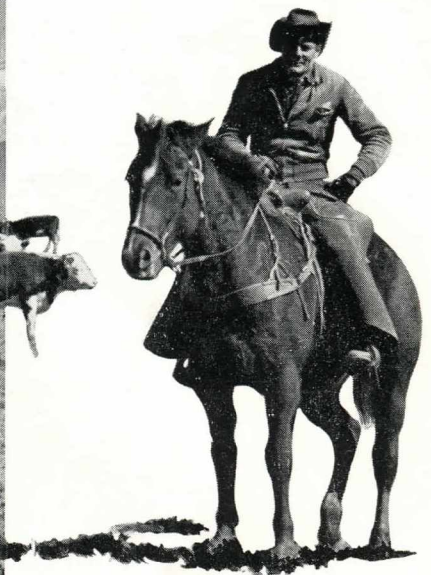


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**RESEARCH
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AGRICULTURE**



SIXTY • EIGHTH ANNUAL REPORT • 1954 • 1955

**AGRICULTURAL
EXPERIMENT
STATION**

FORT COLLINS, COLORADO

**Letter of Transmittal
Sixty-Eighth Annual Report
Colorado Agricultural Experiment Station**

Honorable Edwin C. Johnson
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 several states under the provisions of an act approved July 2, 1862, and under the acts supplementary thereto," I herewith present the Sixty-eighth Annual Report of the Colorado Agricultural Experiment Station for the fiscal year of July 1, 1954 to June 30, 1955.

Fort Collins, Colorado
July 1, 1955



S. S. Wheeler
Director

research
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agriculture

SIXTY-EIGHTH ANNUAL REPORT—COLORADO AGRICULTURAL EXPERIMENT STATION



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Crops and Soils

Soils scientists are trying to find a method for classifying shallow soils underlaid by sand and gravel for purposes of irrigation. In greenhouse experiments, these soils were placed in deep containers with variable heights of water table.

It was found that grasses grown on shallow soils overlying clean gravel produced poorly when the water table is within the gravel. The soils yield normally when the water table is in contact with the gravel soil interface.

Agronomists studied methods to restore the productive capacity of land after the surface soil has been moved by land leveling or erosion. The 1954 experiment was to find the effect of previous treatments on the yield of corn and alfalfa.

It was determined that residual effects of phosphorus may occur for five to ten years after application, especially when high rates are used. Adequate phosphorus levels can be obtained by small yearly applications or by large applications made at longer intervals.

In the San Luis Valley work is under way to restore productivity of alkali soil. Different rates of leaching as well as amendments of gypsum, calcium chloride and Krilium, are being tested.

Results show higher yields occur with high water tables. In addition, a trend toward

higher yields occurs with higher leaching rates and with amendments, namely calcium chloride.

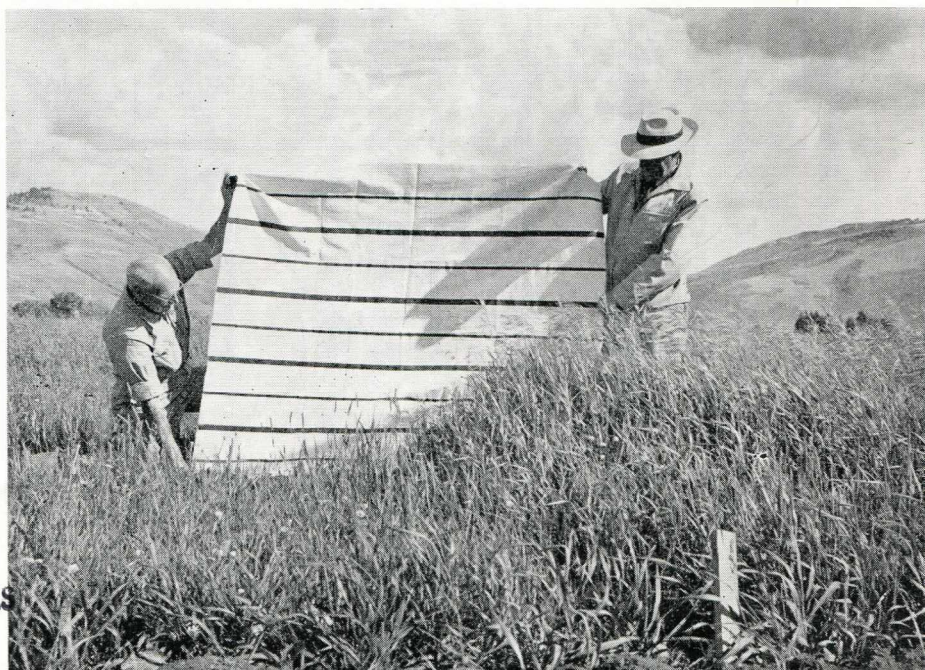
Dryland fertility experiments were conducted on wheat at ten locations in eastern Colorado. Three of these tests were lost because of poor germination and drouth. Of the seven wheat experiments harvested, applications of nitrogen produced a significant increase in yield of grain at three locations, and a significant increase in yield of straw at five locations.

Fall or early spring applications of most nitrogen fertilizers were effective on the sandy land wheat except for late spring applications of ammonium sulfate. Stored moisture in sandy lands to a depth of 36 to 48 inches at fertilizing time is sufficient to risk an application of nitrogen under dryland conditions.

Hybrid corn performance tests were conducted at Fort Collins, Rocky Ford, Akron, Haxtun, Brush, and Johnstown. A total of 217 hybrids was included in these tests under irrigated and dryland conditions. In 1954, five new hybrids outyielded the Colorado 152 variety. Based on a five year average, one new hybrid has yielded six percent more than Colorado 152.

Experiments with nitrogen on irrigated mountain meadows showed that fertilizer will increase the protein content of the hay. The

Application of nitrogen fertilizer on mountain meadows will increase hay yields as well as protein content of the hay. As a result of this research, ranchers can harvest hay two or three weeks earlier than previously.



application of 160 pounds of nitrogen per acre increased the yield of hay by about one ton per acre and the crude protein by about 300 pounds per acre.

In beef feeding trials it was shown that the high protein hay is acceptable to the cattle and it compares favorably with other similar protein supplements. As a result of this research, ranchers are beginning to harvest hay two to three weeks earlier than before and they are beginning to follow better irrigation practices. Proper water control, nitrogen fertilization and good livestock management will result in increased carrying capacity, beef yields, and probably weaner calf sales.

