forester

Home Economics

Elizabeth Dyar, Ph.D. — Chief Home Economist
Miriam E. Hummel, M.S. — Home Economist
Flora L. Slocum, Ph.D. — Home Economist
Marianne Kulas, M.S. — Assistant Home Economist
Elizabeth N. Twomey, B.S. — Research Assistant
May E. Combs, M.S. — Research Assistant
Kathryn C. Colmey — Research Assistant

Horticulture

A. M. Binkley, M.S. — Chief Horticulturist
George A. Beach, M.S. — Horticulturist
Robert Kunkel, Ph.D. — Horticulturist
A. C. Ferguson, M.S. — Associate Horticulturist
Carl J. C. Jorgensen, M.S. — Associate Horticulturist
W. D. Holley, M.S. — Associate Horticulturist
August Mussenbrock — Assistant Horticulturist
J. S. Gregory, B.S. — Assistant Horticulturist
R. F. Farmer — Assistant Horticulturist

Poultry

H. S. Wilgus, Jr., Ph.D. — Chief Poultry Husbandman
F. X. Gassner, D.V.M., M.S. — Associate Endocrinologist
Robert Adolph, M.S. — Assistant Poultry Husbandman
Lore Sulzberger, B.A. — Research Assistant

Rural Economics and Sociology

R. T. Burdick, Ph.D. — Chief Rural Economist
C. R. Creek, M.S. — Associate Rural Economist
J. L. Paschal, Ph.D. — Associate Rural Economist
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Jack E. Cermak, M.S. ..... Assistant Civil Engineer

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Mechanical Engineering

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George Stafford ..... Engineering Aide (USDA)
P. F. Gifford, B.E. ..... Farm Job Analyst (USDA)

Branch Stations

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Herman Fauber, M.S. ..... Superintendent, Arkansas Valley
Ferris M. Green, B.S. ..... Superintendent, Western Slope
C. W. McLain, M.S. ..... Director, San Juan Basin
Dwight Koonce, M.S. ..... Associate Agronomist, San Juan Basin
James Ingalls, M.S. ..... Assistant Animal Husbandman, San Juan Basin
W. F. McGee, B.S. ..... Superintendent, San Luis Valley

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J. F. Brandon, B.S. ..... Associate Agronomist, USDA, Dry Land Field Station