FORTY-SIXTH ANNUAL REPORT

AGRICULTURAL EXPERIMENT STATION

of the

NEW MEXICO COLLEGE OF AGRICULTURE AND MECHANIC ARTS

State College, N. M.
1934-1935

NEW MEXICO AGRICULTURAL EXPERIMENT STATION

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4. Bureau of Plant Industry, United States Department of Agriculture.

LETTER OF TRANSMITTAL

To His Excellency, Clyde Tingley,
Governor of New Mexico.

Sir: Pursuant to the Act of Congress approved March 2, 1887, establishing Agricultural Experiment Stations, I have the honor to transmit to you herewith the forty-sixth annual report of the Agricultural Experiment Station of the New Mexico College of Agriculture and Mechanic Arts for the fiscal year ended June 30, 1935.

Respectfully submitted,

FABIAN GARCIA, Director.

State College, New Mexico, December 1, 1935.

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INTRODUCTION

The New Mexico Agricultural Experiment Station has continued its investigational work and has furnished data and helpful information to the farmers, stockmen, agricultural teachers, and many others who are interested in agricultural problems. It has continued to cooperate with the local, State, and Federal organizations in various agricultural activities, by providing helpful data. Organizations with which the Station has been cooperating are the Civil Works Administration, the Emergency Relief, Rural Rehabilitation, Agricultural Adjustment Administration, Soil Conservation Service, and the State Planning Board. Because of considerable time having been given by the Station to this agricultural adjustment work, it has been necessary in a few instances partially to suspend some of the activities in a few of the projects.

Although New Mexico has been going through a very severe drouth, the Experiment Station work, with the exception of some of the projects in the dry-farming areas, has not suffered. No doubt owing to the prolonged drouth, the Station was called upon more than ever for information.

Much stress and effort were put on the national cooperative project referred to in the first paragraph under "Cooperative Work." Many data were secured on this new project.

COOPERATIVE WORK

The New Mexico Agricultural Experiment Station is cooperating with the experiment stations of the eleven Western States, the National Agricultural Adjustment Administration, and the Bureau of Agricultural Economics of the United States Department of Agriculture on a project entitled "A Study of Adjustments in Farming by Regions and Type-of-Farming Areas, from the Standpoint of Agricultural Adjustment and Planning, including Soil Conservation." This is a very comprehensive study and has involved a number of departments of the Station, principally the departments of Agricultural Economics, Animal Husbandry, Agronomy, and Irrigation. Because of the importance of this cooperative project it was necessary to suspend, partially or temporarily, some of the activities on a few of the other projects of these departments.

A project was started in the spring of 1935 in cooperation with the Extension Service for the purpose of studying the plant *Peganum harmala*, primarily to determine whether or not it has a toxic effect when eaten by livestock.

The Agronomy Department has continued its cooperation with the Bureau of Plant Industry in the sugar-beet seed investigations, as well as in the acclimatization and cotton breeding test conducted by the Office of Cotton, Rubber, and other Tropical Plants. Cooperation with the Bureau of Agricultural Economics on cotton grade and staple estimates and primary market studies has also been continued.

The Horticultural Department has continued to cooperate with members of the Pure Seed Association and with the Extension Service in testing different varieties of potatoes and in determining the effect of different commercial fertilizers on the yield of potatoes.

The Department of Agricultural Economics has been cooperating with a large number of farmers in making a study of the cost of marketing New Mexico fruits and vegetables, in market outlet studies of the Middle Rio Grande Conservancy District, and on farm organization and management in pump irrigation districts. This Department has also been cooperating with the Bureau of Agricultural Economics, United States Department of Agriculture, in a study of farm real estate tax delinquencies, farm land values, and mortgage foreclosures.

The Department of Biology assisted the Extension Horticulturist as in previous years in the control of the grasshopper infestation in the northern part of the State.

The Experiment Station continues to cooperate with the Division of Dry-Land Agriculture, Bureau of Plant Industry, in making studies of different dry-land crops and grasses. The Bureau of Chemistry and Soils, United States Department of Agriculture, has very kindly cooperated in testing soil samples in the project on "Effects of Irrigation on Soil Profiles" now being conducted by the Chemistry Department.

INVESTIGATIONS COMPLETED

During the year the Station published the Forty-Fifth Annual Report, in which were discussed results obtained on practically all projects. Eight regular bulletins were published, giving results from projects that were completed. There were also thirty-eight press bulletins issued, containing timely information based on results of experimental work.

The Agronomy Department published in Bulletin 225 results of a study on quality of cotton produced in New Mexico from 1928 to 1932. It also published in Bulletin 229 results of a variety test of spring grains for irrigated areas of southern New Mexico.

The Animal Husbandry Department issued an emergency bulletin, No. 227, entitled "Emergency Feeding of Livestock."

Bulletin No. 230, containing the results of the project on "The Protein and Moisture Content of Wheat Grown in New Mexico," was issued by the Chemistry Department, on completion of the work on this project.

The Home Economics Research Department completed the investigation on palatability of New Mexico Pinto beans and the results were published in Bulletin 231. Bulletin 232 was also issued, on the "Vitamin B Content of Raw Pinto Beans."

The Dairy Department completed Purnell Project XXXI, on "The Effect of Cottonseed Meal and Alfalfa Rations on the Growth, Vigor, Breeding, and Lactation of Dairy Heifers," and the data were included in Bulletin 226. Work on the goat improvement project was also completed and the data published in Bulletin 229.

NEW INVESTIGATIONS

In the spring of 1935 a new project was started in the Animal Husbandry Department, in cooperation with the Extension Service, for the purpose of studying the plant *Peganum harmala* to determine the extent to which it is consumed by livestock and whether or not it has a toxic effect. This is an exotic plant that was introduced about eighteen or twenty years ago into one of the southwestern range areas of the State.

Purnell Project XXXVI, "Improvement of the Pinto Bean for Uniformity of Maturity and Color, for Earliness, and for Rust Resistance," was started in the Department of Agronomy.

On April 1, 1935, the Experiment Station began work on the new cooperative regional Purnell Project XXXVII, entitled "A Study of Adjustments in Farming by Regions and Type-of-Farming Areas from the Standpoint of Agricultural Adjustment and Planning, including Soil Conservation." The leadership of this project was placed in the Department of Agricultural Economics.

During the spring of 1935 two new pumping plants were installed, one on the Horticultural farm and one for the use of the Agronomy Department.

CHANGES IN STATION STAFF

P. W. Cockerill was appointed economist September 1, 1934, to succeed A. L. Walker, who resigned July 1, 1934, and accepted the position of economist with the Rhode Island Agricultural College.

W. B. Morrow, B. S. A., New Mexico College of Agriculture and Mechanic Arts, was appointed assistant in agronomy September 1, 1934. Glen Staten, M. S., Oklahoma A. and M. College, was appointed January 21, 1935, assistant agronomist, vice W. T. Conway, who resigned to take up commercial farming.

R. P. Callaway, M. S., University of Missouri, was appointed assistant economist October 1, 1934.

J. L. Lantow, Animal Husbandman, was granted leave of absence February 11, 1935, in order that he might be released for Soil Erosion work at Safford, Arizona.

C. L. Englehorn resigned as assistant agronomist in charge of soils to accept a position with the Soil Erosion Service in South Dakota. His resignation became effective July 1, 1935.

PUBLICATIONS

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

Annual Report for the Fiscal Year Ended June 30, 1934.

REGULAR BULLETINS

Number

225 Quality of Cotton Produced in New Mexico, 1928-1932.—J. R. Kennedy and J. C. Overpeck.

226 Cottonseed Meal as the Principal Source of Protein for Dairy Animals.—O. C. Cunningham and L. H. Addington.

227 Emergency Feeding of Livestock.—J. L. Lantow and O. C. Cunningham.
228 Varieties of Spring Grains for Irrigated Areas of Southern New Mexico.—J. C. Overpeck.
229 Milk Goat Breeding.—L. H. Addington and O. C. Cunningham.
230 The Protein and Moisture Content of Wheat Grown in New Mexico.—C. W. Botkin.
231 Pinto Beans: Their Preparation and Palatability.—Mary L. Greenwood.
232 The Vitamin B Content of Raw Pinto Beans.—Mary L. Greenwood.

