THIRTY-FIFTH ANNUAL REPORT

AGRICULTURAL EXPERIMENT STATION

OF THE

NEW MEXICO COLLEGE OF AGRICULTURE AND MECHANIC ARTS

STATE COLLEGE, N. M.
1923-1924

New Mexico Agricultural Experiment Station.

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MARY E. KIRWAN	Stenographer

*In cooperation with Office of Public Roads and Rural Engineering, United States Department of Agriculture.

**Absent on leave.

***Superintendent of the Tucumcari, N. M., Field Station, operated by the United States Department of Agriculture, in cooperation with the New Mexico Agricultural Experiment Station.

LETTER OF TRANSMITTAL.

To His Excellency James F. Hinkle,
Governor of New Mexico.

Sir: Pursuant to the Act of Congress approved March 3, 1887, establishing Agricultural Experiment Stations, I have the honor to transmit to you herewith the thirty-fifth annual report of the Agricultural Experiment Station of the New Mexico College of Agriculture and Mechanic Arts for the fiscal year ending June 30, 1924.

Respectfully submitted,

FABIAN GARCIA, Director.

State College, New Mexico, December 1, 1924.

THIRTY-FIFTH ANNUAL REPORT

INTRODUCTION

The activities of the Experiment Station have been carried on in about the same manner as in past years, although the work has been materially improved and strengthened in a number of departments. Many experiments and investigations are being conducted in the fields of animal husbandry, dairying, range management, improvement and better utilization of our range forage plants, agronomy, horticulture, irrigation, soil fertility, chemistry, entomology, pathology, and plant breeding. The Station, through its different departments, is rendering valuable service to farmers, stockmen, business men, and teachers of agriculture, by furnishing them with agricultural information. This information is given through bulletins, press bulletins, reports, news articles, letters, lectures, and demonstrations.

As agriculture and stockraising develop, new, and oftentimes difficult, problems are encountered, the demands upon the Station for accurate and helpful agricultural information thus constantly increasing; and it has been the endeavor to meet these demands as satisfactorily as possible. More and more we see and realize the importance and necessity of research in agriculture, if this vocation is to keep pace with the growth and development made in other activities. The importance of this fact evidently was realized by the thoughtful and farseeing legislators who were instrumental in enacting the Federal Hatch and Adams laws, which have been responsible for an excellent and nation-wide system of research in agriculture. New information in the farmer's business is as necessary as in other kinds of business, and perhaps in no other line of human activities is this information liable to vary as much and as quickly, due, no doubt, to the influence of the variable conditions in climate, soils, and other environment in which the plant or animal lives. Since the Station is the main channel through which new agricultural knowledge is secured,and since agriculture, especially in this arid section, is so variable in its development, it is very necessary that the Station continue its investigations of the many agricultural problems which are constantly confronting the farmer and the livestock interests

of the State. This is being done as adequately as available funds will permit. It is to be regretted that the Station receives such small State appropriations for its investigations of the many livestock and agricultural problems in this large State with such variable climatic and soil conditions. It is to be hoped that the time may soon come when New Mexico will be in better financial position to increase its appropriations for agricultural research. The future material growth and development in the State depend, to a large degree, upon the development of its agricultural and livestock interests. These are two of the principal industries and through the development of these the wealth of New Mexico will be materially increased.

When it is considered that the cost of material, equipment, and labor shows a decided increase and that there has been no increase for a number of years in the appropriation to the Station, it will be readily realized that the initiation of needed investigations has been very difficult and extensive expansion almost impossible. Within recent years the purchasing value of the dollar has shrunk 33 per cent; consequently the Station appropriation has been proportionately reduced in its purchasing power.

Considering the small State appropriation, the small number of Station workers, their varied duties, and the large amount of investigational work accomplished, New Mexico is certainly receiving full value for every dollar spent in agricultural research. The time is coming,however, when, if the Station is to keep ahead of the agricultural activities of the State and thereby be of greater service, it must be more adequately supported financially. Compare the New Mexico State support of $7,500 a year for agricultural research with that received by our neighboring states of Colorado, $99,000; Utah, $115,000; Arizona, $81,734; Texas, $225,000; Wyoming, $24,770; Idaho, $77,000; and Oklahoma, $10,500. New Mexico receives a very small State appropriation, and if there is a State that needs first-hand and accurate agricultural information, it is New Mexico; particularly when its peculiar topography, its large size, and its varied climatic and soil conditions are considered. When all of these features are taken into consideration, it is only through efficiency and strict economy that the Station is able to carry on its large number of agricultural projects. It should be borne in mind that research work of any kind is always slow and expensive, but that only through this channel has the world de-

veloped to its present stage of civilization.

INVESTIGATIONS COMPLETED.

During the year there were five bulletins issued, representing some of the investigations completed.

Bulletin No. 140, on "The Utilization of Feed by Range Steers of Different Ages," was published. This bulletin contains some of the more practical results of the investigations published in bulletins Nos. 91, 103, and 108. The following are a few of the conclusions reached:—

1. Neither age, individuality, length of feeding period, nor previous treatment ordinarily affects the ability of a range steer to digest feed.

2. Age is one of the most important factors controlling gains per unit of live weight.

3. Young steers tend to use their feed for growth, while older steers tend to fatten.

Bulletin No. 140, "Cotton," contains the results obtained from some of the cotton experiments. The following is a summary of a part of the bulletin:—

The seed bed for cotton should be prepared early, and should be moist and firm, with a mulch to prevent excessive drying. It is probably best to irrigate before planting. Planting should be at a depth of one inch to one and one-half inches, so that the seed will be in contact with moist, compact soil, but with a mulch of one-half to three-fourths of an inch at the surface. Thirty-five to forty pounds of seed per acre should be used on heavy soils. Smaller amounts may be used in lighter, sandy soils.

Fertilizer needs must usually be determined for the individual farms. Phosphorus and nitrogen are the elements which, as a rule, will give the best results. Cultivation with a harrow must begin early to prevent a crust forming and to combat weeds. Spacing should be done when the plants are three to four inches high and should be eight to twelve inches in the row, under irrigation, depending upon soil fertility. The later cultivations and irrigations should be given so that the plants will make a steady, unchecked growth. Usually there should be three pickings, in order to avoid loss of seed cotton.

Acala cotton has been the highest yielding variety at this Station for three years, followed closely by Durango and Triumph. Triumph shows the highest percentage of lint, but Acala shows a

higher percentage than Durango. Durango is slightly earlier than Acala and is ready to pick a little earlier.

The investigation on "The Toxicity, Movement, and Accumulation of Nitrates and Other Salts Occurring in Arid Soils," was completed and the data compiled and published in Bulletin No. 142. This bulletin contains a considerable number of quite technical data, and the following are some of the conclusions reached:—

Nitrates have not been found unusually toxic when applied in large quantities, either alone or with mixed salts. They were found to be less toxic than chlorides and probably only slightly more toxic than sulphates.

Soils containing excess soluble salts have been frequently examined and usually no large excess of nitrates has been recovered. Where unusual amounts of nitrates have been noted they have always been accompanied by a large amount of total salts and it seems that the occurrence of nitrates, even in excessive amounts, may be usually largely accounted for by nitrification accompanied by capillarity.

Examination of soil from the College orchard where the trees were dead or dying, which was thought might be due to accumulation of nitrates, showed only a small amount of nitrates but a large amount of other salts; so it seems that nitrates could not have been the cause of the injury.

Nitrates were found to move more rapidly than other salts, both in capillary and drainage water, followed in order by chlorides, sulphates, and soluble organic matter.

No unusual accumulation of nitrates was observed either in the plat tests in which different amounts of water were used both on fallow and cropped land, or in sand cultures receiving graduated amounts of the various single salts occurring in the soils.

Other alkali investigations which were presented in the course of the project showed that magnesium salts were usually less toxic than either sodium or calcium salts, and beneficial effects were frequently noted following applications of magnesium sulphate. Various alkali salts were found to be more toxic in hot weather. The toxic effect of various salts could be largely overcome up to a certain point by the use of more water; but when too large an amount of water is applied there is difficulty experienced, apparently due to lack of soil aeration.

An investigation of "The Nutritive Properties of Pinto Beans and Pinto Bean Straw and Their Use as Feed for Cattle," was completed and the results compiled and published in Bulletin No. 143. This bulletin is quite technical and contains a large number of scientific data. The following is a part of the summary of this bulletin:—

1. The chemical composition of Pinto bean culls, pulled Pinto bean straw, and cut Pinto bean straw, was determined.

2. Pinto bean culls were fed with corn stover in the approximate ratio of 1:2.06 and the coefficients of digestibility of the ration, and of the components of the ration, were determined. It was found to be impossible to feed Pinto bean culls in greater amounts than four pounds per day to steers of 500 to 600 pounds live weight without causing them to scour.

3. Ten-day nitrogen balances were computed for each of the steers on the Pinto bean culls and corn stover ration.

4. Pulled Pinto bean straw was fed with coarsely ground corn, in the approximate ratio of 1:3.7, and the coefficients of the ration, and the components of the ration, were determined.

5. Ten-day nitrogen balances were computed for each of the steers on the pulled Pinto bean straw and corn ration.

6. Cut Pinto bean straw was fed alone and its coefficients of digestibility were determined.

7. A comparison of alfalfa and cut Pinto bean straw was made, and it was found that the two were very similar in many ways but that the latter had approximately 82% of the feeding value of the former.

8. Ten-day nitrogen balances were computed for each of the steers on the cut Pinto bean straw ration.

9. The amount of feed consumed per 1,000 pounds of live weight and the amount required for a pound gain in live weight were calculated for each of the three different rations.

The experiment on "Range Cow Supplemental Feeding" was completed and the results compiled and published in Bulletin No. 144. The following is a summary of this experiment:—

1. There was little difference in the feeding value of ground corn, cottonseed cake, or a mixture of the two, for maintaining range cows.

2. The whole corn ration indicated inferiority to any other ration fed.

3. One and two-thirds pounds of cotton seed, when fed alone, or one and three-fourths pounds when fed with ground corn, more than equaled a pound of whole or ground corn, cottonseed cake, or a mixture of ground corn and cottonseed cake.

4. Apparently the kind of feed fed had no relative effect on the inclination of the cows to remain at the pens after feeding.

The data obtained from the experiment on "The Effect of Winter Feeding on Range Cows, their Calves and Yearlings" were compiled and published in Bulletin No. 144. The following is a summary of the results obtained:-

1. Calves at birth were heavier from the fed cows than from the unfed.

2. A higher percentage of calf crop was produced from the fed lot.

3. Calves from the fed lot were heavier at the first year's weighing.

4. The yearlings from the unfed lot made larger gains but were not as heavy as the yearlings from the fed lot.

NEW INVESTIGATIONS.

During the year three very intensive research projects, besides a number of minor and more practical experiments, were started:-

The Animal Husbandry Department, through its Nutrition Laboratory, started its investigation on "The mutual influence of the proportion of the several nutrients in feeds on their digestibility;" an experiment on the effective feeding of yearling steers by using the roughage produced on dry farms; an experiment on "All-year grazing for brood sows;" as well as an investigation "To determine if Drymaria is poisonous to cattle." Another important and far-reaching investigation that was started is "A study of the factors affecting the germination and growth of Chamiza (*Atriplex canescens*)."

The Agronomy Department started an investigation on "The value and productivity of sugar beet seed produced annually instead of biennially." An alfalfa fertilizer experiment was also added to the number of projects in this Department. The "Johnson grass eradication" experiment has been modified and intensified.