Reclamation of saline alkali soils in the

Livestock Production

Thirty-two steers sired by four inbred bulls and eleven control steers sired by ranch bulls were obtained from two eastern Colorado ranches. Besides recording of feed performance, it is planned to measure the degree of fatness of the live animal before slaughter.

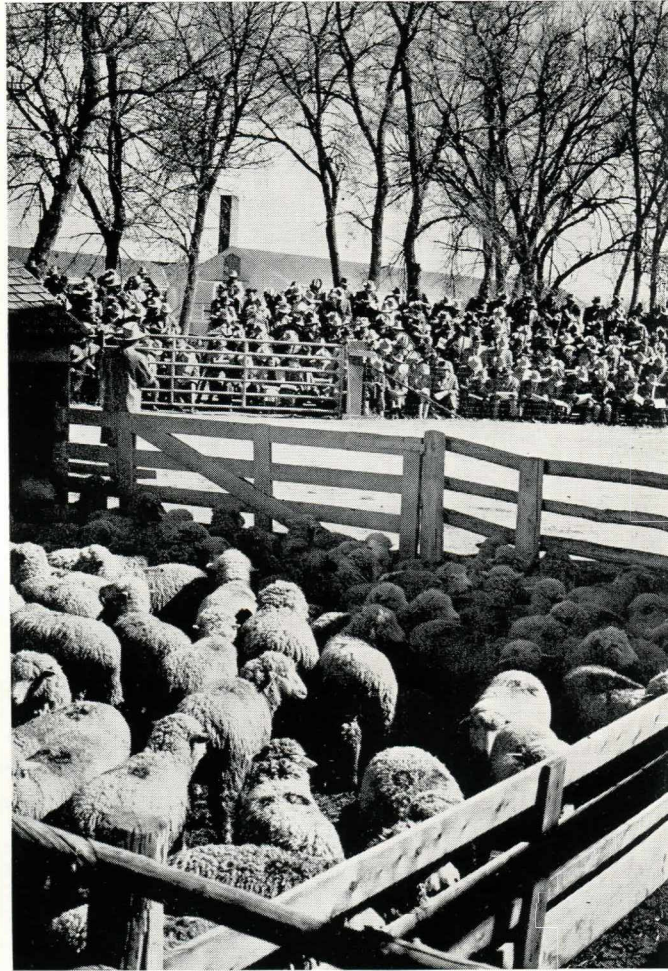
At the San Juan Basin branch station, a control group of ten bred yearling heifers has been secured from three different ranches. Each year these heifers will be bred to a different bull to estimate the usefulness of inbred lines and rotational crossing.

Purdue supplement A with modifications, emphasizing the use of alfalfa hay, is being studied in an attempt to determine how this supplement can best be used under Colorado conditions. From a standpoint of gains and costs of gain, Purdue A fed with corn silage plus a full feed of corn later, compares favorably with a full feeding of corn during the entire fattening period.

The lamb feeding program has been directed toward two basic problems: 1. The self feeding of heavy lambs and 2. the feeding of corn silage to lambs. In the self feed-

Grand Junction area was successfully accomplished through leaching. In 1954, the first year yields of alfalfa were 4.35 and 5.00 tons per acre for the two- and six-inch leaching treatments, respectively. There were signs that salts and alkali were returning to the soil after one year's cropping, indicating that it may be necessary to apply more water than needed by the crops.

In a drainage study, the effect of irrigation control of the water table is being studied. By careful management of irrigation applications, it is possible to keep the water table at a depth of at least eight feet on a field where the water table previously was from 6 to 24 inches from the surface.



Feeders Day always attracts a large number of livestockmen anxious to hear of latest developments in cattle and sheep feeding research.

ing phase, pelleted and unpelleted mixtures of grains and roughages were compared with hand feeding a standard ration. For the most part, the pellets gave larger gains. Equal parts corn and alfalfa seemed to be the best mixture for the pelleted rations.

These pellets can fatten heavy feeder lambs to acceptable market weights in a short period. Lambs can also be fattened on corn silage with a protein supplement and with a short full feeding period on grain.

In cattle experiments, scientists studied the proper amount of concentrates and roughages in fattening rations. It appears that the 2 to 1 ratio of concentrate to roughage gives the best gains and at the lowest cost. This is especially true when the feeding period is started with relatively high

roughage and relatively low concentrate and varied so that overall ratio of the feeding period averages out about two to one.

The program to improve efficiency of lamb and wool production in Colorado emphasizes nutrition and rigid culling combined with various systems of mating.

Another important project was to determine the effect of hormones, drugs and similar substances on the feedlot performance of livestock. In one experiment, cattle fed 10 mg. of diethylstilbestrol daily in a fattening ration made an average daily gain of 2 7/10 pounds at a feed cost of \$19.10 per 100 pounds of gain. The control animals, receiving no diethylstilbestrol, gained 2.3 pounds daily at a feed cost of \$21.99 per 100 pounds of gain.

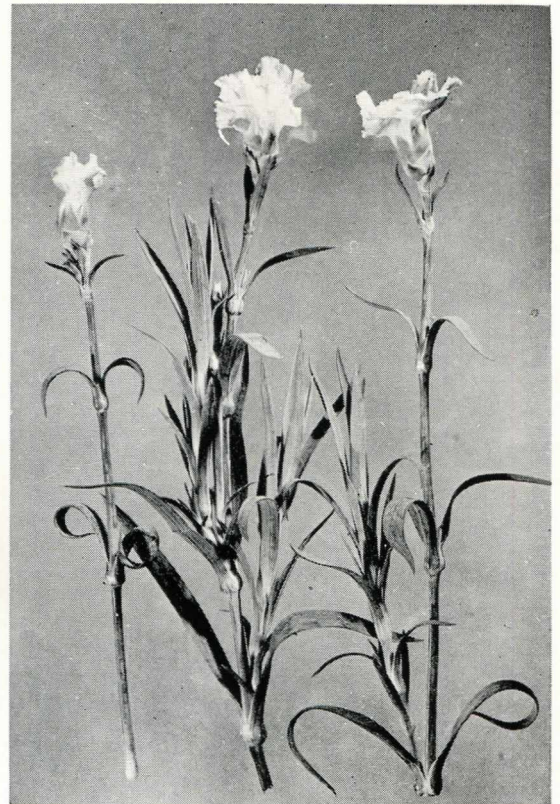
Horticulture

Colorado's \$60,000,000 horticultural production is expanding in spite of increased costs of growing crops. Indications are that the expansion will continue for many years. The demand for information on trees, shrubs, and lawns has brought requests for research by nurserymen and others associated with new home building. The research on commercial horticulture control crops is planned to help growers reduce their costs of production.