PRESS BULLETINS

729 Controlling the Fall Webworm.—J. R. Eyer.
730 The Importance of Chemical Analyses in Determining Calcium and Phosphorus Deficiencies in Range Forage Plants.—W. E. Watkins.
731 Spray Residue on Fruits and Vegetables.—C. W. Botkin.
732 Preparation of Some Emergency Stock Feeds, 1934.—W. E. Watkins.
733 Native Plants of New Mexico. Part I.—Mary Orr.
734 Native Plants of New Mexico. Part II.—Mary Orr.
735 Irish Potato Fertilizer Experiments at Virden, New Mexico, 1934.—H. C. Stewart and C. L. Englehorn.
736 Experiments with Flowering Bulbs.—A. B. Fite.
737 Irish Potato Experiments at Deming, New Mexico, 1934.—H. C. Stewart and C. L. Englehorn.
738 The Trend in Apple Tree Planting in New Mexico, with Special Reference to San Juan County.—P. W. Cockerill.
739 Breeding Cotton for Fiber Uniformity.—G. N. Stroman.
740 Results from the Potato Experimental Plots at Bluewater, New Mexico, for 1934.—Fabian Garcia and S. C. Young.
741 Controlling Root Borers and Woolly Aphis in Apple Orchards.—J. R. Eyer.
742 Preliminary Report on the Farm Organization and Management Study in the Pump Irrigation Districts of New Mexico.—P. W. Cockerill.
743 Important Factors Affecting the Market Qualities of New Mexico Eggs.—L. N. Berry.
744 Pecan Varieties for the Southern Irrigated Valleys of New Mexico.—A. B. Fite and H. C. Stewart.
745 Good Cotton with a Comparatively Small Amount of Water.—A. S. Curry.
746 Evergreen Trees and Shrubs.—A. B. Fite.
747 Alkali Determinations Made on Estancia Valley Soils and Waters.—C. W. Botkin, C. L. Englehorn, and C. P. Wilson.
748 The Irish Cobbler Potato.—Fabian Garcia.
749 Some of the New Roses and their Culture.—A. B. Fite.

750 San Jose Scale Control for 1935.—J. R. Eyer.
751 Rodents and Range Reseeding.—C. P. Wilson.
752 Soybeans in New Mexico.—J. C. Overpeck.
753 Preparation of Land for the Reseeding of Ranges.—C. P. Wilson.
754 Methods of Cooking Pinto Beans. (604 Revised).—Mary L. Greenwood.
755 Hard Water Methods of Cooking Pinto Beans. (605 Revised).—Mary L. Greenwood.
756 Subject Index for Annual Reports, Bulletins, and Press Bulletins.—C. P. Wilson.
757 Effects of Irrigation Agriculture on Soils.—C. W. Botkin.
758 Native Shrubs for Range Improvement.—F. A. Armijo.
759 The Economic Importance of the Grade and Staple Length of New Mexico Cotton.—James R. Kennedy.
760 Arroyo Flow in the Vicinity of State College, New Mexico.—C. P. Wilson.
761 Germination of Southwestern Range Forage Plant Seeds.—C. P. Wilson.
762 Relation of Yield and Cost of Producing Irish Potatoes to Soil Characteristics and to Soil Improvement Practices on 29 Farms in the Deming, Portales, and Virden, New Mexico, Areas.—R. P. Callaway and C. L. Englehorn.
763 The National and State Research Program on Cotton.—G. N. Stroman.
764 The False Chinch Bug.—J. R. Eyer.
765 Fowl Pox.—L. N. Berry.
766 The Use of Fly Poison In and Around Dairy Barns.—L. H. Addington.

RADIO TALKS BY MEMBERS OF THE STATION STAFF

March 1. Reserve Energy and Its Importance.—J. L. Lantow.
March 19. Some Useful Evergreen Trees and Shrubs for New Mexico.—A. B. Fite.
April 11. Soybeans for New Mexico.—J. C. Overpeck.
April 29. A Discussion of Egg Marketing Problems. Part I.—L. N. Berry.
May 6. A Discussion of Egg Marketing Problems. Part II.—L. N. Berry.
May 13. A Discussion of Egg Marketing Problems. Part III.—L. N. Berry.
May 28. The National and State Cotton Research Program.—G. N. Stroman.
May 30. Germination of Seeds of New Mexico Range Forage Plants.—C. P. Wilson.

SCIENTIFIC ARTICLES BY MEMBERS OF THE STATION STAFF

Stroman, G. N. "Breeding for Fiber Length Regularity in Cotton" *J. Amer. Soc. Agron.* 26:1004-1012. 1934.

———, Taubenhaus, J. J., and Ezekiel, Walter N. "Some Effects of Phymatotrichum Root Rot on the Microscopic Characters of Cotton Fibers" *Phytopathology* 25:126-130. 1935.

——— "Genetic Relations of Three Genes for Anther Color in Cotton" *J. Amer. Soc. Agron.* 27:208-215. 1935.

——— "Procedure for Rapid Calculation of Multiple Correlation Coefficients" *J. Agr. Res.* 50:59-69. 1935.

AGRICULTURAL ECONOMICS

The work of the Agricultural Economics Department has been concerned during the current year with six research projects. These projects deal with the general subjects of taxation, farm organization, cost, marketing, and regional adjustment problems. The latter subject occupied practically the whole time of the Department staff during the last three months of the fiscal year.

Data have been collected or analyzed by the Department in connection with the following specific projects:

Project XXXVII.—A Study of Adjustment in Farming by Regions and Type-of-Farming Areas from the Standpoint of Agricultural Adjustment and Planning, Including Soil Conservation.

(In cooperation with the Agricultural Adjustment Administration and the Bureau of Agricultural Economics.)

This was a six months' project, in which the other departments of the Experiment Station were also official cooperators. There were many individuals and organizations who cooperated unofficially, including the Division of Crops and Livestock Estimates, Forest Service, and the State Planning Board. The cooperation of farmers, business men, and other interested persons was enlisted to aid in giving necessary information.

This project was inaugurated by the Agricultural Adjustment Administration for the purpose of obtaining additional information which would enable it to make adjustments in agricultural production in such a manner as to conform more closely to efficient farm management principles, to maintain soil fertility, and control erosion.

The Agricultural Economics Department was made responsible for the completion of the project but practically all departments of the Experiment Station contributed liberally to the work.

Only the preliminary work on the project was completed during April, May, and June of this year. The work in this Department consisted of assembling available data for the purpose of making a division of the State into areas with common farm organization and production problems. These areas are to be considered separately as to the best adjustments for the conservation of the natural resources. Data relating to crop acreage, production, and yields, together with numbers of livestock for each type area, have been assembled. Typical farm organizations have been set up for each area from census and other available sources.

The data referred to above are to be used as a basis from which adjustments are to be made. The trend data also show what has taken place

in the past when little consideration was given to future productivity of the farm land and range areas.

This project may be considered a part of the broad conservation movement which seeks to bring about management of natural resources in such a way that their usefulness may be preserved.

Project XXVII.—A Study of Farm Organization and Management in the Pump Irrigation Districts of New Mexico.

This project has been in progress for two years. The purpose is to study the farm organization and costs in the three pump irrigation areas in New Mexico, which are located in Luna, Roosevelt, and Lea counties. Two visits were made during the year to the farms of the cooperators—one visit in the summer months to aid with the farm accounts and observe farm practices, and one in the winter for the purpose of summarizing the year's work. It is contemplated that this project will continue for at least one more year. It is expected that the final results will explain much of the variation in farm incomes and costs, particularly pumping costs, as between farms, and point to desirable adjustments in these areas.

A publication in the form of a mimeographed press bulletin (No. 742), summarizing the 1933 records, was issued during the year. This bulletin contained some of the main facts of interest with regard to the farms of each area. To show the importance of pumping costs in the operation of a farm in these areas, the average cost of pumping, together with the cost for each crop in the Luna County area, is shown in Table 1. Practically all the pumps in this area are powered with electric motors and those studied pump from an average depth, including drawdown, of approximately 69 feet. The total cost includes depreciation and repairs on the well, depreciation, repairs, and interest on investment in connection with the pump and motor, and the sums paid for power and lubricating oil for operating the pump and engine.

TABLE 1.—COST OF PUMPING FOR IRRIGATING THE PRINCIPAL CROPS IN THE DEMING AREA OF NEW MEXICO, 1933.

Crops	Number of records	Average number of irrigations	Cost per acre	
			Total	Power and lubricating oil
Average of all crops			$8.70	$6.29
Corn	15	4.6	10.25	7.69
Hegari	20	3.8	6.07	4.55
Alfalfa	8	13.5	27.59	20.69
Irish Potatoes (early)	18	8.2	14.70	11.02
Irish Potatoes (late)	7	3.8	11.97	8.98
Tomatoes	10	10.3	15.66	11.75
Beans	22	4.4	6.69	5.02

Project XIII.—Cost of Producing and Marketing New Mexico Fruits and Vegetables.

Studies during the year in connection with this project were carried on in 15 areas in the State and 188 production and marketing records involving 2120 acres of fruits and vegetables were obtained.

The following table shows the average acre yields and costs per acre on the farms studied in connection with the principal fruits and vegetables in the several areas for 1934:

TABLE 2.—YIELD AND TOTAL COST PER ACRE OF GROWING AND HARVESTING THE PRINCIPAL FRUITS AND VEGETABLES IN NEW MEXICO FOR THE 1934 CROP YEAR

Area	Apples		Irish potatoes		Sweet potatoes		Onions		Tomatoes	
	Yield	Cost per acre	Yield	Cost per acre	Yield	Cost per acre	Yield	Cost per acre	Yield	Cost per acre
	Bu.	$	Cwt.	$	Bu.	$	Cwt.	$	Tons	$
Cliff and Gila			95.6	46.77						
Deming			92.2	65.64					4.5	45.36
Espanola	236	38.30								
Ft. Sumner	52	52.68			248	45.17				
Roswell	231	49.32								
Portales			29.9	42.98	177	48.30			2.9	38.90
Ruidoso	176	35.47								
San Juan	249	53.66								
Tres Piedras			3.0	19.64						
Virden Valley			81.3	61.46			164	59.97		
Cuba			7.1	14.79						
Mesilla Valley	223	43.21					236	87.46		
Hatch									6.3	41.42

Soil samples were collected as in the previous years from fields upon which records of Irish potato and sweet potato production were secured. The physical characteristics and organic matter content of these soils have been determined by the Agronomy Department, and the data obtained will be used in helping to determine the effect of soil characteristics on the yield per acre of potatoes. Press Bulletin No. 762 was issued in April, dealing with the relation of yield and cost of producing Irish potatoes to soil characteristics and soil improvement practices. The data were based on records obtained in 1933 from 29 farms located in three irrigated potato producing areas in southern New Mexico.