In the Horticultural Department new features have been added to the experiments in smudging, the tomato test, cabbage fertiliz-

ers, and the onion project. A new cantaloupe project was started to study the factors affecting the yields, principally with the idea in view of increasing the crown set.

In the Biological Department considerable work was added in the project on "Important insects affecting garden crops."

The Irrigation Department added to its projects "The duty of water on the growing of alfalfa and different kinds of vegetables."

The Dairy Department started an experiment having for its object the obtaining of data on the value of sweet clover pasture for dairy cows.

COOPERATIVE WORK.

The following are the cooperative investigations carried on during the year:-

The Irrigation Department, as in past years, is cooperating with the Office of Public Roads and Rural Engineering, in investigations on irrigation and drainage in New Mexico.

The Animal Husbandry Department is cooperating with the Office of Dry-Land Agriculture in conducting an experiment in steer feeding on dry land crops; and with the Bureau of Forestry in the study of range cow maintenance.

The cooperative work between the Bureau of Plant Industry and the Agronomy Department on sugar beet investigations has been continued.

The cooperative work being carried on with a number of county agents in orchard and garden management was somewhat enlarged. Quite an extensive addition was made in onion growing through the Boys' Club Work. The Station furnished the county agents with a number of Spanish onion seedlings to be grown by their boys in onion club work in many parts of the State.

Through the Biology Department the Station is cooperating with the Bureau of Plant Industry, U. S. D. A., on a plant disease survey.

STATION STAFF.

J. L. Lantow, who had been away on a year's leave of absence to pursue advanced work in the University of Illinois, where he received his M. S. degree, has resumed his duties as head of the Animal Husbandry Department.

P. E. Neale, Assistant in Animal Husbandry, resigned to accept a position at the Experiment Station at Fort Hays, Kansas.

C. E. Craig, Assistant Agronomist, resigned to go into farming for himself, and H. V. Jordan, who holds a B. S. degree from the University of Michigan and M. A. from Missouri University, has been appointed in his place.

Dr. Robert Middlebrook, head of the Biology Department, resigned to accept another position and was succeeded by R. F. Crawford, who had been assistant biologist. Dr. Paul A. Gilmer, of the University of Minnesota, has been appointed to the position of assistant biologist, succeeding Mr. Crawford.

Miss Dorothy Peters has been appointed Librarian to succeed Miss Floy E. French, who resigned to accept a position at the Missouri Experiment Station.

PUBLICATIONS.

The following is a list of publications issued during the year:-

Annual Report for Fiscal Year Ended June 30, 1923.

REGULAR BULLETINS.

Number

140 The Utilization of Feed by Range Steers of Different Ages.—M. G. Snell.

141 Cotton.—J. C. Overpeck and W. T. Conway.

142 The Toxicity, Movement and Accumulation of Nitrates and Other Salts Occurring in Arid Soils.—C. E. Craig.

143 Nutritive Properties of Pinto Beans and Pinto Bean Straw and Their Use as Feed for Cattle.—Harry W. Titus.

144 Preliminary Report on Range Cow Supplemental Feeding.—J. L. Lantow and M. G. Snell.

PRESS BULLETINS.

443 Sanitation in the Poultry Yard.—A. L. Walker.

444 Alfalfa Varieties.—J. C. Overpeck.

445 Drymaria.—P. E. Neale.

446 European Elm Scale (*Consyparia spuria*).—Robert Middlebrook.

447 Alkali and its Remedy.—C. E. Craig.

448 Suggestions for the Planting of an Orchard.—A. B. Fite.

449 Cabbage Culture, Part 1.—Fabian Garcia.

450 Delinting Cotton Seed with Sulphuric Acid.—R. F. Crawford.

451 Treatment of Impermeable Soils.—C. W. Botkin.

452 The Use of Volatile Nicotine in the Control of Garden Insects.—Robert Middlebrook.

453 Outline for making Neufchatel Cheese on the Farm.—O. C. Cunningham.
454 Powdery Mildews and their Control.—R. F. Crawford.
455 Lacto, a Frozen Dish from Curdled Milk.—O. C. Cunningham.
456 Winter Pasture for Brood Sows.—M. G. Snell.
457 Grasses with Clovers.—J. C. Overpeck.

LIST OF ARTICLES PUBLISHED BY THE "RIO GRANDE FARMER."

Distribution of Costs in Keeping Dairy Cows.—O. C. Cunningham.

Fusarium Wilt Makes Appearance in Cantaloupes.—R. Middlebrook.

Cheap Eggs All Year by Water Glass Plan.—A. L. Walker.

When Dam can Pay Profit to her Owner.—O. C. Cunningham.

Proper Handling of Eggs will Decrease Poultryman's Losses.—A. L. Walker.

Am I Irrigating too Much, or too Little?—C. E. Craig.

Onion Growing at High Altitudes.—Fabian Garcia.

Feeding the Brood Sow.—P. E. Neale.

Winter Feeding of Lambs.—M. G. Snell.

Why Cattle Eat Old Bones and Horns.—M. G. Snell.

Value of Cotton Seed in the Dairy Ration.—O. C. Cunningham.

How to Grow Sweet Peas.—A. B. Fite.

State College has Fine Bulls.—O. C. Cunningham.

Reduce Cost of Hog Raising by Pasture.—P. E. Neale.

Manure Shows Outstanding Results in Cabbage Fertilizer Test.—A. B. Fite.

Cooperative Bull Associations.—O. C. Cunningham.

Hogs Have Important Place in Livestock in Dona Ana County.—P. E. Neale.

Experiment Station Investigates Food Production and Consumption for Benefit of Farmers.—O. C. Cunningham.

College Maintains Fine Herd of Hogs.—M. G. Snell.

Feed Family from Farm—Cure Your own Pork.—M. G. Snell.

Acala Cotton in the Lead.—J. C. Overpeck.

Care of Ewes at Lambing Time.—P. E. Neale.

Comparative Value of Lime-Sulphur and Red Engine Oil.—R. Middlebrook.

Care in Handling Wool Clip.—M. G. Snell.

Vegetable Planting.—A. B. Fite.

Onion Well Adapted to New Mexico.—Fabian Garcia.

Experiments Show Promising Grasses for Irrigated Valleys.—O. C. Cunningham.

Careless Irrigation Dangerous to Alfalfa.—J. C. Overpeck.

Cut Expenses by Feeding More Silage to Dairy Cattle.—O. C. Cunningham.

NUMBER OF PUBLICATIONS ISSUED DURING FISCAL YEAR ENDED JUNE 30, 1924.

Kinds of Publications.	Number issued.	Pages.	Total number in edition.	Pages in total edition.
Annual Reports	1	50	1,000	50,000
Bulletins	5	171	23,500	576,500
Press Bulletins	15	30	3,000	6,000
Miscellaneous Publications				
"Rio Grande Farmer"	30	30	3,000	90,000
"Farm Information Service"	52	52	225	11,700

The following reports, which give a good idea of the active Station projects, were prepared and furnished by the heads of the different departments:—

CHEMISTRY.

IMPERMEABILITY PROJECT. (Project Q.)

In our annual report for the preceding year, tentative plans for this project were outlined and a report given on the preliminary work. Since that time a study has been made of permeable and impermeable soils in the field, samples of the soils have been analyzed mechanically and chemically, the irrigation and drainage waters have been analyzed, percolation tests have been made in the laboratory to determine the influence of various substances on the permeability of soils, the maximum permeability obtainable with aluminum sulphate has been determined and the toxicity of this substance has been studied on certain soils.

A study of certain infertile areas in irrigated lands indicated a lack of moisture a few feet below the surface. Irrigations in the field and laboratory with these soils proved that the water did not penetrate farther than two feet on standing two to four days. On adjoining fertile areas the water percolated into the lower depths in eighteen hours or less. Both mechanical and chemical analyses showed little difference between the permeable and impermeable soils, except in moisture content. They were about equal in percentages of plant food. The bad soils were

slightly more alkaline and contained a little more soluble matter and a little more clay. After a longer period of irrigation, the impermeable soils increased in soluble matter and in some cases reached toxic percentages.

The first investigations of the causes of impermeability were based on the theory of deflocculation of colloids as a result of basic exchanges in which the sodium and potassium of the irrigation water were thought to displace the calcium and magnesium of the soil, thereby sufficiently increasing the alkalinity to disperse the colloids and cause a bad physical condition. The analyses of the irrigation waters show 58 parts of calcium and 10 parts of magnesium to 52 parts of sodium and 4·8 parts of potassium per 100,000. This ratio (119:100) of divalent to monovalent bases is not such as to indicate serious increase in alkalinity due to displacement of calcium. The ratio for the drainage waters is 126 to 100, which is not materially different from the ratio for the irrigation waters. This ratio for the soils is 205 to 100 and is practically the same for both the permeable and the impermeable soils. Since the soils studied contain about 3.3 per cent of calcium and 1.7 of magnesium, it does not seem probable that they will soon become deficient in these elements.

A study of permeability was made on one-foot columns (three inches in diameter) of the permeable and impermeable soils. Five per cent of sand, silt, and clay were each mixed with these soils. The sand improved percolation somewhat and the clay slowed it down considerably, indicating that the impervious condition is probably associated with the finer soil particles. Different substances which might give further information on permeability were added in one-half per cent quantities to the permeable and impermeable soils before placing in the percolation tubes. It was found that sodium compounds very much decreased the permeability. The tubes containing the sodium chloride were practically impermeable. The sulphate and silicate of sodium diminished the permeability of both good and bad soils, but not nearly so much as the sodium chloride. Aluminum sulphate, tannic acid, calcium acid-phosphate, magnesium sulphate, manure, and gypsum were found to assist the penetration of water into impermeable soils. The respective efficiencies of these materials, when one-half of one per cent (1 per cent of the manure) was mixed with dry soil of low permeability, are represented by the following numbers,—

4, 15, 17, 20, 22, and 23; where 36 represents the number of hours in which the untreated soil took in the first 6 inches of water.

The effect of these substances was studied further in an effort to determine how long the treated soil would retain its increased impermeability under a large number of irrigations. In five months the soil containing aluminum sulphate took in 36 feet of water, an amount equal to about ten years' normal irrigation; while the untreated soil in the same interval took in but two feet of water and the soil containing 0.5 per cent of sodium chloride took in less than eight inches of water. This is sufficient evidence of the permanency of the increased permeability obtained with aluminum sulphate.

The first percolates from the tubes containing substances which increased percolation are lower in Ph value than the percolates from the soils which were untreated. The substances decreasing permeability did not increase the Ph value of the first percolates. The percolates from tubes containing 0.5 per cent of aluminum sulphate contained only 0.002 per cent of aluminum and iron, but contained about 0.34 per cent of calcium sulphate, which is practically a saturated solution and is similar in concentration and composition to the percolates from tubes treated with calcium sulphate. This shows conclusively that highly toxic amounts of soluble aluminum displaced calcium and became insoluble.

The comparatively great influence which aluminum sulphate had in increasing the rate of penetration of water into the soils of low permeability and the persistence of this increased permeability with continued irrigation made it desirable to determine the effect of varied amounts of aluminum sulphate. Soil No. 1 gave a maximum permeability with 0.5 per cent; soil No. 2 with 0.75 per cent; and soil No. 3 with 1.5 per cent of aluminum sulphate. Both larger and smaller percentages in each soil required a longer period to take in six inches of water. The smaller percentages gave increases in permeability sufficient to indicate that small areas of impermeable soil might be profitably improved by treatment with aluminum sulphate. There appeared to be a correlation between the rate of penetration of the water and the hydrogen-ion concentration of the first percolates and, less definitely, with the color of the first percolate. The more rapid percolations were

slightly more acid and almost colorless.