Research results on major horticultural crops are returning about three dollars for every dollar assigned for research. The average per acre yield of potatoes has doubled in the past ten years, due mostly to application of research results. The yield and quality of tree fruits have improved to the point that there is an expanding acreage of apples being planted in western Colorado.

The yield of carnations per square foot of bench space has doubled in ten years. This has been mostly due to research results on seed and propagation of stock, introduction of new varieties, the use of commercial fertilizers, labor reducing cultural practices and better insect control.

Research scientists have proven that the Burbank variety of potato can be grown successfully in Colorado, regardless of soil type, providing proper cultural practices are followed.



Station horticulturists have conducted research which has allowed carnation growers to double the yield per square foot of bench space.

At the San Luis Valley branch station, an experiment was conducted to study what happens during abnormal years when large amounts of commercial fertilizers are used. If potatoes are planted early and harvested early, the yield will be higher than if they are planted late and harvested early.

The effect of 60 pounds of nitrogen when applied at the early planting date was to increase yields by 26 sacks per acre. The effect of 120 pounds of nitrogen, when applied at the early planting date, increased the yield if the crop was harvested.

Skinning of potato tubers during harvest handling operations usually causes considerable losses. Researchers conducted tests to see if they could toughen up potato skins to keep them from being damaged. With Red McClures, the longer the potatoes remained in the soil in the fall, the more resistant the tubers were to skinning. It was also found that high rates of nitrogen caused the tubers to skin more easily.

In floriculture studies, researchers found that cut flowers from older plants have better keeping qualities than flowers from plants that are extremely vigorous. That's because the growth rate of older plants has slowed down.

Soil moisture relations are also important to cut flower keeping. Flowers from plants grown in lower moisture tensions keep the best. Flexible plastic pipe around the greenhouse bench with 180° nozzles seems to be the most practical method of irrigation. Cost of this permanent installation is about the cost of the labor involved in hand watering for one year.

Irrigation tests on turf grass indicate that an inch per week in addition to rainfall is the approximate amount of water necessary to maintain bluegrass during the growing season. An interval of four days between irrigations was apparently as good, if not better, than shorter or longer periods.

Insect Control

One phase of the work carried on by the Entomology section is to test insecticides for the control of aphids, leaf hoppers, psyllids and flea beetles. This season has been characterized by a high incidence of leaf roll, aster yellows and psyllid yellows. Materials

tested included DDT, toxaphene, endrin, systox, dieldrin, and heptachlor.

Western Slope apple and pear growers have benefited from work carried on at the Tongue Creek orchard near Eckert. This orchard has the advantage of having large

Research to find more effective ways to control insect pests is valuable to fruit growers on the Western Slope.



blocks of different varieties of apples and makes possible an increased number of replications. Five insecticides for codling moth control have been evaluated. They were malathion, toxaphene, diazinon, parathion and DDT. Diazinon, a new chemical, gave the highest percentage of clean fruit.

The Entomology section acts as a clearing center for reports of the Colorado Insect De-

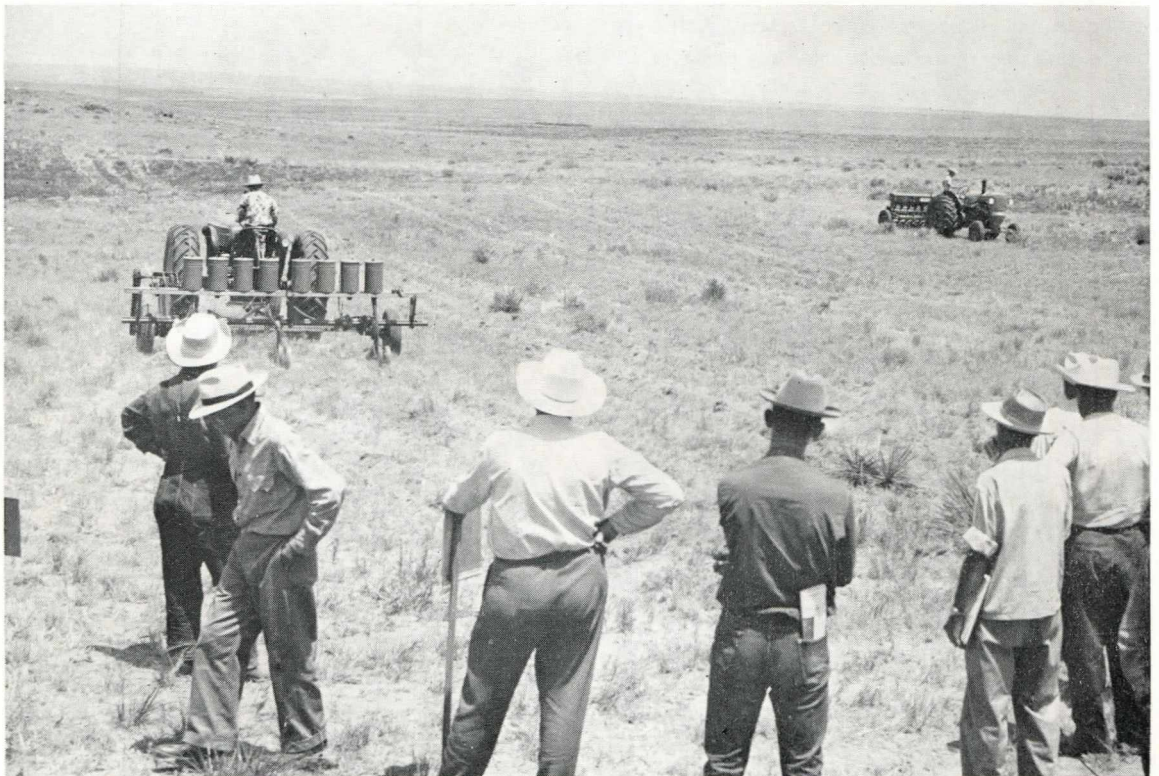
tection Committee. Eighteen weekly reports were sent out to the agricultural chemicals industry, aerial applicators, county agents, and other cooperating agencies. News releases were sent to daily and weekly newspapers and tape recordings were sent each week to radio stations in the state. Through this service farmers and growers can be alerted for timely application of recommended insecticides.