Marketing records were obtained at the same time that the production records were taken. Complete information as to the disposition of the crop was obtained, including the methods of selling, destination, costs of selling, grades, and prices for each grade.

The following table shows one application of the marketing information secured. In this table a comparison is made between the prices received in 1934 by producers in San Juan County for four varieties of apples. A comparison is also made between the prices received for apples that were sold graded and packed, and those sold in bulk with the culls taken out.

TABLE 3.—PRICES RECEIVED PER BUSHEL IN 1934 BY PRODUCERS IN SAN JUAN COUNTY, NEW MEXICO, FOR FOUR VARIETIES OF APPLES WHEN SOLD GRADED AND PACKED, COMPARED WITH PRICES RECEIVED FOR THOSE SOLD IN BULK, TREE RUN, WITH CULLS OUT.

Grade	Rome Beauty	Jonathan	Grimes Golden	Winesap
	Cents	Cents	Cents	Cents
Combination, graded, packed	76	52	55	58
Tree run, culls out, bulk	45	40	41	55

The prices shown are those received by producers after the expense of picking, sorting, and packing, and the cost of the container have been deducted.

Project XXXII.—A Study of Farm Real Estate Tax Delinquency, Farm Land Values, and Mortgage Foreclosures.

(In cooperation with the United States Department of Agriculture and the Civil Works Administration.)

Tax data collected in 29 counties for the years 1928 to 1933, inclusive, are being analyzed with the intent of showing the extent of farm tax delinquency and comparing it with that of other property. Comparisons are also being made of farm tax delinquency in different types of farming areas and as between different types of land within an area.

The following preliminary table shows, for 8 counties, a comparison of the total acreage and the percent of the total acreage that was tax delinquent on farm land and grazing land:

TABLE 4.—COMPARISON OF TAX DELINQUENCY ON AGRICULTURAL AND GRAZING LAND IN EIGHT NEW MEXICO COUNTIES FOR THE YEAR 1932

Type of land	Assessed acreage	Acreage delinquent on 1932 levy	Percent delinquent
Agricultural land	291,226	144,130	49.5
Grazing land	7,729,505	1,520,503	19.6
Total	8,020,731	1,664,823	20.7

It is the plan to issue a publication on this project during the next fiscal year.

Project XXIX.—A Study of the Farm Real Estate Tax Index in New Mexico.

Calculations of a farm real estate tax index for the years from 1913 to 1933, based on the year 1913, have been made for the State and for most of the counties. Work was discontinued on this project after February, because of the emergency nature of Project XXXVII.

Project XX.—Farm Organization and Related Market Outlet Study in the Middle Rio Grande Conservancy District.

The farm organization phase of this project was brought to a close in 1933 with the publishing of Experiment Station Bulletin No. 215. The active phase is concerned with the marketing of the Middle Rio Grande products. No additional data have been gathered during this year. The work on this project has been in connection with additional analysis of the information which concerns the supplying of the local market and of meeting outside competition. This work was done in response to requests from the Chamber of Commerce at Albuquerque and the Extension Service of the College.

AGRONOMY

The Experiment Station took over the new farm, which was mentioned in last year's report, about January 1, 1935. Since that time, more than a hundred trees which would be a hindrance to experimental work have been removed. Over 5000 feet of new ditches have been constructed, and about the same length of alleys or roadways have been laid out so that a uniform size of experimental plot would be established all over the farm. Over 2000 feet of old ditches were straightened and repaired, and nearly 1500 feet of old ditches were abandoned and leveled, because of locations

which would interfere with the laying out of experimental plots of the proper size.

A complete new roof has been laid on the main building, which is to be used for storage and laboratory space, and an old useless poultry building has been removed. An old windmill and water tower have also been removed and a new automatic electric pressure water system installed, which will furnish an adequate supply of water for all stock and laboratory needs and for small nursery plantings.

Plans have been made for the development of a new cotton research laboratory and a sugar-beet research laboratory, to be constructed within the next few months, which will include concrete floors and complete new water and electrical connections.

Almost half of the 61 acres of the farm have not yet been leveled to make the land suitable for agronomic experiments, but it is hoped that much of this work can be completed during the coming year, so that the Agronomy Department will then be better prepared than ever before to investigate many new problems; especially those pertaining to soil fertility and soil management, crop rotations, and many other kinds of work for which there is a demand.

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

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

As a result of the investigations in sugar-beet seed production by this Experiment Station, a new industry has been established in southern New Mexico, and in 1934 there was a production of nearly 1,000,000 pounds of seed in the Mesilla Valley. This was shipped to sugar-beet growing areas of Colorado, Utah, Idaho, and California. The value of this seed crop is estimated at from $75,000 to $100,000.

Approximately 1000 acres of the crop were planted in the fall of 1934 for harvest in 1935, but unfortunately an unexpected infestation of the curly-top disease, which attacked the fields early, will result in a greatly reduced yield in 1935.

The Experiment Station has rather definitely solved the problems of the date, rate, and method of planting, and regarding irrigating, harvesting and threshing. During the past year the research work has been devoted to problems of fertilization. It was shown that applications of 10 to 15 tons of manure to the acre are quite necessary, and the value of spring applications of nitrogenous fertilizers has been demonstrated quite definitely. The highest yield of seed was obtained in one series of plantings from an application of 100 pounds of 45 percent superphosphate and 15 tons of manure to the acre at planting time, followed by two applications of ammonium sulfate of 100 pounds each in March and April. It was found that in applying ammonium sulfate, the heaviest yield was obtained from the March application, which resulted in a production approximately 300 pounds to the acre greater than from the April application. Further tests in 1935 are being made with various applications of manure com-

bined with ammonium sulfate, sodium nitrate, and calcium cyanamid. Seed of select strains is also being increased in seven isolated fields, to prevent cross pollination.

An observation of the fields just before harvest would indicate for the first time that sodium nitrate has caused a greater vegetative growth, but whether or not it has increased the yield or improved the quality of the seed cannot be determined until the threshing is completed.

The 1934-35 sugar beet seed production experiments also include investigations of the source of the plant nutrients used, in that comparisons are being made between applications of 45% superphosphate and applications of Ammophos together with ammonium sulfate, calcium cyanamid, and sodium nitrate applied partly in the fall at planting time and partly in March, which past experiments seem to indicate is the best time for spring applications.

Project 2.—Variety Tests of Cereals.

Bulletin No. 228 of this Experiment Station, entitled "Varieties of Spring Grains for Irrigated Areas of Southern New Mexico," was published in May, 1935. This recorded the results of the variety tests for the ten-year period 1925-1934.

In the 1934 tests of spring grains, there were included five varieties of wheat, two of oats, and five of barley. The highest yield of wheat was obtained from the Soft Federation, which yielded 37.3 bushels to the acre; followed closely by Sonora, with a production of 36.8 bushels to the acre. Sonora has almost always been the highest yielding wheat in the spring tests and is most often recommended for spring planting.

Of the two oats varieties, Ferguson No. 71 yielded 65.0 bushels to the acre and Ferguson No. 922, 64.4 bushels to the acre. It has been definitely established that the red oats are the preferable types to grow in this area.

The highest yield of barley was obtained from a new unnamed selection of smooth-awned barley which originated from three spikes selected from a plot of Club Mariout in 1931 by W. T. Conway, formerly assistant agronomist. This was the first year that there was sufficient seed for regular comparisons, and it outyielded Trebi, which was next highest, by 8.4 bushels to the acre, the yield being 68.7 bushels. This new variety will be properly identified and classified during the coming year. The results have shown that barley is a more productive crop than oats, so far as total yields of grain are concerned.

In the tests of fall grains harvested in 1934, there were included six varieties of wheat, three of barley, and three of oats. Tenmarq, with the yield of 43.9 bushels to the acre, was the highest, but this was only slightly higher than Kanred or Turkey Red, which are usually the highest yielding. The greatest production of barley was from C. I. No. 4673, which yielded at the rate of 68.9 bushels to the acre. A plot of Texas Red No. 765 oats yielded 101.8 bushels to the acre.

Six varieties of wheat, five of barley, and four of oats are included in the 1935 tests of fall-sown varieties. Of the spring-sown varieties there

were included five of wheat, four of oats, and six of barley. It would seem that barley is becoming of increasing importance as a feed crop because of the relatively short season required to produce a crop and because of its yielding better than oats. More attention is therefore being given it and more varieties are being tested than in former years.