Much has appeared in the literature on the toxicity of aluminum. This work, in the main, has been on soils of moist climates. The high percentage of calcium carbonate in the soils under investigation suggested that aluminum sulphate might be added in considerable amount without toxic effect. A series of experiments was conducted with four types of soil which showed that aluminum sulphate up to two per cent could be added without toxic effect. In fact, the soils containing aluminum sulphate gave better growth than the controls which did not contain this substance. For the higher percentages of aluminum sulphate this was quite unexpected, since the aluminum sulphate added contained what is usually considered as highly toxic amounts of aluminum and of soluble sulphates. Burgess' method for "Active" Aluminum in Acid Soils ("Soil Science," Vol. 15, 131) gave, as expected, quite high percentages of "active" aluminum in the treated soils. "Active" aluminum is not compatible with alkaline soils or soils containing an excess of calcium carbonate. The aluminum sulphate in the soils under investigation evidently reacted with the calcium carbonate, producing insoluble aluminum hydroxide and slightly soluble calcium sulphate, neither of which was toxic under the conditions. The loosening effect of aluminum sulphate on the soil is probably in part mechanical, like the alum baking powder reaction in making bread. We are now conducting some experiments to determine the rule of carbon dioxide in the increased permeability and the influence of the high percentage of calcium carbonate as a cause of impermeability. The effect of the hydrogen-ion concentration and the extent to which colloids are a factor in influencing permeability are also being made subject for further investigation.

SUGAR BEET PROJECT.

The Chemistry Department has analyzed samples of the different varieties of beets grown by the Agronomy Department. The beets have a uniformly high percentage of sugar. The problem involved is one of yield, involving climatic conditions, plant diseases, and the development of resistant varieties, and is reported more fully by the Agronomy Department.

MISCELLANEOUS WORK.

In addition to the work on the above projects the Chemistry Department has made the following analyses:—

	Number of samples.	Number of determinations.
Fertilizers	5	9
Feeds	6	7
Soils	97	241
Waters	29	90
Poisons	8	14
Minerals	15	15
Salt	2	12
Miscellaneous	12	12
Total	174	413

Two hundred and fifty-eight letters of information have been written in reply to inquiries relating to waters, soils, fertilizers, feeding materials, poisons, salt, minerals, and other substances.

BIOLOGY

ADAMS PROJECTS.

B.—Disease of Chile Pepper.

A study of the data secured the past two years shows a definite lack of correlation between the percentage of moisture in the soil and the percentage of wilted plants. These variations have been found to be due to the fact that the soil in certain spots is much more heavily infected with the wilt fungus than in other parts.

In the spring of 1924 a new plan was adopted. A piece of ground was selected that had never grown a crop of chile. This plot was planted to chile and the irrigation schedule carried out as in former years. The wilt fungus was isolated and cultured in large amounts on alfalfa meal and wheat bran. This material, after it had become thoroughly impregnated with the wilt fungus, was scattered uniformly over the plots, particular attention being paid to see that some of the culture was placed at the base of each plant. The data for this season's work have not been compiled, but there is apparently a definite correlation existing between the percentage of moisture in the soil and the percentage of wilted plants.

Some additional work should be taken up, such as determining whether or not the wilt fungus is carried in or on the seed from one year to another. Intensive selection for resistant plants should also be done.

P.—Apple Measles.

Efforts have been made to isolate an organism from apple measled wood, but with negative results. Various culture media have been used.

A large number of successful grafts were made this spring. Most of these grafts were healthy scions on diseased stock; the scions having been obtained from disease-free areas outside of New Mexico. Due to the fact that it is almost impossible to find healthy trees to graft on diseased scions, some of the measled wood was sent to Iowa to be grafted on healthy trees. Observations are being made to determine the varieties of apples that are susceptible to measles.

Histological sections of diseased and healthy wood are in preparation. Some sort of an enclosure that would be insect proof should be built and healthy trees secured and planted in this enclosure. Experiments are being conducted to determine if the sun has any effect on the occurrence of measles.

HATCH PROJECTS.

Project 5.—San Jose Scale.

Experiments carried on in a small way during the spring indicate that the use of oil sprays is more efficient for the control of the San Jose scale than is lime sulphur. Ordinary waste engine oil emulsified with casol gave the best results of all the emulsions tried. This experiment will be continued on a larger scale the coming year.

Project 6.—Chlorosis.

The use of iron sulphate to correct the chlorotic condition so common in trees all over the State, gives indication of being at least a temporary remedy for this condition. Holes were bored in a number of chlorotic trees and a small amount of iron sulphate put into these holes. In about three weeks the trees began to show a decided change in the color of their leaves, changing from a yellowish to a healthy green color. Further work will be done to try to determine the correct dosage for certain sized trees and observational work to find out if this remedy is merely temporary.

Project 7.—Important Insects affecting Garden Crops.

1. *Cabbage Aphis.* The insect was extremely numerous this year, but where the plants were thoroughly dusted with nico dust, very little damage resulted.

2. *Cotton Boll Worm.* This worm appeared in large num-

bers in certain areas of the State where cotton is grown, doing considerable damage to the young squares and bolls. Most growers dusted with arsenicals, but the results are doubtful.

Project 8.—*Root Rot.*

During the summer it has been found that Texas Root Rot has been responsible for the rotting of a large number of cotton plants in the Mesilla Valley and also has been causing serious losses of locust trees in the Pecos Valley. The alfalfa stem nematode, *Tylenchus dipsaci*, has been found to cause a distinct rotting of the stem bases and crowns of alfalfa plants in San Juan County. Further work will be done to determine other fungi or bacteria that are causing root rots over the State.

MISCELLANEOUS.

Due to the fact that the department was without an entomologist for three months during the summer, very little work on the control of economic insects was accomplished.

The department has had a large number of requests for bacteriological determinations of various sorts. Dead and dying chickens have been sent in to determine whether or not cholera was present. A bacterial count was made of over two hundred different samples of milk. One hundred and ten samples of water were tested for the presence of *Bacterium coli* and typhoid bacteria. Several trips have been made to various parts of the State to determine the cause of the diseased condition existing among the alfalfa and lettuce crops. Two of these trips were made in cooperation with the United States Department of Agriculture, Plant Disease Survey.

IRRIGATION.

Project 1.—*Ground Water Studies in the middle Rio Grande Valley.*

(In cooperation with the Bureau of Public Roads, Division of Agricultural Engineering, United States Department of Agriculture.)

Work on this project has been at a standstill since March, but prior to that time, the data, which will be issued as a report, were being revised.

Project 2.—*Duty of Water Investigations.*

(In cooperation with the Bureau of Public Roads, Division of Agricultural Engineering, United States Department of Agriculture and the Agronomy Department of the Experiment Station.)

The work on this project consisted principally in taking water

measurements on small grains (wheat, oats, barley, and rye), cabbage, grapes, and alfalfa. These data are presented in the following tables:—

TABLE 1.—DUTY OF WATER INVESTIGATIONS FOR VARIOUS CROPS.

Crop	Yield per acre.	Acre-feet applied per acre.	Rainfall.	Total acre-feet per acre.	Yield per acre-foot.*
	Pounds.		Acre-ft.		Pounds.
Rye, field L	1605	1.7608	0.164	1.9248	912
Rye, field N	1616	3.6203	0.300	3.9203	281
Small grains, field M	2455	2.6728	0.072	2.7448	918
Small grains, field G	1412	2.9111	0.300	3.2111	485
Grapes	11640	1.5809	0.009	1.5899	7367
Cabbage	20851	2.27	0.934	1.9522	4266

*Irrigation water.

The water for the above fields was applied as the plants seemed to require it and not at regular intervals. From the results in the table it might be concluded that rye, Field N, received more water than was best for the crop, since it received practically twice as much water as the other rye field and gave several hundred pounds less yield. The first field received seven applications from November 20 to May 24, making 186 days during the irrigation season. Field N, during 221 days, received six applications.

The small grains in Field M included wheat, barley, and oats of several different varieties. This field received seven applications from February 14 to June 14, or 122 days, and gave the highest yield of all the grain fields with about the average amount of water.

The other field of small grain, designated as G, included varieties of wheat, oats, barley, and rye. During 233 days, from October 19 to June 7, eight applications were given, resulting in an average yield for all plats and grains of 1412 pounds per acre, from about three feet of water.

The grapes gave a yield of 11640 pounds per acre, with a little over 1.5 feet of water applied in six irrigations from April 13 to October 25. The last application was given to carry the plants through the winter.

The cabbage was given ten irrigations, eight of which were measured, totaling 23.01 acre-inches, or 1.9182 acre-feet, per acre. The two applications not measured probably amounted to 4.3 acre-inches, making the total amount of water to produce the crop about 27.31 acre-inches, or 2.27 acre-feet, per acre. The yield was 20851 pounds per acre. The irrigations were applied on March 17, April

4, April 21, May 5, May 14, May 27, June 5, June 11, June 18, and June 25. The irrigation on March 17, which was not measured, was given when the plants were transplanted, and probably was 2.9 acre-inches. On April 21, after the severe freeze, an irrigation was given for the replacing of frozen plants. This irrigation was not measured, but the ground was wet and probably one-half of the usual amount was applied, or about 1.4 acre-inches.

TABLE 2.—DUTY OF WATER FOR ALFALFA.

Variety.	Yield per acre.	Acre-feet applied per acre.	Rainfall.	Total acre-feet per acre.	Yield per acre-foot of water.
	Tons.		Acre-feet.		Tons.
Average	5.67	4.60	0.46	5.06	1.23
Hairy Peruvian	7.33	4.70	0.46	5.16	1.56
Common	5.44	4.60	0.46	5.06	1.18
Grimm	5.90	4.80	0.46	5.26	1.23
Turkestan	4.90	4.30	0.46	4.76	0.93

The above mentioned fields had an irrigation season of 209 days, which extended from March 8 to October 2. During this time each variety received thirteen applications of about 4.2 inches of water each. As has been noticed for the preceding years, the Hairy Peruvian variety gave the heaviest yield per acre as well as the highest duty for this season, which was 1.56 tons per acre-foot of water applied. The average for all fields was 1.23 tons. The duty for this year was about 20 per cent higher than for last season but the total yield was less. This is probably due to the fact that 20 per cent less water was applied than during the previous year.

Project 3.—Rate and Cause of Rise of Ground Water in the Mesilla Valley.

(In cooperation with the Bureau of Public Roads, Division of Agricultural Engineering, United States Department of Agriculture.)

The field work on this project is essentially the same as for previous years, consisting principally in gathering data from wells and drains. This year's results indicate that the water table is lower by 1.3 feet, than last year. This is in conflict with the prevailing opinion that the water table is gradually rising, due to plant growth in the drains and their filling in slowly from trash and other accumulating matter.

From a study of wells near drains the fact is revealed that the drains have lowered the water table several feet below the level

before the drains were installed but the wells at greater distances were affected only slightly.

In general, the data indicate that the water has gradually lowered each year for the past three years. The water table lowered more this year than during any of the previous years.

ADAMS PROJECTS.

Project I.—Irish Potato Culture.

(In cooperation with the Biology and Horticultural Departments of the Experiment Station.)

This project was set aside for the year but will be continued in the future.

Project I.—Duty and Effect of Duty of Water on Alfalfa.

(In cooperation with the Bureau of Public Roads, Division of Agricultural Engineering, United States Department of Agriculture.)

The results of the year's work are included in Table 3.

TABLE 3.—DUTY AND EFFECT OF DUTY OF WATER ON ALFALFA.