Mechanical Engineering

A new five-row grass planter was designed and constructed along the general lines of the first experimental three-row planter built in 1953. Changes and improvements were incorporated to improve the functions of the machine. Adverse climatic conditions and grasshoppers made it difficult to obtain germination stands, however.

Engineers also studied American, English and Swiss sugar beet planters to devise ways to get more accurate seed metering for both processed and monogerm sugar beet seeds. Tests with the English planter showed higher germination and less seed damage than with the American model.

Farmers attending a field day see a demonstration of a grass planter adapted for rangeland use.



Forestry and Range Management

At Great Divide in northwestern Colorado a kill of 92 percent of big sagebrush was obtained with aerial applications of butyl and isopropyl esters of 2,4-D at the rate of one and one-half pounds of acid equivalent per acre. This appears to be an economical method for improving sagebrush ranges which have a grass understory.

Sagebrush plants more than six inches in height were three and three-tenths times as susceptible to the 2,4-D as plants smaller than six inches.

In tests with beef animals, weight gains were greatest on pastures where the sagebrush was burned and the range reseeded. On a per-acre basis, this is how the gains for each experimental area compared:

Untreated sagebrush (control pasture)	10.7 pounds
Burned, natural recovery	17.0
Burned and reseeded	31.4

Spraying sagebrush pasture with 2,4-D and 2,4,5-T also shows promise in experiments at Great Divide.

At the Fort Collins Foothills Nursery, the addition of alfalfa to grass plantings on dryland caused an extra three tons of forage to be produced despite the drouth. This indicates the possibility of increased income to ranchers from the use of alfalfa-grass mixtures in reseeding rangelands.

Efforts to control blowout areas got under way at the Eastern Colorado Range Station near Akron. First year results show the best stand was obtained with a mixture of warm season grasses planted on an area where wheat straw had been worked in earlier to stabilize the soil. It was fertilized with 90 pounds of phosphate.

Home Economics

As Colorado's contribution to a regional study, home economists collected and analyzed data on space requirements for clothes storage. They determined the space required for all types of garments according to the different methods of storage, such as rod, hook, drawer or shelf.

From this information, they developed

design data for different clothes storage areas and facilities in rural homes.

In connection with high altitude baking studies which have been under way for more than 20 years, home economists have prepared a file of recipes for cakes, yeast breads and quick-mixes. During 1954-55, standard quick bread and cookie recipes were checked at 5,000, 7,500 and 10,000 feet.

Plant Diseases

Studies of peach tree diseases were conducted on experimental plots in Mesa county. Investigations of peach gummosis were directed toward finding a simple and effective treatment for the inactivation of cankers. Tests indicate that only one material, a di-nitro compound, is partially effective in retarding canker development.

Red McClure potatoes grown at the San Luis Valley branch station were used to determine the most favorable technique for using 2,4-D and maleic hydrazide to secure both the color advantages of 2,4-D and the

sprout inhibiting properties of maleic hydrazide. Results indicate the two chemicals can be used alone or together and applied either separately or together and either early or late with no loss in yield.

The best procedure to obtain high color and maximum sprout inhibition where both are wanted is to use 2,4-D when the tubers average three-fourths inch in diameter, and apply the maleic hydrazide late in the season.

Research shows that loose smut in barley can be eliminated by soaking the seed in Spergon solution. This, however, greatly re-

duces germination percent. Recent tests have demonstrated that seed which is dried before planting has a higher germination percentage than seed planted immediately after removal from the solution.

Most of the research on diseases of truck crops and small fruits has been done with industry funds. Companies participated through the Western Crop Protection Laboratory and the Colorado Agricultural Research Foundation. Twenty different fungicides were tested on the major truck crops and small fruits.

Fifteen different herbicides were tested. The three most promising are various formulations containing chlordane, lead arsenate combined with nitrogen fertilizer, and phenyl mercuric acetate sprays. The best time of

application appears to be between May 10 and June 20.

Stem rust of wheat is one of the most destructive diseases known to plant pathology. Each year it causes heavy losses in the United States and throughout the world. An important factor in the occurrence of stem rust is the dispersal of fungus spores. Studies show that the rate of fall increased with relative humidity.

The Seed Laboratory is responsible for the research on control of field weeds. Two years ago it was decided to decrease emphasis on foliage treatments and concentrate more on testing materials available for actual eradication of weeds. Eradication of smaller infestations even at high cost may be cheaper and more satisfactory than attempting to control such infestations with foliage treatments.

Economics and Sociology

North Park has been selected as an area for a pilot study to collect results of range reseeding experiments. The information will provide a guide under which methods of range reseeding would be the most economical means of expanding forage supply.

In egg marketing a working knowledge of the poultry industry was obtained at the retail, wholesale and producer levels. Many of the retail stores in Denver and most of the wholesalers were visited. Additional information on sources of supply, quantities handled, and methods of storing, will be obtained later.

Marketing of sheep and lambs is a regional project in which three phases of the sheep industry will be studied. They are the range operators, the feedlot operators and the farm flock operators.

Factors that influence consumer acceptance of beef were studied in a survey of 500 Denver households. Photographs of cuts and grades of meats were used in testing consumers' knowledge and preference for different types of meat. Another survey of 200 households with actual meat samples will be made later.

Chemistry and Endocrine Studies

Preliminary tests show that a new hormonal substance effectively relaxes the cervix in the pregnant cow. It was used successfully in several cases of hydrops amnii and mummified fetus and it is expected to be useful in the treatment of pregnant feedlot heifers.

In tests to determine the effects of hormones on fattening beef cattle and lambs, analysis of tissues taken from animals treated with hormones by implantation was com-

pleted. Since no residual hormones were found in any of the tissues, it is now possible to recommend hormone treatment of livestock to improve feedlot performance.

A study of virus yellows in sugar beets was made to evaluate beet varieties which are resistant to this disease. Three varieties were selected for the study. They included a variety resistant to virus yellows, a variety moderately susceptible and a variety very susceptible. It is hoped some information

can be gathered in the laboratory about the proteins that may help in classifying a resistant and susceptible variety, as well as identifying plants infected with virus yellows.

In studies of fruit composition and quality, the limits of variation of more than 50 varieties of peaches investigated during the past several years were found to be quite large. The chemical composition of peaches not only differs with variety, but also with the season and state of maturity at picking.

Varieties were found to vary considerably in color of both flesh and the amount of red color in the pit cavity. Peaches having a highly red color pit cavity usually make an attractive frozen product.