Project 4.—Variety Tests of Corn.

Ten varieties of corn were included in the tests in 1934. As usual, the highest production was from Mexican June, which yielded at the rate of 61.5 bushels to the acre. This was followed by Bloody Butcher, Ferguson's Yellow Dent, Surcropper, and Delta Prolific, as the five leading varieties. While there is considerable interest in the development of a high yielding variety of yellow corn, no variety has yet been found that compares with Mexican June in yield, either of grain or fodder or silage.

Eight varieties are included in the 1935 tests. It is always the policy to add new sorts which might be promising and drop those which have definitely shown that they are not suited to this area. Two of the 1935 varieties are being grown for the first time. An improvement program on a limited scale with Mexican June corn was begun in 1935. This involves the establishment of a number of selfed strains, for later use in hybridization work.

Project 6.—Johnson Grass Eradication.

Further use has been made during the year of a large weed burner which uses kerosene, but no definite recommendations regarding this method of eradication can yet be made based on the work done. It is doubtful, however, whether it will be found more economical to burn the weeds from ditches and fences instead of hoeing. The burner itself is very heavy, and it has been found that it requires about four men to operate. Undoubtedly, burning might be a better plan to keep ditches clean, because of the greater tendency to make ditches wider by hoeing than they should be; but as has been indicated, more experimentation will be necessary before definite recommendations can be made.

Project 9.—Curly-Top Investigations with Sugar Beets.

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

The 1934 investigations were confined to breeding work and agronomic tests of progenies showing curly-top resistance.

The breeding program for varieties resistant to curly-top was principally a matter of selection of roots of the F_3 generation of cultivated beets (*Beta vulgaris*) and the wild beet (*Beta maritima*).

The ultimate aim of such a cross is to recombine the resistance to curly-top of the wild beet with the desirable characters of the cultivated variety. One such recombination was selected and sufficient seed will be available by 1936 to test this line in the agronomic test.

A 12-foot Latin square agronomic evaluation test was conducted in 1934. Varieties included all U. S. No. 1 generations, a resistant variety developed by one of the large sugar companies and known as "600," and several varieties developed by the Bureau of Plant Industry. The out-

standing variety in this test was a reselection of U. S. No. 1 known as Accession 34, which is being used in large quantities by sugar companies in curly-top areas.

Project 10.—Cotton Investigations.

Eleven strains and varieties of cotton were included in the 1934 tests. The highest yielding strain was a selection of Acala, No. 1061, developed by this Station, which yielded 1203 pounds of lint to the acre. Of the eleven varieties or strains tested, the five highest yielding were strains of Acala. The sixth highest yield was from the Lightning Express, but the highest producing Acala outyielded this by about 260 pounds of lint to the acre. It is a conservative estimate that as a result of the tests and other work of this Experiment Station and the United States Department of Agriculture, ninety percent or more of the cotton grown in New Mexico is of the Acala variety.

A cotton fertilizer experiment is being conducted in which various commercial fertilizers and manure are compared on a field which has been planted continuously to cotton for six years. The 1934 results have again shown that no advantage in yield is obtained by the application of superphosphate. The highest yield, 1276 pounds of lint to the acre, was obtained from applications of 8 tons of manure to the acre. Ammonium sulfate alone at the rate of 150 pounds to the acre gave a yield of 38 pounds of lint to the acre more than the check plots, and a combination of superphosphate and ammonium sulfate increased the yield by 69 pounds of lint to the acre. The results are indicating quite clearly the importance of manure in maintaining the production when the crop is grown continuously on the same land.

In cotton topping experiments, as has been shown in previous years, there were no significant indications that topping was a paying practice. In comparing topping at three different dates, in no instance was the difference in yield as much as 100 pounds to the acre. In one instance the difference was slightly in favor of the topping, but in two others the untopped cotton gave higher yields.

Project 12.—Alfalfa Fertilizer Experiments.

In 1934 comparisons were made between various quantities of 45% superphosphate, the rates of application being 90, 135, 180, and 225 pounds to the acre, respectively. Applications on one series of plots were made annually, and on another series in alternate years. The gains from these respective applications over no treatment were 550 pounds, 838 pounds, 950 pounds, and 963 pounds of hay to the acre, respectively.

In considering the cost of the fertilizer, the greatest profit was realized from the application of 135 pounds to the acre; and as in previous years, it was evident that annual treatments gave heavier yields than biennial treatments.

Project 13.—Dates of Cutting Alfalfa.

It is being observed more and more in recent years, and is being called to the attention of the Experiment Station, that stands of alfalfa do not

last as long as they did in former times, and it is undoubtedly true that these observations are correct.

It has been thought that perhaps one of the contributing factors was that there is a tendency to cut the crop too frequently without permitting it to make sufficient growth to build up a strong root system to carry it over into future years; but it is now rather certain that one of the most important factors in shortening the length of life in alfalfa stands is the presence of bacterial wilt and root rot.

In 1934, cuttings were made at intervals of four, five, and six weeks. A slightly higher yield of hay was produced from four cuttings, but there was no significant difference in yield between five- and six-week intervals. The lowest total yield, however, was obtained from the most frequent cutting. While there was a slightly higher yield from four cuttings, the quality of hay was low because of the advanced stage of maturity, and the practice would not be recommended.

Project 15.—Legumes.

In 1934, two varieties of cowpeas, Brabham and Groit, and two of soybeans, Laredo and Mammoth Yellow, and mung beans were grown. As in previous years, the Brabham was shown to be the best forage producer, and the Groit the best in seed production. The Laredo soybean has rather consistently been an excellent hay producer; as in previous years, there seemed to be difficulty in getting a good stand of the Mammoth Yellow soybean. The mung beans show all indications of comparing very favorably with the Brabham cowpea or the Laredo soybean for soil improvement or for hay production.

In 1935, with added facilities at the new farm, this work has been expanded to include five varieties of cowpeas; and besides the forage tests for soybeans, there are included several types of vegetable soybeans.

In addition to the above, a series of plantings of sesbania has been made in 1935, in order to determine the best date and rate of planting this crop. Sesbania has received much publicity in recent years as a soil improvement crop, but information is lacking on these points. It is hoped that as a result of these plantings, definite recommendations may be furnished and further observations made as to the value of this crop for soil improvement work.

Project 16.—Forage Crops.

In 1934, plantings of various grain and sweet sorghums were made, in order to obtain green weights for yields of silage. There were included hegari, kafir, Grohoma, Atlas sorgo, Japanese cane, Orange cane, and Gooseneck sorgo. The Gooseneck sorgo yielded highest,—23.45 tons to the acre. This was followed by Japanese cane, which yielded 22.76 tons to the acre; Atlas sorgo, 15.2; and Orange cane, 14.64. This was the third year in which Gooseneck sorgo had given the highest production of silage.

In 1935, additional sorghums are being grown in the test, and there has also been included a test to determine the best date of planting hegari. Hegari is becoming increasingly popular as a forage crop, because

of the short season in which it will mature and since it can be used so extensively as an emergency crop after other crops are removed.

Project 18.—Cooperative Tests of Ladak Alfalfa for Drouth and Cold Resistance.

The 1934 season, because of the extreme drouth, was decidedly unfavorable to the plantings of alfalfa that had been made the previous year, and with so many changes in personnel of cooperators, no data were obtained from the various plantings.

It is expected that additional data will soon be obtained to determine further the ability of this variety to survive extreme drouth conditions and the severe winters of the northern counties.

Project 19.—Cooperative Potato Fertilizer Experiments.

Owing to the fact that there has been considerable interest in potato growing in several areas of New Mexico during the last few years, a series of fertilizer tests was planned in cooperation with the Extension Horticulturist. Data were obtained from tests in 1934 from experimental plantings near Deming and from other plantings in Hidalgo County near Virden, New Mexico.

On one of the plantings near Deming an application of superphosphate gave an increased yield of 1900 pounds to the acre. An application of 200 pounds of ammonium sulfate to the acre gave an increased yield of 2500 pounds; and the combination of the two increased the yield by 3740 pounds.

In another test at the same place the application of ammonium sulfate increased the yield by 123 pounds; superphosphate, by 653 pounds; and the two in combination gave an increased yield of 2027 pounds. An application of 100 pounds of potassium chloride actually resulted in a decrease in yield.

The results of these plantings would, therefore, indicate that a slight increase in yield may be obtained from the use of either ammonium sulfate or superphosphate alone, and a marked increase may be obtained when the two are used in combination.

With the same type of experiment near Virden an increased yield was also obtained from the use of ammonium sulfate alone, but with superphosphate alone there was a small decrease in total yield. A combination of the two resulted in a slightly higher yield than the use of ammonium sulfate alone. It was also noted at this place that applications of potassium chloride resulted in a decrease in yield.

The work is being carried on in a similar manner with the same types of treatments in 1935.

Project VIII.—Dry-Farming Investigations in Northeastern New Mexico.

Weather data, consisting of daily temperatures and precipitation, at the three experimental fields near Clayton, Capulin, and Mosquero have been recorded throughout the twelve-month period.