Series	Yield per acre.	Acre-feet applied per acre.	Rainfall. Acre-feet per acre.	Total acre-feet per acre.	Yield of hay per acre-foot.
	Tons.				Tons.
700	5.93	4.964	0.495	5.459	1.19
600	8.13	5.144	0.495	5.639	1.39
400	8.31	4.479	0.495	4.974	1.85
200	6.95	4.084	0.495	4.579	1.48
4-ft. head	6.64	5.271	0.495	5.766	1.26
3-ft. head	6.78	4.943	0.495	5.438	1.37
2-ft. head	6.44	4.586	0.495	5.081	1.40
1-ft. head	6.44	3.870	0.495	4.365	1.66

The above table indicates that the 400-foot series gave the highest yield per acre, as well as the highest yield per acre-inch. This was probably caused by factors other than water, since these plats received less water than several of the other plats. The lightest yield was obtained from the 700-foot series, which received more water than the average. At present this instance is inexplainable, since last year this series gave the highest yield as well as high duty. The majority of the series yielded over six tons per acre with about 4.5 acre-feet of water.

The soil moisture determinations are being carried on in accordance with plans of the previous years. The percentage of moisture and its position in the soil are being plotted as curves for studying the above factors in relation to crop growth.

HORTICULTURE.

Project 1.—Phenological Fruit Investigations.

The phenological data were recorded as in previous years. Due to the favorable weather conditions and lack of killing temperatures in the spring of 1923, peaches, American and European plums, pears, apples, and a few of the Japanese plums matured a good crop in the summer of 1923.

The winter of 1923-24, on the whole, was a little cooler than the previous winter. The lowest temperature recorded at the Horticultural Farm was 5 degrees Fahrenheit, on December 13, 1923. The next coldest temperature, 9 degrees Fahrenheit, was recorded January 6, 1924. Although the winter was a little colder than usual, the spring was about normal. The Japanese plums started to bloom during the last week in February. The Wickson and the Satsuma plums were recorded in first bloom on February 22, and the Climax on March 1. Most of the Japanese plums were recorded in first bloom on February 22. Most of the Japanese plums were recorded in full bloom from February 29 to March 6. The Elberta and J. H. Hale peaches were recorded in first bloom on March 5 and in full bloom on March 15. The Bartlett pear was recorded in first bloom April 1, and in full bloom April 9. The Jonathan apple was recorded in first bloom April 3 and in full bloom April 9. The Rome Beauty was recorded in first bloom April 12 and in full bloom April 20. This variety produced a very good crop of apples. Practically all of the Japanese plums and early set of peach blossoms were killed by severe temperatures during the first two weeks in March. It was observed in the case of the Elberta, J. H. Hale, and Crothers, that there were some blossoms which had escaped these cold temperatures and quite a large number of belated buds were left after the 15th of March. It was also observed that the J. H. Hale had a considerably larger number of blossoms and buds left after the cold temperatures of the middle of March. It appears that this variety is a little hardier in the bud than the Elberta peach. During the last two weeks in March and the first two weeks in April, with the exception of March 23, there were no killing temperatures and a very good crop of fruit had still remained on different varieties of peach trees, and a good crop was set on apples, pears, and European plums. On the morning of April 17 the temperature dropped to 22 degrees, which proved fatal to everything that was in bloom. This temperature was

followed on the 18th and 19th by temperatures of 24 1-2 and 25 1-3, respectively. All of the peaches which were not smudged, plums, pears, and apples were killed by the low temperatures. A few varieties, like King David, Janet, Arkansas Black, Senator, and Stayman Winesap, had a few belated buds left, which set a small amount of fruit. The Rome Beauty, which was not in bloom, set a good crop.

The grapes were not out at the time of this freeze, so set an excellent crop. Not since April 21 and 22, 1907, had we experienced such late and severe killing temperatures as we had this spring. This year, with the exception of grapes and a very light crop produced by the belated buds left on a few of the varieties of apples and a few European plums, the fruit crop was a failure.

Project 4.—The Testing of a Number of Varieties of Apples, and of one- and two-year-old Apple Grafts.

The observations made on this project were recorded as in previous years.

Project 5.—Smudging Experiments.

The smudging in the spring of 1924 was confined to the peaches, as the Japanese plums (with the exception of the Climax variety) were killed before it was considered advisable to begin smudging. While the question of how soon it would pay to begin smudging in the spring after the fruit has bloomed, is one of economics and the time would vary with the season, cost of smudging, and price of fruit, it has generally been considered that it would probably not pay to begin before the middle of March.

The small Elberta and Crothers peach orchards were smudged, besides a few isolated Hale trees. Smudging was done on the mornings of April 17, 18, and 19. This cold spell was preceded by a warm period, which appeared to have produced a succulent, tender condition, and the injury was very severe to both fruit and vegetables. A hard wind blew April 15 and 16, and the thermometer was around 55 degrees all day. By six o'clock the temperature had dropped to 50 degrees and a freeze was inevitable. The following table gives the results of the smudging work April 17, 18, and 19.—

April 17, Time, A. M.	Temperatures. Outside.	Temperatures. In peach orchard.	April 18, Time, A. M.	Temperatures. Outside.	Temperatures. In peach orchard.	April 19, Time, A. M.	Temperatures. Outside.	Temperatures. In peach orchard.
2:00	27		2:30	28	30	4:20	27	27
2:20	26	30	3:50	27	28	4:50	26	31
2:40	27	31	4:35	26	28½	5:30	25 1-2	31
3:15	26	29	5:00	25	28½			
4:00	24	29	5:30	24½	29			
4:30	26	30						
5:20	23	27						
5:40	22	26						
6:00	26	30						

The Crothers peach orchard had the two-gallon Bolton pots with spiders on, and the Elbertas had the one-gallon Troutman pots without spiders. They were distributed at the rate of one pot per tree. Only the outside row of pots (about 45) were lighted at 2:00 o'clock on the morning of April 17, but by 4:00 the balance were lighted, making a total of eighty pots in the block. At 5:20 the spiders were taken off and the pots first lighted were refilled. By 5:40 considerable wind was blowing from the north, and 27 extra pots were placed on that side of the orchard, making 107 pots in the Crothers and 49 in the Elbertas, but in spite of the extra pots, the temperature dropped to 26 degrees in the Crothers. The refilling of the pots with cold crude oil tended to reduce the heat for several minutes and the north wind carried the heat from the narrow strip of orchard so quickly that it was impossible to keep the temperature above the danger point.

The 22 degrees recorded outside of the heated area proved quite fatal to the unsmudged fruits and many vegetables. Chile that had just been transplanted was practically all killed. English peas were badly injured, and sweet peas that had stood all winter suffered greatly, many of them being killed. Practically all of the apples except the Rome Beauty and Janet were killed. A good crop of buds on the Rome Beauty and Janet trees, and a few on the Arkansas Blacks, were not yet open. The Crothers peaches produced 1,000 pounds of marketable fruit, and the Elbertas 300 pounds, which sold at seven to eight cents a pound. The few isolated Hale trees that

had about four pots to the tree, produced a good crop of nice fruit. This variety seems to be slightly hardier in the bud than the Elberta.

Project No. 6.—Variety and Pollination Experiments with Pears.

While the spring of 1923 was very favorable and the different varieties of pears set a heavy crop of fruit, by reason of a very heavy infestation of pear blight there was probably not over 25 per cent of the crop harvested in the summer of 1923. The details of the pear blight infestation and the attempt to control it have been stated in a previous report.

On account of the exceedingly late frosts in April, 1924, with the exception of a very few straggling buds left on some varieties the pear crop was a failure.

Project No. 7.—A Study of the Affinity between the Apple Scion and the Pear Stock.

This experiment is now completed, but the results shown, on the average, are not as promising as was originally expected. In the beginning the young pear trees were budded on scaffold limbs and buds from King David and Stark's Delicious apples were used. The buds, on the average, took very well and the branches made good growth. Most of the apple branches have been bearing every year but the apples, on the whole, have not been as large as those produced by the apple trees on apple roots. A factor that probably entered into the results not being very satisfactory is that the adjacent pear limbs were not removed from the pear tree in order to give the apple branch an opportunity to develop without interference. In every case it has been noticed that the apple branch above the union with the pear stock has grown considerably larger than the stock, and in one or two cases it has been quite top-heavy.

Project No. 8.—Pruning Experiments.

While this project was continued, very little work was done in pruning during the year.

Project No. 13.—Tomato Experiments.

The results of the new method, previously described, of growing tomatoes are showing up very satisfactorily, and it is believed that if growers will take the pains necessary in growing tomatoes under the new method, the damage done to the tomatoes by irrigation water and to the vines by being trampled by the pickers, will be materially reduced.

In the spring of 1924 two new varieties, supposed to be blight-resistant, were planted; the Red and Pink Louisiana tomatoes. There was practically no blight during the summer, although the weather was just as dry and hot as in previous years.

Project No. 14.—Cabbage Experiment.

The cabbage fertilizer experiments were continued in 1924 in the same manner as in 1923. The yields were not so good as in 1923, due, no doubt, to a heavy frost that occurred April 17, when the temperature dropped to 22 degrees Fahrenheit, resulting in severe injury to the newly transplanted plants. The plants on the nine level plats suffered much worse than those on the last nine plats planted on the sides of the ridges. It so happened that the first nine plats, planted on the level, had been fertilized by the use of a drill the day before the frost, and it was thought that the roots may have been slightly disturbed, which may have been responsible for the difference in the frost injury, rather than the difference in the cultural methods. For about thirty-six hours just preceding the freeze there was a wind blowing from the west.

The seed was planted in coldframes November 28, 1923, and a part of the frames covered with glass until the plants had a good start; then the glass was removed and a cloth cover used, the same as was being used on the rest of the frames. The plants were transplanted to the field March 17, and the phosphorous, potash, and cottonseed meal fertilizers applied March 25. The nitrates were applied April 16 and May 20.

After the frost of April 17, additional plants were set about four inches to the side of those that showed the greatest injury. The irrigation for this work was not measured. These re-sets did not thrive, however, and practically none of them produced heads, while most of the original plants recovered and headed, although the heads were below normal size.

The damage from the aphis was not great, but the green worms were much worse than usual. Probably the greatest loss in yields was caused by the windbreak or large shade trees growing along the west side of the patch.

The following tables give detailed results of the 1924 crop:—

TABLE 2.—PLAN OF CABBAGE FERTILIZER TEST, SHOWING YIELDS FOR SEASON OF 1924 ON LOAMY SOIL.

	RATE PER ACRE OF FERTILIZING MATERIAL USED.																			
	Plat 1. Check.		Plat 2. Sodium nitrate, 400 pounds.		Plat 3. Cottonseed meal, 1000 lbs.		Plat 4. Ammonium sulphate, 200 lbs.		Plat 5. (Gypsum, 225 lbs. carrying 40 lbs. sulphur).		Plat 6. Check.		Plat 7. Manure, 20 large loads, approximately 30 tons.		Plat 8. (Complete Fert.) Manure, 20 tons; steamed bone, 500 lbs.; sulphate of potash, 150 lbs.		Plat 9. Manure, 20 tons; steamed bone, 500 lbs.	
	YIELD, IN POUNDS, AND NUMBER OF HEADS CUT, PER PLAT.																			
Dates of harvesting	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.
June 9	58	21	67	30	40	17	131	51	36	25	153	68	353	132	341	136	197	75		
June 18	162	74	359	146	258	150	333	154	130	65	308	153	458	140	284	105	126	57		
June 25	319	130	185	80	207	84	286	115	403	178	355	140	700	242	718	232	519	150		
June 30	493	257	410	206	304	140	452	222	477	222	600	283	451	187	487	204	853	306		
July 8	85	58	118	64	151	42	137	81	119	54	127	62	145	68	148	61	168	74		
Total	1109	532	1139	526	982	433	1339	623	1285	544	1603	706	2116	769	1978	739	1854	642		
	CALCULATED YIELD PER ACRE.																			
	13296	6264	13659	6312	11744	5196	16068	7476	15420	6528	19234	8352	25392	9228	23736	8868	22248	7704		

TABLE 2—Continued.