In canning, the highly colored pit cavity may distract from the appearance of the fruit due to the brown discoloration of the cavity

during processing. If the fruit is picked when too immature it will not develop as good a color as fruit picked at the proper stage of maturity.

Apples, like peaches, vary greatly in chemical composition. For pie baking, two outstanding quality characteristics are the amount of acidity and the texture of the fruit after baking. Jonathan apples make a flavorful pie, but they must be properly mellowed after harvest. The Rome type apples are better for processing soon after harvest because of higher acidity at that stage. Delicious apples are not considered good for pie use. When Delicious and other low-acid apple slices were treated with a special syrup and then frozen as a pie-mix, however, excellent pies were produced.

Animal Diseases

Considerable progress has been made on several animal disease projects during the past year. When an outbreak of an upper respiratory infection occurred in feedlot cattle in northern and eastern Colorado, feeders organized the Northern Colorado Cattle Feeders Association. The organization plans to hire a veterinarian to conduct field investigations and to cooperate with the Experiment Station to determine cause and prevention of this disease.

During the past fiscal year most of the work on shipping fever has been devoted to the study of a relatively new type of respira-

tory infection known as "Red-Nose."

Results of the study to date indicate:

1. The disease is caused by a virus.
2. The virus is present in the blood and nasal exudates of infected cattle.
3. The virus from the above sources can be readily transmitted to susceptible cattle by spraying it into the trachea.

The diagnostic service continues as a time-consuming but important work of the Animal Pathology and Veterinary Medicine Section. Through case and herd histories, scientists obtain information which is of great value in the research program.

Information and Publications

As in past years, all available communications media were used to help keep Colorado citizens informed of research progress made by the Colorado Agricultural Experiment Station.

More than 1,500 news releases were prepared by the News and Radio Service and sent to weekly and daily newspapers, radio stations and farm magazines.

Regular editorial service for the Experi-

ment Station consisted of processing the technical papers and bulletins listed and the preparation and distribution of 400 radio programs on research.

General Series Papers

Amemiya, M.; Whitney, R. S.; Greb, B. W. "Commercial Fertilizer Experiments with Non-Irrigated Corn and Sorghum in Eastern Colorado in 1953." Gen. Series 586.

Amemiya, M., et al. "Soil, Water, and Crop Management Research—Upper Colorado River Basin." Gen. Series 591.

- Binkley, A. M.; Rogers, Ewell; Green, F. M. "The Effect of Increased Rates of Potassium Application on Elberta Peaches." Gen. Series 600.
- Daniels, L. B. "Insect Control Recommendations for 1955." Gen. Series 598.
- Fulfs, J. L. "Western Leak Disease." Gen. Series 597.
- Gardner, R. and Johnson, D. "Water and Nitrogen Control for Hay Production on Mountain Meadows." Gen. Series 588.
- Greb, B. W.; Whitney, R. S.; Tucker, Rodney. "Commercial Fertilizer Experiments with Non-Irrigated Crops in Colorado." Gen. Series 592.
- Hervey, D. "Sagebrush-Range Improvement and Grazing Use." Gen. Series 585.
- Koonce, Dwight; Fauber, Herman; Brandon, Joe. "Performance Tests of Hybrid Corn Varieties Grown in Various Regions of Colorado in 1954." Gen. Series 590.
- Stockwell, H. J. "Snow Survey." Feb. 1, 1955. Gen. Series 594-96.
- Stockwell, H. J. "Snow Survey." March 1, 1955. Gen. Series 602-04.
- Stockwell, H. J. "Snow Survey." April 1, 1955. Gen. Series 606-08.
- Stockwell, H. J. "Snow Survey." May 1, 1955. Gen. Series 610-12.
- Stonaker, H. H. "Beef Breeding Research, 1955 Report." Gen. Series 613.
- Thornton, Bruce. "New Developments in Present Day Herbicides." Gen. Series 593.
- Whitney, R. S. and Sonntag, L. C. "Progress Report on Reclaiming Saline-Alkali Soils of San Luis Valley." Gen. Series 584.
- 1954 Progress Report. San Luis Valley. Gen. Series 609.
- 1954 Progress Report. Arkansas Valley Branch Station. Gen. Series 599.
- 1954 Progress Report. Western Slope Branch Station. Gen. Series 600.
- 1954 Feeders Day. Gen. Series 605.
- 1954 Progress Report. USDA Akron Field Station. Gen. Series 587.

Scientific Series Papers

- Barmington, R. D. "Metering Devices and Test Results of Some Foreign and Domestic Sugar Beet Planters." Journal of American Society of Sugar Beet Technologists. Sci. Series 473.
- Blouch, Roger and Gaskill, John O. "Effect of Dalapon on Volunteer Oat Control and Crop Yield in Sugar Beets." Jour. of Amer. Soc. Agron. Sci. Series 458.
- Deane, H. M. and Jensen, Rue. "The Pathology of Foot-Rot in Sheep." Amer. Jour. Vet Research. Sci. Series 453.
- Holley, W. D. "Carnation Nutrition I: Nitrogen and Soil Moisture." Proc. Amer. Soc. Hort. Sci. Vol. 65. Sci. Series 456.
- Jensen, Rue and Seghetti, L. "Elaeophoriosis in Sheep." AVMA Jour. Sci. Series 460.
- Miller, D. E.; Willhite, F. M.; Rouse, H. K. "High Altitude Meadows in Colorado—II: Effect of Harvest Date on Yield and Quality of Hay." Agronomy Journal. Sci. Series 449.
- Olsen, S. R. and Watanabe, F. S. "Application of the Langmuir Absorption Isotherm to Phosphate Reaction With Soils." Proc. SSSA. Sci. Series 465.
- Payne, Merle G. and Fulfs, Jess. "The Effect of Maleic Hydrazide and 2,4-D on Reducing Sugars and Sucrose of Red McClure Potatoes." Amer. Potato Journal. Sci. Series 452.
- Roberson, D. W.; Wiebe, G. A.; Shondo, R. G. "Summary of Linkage Studies in Barley." Agronomy Journal. Sci. Series 454.
- Robinson, A. R. "Seepage Measurement and its Relation to Drainage and Canal Lining Programs." Journal of Soil and Water Conservation. Sci. Series 475.
- Rouse, H. K.; Willhite, F. M.; Miller, D. E. "High Altitude Meadows in Colorado—I: Effect of Irrigation on Hay Yield and Quality." Agronomy Journal. Sci. Series 448.
- Schaal, L. A. and Johnson, Gestur. "Inhibitory Effect of Phenolic Compounds on the Growth of *Streptomyces Scabies* in Culture Medium." Phytopathology. Sci. Series 459.
- Schmehl, W. R.; Olsen, S. R.; Gardner, R. "Effect of Method of Application on the Availability of Phosphate for Sugar Beets." Pro. Am. Soc. Sugar Beet Tech. Sci. Series 451.
- Willhite, F. M.; Rouse, H. K.; Miller, D. E. "Effect of Nitrogen Fertilization on Crude Protein Production." Agronomy Journal. Sci. Series 450.
- Wood, Don. "Effect of Raw Shale Oil Naphtha on Yield of Pinto Beans." Agronomy Journal. Sci. Series 455.
- Wood, D. R. and Ramos, F. C. "Effect of Chromosome Doubling Upon Growth Characteristics." Journal of Heredity. Sci. Series 457.