The precipitation was very much below normal throughout the year,

especially during the growing season, on all three fields, as shown in the following table:

Field	Total rainfall		Seasonal rainfall		Deficiency, 1934	
	7-year average, 1927 to 1933	1934	7-year average, 1927 to 1933	1934	Total	Seasonal
	Inches	Inches	Inches	Inches	Inches	Inches
Clayton	14.99	9.91*	10.97	8.33	5.08	2.64
Capulin	16.89	7.92	13.57	5.51	8.97	8.06
Mosquero	17.47	6.41	13.08	4.69	11.06	9.39

*A rain of 3.19 inches on the Clayton field August 31 increased the total moisture but did very little good, as it came too late and a large percentage of it was lost by runoff.

Temperatures were very much higher throughout the year than in any of the past seven years on record. At Clayton, the maximum and minimum temperatures were 106 and 6 degrees, respectively; Capulin, maximum 97, minimum —5; Mosquero, maximum 104, minimum 5.

At the Clayton field eight varieties of corn, eight of kafir, six of milo, and five varieties of forage sorghums were planted on May 28 and on June 5, 6, and 7, respectively. All plots came up to a good stand, only to be destroyed by excessively hot weather and high winds. Four varieties and six selections of beans were planted between strips of Sudan grass on June 12, but owing to the dry weather, very few of the beans came up. No yields were secured in the Clayton field during the year.

At the Capulin field the lack of moisture was so severe that stands in all plots were very poor. From March 1 to July 21 there was a total of 1.26 inches of rainfall. The largest rain of the season, 1.60 inches, occurred on August 31. All crops were a failure in this field.

At the Mosquero field, all spring crops were a failure because of the excessively dry weather conditions. In the winter wheat variety test, Blackhull yielded highest of five varieties. The yields were as follows: Blackhull, 2.36; Tenmarq, 2.26; Turkey, 2.06; Nebraska No. 60, 2.00; and Kanred, 1.60 bushels to the acre, respectively. There were only two months, May and August, during the year when the precipitation exceeded one inch.

Bean improvement work and all nursery work started in 1933 and 1934 are being continued in 1935.

Project XV.—Breeding Cotton of Uniform Quality for the Irrigated Areas of Southern New Mexico.

There were planted in the 1934 progeny test 338 progeny rows. Included in this number were about fifty rows planted to self topping progenies from the 550 strain. In addition to this, seed of two 1933 progenies was planted in an increase block and seed of another progeny, thought to be the third best row in the 1933 test, was planted in the variety test.

During the season the early flowering plants within the rows were self-pollinated, to insure selfed seed for each of the early rows and selfed seed of the early plants within other rows.

At harvest time about 2000 individual selections were taken from the block for laboratory analysis. The cotton from these individual plants was all ginned and records of the yield and lint characters obtained. The sorter

test was secured on the ones that were superior in regard to the yield characters before the planting list was concluded.

Nineteen hundred and thirty-four was a rather unusual season for cotton, owing to an early spring and a late fall. These conditions allowed all strains to mature their cotton fully. Therefore, in regard to earliness, and yield as affected by earliness, the progenies did not greatly exceed the checks, planted to College Acala. However, a majority of the progenies did significantly exceed the checks in yield.

The length of lint on all individual plant samples was determined by the El Paso office of the Division of Cotton Marketing, Bureau of Agricultural Economics, United States Department of Agriculture. In regard to the length of lint, except in a very few cases, all the progenies exceeded the standard variety checks. These differences were from a mean difference of ½ to ⅛ inch.

The seedling vigor test was carried on as usual and some improvement in this respect was noted. In the field there was very little difference in the progenies and the checks, as there were practically ideal conditions for obtaining stands of cotton in the spring.

The sorter tests were continued and very satisfactory results obtained from their use. The percentage of 1⅛-inch-plus fibers was not so high in some progenies as last year, which might have been caused by the nature of the season during the life of the cotton.

The 1061 family was planted in the variety test and led all varieties in pounds of seed cotton, as well as lint cotton, per acre, and led all Acala strains in length of lint.

The 1064 and 829 families which were grown in an increase block, when corrected to 100% stand, yielded 3.01 and 2.93 bales per acre, respectively. One complete bale of each was ginned. The length of lint in these two bales was 1 3/16-plus inches.

In 1935 a test of these two strains is being made at Socorro, Los Lunas, and Arrey. At State College the 1064 is in a test with other strains of Acala, and a further increase is being made for possible general distribution.

Project XXIV.—Cotton Grade and Staple Statistics.

(In cooperation with the Division of Cotton Marketing, Bureau of Agricultural Economics, United States Department of Agriculture.)

The investigations of the grade and staple of New Mexico cotton were continued as last year. Samples of cotton from each bale ginned at five gins, to represent as accurately as possible a cross section of the total production in New Mexico, were obtained and the grade and staple were determined by a senior specialist in cotton classing in the El Paso, Texas, office of the Division of Cotton Marketing. The cooperating gins were the Artesia Farmers' Gin Company of Artesia, the Otis Gin and Warehouse Company of Loving, the Bason Gin at Mesilla Park, the Chamberino Gin at Chamberino, and the Greenfield Gin Company at Dexter, New Mexico.

A total of 13,360 bales was ginned at these gins. Reports on the grade, staple, and tenderability of cotton ginned in the United States and

in the individual States were published five times during the ginning season, in which New Mexico cotton was included. At the end of the season a summary of the grade, staple, and tenderability was compiled and the information made available to ginners.

The most important features of the work of the past year were that copies of the classification sheets showing the grade, staple, and preparation of each bale ginned, together with the identifying gin number, were sent regularly to the gins and to the State cooperating agency. In addition, during October, November, and December, weekly reports on the grade, staple, and tenderability of the cotton ginned and classed were issued for each State. These last named features have been very valuable to farmers, ginners, cotton breeders, and to investigators doing research on cotton.

Project XXXVI.—Improvement of the Pinto Bean for Uniformity of Maturity and Color and for Earliness and Rust Resistance.

In 1934, plantings of select seed from several bean producing areas of New Mexico were made at State College and at Deming, for the purpose of bringing together in one or two places as many different types of beans as could be found for observation and selection of foundation stock.

Selections were then made from these plantings in the fall of 1934, and further selections of individual plants were obtained in all of the principal bean producing areas of New Mexico. These selections were made shortly before the regular harvest time, in order that observations might be made on earliness of maturity. Approximately three hundred individual plant selections were brought to the Experiment Station laboratory, where they were threshed and studied especially as to size and color markings. Of these, 163 were saved for plant-to-row tests in 1935, half of each sample to be planted near Clayton, New Mexico, and the other half on the Experiment Station farm.

In making the original selections in 1934, many different types were observed. Color markings varied from a plain uniformly mottled marking to crescent-shaped or striped markings; and several shades of brown color were noted, varying from a light brown to almost black. The crescent-shaped or striped markings are undesirable, since they affect the market price paid for the beans, in that the highest price is nearly always paid for beans showing the greatest uniformity of mottling. Other shades of color noted were pink and blue and, occasionally, beans were found that were almost white in color.

It is hoped that the 1935 crop will indicate whether or not these various color markings are inherited and that progress in improvement of the uniformity and quality of the beans may be made by further selection.

MISCELLANEOUS WORK

As in many years past, the Department of Agronomy has had supervision of the local weather station. During the past year the weather station has been designated as an Airways Observing Station by the United States Weather Bureau, and daily reports at certain stated hours are furnished the airports at Albuquerque, N. M., and El Paso, Texas.

The seed testing laboratory is also supervised by the Agronomy Department. More seed testing has been done during the past year than in any previous year, owing largely to the fact that various Federal agencies which have been supplying seeds in connection with relief measures, have been sending samples of the seeds for testing at this laboratory. Also in connection with the New Mexico Crop Improvement Association, as a part of the certification, germination tests are required and this work is expanding each year.

At the present time the Department of Agronomy is somewhat handicapped through lack of convenient laboratory and office space to take care of the various activities, and one of the urgent needs of the Department is the centralization of the soils, seed, and crops laboratories in one place. At present these various activities are located in five different buildings, some of which are half a mile to a mile apart.

ANIMAL HUSBANDRY

Project XVIII, revised.—*Comparative Supplemental Values of Monocalcium Phosphate; Dicalcium Phosphate, Anhydrous; and Finely Ground Bone Meal when Fed to Cattle on a Deficient Calcium and Phosphorus Range.*

This experiment has been in progress two full years. The first calf crop is on the ground now. The primary object was for a follow-up of the mineral experiment completed in 1933, the results of which were published in Bulletin No. 214 in 1933. The experiment completed in 1933 determined the need of mineral supplement for range cattle in this area. The object of the one now in progress is to ascertain which mineral compound—bone meal, which is a tricalcium phosphate; monocalcium phosphate; or dicalcium phosphate—will furnish the deficient minerals most efficiently. All of the above compounds are widely used and advertised.