RATE PER ACRE OF FERTILIZING MATERIAL USED

	Plat 10. Manure, 30 tons; sulphate of potash, 120 lbs.		Plat 11. Manure, 30 tons; sulphur, 40 lbs.		Plat 12. Manure, 30 tons; superphosphate, 225 lbs.		Plat 13. Manure, 30 tons.		Plat 14. Complete fertilizer: Manure, 30 tons; Basic slag, 600 lbs.; sulphate of potash, 120 lbs.		Plat 15. Manure, 30 tons; Basic slag, 600 lbs.		Plat 16. Manure, 30 tons; sulphate of potash, 120 lbs.		Plat 17. Manure, 30 tons; sulphur, 40 lbs.		Plat 18. Manure, 30 tons; superphosphate, 225 lbs.	
Dates of harvesting	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.
	CALCULATED YIELD PER ACRE.																	
June 6	145	74	234	95	104	70	269	100	125	73	237	112	65	37	315	87	537	396
June 18	134	46	221	68	109	38	118	41	146	38	266	77	123	25	220	80	146	48
June 22	315	85	675	197	709	200	582	243	890	161	832	197	256	102	556	183	964	338
June 30	690	257	689	220	971	346	714	254	759	225	749	246	578	277	734	256	876	339
July 8	274	116	369	135	538	141	262	124	284	157	585	140	354	228	429	178	667	217
Total	1558	582	2110	765	2566	795	1944	762	1463	654	2669	872	1378	667	2146	780	2587	898

*Half steamed bone and half acid phosphate.

Each plat contained 1-12 acre. Nine hundred and sixty-eight points were transplanted to each plat.

TABLE 3.—CABBAGE FERTILIZER TEST, SHOWING YIELDS FOR 1924 ON LIGHT SANDY SOIL.

RATE PER ACRE OF FERTILIZING MATERIALS USED—NO MANURE.

	Plat 1. Half and Half, 600 lbs.		Plat 2. Sodium nitrate, 600 lbs.		Plat 3. Sulphate of ammonia, 450 lbs.		Plat 4. Acid phosphate, 750 lbs.		Plat 5. Sodium nitrate, 600 lbs.; acid phosphate, 750 lbs.		Plat 6. Sodium nitrate, 600 lbs.; acid phosphate, 750 lbs.; sulphate of potash, 120 lbs.		Plat 7. Check.	
	YIELD IN POUNDS PER PLAT AND NUMBER OF HEADS CUT.													
Dates of harvesting.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.	Yield.	Heads.
June 18	0	0	12	2	7	3	4	1	14	7	3	2	0	0
June 25	6	6	0	0	24	14	17	6	65	24	22	11	3	3
July 2	6	5	63	39	47	22	10	11	59	31	36	15	1	1
July 9	8	5	28	21	67	38	28	21	35	19	31	19	4	2
Total	13	10	100	62	155	77	78	40	173	83	91	47	8	6
	CALCULATED YIELD PER ACRE.													
	1560	1200	8000	4960	12400	6160	6240	3200	13840	6640	7280	3760	720	480

Plat 1 is 1-120 acre; each of the other six plats is 1-80 acre. The soil in these plats is very poor in humus.

Project No. 18.—Small Fruit Experiment.

There were no data collected on small fruits in the spring of 1924, on account of the late frosts in April having destroyed the crop.

Project No. 19.—Pecan, Walnut, and Almond Experiments.

In the fall of 1923 a few almonds were gathered from the Texas Prolific trees,the spring having been so favorable that a few of the belated buds escaped the late frosts. The entire crop on the almond trees was killed by the late frosts of 1924.

There was no crop produced by the walnut trees of 1923. A few of the trees that had escaped being winterkilled in the past three years bloomed in the early part of April, 1924, but the late frosts of April 17, 18, and 19 destroyed all of the blossoms that the trees had produced.

A number of varieties of pecans produced a good crop in 1923, and in the fall the following yields were harvested:—

Two trees of the Success variety produced ten and one-half pounds of fine, large nuts, and quite well matured.

Two trees of the Indiana variety produced seven and one-half pounds of fine, large nuts, well matured.

One Texas Prolific tree produced seven pounds of very fine nuts, although a few of them were slightly immature.

Two Moneymaker trees produced eleven pounds. These were rather late in ripening and a number did not fill out properly.

Three Niblack trees produced two pounds of small, immature nuts.

One tree of the Pabst variety produced two pounds of nice, large, nuts well matured and resembling the Success.

Two Halbert trees produced ten pounds of well matured but small nuts.

Three Warrick trees produced ten pounds of small nuts, some of them not being well filled out.

Three Kentucky trees produced two pounds of fairly well matured, medium sized nuts.

Two Van Deman trees produced fourteen pounds of nice, attractive nuts, with a few not matured.

One Onliwon tree produced four pounds of medium sized nuts.

One Stuart produced one-half pound of nuts.

One Green River tree produced a half pound of very small nuts.

One tree of Seedling No. 1 produced 23½ pounds of very soft shell, fairly well matured nuts.

One tree of Seedling No. 2 produced sixteen pounds of medium sized nuts.

One tree of Seedling No. 3 produced thirteen pounds of very nice, large nuts, well matured.

One tree of Seedling No. 4 produced six and one-half pounds of very small nuts.

These trees were transplanted to the experimental orchard in March, 1916. Most of the trees were two years old when transplanted. Some of these varieties have been bearing for three seasons. The results up to date are quite promising, although the indications are that some varieties are better adapted than others to Southwestern conditions. In the spring of 1924 there was a heavy bloom crop of staminated blossoms started before the frosts of April 17, 18, and 19. Most of the crop of pistillated blossoms did not open until after the frosts and as a result of this a fairly good crop set on a number of varieties.

Project No. 20—Stump vs. Trellis, and Duty of Water Experiment with Grapes.

The stump vs. trellis part of this experiment has been completed and the results show that, other features remaining equal, the trellis method of growing the Vinifera grape is not satisfactory under irrigation conditions. The vines can be handled considerably easier when trained by the stump system, and on the whole, the bunches, as well as the berries, are much larger and better formed. The fruit also colors considerably better when the vine is trained on the stump than when on the trellis.

The grape seems to be a plant that will thrive with as little water as any other fruit that we are growing. The duty of water experiment is being conducted in cooperation with the Irrigation Department, and the details of this year's experiment will be found in the report from the Irrigation Department. The yield per acre in 1923 was 11640 pounds, with a little over 1.5 feet of water applied in six irrigations, which were given on the following dates: April 13, May 30, June 22, July 3, August 10, and October 25. The October irrigation was not given until after the fruit had been harvested and in no way did it contribute to the maturing of the crop. This irrigation was given simply to moisten the soil in order that the vines might be more easily covered, and to keep the ground

moist during the winter. The first irrigation given the vineyard in 1924 was on April 13, immediately after it had been pruned.

Project No. 21.—Garden and Field Pea Experiments.
Temporarily discontinued.

Project No. 22.—Head Lettuce Experiment.
The head lettuce experiment was renewed in January, 1924. On the 2nd of January about one-fourth acre was planted to seed

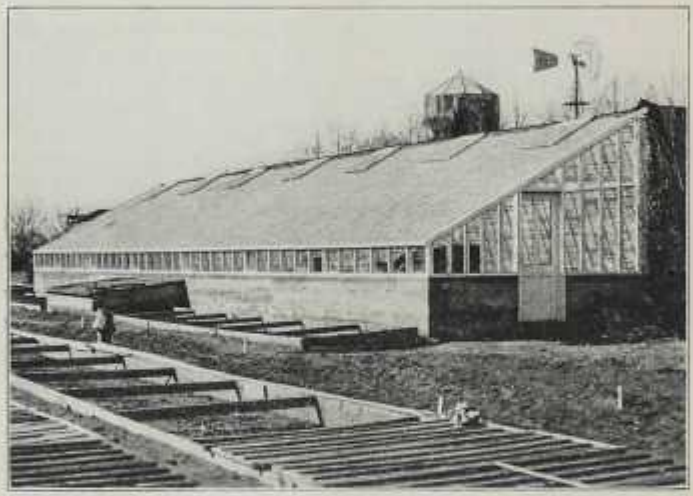

FIG. 1.—New Lean-to to Greenhouse—1924.

of the Los Angeles Market lettuce. On account of the exceedingly cold weather during the first two weeks of January, the germination was only 40% to 50%, and on the 22nd of the month most of the rows were replanted. The germination of this was excellent. On March 4 the plants were thinned to 12 inches apart in the rows. During May the weather turned very warm, and many of the heads were somewhat soft. On the 21st of May a count was made and it was found that about 40% of the field had headed.

While no new additions were made to the Department equipment, eleven acres of land were bought. This land lies directly north of and across the road from the old Horticultural farm.

ADAMS PROJECTS.

G.—Codling Moth Investigations.

On account of the exceedingly heavy crop of apples being produced by the trees in 1922 there was only a fair crop in 1923. Since a part of this experiment is to try out the spraying schedules which have been worked out on the results of investigations of the life history of the codling moth, most of the work in this connection consisted in testing these different schedules.

I.—Irish Potato Culture.

A very good piece of sandy loam soil that had been manured in 1923 was used for the potato experiment in 1924. Certified seed potatoes were secured from Wyoming, Wisconsin, and Minnesota.

One row was planted March 1 and covered with glass to protect it until the danger of frost was over, to enable the plants to get an early start and produce their tubers before the extreme heat of summer came on. However, while they matured earlier than the main crop planted later, the yield was smaller.

The main crop of experimental potatoes was planted March 15 and was coming up nicely by April 10. The plants were looking well when, on April 17, the temperature dropped to 22 degrees and they were frostbitten to the ground, which gave them a considerable setback.

By May 7 quite a few of the plants were beginning to look "sick", and some of them were pronounced mosaic by a Government potato specialist. However, the patch was immediately irrigated and the vines recovered to a large extent and continued to grow fairly well until about the middle of June, when they began to go down. They were dug July 3, and produced at the rate of 2907 pounds to the acre.

Many of the tubers were quite scabby and seemed to have been rather badly affected with nematode. It was thought that the nematode was probably the principal factor in limiting the yields in 1924, and an effort will be made to secure soil free from nematodes for the potato experiments in 1925.

Project O.—A Study of Air Drainage and Air Temperature Variations as Affecting Frost Injury to Fruits.

The trees used in these experiments are large enough for some of them to have started into bearing. The phenological data on the blooming and ripening of fruit on those trees that had come into

bearing were kept during the spring, but due to the late and very severe freeze in April, 1924, all of the blossoms and buds were killed in all of the experimental orchards.

Project B.—Disease of the Chile Pepper.

The cooperative project on the control of the chile blight was continued as in the previous year. Considerable blight was found on the plants in 1923, but not so much in 1924.

ANIMAL HUSBANDRY.

Project 1—Fattening Yearling Steers.