Other Published Articles

- Beach, George A. "The Effect of Rates and Intervals of Irrigation Water Use on Turf Grass." Rocky Mountain Regional Turf Grass Conference Report. 1954.
- Binkley, A. M. "Commercial Fertilizers for the Production of Canning Tomatoes." Western Colorado Horticultural Society Proceedings. 1954.
- Charkey, L. W.; Kano, Adeline; Anderson, John. "Effects of Fasting on Free Amino Acid Levels in Thick Blood as Modified by Vitamin B12." J. Biol. Chem., Vol. 210, p. 627-632. Oct. 1954.
- Charkey, L. W.; Kano, Adeline; Houghaw, Duane F. "Effects of Fasting on Blood Non-Protein Amino Acids in Humans." Jour. of Nutrition. Vol. 3, No. 3, p. 469-480. March 1955.
- Farmer, Roger and Holley, W. D. "The Effect of Partial Shading on the Quality and Production of Better Times Roses." Amer. Soc. Hort. Sci. Vol. 64. 1954.
- Holley, W. D. "Precision Growing of Carnations." Colo. Flower Growers Assn. Special Bul. June 1954.
- Holley, W. D. "Care of Carnation Mother Blocks." CFGA Bul. 56. June 1954.
- Holley, W. D. "Second Pinching of Carnations." CFGA Bul. 57. July 1954.
- Holley, W. D. "Potassium, Sodium and Calcium Nutrition of Carnations." CFGA Bul. 60. October 1954.
- Holley, W. D. "Soil Temperature Has Little Effect on Carnation Timing." CFGA Bul. 61. Nov. 1954.

Holley, W. D. "A Fine Greenhouse Climate is at Our Back Door." CFGA Bul. 62. Dec. 1954.
 Holley, W. D. "Growing Carnations More Than One Year." CFGA Bul. 65. March 1955.
 Holley, W. D. "Sulphur Vaporizers and Mildew Control." Roses, Inc. Bul. 202. Feb. 1955.
 Holley, W. D. and Caparas, Jorge. "A Comparison of Three Cutting Heights on Carnations." CFGA Bul. 51. Sept. 1954.
 Holley, W. D. and Sauer, C. W. "The Growth of Carnations in Artificial Media." CFGA Bul. 55. May 1954.
 Knappenberger, Richard L. "Cut Flower Keeping Studies." CFGA Bul. 62. Dec. 1954.
 Knappenberger, Richard L. and Holley, W. D. "Tests with Cut Flowers Preservatives." CFGA Bul. 63. Jan. 1955.
 Kunkel, Robert. "Vine Killers." Market Growers Journal. Sept. 1954.

Kunkel, Robert. "Available Moisture Effects on Burbank Grade." Colo. Farm and Home Research. Vol. 5, No. 4. 1954.
 Kunkel, Robert. "Kill Spud Vines for Easiest Harvest." Colo. Farm and Home Research. Vol. 5, No. 2. 1954.
 Larsen, Walter F. and Holley, W. D. "Fast Schedule Chrysanthemums." CFGA Bul. 63. Jan. 1955.
 Priola, Michael A.; Ferguson, A. C.; Bates, D. B. "Chemical Weed Control in Onions." Mimeo report. Amer. Cyanamid Co. 1954.

Technical Bulletin

Ferguson, A. C. "The Effect of Certain Commercial Fertilizer Combinations on Yield, Grade, and Storage Quality of Sweet Spanish Onions." Technical Bulletin 52.

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W. H. Leonard, Ph.D.	Agronomist (Crops)
D. S. Romine, M.S.	Associate Agronomist (Soils)
S. D. Romsdal, B.S.	Assistant Agronomist (Soils)
W. R. Schmehl, Ph.D.	Associate Agronomist (Soils)
E. G. Seimer, B.S.	Assistant Agronomist (Soils)
R. S. Whitney, Ph.D.	Agronomist (Soils)
D. R. Wood, M.S.	Assistant Agronomist (Crops)

Cooperators:

Minoru Amemiya, Ph.D.	Associate Agronomist (USDA)
C. V. Cole, Ph.D.	Soil Scientist (USDA)
J. G. Dean, M.S.	Agronomist (USDA)
G. W. Deming, B.S.	Assistant Agronomist (USDA)
S. R. Olsen, Ph.D.	Senior Soil Scientist (USDA)
J. L. Paschal, Ph.D.	Agricultural Economist (USDA)
E. M. Payne, B.S.	Soil Scientist (USDA)
M. Robecker, B.S.	Soil Scientist (SCS)
H. K. Rouse, C.E.	Irrigation Engineer (USDA)
F. S. Watanabe, M.S.	Soil Scientist (USDA)
F. M. Willhite, M.S.	Associate Agronomist (USDA)

Animal Investigations

L. E. Washburn, Ph.D.	Chief Animal Husbandman
W. E. Connell, M.S.	Animal Husbandman
F. C. Daugherty, M.S.	Associate Animal Husbandman
B. J. DeMott, Ph.D.	Assistant Animal Husbandman
A. L. Esplin, M.S.	Associate Animal Husbandman
C. W. Fox, B.S.	Assistant Animal Husbandman
E. K. McKellar, M.S.	Associate Animal Husbandman
H. H. Stonaker, Ph.D.	Animal Husbandman
G. E. Ward, Ph.D.	Assistant Animal Husbandman