The data to date show that the animal will get sufficient amounts of mineral from any of the three compounds. The difference seems to be mainly in consumption and the consumption appears to vary inversely with the percentage of phosphorus; that is, there is heavier consumption of bone meal, and it has a lower percentage of phosphorus. The next in consumption is dicalcium phosphate, which has a phosphorus percentage which falls between that of bone meal and monocalcium phosphate. The least consumption is of monocalcium phosphate, which has the highest percentage of phosphorus. In gains and percentage of calf crop, the bone meal lot is a little behind the other lots, but the difference is not large enough to be especially significant. The monocalcium and dicalcium lots are practically equal as to gains and percentage of calf crop.

The above results tend to show that all three supplements can be used to advantage and that so far as the health of the animal is concerned the monocalcium and dicalcium phosphates are equal, but that possibly bone meal is hardly so good. These results corroborate those found in the preceding experiment, that the animal tended to consume a uniform amount of phosphorus regardless of the form of the compound.

Project XXVIII.—A Study to Determine Whether or not Dicalcium Phosphate, when Fed to Sheep, Will Decrease the Death Loss of the Sheep on Pingue Areas; and of the Increase or Decrease of Pingue on Grazed and Protected Plots.

Two grazing seasons have been completed under this project and the third season is at present being entered upon. With the end of the present grazing season, about November 1, the project will be completed.

The objects were to study causes and cures for poisoning of sheep on pingue areas. To date there have been no deaths attributable to pingue poisoning. The mineral supplement which was fed to one lot cannot be said to be necessary or helpful in keeping the sheep from eating the weed, as there were no deaths in the lot in which no mineral was fed. It is believed that there were numerous causes for there being no deaths among the sheep; such as keeping them off the range in the spring until the grass has a start, not overstocking, and proper winter feeding. The experiment is not on a sufficiently extensive scale to permit of the testing of these theories.

A detailed report of the object and methods of carrying on this experiment was published in the forty-fifth annual report.

Project XXXV, revised.—The Importance of Alfalfa Hay in Different Proportions in Replacing Hegari Fodder for Fattening Lambs when Used with Shelled Corn and Cottonseed Meal.

One year of the feeding trial has been completed in this project. The object is to determine the feeding value of alfalfa hay and ground hegari fodder as roughages for fattening range lambs. These two roughages are used most extensively in the irrigated and dry-farming areas of the State. The yield in the irrigated districts is about the same and usually the price and cost of raising hegari is lower than that of alfalfa. A cheap supply of cottonseed meal is available, so alfalfa hay is not particularly needed for its high protein content. The above facts being true, the comparison can be made on a weight basis and the one that produces gain with the least amount of feed should be the most desirable to feed.

The first year's feeding trial indicates that both are about equal. However, alfalfa hay in combination with hegari was the best gain producer.

The lambs used were from a drouth area and were about 10 pounds light for good feeders. They were probably low in stored vitamin A and mineral. The alfalfa hay, having these two necessary nutrients, undoubtedly was the better for feeding this year. However, if the lambs had been of the proper size and had run on good, or the usual green range, the hegari might have made a better showing.

Project XXXVII.—A Study of Adjustments in Farming by Regions and Type-of-Farming Areas from the Standpoint of Agricultural Adjustment and Planning, Including Soil Conservation.

(In cooperation with the Agricultural Adjustment Administration and the Bureau of Agricultural Economics.)

Members of the Animal Husbandry staff of the Experiment Station collected and compiled the data relating to the range and livestock survey of this project. Since New Mexico has about 75,000,000 of her

78,401,920 acres in lands other than farming lands, the animal husbandry work for this project was very extensive. Data and maps were compiled to show vegetative cover of the past and the present, and recommended grazing areas, time required for vegetation and animal improvement to return the range to normal productive capacity, and the effect of drouth on livestock and vegetative cover.

Project R, modified.—*A Study of the Phosphorus and Calcium Content of the Important Livestock Grazing Forages in Different Sections of the State of New Mexico.*

This project began with the collection of 203 samples of range grasses and browse from different counties of New Mexico. The analyses of these samples have been completed and a summary of the results will be published in a preliminary report or press bulletin in the near future. The complete results will be published in a technical bulletin during the spring of 1936.

The work already completed indicates that there are areas similar to those reported in other parts of the Rocky Mountain region in which the calcium and phosphorus in the range grasses are low and in which some calcium or phosphorus mineral supplement should be fed to obtain the best results with livestock which are run on these ranges.

In June of 1934 the continuance of this project was approved. It was planned to obtain additional samples of the most important grasses during February of 1935. The collection was planned for that month in order to determine the amounts of calcium and phosphorus contained in them after they had been exposed to the wintering and leaching processes.

Between January 25 and April 8, 1935, collections were made of 226 grass samples from the different counties of New Mexico. These samples have been prepared for analysis and the determination of their calcium and phosphorus contents is well under way. These analyses will be completed early in 1936, so that the bulletin containing both parts of this project can be published before July 1, 1936.

It is believed that upon the completion of this work it will be possible to indicate areas in the State in which calcium and phosphorus are deficient in the range forage. Also, there will be data that may show a relationship between precipitation and the calcium and phosphorus contents of the range grasses.

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

The chamiza planted in 1932 in the experimental field a few miles north of Estancia survived the drouth of 1934 well and produced a good deal of seed, though the total precipitation during the year was only 5.95 inches. Good stands were obtained from the additional plantings of chamiza that were made in the Estancia Valley in 1934. Despite the drouth, a large crop of seed was produced by this saltbush in 1934. A considerable percentage of the young chamiza bushes on unirrigated hills at State College had died by the end of the fiscal year. However, this

shrub endured the unusually dry weather much better than any of the grasses; also somewhat better, apparently, than winter fat (*Eurotia lanata*).

Project U.—Factors Affecting the Germination and Growth of Winter Fat (Eurotia lanata) and Valota saccharata.

During the prolonged drouth which ended at State College August 29, 1935, about 90 percent of the winter fat bushes grown from seed planted in November, 1931, died; apparently from drouth. Those that survived, however, resumed growth early in September, and some of them produced considerable seed. A large percentage of the winter fat in the plots at State College that were planted in December 1930 and January 1931, and irrigated the first growing season, survived the drouth. In some of the plots, though, apparently on account of some soil condition, the mortality was high. Most of the winter fat that came up voluntarily near the plot that was planted in 1928 is still in good condition, although never irrigated.

By the end of the fiscal year, apparently all of the *Valota saccharata* that was grown at the College from seed planted in July 1928 was dead; as was a large percentage of the dropseed (*Sporobolus* spp.) and other grasses that were growing near the plot.

Project XVI.—A Study of the Adaptability of Blue Grama Grass (Bouteloua gracilis), Slender Wheat Grass (Agropyron tenerum), Crested Wheat Grass (A. cristatum), Smooth Brome Grass (Bromus inermis), and Ladak Alfalfa for Range Improvement in New Mexico.

Notwithstanding the fact that 1934 was the driest year on record at Estancia, New Mexico, with one or two exceptions a good stand of the species that were planted in rabbitproof exclosures in the Estancia Valley during that year was obtained. They did not come up until about the first of September, but the minimum temperatures during the fall were comparatively mild and there was little winter-killing. The spring of 1935 was also favorable for plant growth in that vicinity.

The blue grama grass grown from seed planted in 1932 was not damaged to any appreciable extent by the drouth of 1934, but a large percentage of the wheat grasses and brome grass from seed planted in adjacent plots at the same time died during the fiscal year.

The Ladak alfalfa in the experimental field north of Estancia survived the drouth much better than the Grimm, and almost as well as the blue grama grass. It has also withstood the depredations of rabbits somewhat better than the Grimm variety. There was not sufficient rain in either 1934 or 1935, however, to produce a cutting of either of these varieties. On digging out a few of the alfalfa plants in this field June 28 and 29, 1935, it was found that since the alfalfa came up the latter part of July 1932, the Ladak roots had gone into the soil 6½ or 7 feet deep, while the roots of the Grimm alfalfa in an adjacent plot had penetrated the soil only about 3 feet deep.

Three cuttings of hay were obtained in 1935 from the small plot of alfalfa approximately 7½ miles southwest of Estancia that was fenced

in June 1934. The plot has not been irrigated for at least four years, has received no runoff water, but the water table is only 12½ or 13 feet from the surface. The total yield for the year was 3560 pounds of hay to the acre.

Largely as a result of the experimental work that has been done under this project, there is at present considerable interest in the growing of alfalfa in the Estancia Valley; especially on some of the comparatively large area of land in that Valley which has the water table between about 4 and 15 or 16 feet of the surface.

Large quantities of chamiza, winter fat, and blue grama grass seed have been gathered or purchased by the Soil Conservation Service for use in erosion control work in the Southwest. There have also been many requests from employees of that Service and from stockmen for information on artificial reseeding. The Chief of Range Studies on one of the Soil Conservation projects wrote some time ago that the results obtained at this Station in the artificial reseeding of ranges would "not only save us trouble in getting under way, but will serve as a basis for further work."

MISCELLANEOUS

On June 7, 1935, seeds of the following species, received a week or two before from the Division of Plant Industry, Council for Scientific and Industrial Research, Canberra, F. C. T., Australia, were planted in a small plot in the northwest corner of the Mesa Plots exclosure at State College: *Atriplex halimoides, A. prostratum, A. vesicaria, Acacia aneura, Bassia sclerolaenoides, Kochia pyramidata, K. triptera,* var. *eriocl*ada, and *Pentzia virgata.* The plot was watered frequently, but none of the seeds grew.