This experiment was conducted in cooperation with the Bureau of Animal Industry and Office of Dry-Land Agriculture, United States Department of Agriculture. The following are the results obtained from this feeding trial:—

	Lot I	Lot II.	LOT III.	LOT IV.
Number of head	10	10	10	9
Average initial weight; lbs.	575.8	577.1	568.0	586
Average final weight; lbs.	807.3	799.7	775.3	809.8
Average total gain; lbs.	231.5	222.6	207.3	223.8
Average daily gain; lbs.	1.77	1.71	1.59	1.72
Average daily ration:				
Ground milo; lbs.	11.396	11.522	11.517	11.281
Cottonseed meal; lbs.	1.898		1.90	
Cowpea hay; lbs.		4.896		3.850
Sorghum hay; lbs.	11.345	8.592		
Sorghum silage; lbs.			17.893	16.516
Feed per 100 pounds gain:				
Ground milo; lbs.	638	674	724	657
Cottonseed meal; lbs.	107		114	
Cowpea hay; lbs.		284		225
Sorghum hay; lbs.	641	502		
Sorghum silage; lbs.			1124	955

This experiment will be continued during 1924-25.

Project 2.—All-Year Grazing for Brood Sows.

It is a well established fact that the southern valleys of New Mexico permit the grazing of livestock during the greater part of the year. Certain grazing crops are recognized to be best suited for these sections. Of these alfalfa and rye are two well known and well established crops. The alfalfa is suitable for grazing in the late spring and summer months, while rye is suited to fall, winter, and early spring grazing. Consequently, it is desirable to work out a rotation for all-year grazing with these two crops as the basis.

Method of procedure.—Ten brood sows, weighing approximately three hundred pounds each, were grazed on alfalfa or other

pasture throughout the year. Three half-acre lots were planted to rye and used for grazing in the fall, winter, and early spring. Two half-acre lots were seeded to alfalfa and used for spring and summer grazing.

When possible to have a rye crop mature after it has been grazed, and then hogged down in the summer, this method was followed. Sufficient concentrates were added to the feed to keep the sows in thrifty condition. The pigs were kept with the sows on pasture until approximately ten weeks old. Weights were taken in ten-day periods, and the pigs were weighed at the time they were taken off of pasture. All hogs added to the experiment, or taken out, were weighed at that time.

One acre of rye, which was divided into two half-acre plats in order that the grazing could be rotated and the plats irrigated without removing the sows, was used. These plats were seeded to Rosen rye on October 1, 1923, and grazing with brood sows was begun November 19, 1923. These sows were fed and watered on pasture, and raised their pigs there. The pigs were fed in a creep separate from the sows. An accurate record was kept of the feed consumed, the gains made by the pigs, and the gain and loss in the weight of the sows. From time to time a sow was removed, or put on other pasture, in order to keep the carrying capacity of the rye at its maximum. Due to cold weather and the slow growth of the rye, eleven sows were taken off of pasture December 4, 1923, but were again put on pasture January 19, 1924. They were kept on rye from then on until May 27, when the experiment was concluded, totaling one hundred and sixty-two days on pasture.

Results.—A total of 2,623 pounds of hogs, (equivalent to 8.74 three-hundred-pound brood sows) was kept on this one acre of rye for one hundred and sixty-two days. An average of 1.14 pounds of grain per day per hundred pounds of live weight was fed.

Fifty-two pigs were raised by the sows while on pasture. These pigs required 1.53 pounds of grain to produce one pound of gain on pasture, up to the weight of fifty pounds, when they were weaned and taken off of the rye.

Although these results are below the average that might be expected from winter pasturing, because of the unusually cold weather this year, yet, when compared to dry lot feeding, they show a decided advantage in favor of the rye pasture. Brood sows in a

dry lot require an average of about 8.5 pounds of concentrates per 100 pounds of live weight daily. This shows a saving of 1.36 pounds of grain per day, or more than half the grain ration of the sows. Pigs in a dry lot require about 3.0 pounds of grain to produce a pound of gain, as compared with 1.53 pounds of grain required by the pigs on pasture to produce a pound of gain.

Project 3.—Cooperative Poisonous Plant Investigation.

This experiment was carried on in cooperation with the Bureau of Plant Industry, U. S. D. A., and Mr. B. W. Rentfrow. This test was conducted on Mr. Rentfrow's ranch near Carrizozo, the cattle for the test being furnished by Mr. Rentfrow. The following are the details of the operation and results obtained:—

For a number of years past ranchmen in the vicinity of Carrizozo have lost cattle due to some unknown cause. There is a small plant which is peculiar to that section of New Mexico and which the ranchmen have looked upon with suspicion for a long time. In an attempt to throw some light upon this matter, the New Mexico Agricultural Experiment Station, in cooperation with the Bureau of Plant Industry and Mr. W. B. Rentfrow, began a study of this plant, which is known as *Drymaria glauca* W. & S.

Description and Growth Habits.—Drymaria is a small plant growing flat on the ground from one-half inch to one and one-half inches high, obtaining under good conditions a diameter of five to eight inches. It has a single root stock and does not spread by means of runners. It is an annual and reproduces only by seed. The seed may stay in the ground for as long as three years without germination, if conditions are unfavorable. The leaves are almost round and a dark green in color. The blossoms are small and white, looking somewhat like a cup. The seed pods are blood red in color when ripe. Before ripening, a red fluid can be mashed out of them. The plant is killed by the first frosts and after this there seems to be no danger of poisoning.

Places Found.—Drymaria, so far as is now known, has only been found on the range west of Three Rivers, Oscuro, and Carrizozo between the White Mountains and the Oscuro Range, on the west side of Malpais (a lava formation running thirty-five to forty miles through the valley). It grows on the flat where no grass or other weeds are growing and in places that are subject to being flooded but where the water does not stand.

Experiment.—Two attempts were made to feed range cows Drymaria. Each time the cows were shut up without feed but with plenty of water, and Drymaria was offered them at intervals either by itself or mixed with other feeds. In the first case, a cow was starved for a period of five days and offered green Drymaria. She would not eat Drymaria either alone or mixed with other feeds. In the second case a cow was starved five days and offered the Drymaria in a mature condition. As in the first case, the cow refused to eat it in any form. Seven pounds of Drymaria were picked, stewed, and the juices extracted. Cow No. 1 was drenched with the extract and turned out on grass. She died twenty-three hours after drenching. Another cow, No. 2, was taken off the range and drenched with a similar extract, without a preliminary starving period. She also died twenty-three hours after drenching.

Post Mortem.—Post mortem examination showed an inflammation of the manyplies, or third stomach, and red blotches in the small intestines. The gall bladder in both cows was abnormally large and contained a yellowish fluid. Also the liver in each case was extremely red and abnormally colored.

These results show Drymaria to be poisonous to cattle, also that it is very unpalatable to cattle. So far as is known, no one knows definitely of an instance where cattle have eaten Drymaria, yet Drymaria is suspected of causing the death of cattle, as cattle in that section die of unknown causes during the months of August, September, and October, when it is abundant. No horses have been known to die of plant poisoning, and there are no sheep on this range.

ADAMS PROJECTS.

Project M.—Range Cow Nutrition Investigation with Pinto Beans and Pinto Bean Straw.

This investigation was completed and the results published in Bulletin No. 143.

Project R.—The Mutual Influence of the Proportion of the Several Nutrients in Feeds on their Digestibility, with Special Reference to New Mexico Range Steers.

Some preliminary work was carried on in the spring of 1924, but the principal part of the work will be continued during the following season.

Project S.—A Study of the Factors Affecting the Germination and Growth of Chamiza (Atriplex canescens).

INTRODUCTION.

The periods of extreme drought on the ranges of New Mexico are a source of great financial loss to the cattlemen, sheepmen, and to the State. In the mountainous sections where there is browse, although the grass may be eaten to the ground, some cattle may be kept until the rains again revive the main forage.

There are several shrubs and bushes that may be considered browse in the mountainous areas, but on the plains there is little besides grass, weeds, the yuccas, and sotol. We do not have the sages and so-called sages, which grow and withstand drought to a marked degree. One of the best browses for the plains area is chamiza. In spite of the fact that it is sometimes poisonous to sheep, this bush comes the nearest of all plants on the range to filling the requirements, when used as a feed in time of emergency. Its habitat is over most of southern New Mexico and extends beyond the northern portion, but it seems to thrive best in certain sections, and the line of demarcation between where reproduction does or does not take place is quite marked.

By observation and experiments carried on by the New Mexico Experiment Station, it has been proved that chamiza has a high carrying capacity over an extended period of time, gives good succulent feed in winter, as well as summer, for cattle, will sustain a cow and enable her to produce a normal calf, and will recuperate very quickly after over browsing. The experimental work done at State College, New Mexico, (New Mexico Experiment Station Bulletins Nos. 125 and 133), also shows that this plant is high in protein and that no protein supplement is needed when pasturing chamiza. Since supplemental feeding is getting to be one of the most important phases of the cattle industry of the Southwest, and since one of the best browses—if not the best—that we have so far studied is chamiza, it is believed that the subjects of extending the range and improving the stand of this bush are worthy of further investigation.

If a stand of chamiza can be economically obtained on one-tenth of the area of a given range and this tenth protected for drought years, it will carry the cattle for possibly a year, or more, without supplemental feeding.

A stand of chamiza having been obtained, under range conditions, on a small plot of ground at State College, New Mexico, as preliminary work, and since this has long been known to be a valuable bush for carrying stock over during times of drought, it is proposed that this investigation be undertaken.

OBJECTS.

The objects of this experiment will be as follows:—

1. To make a study of the best depth and the best time of planting on different types of soil.
2. To ascertain the amount of soil moisture and the temperature required for germination and growth of the young seedlings.
3. To study the rate of growth and the root system of young seedlings.
4. To ascertain how rapidly the vitality of chamiza seed deteriorates from year to year.
5. To find if it will be practicable to extend the range of the plant under natural rainfall conditions, and if so, to what extent.
6. To make a study of the conditions under which chamiza grows naturally in comparison with spots in the immediate vicinity in which the chamiza does not grow, to ascertain the soil or moisture conditions favorable or unfavorable to the growth of this shrub.

PLAN OF EXPERIMENT.

Chamiza seed will be planted in small plats at different depths at different seasons, and on different types of soil. The seed will be scattered on top of the ground, and planted at depths of one-half inch, one inch, one and one-half inches ,and two inches, in at least three different types of soil around the Station. The seasons of planting will be fall, winter, and spring. One-half of the plats will be irrigated, enough water being supplied to approximate eight, twelve, sixteen, and twenty inches of rainfall. Duplicate plats will receive no irrigation. These plats will be enclosed by a rabbit proof fence. A count will be made of the percentage of seed germinating, and of the number of plants surviving. Soil moisture determinations will be made where plants are found dying due to lack of moisture, in order to determine the amount of soil moisture necessary to keep the plant alive. A study will be made of the growing habit of the entire plant, especially of the root system. Germination tests will be run from time to time to determine the viability of the seed at different ages. Seed will be planted in different parts of

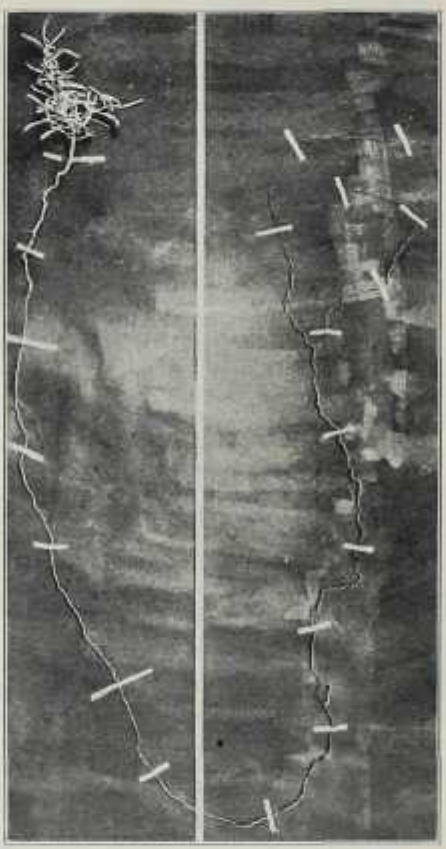

Fig. 2.—A chamiza (**Atriplex canescens**) bush eleven months after seed was planted. When dug, the top was three inches tall and the tap root went into the soil nearly five feet.

the State, if the cooperation of a few stockmen can be secured, to determine the practicability of extending the range of the plant.