Animal Pathology and Veterinary Medicine

A. W. Deem, D.V.M., M.S.	Chief Veterinary Pathologist
T. L. Chow, D.V.M., Ph.D.	Assistant Virologist
Floyd Cross, D.V.M.	Veterinary Pathologist
Maxine Benjamin, D.V.M., M.S.	Assistant Veterinary Pathologist
W. R. Graham, D.V.M.	Assistant Veterinary Pathologist
L. A. Griner, D.V.M., M.S.	Associate Veterinary Pathologist
M. A. Hammarland, D.V.M.	Assistant Pathologist
H. J. Hill, D.V.M.	Veterinarian in charge, Artificial Insemination
E. T. Hederick, B.S.	Field Supervisor, Artificial Insemination
Rue Jensen, D.V.M., Ph.D.	Veterinary Pathologist
V. A. Miller, D.V.M.	Assistant Veterinary Pathologist
J. W. Tobiska, M.S.	Chemist

Botany and Plant Pathology

J. L. Fults, Ph.D.	Chief Botanist and Plant Pathologist
R. M. Blouch, M.S.	Assistant Botanist
N. R. Gerhold, M.S.	Assistant Plant Pathologist
H. D. Harrington, Ph.D.	Associate Botanist
G. H. Lane, M.S.	Associate Plant Pathologist
R. H. Porter, Ph.D.	Plant Pathologist
R. R. Baker, Ph.D.	Assistant Botanist
C. E. Seliskar, Ph.D.	Associate Plant Pathologist
W. D. Thomas, Ph.D.	Plant Pathologist

Cooperators:

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

Chemistry

W. E. Pyke, Ph.D.	Chief Chemist
R. E. Carlson, Ph.D.	Associate Chemist
L. W. Charkey, Ph.D.	Chemist
H. A. Durham, M.S.	Assistant Chemist
P. R. Frey, Ph.D.	Chemist
F. X. Gassner, D.V.M., M.S.	Endocrinologist
C. O. Guss, Ph.D.	Associate Chemist
M. L. Hopwood, M.S.	Assistant Chemist
Duane Johnson, B.S.	Assistant Chemist
Gestur Johnson, M.S.	Assistant Chemist

Adeline Kano, B.S. Research Assistant
 Catherine Kob, B.S. Research Assistant
 J. J. Lehman, Ph.D. Research Assistant
 D. D. Maag, M.S. Research Assistant
 Marjorie Mayer, M.S. Research Assistant
 A. R. Patton, Ph.D. Chemist
 Merle G. Payne, M.S. Assistant Chemist
 H. S. Puleston, Ph.D. Assistant Chemist

Entomology

L. B. Daniels, M.S. Chief Entomologist
 J. L. Hoerner, M.S. Associate Entomologist
 G. M. List, Ph.D. Entomologist
 J. O. Moffett, M.S. Assistant Entomologist
 J. H. Newton, B.S. Associate Entomologist
 T. O. Thatcher, Ph.D. Associate Entomologist

Cooperators:

F. B. Knight, M.F. Entomologist (USDA)
 Calvin Massey, P.D. Entomologist (USDA)
 R. H. Nagel, M.S. Entomologist (USDA)
 B. H. Wilford, Ph.D. Entomologist (USDA)
 N. D. Wygant, Ph.D. Entomologist (USDA)

Forestry and Range Management

D. F. Hervey, M.S. Chief Range Conservationist
 A. C. Everson, M.S. Assistant Range Conservationist
 H. E. Troxell, M.F. Assistant Forester
 C. H. Wasser, M.F. Range Conservationist

Home Economics

Elizabeth Dyar, Ph.D. Chief Home Economist
 Ferne Bowman, Ph.D. Home Economist

May Combs, M.S. Assistant Home Economist
 Miriam Hummel, M.S. Assistant Home Economist
 Mariana Kulas, M.S. Assistant Home Economist
 Edna Page, Ph.D. Associate Home Economist
 Mildred J. Roush, M.A. Assistant Home Economist
 Adelia E. Weis, Ph.D. Associate Home Economist

Horticulture

A. M. Binkley, M.S. Chief Horticulturist
 G. A. Beach, M.S. Horticulturist
 A. C. Ferguson, Ph.D. Associate Horticulturist
 W. D. Holley, M.S. Associate Horticulturist
 C. J. C. Jorgensen, M.S. Associate Horticulturist
 Robert Kunkel, Ph.D. Horticulturist
 C. W. McAnelly, M.S. Assistant Horticulturist
 E. A. Rogers, M.S. Assistant Horticulturist

Poultry

E. G. Buss, M.S. Chief Poultry Husbandman
 L. C. Blaylock, Ph.D. Assistant Poultry Husbandman

Rural Economics and Sociology

R. D. Rehnberg, Ph.D. Chief Agricultural Economist
 C. R. Creek, M.S. Associate Economist
 D. M. Blood Temporary Associate Economist
 H. J. Hudek Assistant Economist
 F. O. Sargent Assistant Economist

Cooperator:

H. G. Sitler, M.S. Agricultural Economist (USDA)

Experiment Station Staff — Engineering Division

Civil Engineering

D. F. Peterson, D.C.E. Chief Civil Engineer
 M. L. Albertson, Ph.D. Civil Engineer
 J. E. Cermak, M.S. Assistant Civil Engineer
 W. E. Code, B.S. Associate Irrigation Engineer
 R. D. Dirmeyer, B.S. Temporary Assistant Geological Engineer
 N. A. Evans, M.S. Assistant Irrigation Engineer
 M. M. Hastings, B.S. Part-time Assistant Irrigation Engineer
 Hsin Kuan Liu, Ph.D. Temporary Assistant Engineer
 Maxwell Parshall, B.S. Assistant Irrigation Engineer

A. R. Robinson, M.S. Assistant Irrigation Engineer
 E. F. Schulz, B.S. Assistant Civil Engineer
 Aristokles Spengos, M.S. Assistant Civil Engineer

Cooperators:

C. H. Rohwer, B.S., C.E. Senior Irrigation Engineer (USDA)
 H. J. Stockwell, B.S. Irrigation Engineer (USDA)

Mechanical Engineering

T. J. Strate, M.S. Chief Mechanical Engineer
 R. D. Barmington, B.S., M.E. Associate Mechanical Engineer

Branch Stations

Herman Fauber, M.S. Superintendent, Arkansas Valley
 Verne Cooper, Jr., B.S. Superintendent, San Luis Valley
 F. M. Green, B.S. Superintendent, Western Slope
 H. O. Mann, M.S. Assistant Agronomist, San Juan Basin
 Kent Riddle, B.S. Assistant Animal Husbandman,
 San Juan Basin