BIOLOGY

Project G.—Codling Moth Investigations.

(In cooperation with the Department of Horticulture.)

1. Bait and Light Trap Experiments.

During the past four years forty-five different types of baits and five different designs of light traps have been tested both alone and in combination, to determine whether such devices can be perfected to the extent of becoming commercially practical in codling moth control. Two baits, i. e., slowly fermenting cane sirup with sodium benzoate added in order to delay fermentation, and an ester, ethyl-oxyhydrate, have been found to be the most attractive of the first class; and a mercury vapor tube lamp developing approximately 30 foot-candles, and delivering a high percent of rays in the blue, violet, and ultraviolet portion of the spectrum has proved to be the most efficient light trap tried. This past season, by combining the above-mentioned baits with the light, it has been possible to capture as high as 85 codling moths per tree each night during their maximum flight periods.

To determine further the efficiency of this bait-light combination in re-

TABLE 1.—COMPARISON OF SPRAYING, BAIT-LIGHT TRAPPING, AND BANDING FOR CODLING MOTH CONTROL, 1934.

Jonathan variety

Treatment	Windfalls				Picked				Totals			
	Total fruit	Number wormy	Number sound	Percent sound	Total fruit	Number wormy	Number sound	Percent sound	Total fruit	Number wormy	Number sound	Percent sound
Spray, bait-light trap, and band	383	270	113	29.5	319	113	206	64.5	702	383	319	45.4
Spray	427	306	121	28.3	297	159	138	46.4	724	465	259	35.7
Bait-light trap	734	566	138	19.6	537	189	149	44.2	1036	754	282	27.2
Band	636	540	96	15.1	346	226	123	35.0	984	766	218	22.1
No treatment	408	375	33	8.0	315	197	118	37.4	723	572	151	20.8

Rome Beauty variety

Treatment	Windfalls				Picked				Totals			
	Total fruit	Number wormy	Number sound	Percent sound	Total fruit	Number wormy	Number sound	Percent sound	Total fruit	Number wormy	Number sound	Percent sound
Spray, bait-light trap, and band	381	181	200	52.4	209	79	130	62.2	590	260	330	55.9
Spray	621	355	266	42.8	220	50	170	77.2	841	405	436	51.8
Bait-light trap	872	587	285	32.6	968	95	893	90.3	1860	682	1178	63.3
Band	818	678	140	17.1	288	220	68	23.6	1106	898	208	18.8
No treatment	207	170	37	17.8	143	48	95	66.4	350	218	132	37.7

ducing the worminess of fruit, several Jonathan and Rome Beauty apple trees were equipped with these traps. These were operated continuously throughout the season, and the amounts of infested fruit compared with that from neighboring sprayed and banded trees at picking time. These comparisons are shown in Table 1. In both varieties the percentage of sound fruit of the bait-light trap series considerably exceeded that of the untreated check trees. Combinations of bait-light traps and spraying also exceeded the checks, but the results thus far are not sufficiently consistent to recommend such traps either as a substitute for, or supplement to, spraying.

Recent information gathered with respect to the chemistry of fermenting cane sirup baits and ethyl-oxyhydrate indicated that they contain certain ingredients in common, e. g., caramelized cane sugar, acetic acid, ethyl acetate, and ethyl alcohol. Further investigations are under way to determine the relative importance of these four ingredients as codling moth attrahents.

2. Insecticide investigations.

In attempting to develop a spraying program that will secure efficient control and yet minimize the amount of spray residue on the fruit at the end of the season, a number of substitutes for lead arsenate have been interpolated into the last three applications of the standard six-spray schedule. The numbers of wormy and sound apples picked from these various treatments are shown in Table 2. The combination of 40 percent nicotine (1 to 800) and bentonite-sulfur, 3 pounds to 100 gallons, was found to compare favorably with lead arsenate in reducing the percentage of wormy fruit. Chemical analysis showed that this combination left a residue slightly below tolerance at picking time (i. e., 0.005 to 0.019 grains of arsenic trioxide per pound of fruit). Another spray showing some promise was a mixture of paradichlorobenzene (35%) in white oil emulsion, used at summer (2%) strength.

Project I.—Potato Insect and Disease Investigations.

(In cooperation with the Department of Horticulture.)

1. Spraying Experiments.

Lime-sulfur sprays (four applications at two-week intervals) were found to control potato psylla effectively under New Mexico conditions. Plants thus sprayed did not develop severe "yellows" symptoms. A comparison of the yields of No. 1 potatoes from the 1935 series of treated and untreated plants is given in Table 3. Early blight was also controlled by the sulfur applications. Applications of calcium cyanamid and agricultural sulfur (1000 pounds per acre) slightly reduced nematode infestation (Table 4) and increased the yield.

2. Physiology.

Histological and biochemical examinations of plants diseased with psyllid yellows indicated that the disease is characterized by inhibition of photosynthesis, as evidenced by abnormal chloroplasts, larger amounts of starch in the stems, and a lag in hexose translocation. (Fig. 1, page 32.)

Field comparison of the nitrate content of diseased and healthy plants,

TABLE 2—SUMMARY TABLE OF CODLING MOTH INSECTICIDE TESTS, 1934

Materials	Delicious variety					Stayman Winesap variety				
	Windfalls		Picked		Total sound	Windfalls		Picked		Total sound
	Wormy	Sound	Wormy	Sound		Wormy	Sound	Wormy	Sound	
Lead arsenate 6 sprays	Percent 17.5	Percent 82.5	Percent 7.3	Percent 92.7	Percent 89.8 (.185)*	Percent 19.1	Percent 80.9	Percent 11.6	Percent 88.4	Percent 84.9 (.108)
Nicotine-oil supplement	32.8	67.2	18.1	81.9	75.2 (.029)	20.8	79.2	28.4	71.6	75.1 (.014)
Nicotine and bentonite-sulfur supplement	18.8	81.2	14.6	85.4	83.9	26.7	73.3	3.0	96.9	89.9
Pyrethrum, derris, and bentonite sulfur supplement	28.6	71.4	21.8	78.2	76.6 (.019)	30.0	70.0	23.5	76.5	73.0 (.016)
Check. No insecticide during season	33.6	66.9	22.4	77.6	73.8 (.005)	21.0	79.0	16.1	83.9	81.5 (trace)
Lead arsenate, 3 sprays. No insecticide remainder of season	22.3	77.7	17.7	82.3	80.9	18.9	81.1	16.4	83.6	82.2 (.007)
Paradichlorobenzene and white oil supplement	25.1	74.9	19.1	80.9	80.1	25.0	75.0	13.9	86.1	80.6
Tartar emetic supplement	27.3	72.7	20.9	79.1	77.9 (0.17)					

Materials	Gano variety					Arkansas Black variety				
	Windfalls		Picked		Total sound	Windfalls		Picked		Total sound
	Wormy	Sound	Wormy	Sound		Wormy	Sound	Wormy	Sound	
Lead arsenate 6 sprays	Percent 22.9	Percent 77.1	Percent 15.8	Percent 84.1	Percent 82.2	Percent 5.6	Percent 94.4	Percent 4.1	Percent 95.9	Percent 95.4 (.146)
Nicotine-oil supplement	25.3	74.7	9.4	90.6	87.6	21.2	78.8	19.9	80.0	79.8 (.006)
Nicotine and bentonite-sulfur supplement	29.3	70.7	24.6	75.4	74.2	27.1	72.9	17.5	82.5	81.0 (.005)
Pyrethrum, derris, and bentonite sulfur supplement	32.3	67.8	33.7	66.3	66.8	16.6	83.7	18.4	81.6	82.2 (.012)
Check. No insecticide during season	59.0	41.0	50.7	49.3	47.0	27.5	72.5	38.0	62.0	65.6 (trace)
Lead arsenate, 3 sprays. No insecticide remainder of season	38.5	61.5	29.9	70.1	67.5	29.2	70.8	16.3	83.7	81.5 (.007)
Paradichlorobenzene and white oil supplement	33.9	66.0	26.0	74.0	72.1	33.2	66.8	35.6	64.5	65.4 (.006)
Tartar emetic supplement	28.2	71.8	20.8	73.2	72.9 (.013)	35.1	64.9	32.4	67.6	67.4 (.011)

*Numbers in parenthesis=grains of arsenic trioxide per pound o trust

using the method of Emmert[1], showed the former to be consistently lower. (Table 5.)

TABLE 3.—COMPARISON OF YIELDS OF NO. 1 POTATOES FROM PSYLLID YELLOWS SPRAYING EXPERIMENT, 1935.

Treatment	Seed No. 1 (Colorado)		Seed No. 2 (Bluewater, N. M.)	
	Treated	Check	Treated	Check
Liquid lime sulfur*	8365.8	8398.5	4966.0	4049.0
Liquid lime sulfur and nicotine	7202.6	5577.0	6078.3	3519.9
Dry lime sulfur	4249.8	3394.0	4087.0	3056.0
Bentonite lime sulfur	7840.5	6895.0	3683.5	2597.6
Sulfur dust	5796.8	5010.2	3845.9	2616.7

*Yields in pounds per acre, average of four replications for each series.