This investigation will cover a period of several years. Suitable land containing all types of soil for the investigation is available at State College, New Mexico.

RESULTS OF FIRST SEASON'S WORK.

The latter part of October, 1923, three series of plats were laid out for this investigation: Series 1, near the west side of the Mesa Plats; series 2, a short distance southeast of the pump house, on the mesa; and series 3, on a foothill about 150 yards southeast of series 2. Each series contained 5 plats and each plat was divided into 15 subplats. The seed was planted at different depths, ranging from surface planting to 2 inches deep. Plat 1 in each series was not irrigated; plat 2 was irrigated sufficiently to make the amount of moisture received, including irrigation, approximately 8 inches. The total amounts of moisture received by the other plats were approximately as follows: Plat 3, 12 inches; plat 4, 16 inches; and plat 5, 20 inches. The seed was planted November 1 and 2, 1923, and February 1 and May 1, 1924. Seed that was gathered in the fall of 1923 was planted November 1 and 2; but seed that was gathered in the fall of 1920 was used for the later plantings, as laboratory tests made by the Agronomy Department had indicated that this would germinate a good deal better than the seed that was gathered in 1923.

The results thus far obtained appear to be quite promising. The following are conclusions that have been drawn from them:—

1. Chamiza seed that had been gathered several years previous germinated better than seed that had been gathered only a month or two. In the tests run at the Station the germination has always been low, the highest thus far obtained being twenty-two per cent. This was with seed that had been gathered a little over six years. With seed that had been gathered between two and three years, the highest germination was twenty per cent. The highest obtained with seed that was between one and two years old was seven per cent. Seed that had been gathered less than a year never gave a germination of more than two or three per cent, and often the germination was less than one per cent.

2. The best germination so far obtained has been from seed planted about an inch deep.

3. The results secured to date indicate that in the southern part of New Mexico the best germination will be obtained by planting in the late fall or winter. Seed planted November 1 and 2, 1923, germinated fairly well. This was also true of plantings made February 1, 1924; but practically all of the seed planted May 1 has so far failed to germinate.

4. Even with the small amount of rain that usually falls in southern New Mexico, the indications are that it may be possible to obtain a stand of chamiza, without irrigation and at comparatively small expense; provided that injury from rabbits is not too severe.

AGRONOMY.

ADAMS PROJECTS.

Project N.—The Relation of Concentration of Soil Solution to Nitric Nitrogen in Soils Containing Large Quantities of Available Nitrogen and their Effect upon Plant Growth.

This project has been completed and the results have been published as Bulletin No. 142. A summary of the principal points brought out in this publication follows:—

1. Nitrates, either singly or in combination with varying amounts of mixed salts, were found not to be unusually toxic to pop corn in water and sand cultures.

2. Nitrates applied to soils containing mixed salts were not unusually toxic to pop corn in pot tests; nor to field corn in plat tests.

3. Nitrates in water and sand cultures were less toxic to pop corn than chlorides, and probably but slightly more toxic than the sulphates.

4. Magnesium salts were usually found to be less toxic to pop corn than either sodium or calcium salts. The beneficial effects of magnesium sulphate were frequently noted in water, sand, and soil cultures.

5. The different salts used in sand cultures showed some differences in reaction of the sand solution, some solutions being more alkaline than others. The sand contained an abundance of non-alkaline carbonates.

7. The toxic effect of excess salts may be largely overcome up to a certain point, by the use of more water; but when too large an amount of water is required there may be difficulty due to lack of soil aeration.

8. No unusual accumulation of nitrates was observed either in plat tests in which different amounts of water were used on both fallow and cropped land, or in sand cultures receiving graduated amounts of the various single salts occurring in soils.

9. Excessive leaching not only removed practically all of the nitrates from the soil but probably most of the soluble organic matter. The physical condition of the soil was injured, as indicated by the slower penetration of water toward the end of the season. The following year, corn grown on the excessively leached plat responded to the use of nitrates. Probably after the soil had recovered for one year, nitrates would have gven no results.

10. A great difference was shown in the effectiveness of leaching in very short distances. In some subplats in the excessively leached plat, probably the salts retained had about reached an equilibrium between the absorptive capacity of the soil and the salt content of the irrigation water. Most of the retained mineral salts were sulphates, due to the relatively slow leaching of these salts, and to the relatively large amounts of sulphates in the irrigation water. On account of impermeability, the clay layer in some subplats had lost very little or no salts.

11. Soils containing excess salts have been frequently examined and usually no large excess of nitrates has been recovered. Where unusual amounts of nitrates have been noted, they have always been accompanied by a large amount of total salts. It is believed that the occurrence of nitrates even in excessive amounts may be usually largely accounted for by nitrification accompanied by capillarity.

12. Examination of the soil on which apple trees were dead or dying in the College orchard showed a small amount of nitrates but a large amount of other salts; so the nitrates could not have been the cause of the injury. Even the relatively large amounts of nitrates observed at the beginning of this study about the trees which were injured, probably were only a minor cause of the injury.

13. Nitrates move more rapidly than other salts either in capillary or drainage water; followed in order by chlorides, sulphates, and soluble organic matter. The nitrates and chlorides are removed more completely by capillary water, but the sulphates and soluble organic matter are moved more completely in drainage than in capillary water.

14. In both capillary and drainage water the greatest concentration of mineral salts is found near the point to which the water has reached; but the soluble organic matter lags behind the mineral salts.

Project T.—The Value and Productivity of Sugar Beet Seed produced Annually Instead of Biennially.

In order to determine the best date of planting sugar beets, in the fall of 1922 plantings were made at fifteen-day intervals, beginning September 1. Beets which were planted in September and October sent up seed stalks the following spring and produced an abundance of seeds instead of making the normal root growth. It was thought desirable to give this seed which was produced in one year's time a thorough test to determine its value and productivity, with the possibility of developing the seed production on a commercial basis. With these ideas in mind this project was submitted and approved. The objects as set forth in this project are: first, to study the value and productivity of sugar beet seed produced in one year's time; second, to study the effect of growing seed annually for several years on the future yield and quality of the beets; and third, to study the effect of different dates of planting on seed yields the following year. Since the project was approved only a few months ago, there is very little to report at present. Much of the first work will be done in the autumn of 1924. Beet seeds have been obtained from sugar companies and experiment stations of the sugar beet growing States and these have been planted with the idea of later returning seed produced in one year's time to the original senders, so that it can be compared with their biennial seed in regular plat tests.

HATCH PROJECTS.

Project 2.—Variety Test of Cereals.

(a) Fall Sown Cereals.

The variety tests seeded in the fall of 1922 included nine varieties or strains of wheat, four varieties of oats, and three varieties of barley. The season of 1923 was very unfavorable and much loss occurred, due to the ravages of the spring grain louse or "green bug." The highest yielding varieties of wheat were Turkey Red, Kanred, and Early Baart, in the order named. The highest yielding oats variety was Gray Winter, followed by Boswell and Texas Red. California Feed was the highest yielding barley variety. Rosen rye yielded at the rate of 30.3 bushels per acre.

(b) Spring Sown Cereals.

The spring seeding of 1923 included nine varieties of wheat, four of oats, and three of barley. As in the preceding year, Sonora wheat was by a considerable margin the heaviest yielder. Early Baart and Kubanka were second and third, respectively. Kanota oats gave highest yield, followed closely by Oklahoma Red and Ferguson No. 71, a selection of Red Rustproof. Blue Ball barley gave the highest yield, but none of the grain in the spring variety test gave profitable yields, due to the ravages of the grain louse.

The same varieties, with a few additional varieties, have been continued in the test of the season of 1924. This season has been quite favorable and the prospects are excellent for very favorable yields of grain, especially of spring wheat.

Project 4.—*Cultural Methods and Variety Tests of Corn.*

Twelve varieties of corn were tested in 1923. Dwarf June and Mexican June were the leading varieties, as in 1922. The yields of all varieties were as follows:—

Variety	Yield per acre.	Variety	Yield per acre.
	Bushels.		Bushels.
1. Dwarf June	64.9	7. Native Yellow Dent	41.8
2. Mexican June	62.7	8. Pioneer	34.8
3. White Elephant	55.6	9. Hickory King	34.8
4. Surcropper	55.6	10. Silvermine	30.1
5. Arlington Prolific	44.0	11. Reid's Yellow Dent	29.2
6. Chisholm	41.8	12. Buster's Yellow Dent	16.2

As a general rule, it seems that the tall coarse-growing varieties which are late in maturing yield heaviest. A few new varieties have been added to the tests in 1924.

Project 6.—*Johnson Grass Eradication.*

Work on this project was discontinued during the year but plans are under way to do further work during the coming year.

Project 9.—*Sugar Beets.*

(In cooperation with the Office of Sugar Plant Investigations, Bureau of Plant Industry, United States Department of Agriculture.)

The work was continued as in the previous year. Sugar beet seed was planted at fifteen-day intervals, beginning September 1, 1923, and continued throughout the winter, except for a period when there was no irrigation water available. Beets were also planted on two types of soil, sand and adobe, beginning March 1, 1924, and continued at fifteen-day intervals until July 1.

The crop which was planted in the fall of 1922 and spring of 1923 was so seriously damaged by the curly top disease that no yields worth recording were obtainable in the fall of 1923. Plantings were made during the middle of the summer, which seemed to escape the ravages of the disease, but it has proved very difficult to get a stand in midsummer. It is very evident that the 1924 crop will also be practically worthless and probably the only possible solution of the problem is by breeding and selection for disease resistance. It is planned to emphasize this phase of the work in the future.

Project 10.—*Cotton Variety Tests.*

Bulletin No. 141 on Cotton was published in January, 1924. This summarizes all the data obtained in variety tests for the years 1920 to 1923, inclusive. The results for 1923 are summarized in the following table:—

Variety.	Seed cotton yield per acre.	Lint.	Lint yield per acre.	500-lb. bales per acre.	Length of lint.
	Pounds.	Per cent.	Pounds.		Inches.
Acala	2,997	38.0	1,139	2.28	1 1-4
Triumph	2,523	40.9	1,032	2.06	.....
Durango	2,704	36.3	981	1.96	1 5-16
Kekchi	2,612	33.4	926	1.85	1 1-8
Lone Star	2,284	39.0	891	1.78	1 1-8
Durango 1	2,582	27.0	770	1.54	1 1-4
Durango 2	2,111	35.5	749	1.50	1 3-16
Meade	1,986	31.4	624	1.25	.....
Pima	1,489	34.0	506	1.01	1 3-4

Twenty-nine varieties were also tested in forty-six-foot rows in 1923. These made up a cooperative series sent out by the Bureau of Plant Industry of the United States Department of Agriculture. The three highest yielding varieties of this series were Triumph, Acala, and Durango. These twenty-nine varities are also being tested in short rows in 1924.