L. C. Sonntag, B.S. Temporary Associate Agronomist,
 San Luis Valley
 A. H. Denham, B.S. Superintendent Eastern Colorado Range
 Branch Experiment Station

Personnel Changes

Joining the staff during the fiscal year were:

Hsin Kuan Liu Temporary Assistant Civil Engineer
 M. A. Hammarlund Assistant Pathologist
 K. G. Brengle Assistant Agronomist
 L. C. Sonntag Temporary Associate Agronomist
 A. H. Denham Superintendent Eastern Colorado
 Branch Station
 H. J. Hudek Assistant Economist
 W. D. Kemper Part-time Assistant Agronomist
 D. M. Blood Temporary Assistant Economist
 Edna Page Associate Home Economist
 F. O. Sargent Assistant Economist

M. M. Hastings Part-time Assistant Irrigation Engineer
 R. D. Dirmeyer Temporary Assistant Geological Engineer
 A. R. Harris Part-time Assistant Agronomist
 L. C. Blaylock Assistant Poultry Husbandryman

Resignations from the staff during the fiscal year were:

Pin Nam Lin Temporary Assistant Civil Engineer
 Alfred R. Harris Temporary Assistant Agronomist
 Wm. P. Kintzley Farm Manager
 B. W. Greb Assistant Agronomist
 W. R. Graham Assistant Pathologist
 J. E. Dixon Assistant Agricultural Engineer

Financial Report for Year Ending June 30, 1955

	RECEIPTS 1954-1955			DISBURSEMENT OF FUNDS BY CLASSIFICATION FOR THE FISCAL YEAR ENDED JUNE 30, 1955												TOTALS			
	Balance July 1, 1954	Receipts from U. S. Treasurer	Receipts Other Sources	Total Receipts	Personal Services	Travel	Transportation of Things	Communi- cation Service	Rents and Utility Service	Printing and Binding	Other Contractual Services	Supplies and Materials	Equipment	Land and Structures	Contribution to Retirement	Investment Account	Total Expendi- tures	Balance June 30, 1955	Grand Total
Hatch		15,000.00		15,000.00	12,149.65	506.21		8.55	241.92	115.41	201.12	474.43	768.97		533.74		15,000.00	15,000.00	
Adams		15,000.00		15,000.00	12,475.81	137.30	4.78	21.78	360.58		271.91	1,145.03	144.39		438.42		15,000.00	15,000.00	
Parnell		60,000.00		60,000.00	43,640.38	2,162.95	134.54	195.74	540.92		876.11	6,438.26	4,241.09		1,770.01		60,000.00	60,000.00	
Bankhead-Jones, Sec. 5		25,460.16		25,460.16	19,218.95	218.14	7.10	26.75	670.62		355.98	1,818.43	2,370.70		773.49		25,460.16	25,460.16	
Bankhead-Jones, Sec. 9b 1 and 2		95,920.53		95,920.53	57,905.03	3,592.60	546.89	116.83	519.75	12.55	2,664.24	10,644.70	17,459.75	660.00	1,798.19		95,920.53	95,920.53	
Bankhead-Jones, Sec. 9b 3		70,900.00		70,900.00	45,700.23	3,203.33	604.55	295.50	1,057.04	104.50	1,584.23	8,816.38	8,328.00	355.65	850.59		70,900.00	70,900.00	
Bankhead-Jones, Sec. 9b 3 (trust)		8,700.00		8,700.00	592.12	6,176.15	101.17	572.44	83.30	1,000.00	103.85	2.26	36.71	32.00			8,700.00	8,700.00	
Bankhead-Jones Title II		5,000.00		5,000.00	4,003.90	45.81			6.00		490.37	253.92	13.30		183.04		4,996.34	3.66	5,000.00
State General Approp.			240,000.00	240,000.00	174,427.19	3,848.64	227.96	1,211.34	4,889.99	1,652.69	14,883.15	22,169.55	7,952.92	1,592.61	7,143.96		240,000.00		240,000.00
Plant Disease Approp.			25,000.00	25,000.00	16,899.43	582.57	26.28	191.88	409.88	56.34	1,697.36	1,836.95	2,757.98		541.33		25,000.00		25,000.00
Pure Seed Approp.			8,000.00	8,000.00	7,658.41		7.74	27.94		9.75	57.67	139.72	5.45		93.32		8,000.00		8,000.00
Vibrio Fund	5,930.61		11,663.40	17,594.01	4,341.34	368.24			4.20		5.00	8,517.76	353.50		146.66		13,736.70	3,857.31	17,594.01
Mountain Meadow Fund	5,787.74			5,787.74	4,082.21	54.88	1.25	125.76			504.32	929.24	77.60		12.48		5,787.74		5,787.74
Mill Levy Tax	17,168.95		142,845.71	160,014.66	77,780.23	3,830.06	1,496.97	3,959.47	7,012.20	3,179.12	13,200.83	24,057.38	12,523.22	361.18	2,708.88		150,109.54	9,905.12	160,014.66
Station Special	42,261.88		134,109.75	176,371.63	28,769.54	2,433.36	851.69	336.55	13,733.06	488.78	16,978.89	80,311.61	16,990.97	10,248.46			171,142.91	5,228.72	176,371.63
Hybrid Corn	6,768.72		3,114.10	9,882.82	1,077.90	312.29		21.69			692.63	922.47					3,026.98	6,855.84	9,882.82
ARS Vibrio Fund			3,750.00	3,750.00	1,445.75	79.24			3.00		793.39	2,111.76	54.33				4,487.47	(737.47)	3,750.00
ARS Vitamin E and K			7,000.00	7,000.00	1,332.22	43.72	20.01	8.45	207.18			1,589.14	4,040.64		22.92		7,264.28	(264.28)	7,000.00
CAMRF	122,600.74		392,671.72	515,272.46	187,792.22	8,892.85	692.38	879.30	3,783.62	571.92	73,541.17	34,883.46	26,561.61	12,961.07	2,251.55	24,964.83	377,775.98	137,496.48	515,272.46
TOTALS	200,518.64	295,980.69	968,154.68	1,464,654.01	701,292.51	36,488.34	4,723.31	7,999.97	33,523.26	7,191.06	128,902.22	207,062.45	104,681.13	26,210.97	19,268.58	24,964.83	1,302,308.63	162,345.38	1,464,645.01