The cotton experimental work in 1924 has been expanded to include tests of delinting, topping, spacing, and different frequencies of irrigation. Only five varieties—Acala, Durango, Triumph, Mueck, and Kekchi—have been included in the regular plot testing of varieties this year.

Project 11.—*Alfalfa Variety Test.*

The results for the entire year of 1923 and for the first two cuttings of 1924 are given in the following table.

Variety.	1923.						1924.		
	1st cutting.	2nd cutting.	3rd cutting.	4th cutting.	5th cutting.	Total.	1st cutting.	2nd cutting.	Total—two cuttings.
Hairy Peruvian	2.01	1.81	1.76	1.22	.64	7.38	1.52	1.53	3.05
Common	1.15	1.37	1.38	1.10	.49	5.49	1.06	1.24	2.30
Grimm	1.22	1.24	1.24	.90	.30	4.90	.98	1.14	2.10
Turkestan	.95	.99	1.12	.90	.04	4.00	.81	1.07	1.88

The yields are in tons per acre.

Hairy Peruvian alfalfa continues to outyield the other varieties as in previous years. Common and Grimm seem to be approximately equal and Turkestan is shown to be the lowest yielding variety. It would seem that it has been definitely established that Hairy Peruvian is the best variety of alfalfa for the irrigated valleys of southern New Mexico.

Project 12.—Alfalfa Fertilizers.

A new project has been started this year with the idea of studying the effect upon yields of various amounts of phosphoric acid, sulphur, and manure on an old established field of alfalfa. During 1924, accurate measurements of irrigation water have been made and weights recorded by plats in an old established field. Before the 1925 growing season starts the fertilizers will be applied and disked in. The data for 1925 will then be compared with the yields and differences carefully noted.

Project 13.—Broom Corn.

Thirty-six one-hundredths of an acre of broom corn was planted on a field following wheat harvest and a yield of approximately 850 pounds per acre was obtained. This shows the practicability of growing the two crops on the same land the same year, at a very good profit.

SEED TESTING.

Seeds which are sent to the seed laboratory are tested without cost to the sender. During the year 373 samples of seed were tested in the laboratory. The results of the test are summarized in the following table:—

RESULTS OF SEED TESTS BY THE STATE SEED LABORATORY, 1923-1924.

Kind of seed	Number of samples tested.	Germination tests.		
		Highest.	Lowest.	Average.
		Per cent.	Per cent.	Per cent.
Cotton	114	95.5	7.0	61.1
Alfalfa	44	95.0	53.0	81.7
Corn	10	100.0	74.5	88.8
Kafir	32	99.5	66.0	89.0
Milo	14	97.5	38.5	80.9
Cane	17	96.0	35.5	73.0
Broom corn	11	96.5	62.5	81.0
Sudan grass	5	87.5	69.5	79.6
Wheat	16	100.0	48.5	91.5
Oats	13	99.0	21.0	76.5
Barley	5	100.0	28.5	79.0
Sweet clover	10	88.0	46.0	72.0
Grasses	17	....	....	....
Sweet corn	6	92.0	78.0	85.4
Miscellaneous	59	....	....	....
Total number	372			

DAIRY HUSBANDRY.

Project 1.—Milk Goat Improvement.

The work of improvement of native goats in milk production by using purebred Toggenburg bucks is being continued. There are now 20 half blood, nine three-quarter blood and two seven-eighths blood does that are milking. The buck that is now being used is Rosemont's Angelus No. 13201 A. M. G. R. A. His dam has a milk production record under official test of 3265.7 lbs. in twelve months. His granddam has a record of 4350 lbs. in twelve months. A bulletin will be published next year, reporting the results of the work up to date.

Nineteen grade Toggenburg bucks from the experimental herd at the Station have been placed in native herds by county agents during the past two years. In the herds in which these bucks have been placed, no previous attempt whatever has been made to improve the breeding. It will not be possible to keep an accurate record of results in these herds but an attempt will be made through county agents to learn the general results of using these grade Toggenburg bucks.

Project 2.—Sweet Clover Pasture.

The sweet clover pasture work started two years ago was not successful, because of root rot in the clover, the second season. A new project was started the past spring, to attempt to determine what may be expected of sweet clover as a pasture.

The dairy department has conducted official tests for Advanced Registry in three purebred herds, during the past year, one Jersey and two Holstein. Advanced Registry tests have been completed during the past year on the following cows in the College herd:—

HOLSTEINS.			
Cow.	Age.	Milk.	Fat.
		Pounds	Pounds.
Ten-Month Division.			
Jane Tehee Pontiac N. M. A. C.	Jr. 2-year-old	12543.7	461.5
Seven-Day Division.			
Mechthilde Lyons DeKol	Mature	670.2	20.788
Tehee Segis Barbara N. M. A. C.	Sr. 3-year-old	462.3	20.462
Jane Tehee Pontiac N. M. A. C.	Jr. 3-year-old	520.0	17.042
Tehee Segis Hengerveld N. M. A. C.	3-year-old	388.9	15.233
Records of Merit.			
Tehee Pontiac DeKol N. M. A. C.	Sr. 2-year-old	321.8	11.057
Mechthilde Artis Pontiac, N. M. A. C.	Sr. 2-year-old	287.2	10.444
JERSEYS.			
365-Day Class.			
Mesa Oxford Sunbeam	Mature	7970	406.1

POULTRY HUSBANDRY

Project 1.—*Feeding.*

This test was completed on December 1, 1923. Feed stuffs of all kinds are high in price in most parts of the State and especially so at the Station. Because of this fact an experiment of a year's duration was run to determine the value of semi-solid buttermilk as a protein supplement when compared with feeds containing a high percentage of animal protein, such as tankage.

Pen A, the check pen, was fed a mash composed of 40 lbs. bran, 40 lbs. ground oats, 40 lbs. ground corn, and 30 lbs. Swift's 60% tankage. The scratch consisted of a mixture of two parts cracked corn, one part whole wheat, and one part barley, in amounts that could be cleaned up by the hens daily.

Three other pens, B, C, and D, were fed in various ways. Pen B was fed the same as A, but the hens were subjected to the use of electric lights from 4:30 A. M. until 7:30 A. M. each day during December and January. Pen C was fed like A except the hens were given all the semi-solid buttermilk they would consume and had no tankage in the mash fed them. Pen D received no mash but the birds were supplied with all the scratch and semi-solid buttermilk they would consume.

The results of this study were not published in bulletin form, it being thought best to supplement the data with another experiment of like character. However, Table 1 shows the results obtained.

TABLE 1.

Pen.	Feed.	Average cost of feed per bird.	Average value of eggs per bird.	Average return per bird.*
A (Check pen)	Mash Scratch	$1.85	$2.30	$0.45
B	Mash Scratch (Subjected to electric lights)	2.52	3.29	0.77
C	Mash with no tankage Scratch Milk	2.40	3.31	0.91
D	Scratch Milk	1.74	2.97	1.23

*Value of eggs minus cost of feed.

The conclusions that can be drawn from this study are as follows:—

1. The use of electric lights materially increased production during the winter months, but not enough to make their use profitable in this section, due to the fact that the kilowatt-hour rate for electricity is exceedingly high.

2. Hens receiving no mash, but fed all the scratch and milk they would consume, as Pen D, made the greatest net profit even though their production was not the highest.

3. The cost of feed per bird for hens getting milk and mash without tankage was relatively high, but the production was likewise high, especially during the period of high egg prices; making the net return twice as much as with the hens receiving tankage in the mash but no milk.

4. Hens compelled to use milk for the major portion of the protein supplement molted earlier in the season than those receiving tankage.

Project 2.—Breeding.

The work done in this project with Barred Plymouth Rocks and White Wyandottes was completed, with unlike results to report for the different breeds.

A Barred Plymouth Rock male used in breeding up the flock was a typey bird and had a fair production record. The White

Wyandotte male had good type and came from a line of relatively high production stock.

The work with the Barred Rocks was disappointing, due to the fact that the male bird used seemed to have little desirable influence on his offspring. His good color did have some influence but birds below standard weight and of mediocre type resulted from his use.

The White Wyandottes, due to the fact, possibly, that more desirable females were used with the good male, showed appreciable improvement. Not only was the production standard raised but a pen of four pullets and one cockerel won sweepstakes prize as best pen at the local poultry show.

Project 3.—Incubation.

The common belief of the people of the State that chicks could be hatched profitably at any time of year was the basis of an experiment to ascertain whether the time of year that chicks are hatched has any bearing on the laying ability of the pullets. Two hatches per month are being taken off.

Breeding Stock. With but few exceptions, females in their second year's production are being used for this experiment and are mated with high vitality males that come from high production stock.

Incubation. Two hundred and forty-egg capacity Queen incubators are being used. The amount of fuel required for every hatch is being recorded.

Results. The experiment has been of too short duration to report results at this time; however, it has been found that the amount of moisture in the egg chamber is an important factor in artificial incubation in the Southwest.

Project 4.—Brooding Experiment.

The purpose of the experiment as planned was to check results secured through natural and artificial incubation, but on account of lack of equipment the project was discontinued.

An experiment run on a small scale indicated that chicks fed cornbread and milk for the first ten days of brooding made much more rapid and a more thrifty growth than the ones fed on a commercial mash distributed in this section. All indications point to the fact that the commercial mash was too high in protein for the

best growth of baby chicks. The mash contained a high percentage of both meat scrap and dried buttermilk.

MISCELLANEOUS.

More or less trouble is encountered in southern New Mexico with heavy hens getting on the nest and dying as a result of the heat. A semimonitor colony house capable of housing sixty hens was constructed. It is twelve feet wide and eighteen feet long, and has a large door on the back which can be opened to permit a free circulation of air. This arrangement, combined with well aerated nests, removed the cause of death among the heavy hens during the hot summer months.

REPORT OF THE ACCOUNTANT.

I have the honor to submit the following report of receipts and disbursements from Federal and State funds of the New Mexico Agricultural Experiment Station for the fiscal year ending June 30, 1924.

RECEIPTS.

Dr.

	Hatch Fund.	Adams Fund.	Hatch Supplementary Fund.	State Station Fund.
Balance on hand July 1, 1923	None	None	14870.99	7327.65
By appropriation from United States Treasury	15000.00	15000.00		
Receipts from State Treasury				7500.00
Receipts from farm sales			19453.70	
	15000.00	15000.00	26324.69	14827.65

EXPENDITURES.

Cr.

Salaries	7483.49	9162.60	3815.00	3183.77
Labor	2808.28	2335.62	1784.53	897.32
Stationery and office supplies	96.14	151.50	5.90	32.24
Scientific supplies	136.02	1293.02	14.75	3.29
Feeding stuffs	484.97	.....	2348.35	85.43
Sundry supplies	267.24	214.46	181.06	43.32
Fertilizers	150.30	73.44	89.65	21.60
Communication services	95.88	27.48	54.85	214.20
Traveling expenses	298.02	.....	329.69	77.37
Transportation of things	94.20	372.68	57.20	65.26
Publications	1723.12	.....	8.79	75.50
Heat, light, water and power	205.74	188.61	71.05	68.51
Furniture and fixtures	19.65	23.80	16.12	10.80
Library	.....	7.50	6.75	14.35
Scientific equipment		258.20		
Livestock	153.60	120.00	1372.45	
Tools, machinery, etc.	721.21	682.26	181.06	79.51
Buildings and lands	422.42	86.73	64.66	3121.82
Contingent expenses			40	4.33
Balance	None	None	14972.73	6838.43
	15000.00	15000.00	26324.79	14827.65

RESPECTFULLY SUBMITTED,

VENSON GLENN,

Accountant.