TABLE 4.—NEMATODE CONTROL TEST, 1934.

	Grade	Treatment		
		Cyanamid 600 lbs. per acre	Sulfur, 1000 lbs. per acre	Untreated check
Yield per 1/20 acre	No. 1	162	127	92
	No. 2	42	32	47
	No. 3	15	8	16
	Total	219	167	155
Percent of tubers showing nematode injury		95	82	98

TABLE 5.—NITRATE CONTENT OF POTATO PLANTS. SPRAY TREATED PLOTS.

Treatment	Parts per million of nitrate nitrogen in .5 gram of potato stem	
	Healthy	Diseased
Kolodust sulfur	10,175	7,150
Bentonite-sulfur	8,925	5,200
Dry lime sulfur	10,500	8,250
Liquid lime sulfur	9,775	5,900
Nicotine lime-sulfur	9,200	7,775
Check	7,625	5,500

Project P.—Apple Measles.

Three different organisms have been found to be associated with apple measles. These belong to the following genera: Phoma, Plenodomus, and Alternaria. The relationship of these organisms to the disease has not been proved, on account of a lack of a suitable enclosure in which to grow apple trees under control conditions. Owing to the fact that the disease is present in all orchards, and develops sooner or later on all trees, field inoculations with the suspected organisms have not proved satisfactory. However, new methods of inoculation have been developed and will be tried this season. These will consist of protecting limbs of healthy trees with a celluloid sleeve after the suspected organisms have been introduced in and on the tissues.

The Jonathan apple trees planted last spring in the greenhouse died from attacks of woolly aphis and powdery mildew. A new supply of trees has been purchased and planted in the greenhouse. As soon as they are established, inoculations will be made with the suspected cultures.

Histological work on diseased wood has continued and a series of slides has been made from various stages of the disease.

[1]Emmert, E. M. Field method of estimating nitrate, phosphate, and potassium in plants. Plant Physiology 7:315. 1932.

Pictures of different stages of the disease, as well as of diseased and healthy trees, have been made.

It is hoped that the project will be completed in the immediate future. Practically all that remains to be finished is to establish the pathogenicity of the organisms isolated from measled wood.

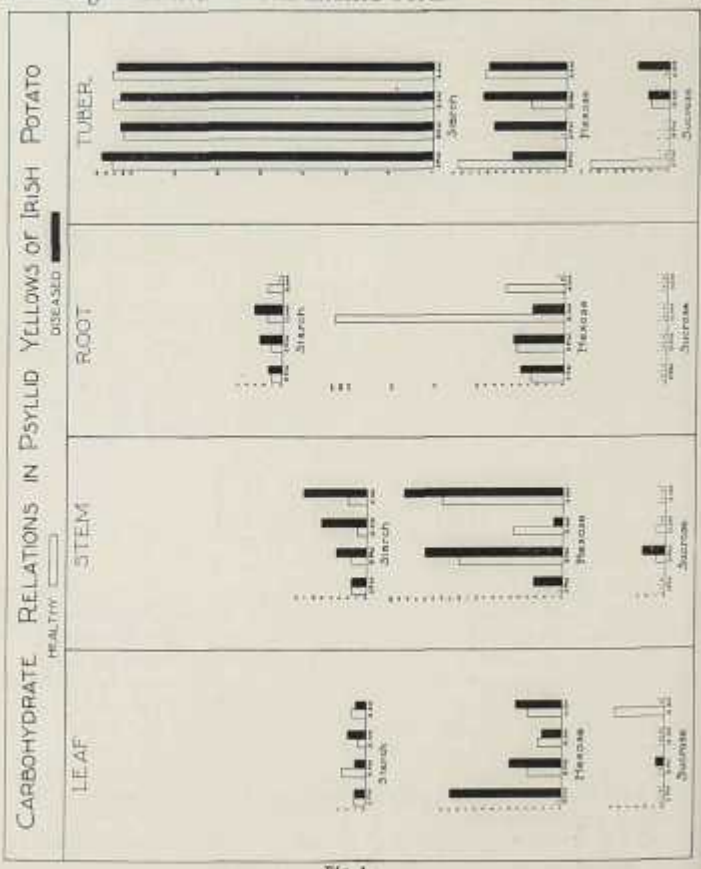


Fig. 1.

Project 6.—Chlorosis.

Combinations of aluminum sulfate, iron sulfate, and barnyard manure have proved satisfactory in controlling chlorosis of Concord grapes. These materials are worked into the soil around the vines. The same

treatment produces desired results when used to correct the chlorotic condition of other plants.

Project 7.—Insects Affecting Field and Garden Crops.

The major portion of the time allotted to this project during the present season was spent in an investigation of sprays and dusts for control of onion thrips (*Thrips tabaci* Lind.). A severe infestation of this pest appeared in April on Grano onions which had been grown overwinter for producing seed. A series of plots was selected in the most heavily infested portions of the fields, and tests of a number of contact sprays and dusts were made. The efficiency of these treatments was compared through infestation counts made prior to treatment and again 48 hours and 14 days after treatment. The results obtained are summarized in Tables 7 and 8.

TABLE 7.—SUMMARY OF LIQUID SPRAY TESTS FOR ONION THRIPS, 1935.

Treatment	48-hour count					2-week count	
	Number living (30 plants)	Number dead (30 plants)	Percent dead	Corrected percent mortality	Percent reduction over check	Number living (3 plants)	Percent gain or loss over initial infestation
Untreated checks	295	60	7.1			143	—66.6
Nicotine oil	101	152	60.0	56.9	67.2	244	+92.8
Nicotine and bentonite-sulfur	115	173	60.4	56.5	63.7	322	+55.2
Pyrethrum-derris oil	452	155	25.6	19.8	43.1	257	—15.3
Pyrethrum, derris and bentonite-sulfur	303	118	53.3	49.7	67.0	156	+41.0
Paris green and molasses	270	35	17.0	10.6	78.6	29	—73.6
Naphthalene oil	268	90	25.7	20.0	66.2	161	—35.8

TABLE 8.—SUMMARY OF DUSTING EXPERIMENT FOR ONION THRIPS, 1935.

Treatment	48-hour count					2-week count	
	Number living (10 plants)	Number dead (10 plants)	Percent dead	Corrected percent mortality	Percent reduction over check	Number living (3 plants)	Percent gain or loss over initial infestation
Untreated check	447	89	10.0			172	—31.8
Naphthalene-lime	426	102	19.3	10.3	4.7	390	+36.3
Naphthalene-sulfur	195	71	26.6	18.4	56.3	324	+14.1
Nicotine-sulfur	247	33	11.7	9.2	44.2	101	—36.4
Beta naphthol and naphthalene-lime	12	31	71.1	70.0	97.3	86	+39.1
Alpha naphthalamine and naphthalene-lime	219	79	26.2	18.0	51.0	120	—19.1

Project 8.—Root Rots.

Violet root rot (*Rhizoctonia crocorum* Pers. D. C.) apparently is confined to the sweet potato area around Portales. A survey failed to find the disease attacking other reported susceptible crops in the area. So far the organisms causing violet root rot have not been grown on culture media at this Station.

The efficiency of soil treatments for Texas root rot is being determined

in several areas. A fusarial and a bacterial root rot of alfalfa are quite destructive in the Pecos and Mesilla Valleys, and are being investigated. Resistant varieties of alfalfa are being tried and selections made from badly infested fields where a few plants apparently resist the disease.

Project 9.—Giant Apple Root Borer.

Tests of soil insecticides found effective in controlling the larvae of *Prionus californicus* Mots. in the roots of apple trees were continued. Results of this season indicate that potassium sulfocarbonate in water solution at the rate of 1 ounce per gallon is more effective than paradichlorobenzene dissolved in high test gasoline.

CHEMISTRY

Project W.—Effects of Irrigation and Cropping on Soil Profiles.

Under irrigation agriculture the soils of arid regions appear to be undergoing some changes that are different from the usual changes of humid regions, while the unirrigated virgin soils are apparently little changed by time. An attempt is being made in this project to obtain dependable information regarding these changes. Profile samples of soils that have been under irrigation for a long period of time are being compared with virgin soils of the same types that have not been irrigated or cropped.

In the two types of soils studied a large amount of lime has moved downward during forty years of irrigation agriculture. Although these losses are large, the lime content of the upper horizon is still sufficient for hundreds of years. Neither Gila clay adobe nor Pecos sandy loam showed appreciable losses of potash in the forty-year period. The potash removed by cropping and by drainage water has been offset by the potash in the irrigation water and sediments. These soils also contain a large reserve of potash, which is only slightly soluble and consequently there is no indication that potash fertilizer will be needed.

The phosphoric acid of Gila clay adobe decreased about one ninth during the forty years of cropping. At this rate there would not be a deficiency of phosphorus in a great many years; but since the irrigation sediments have decreased and since the lighter sandy soils respond to superphosphate, it is evident that this fertilizer will be needed for some of the soils of the Mesilla Valley. The phosphorus of the virgin Pecos sandy loam is low enough to suggest a deficiency after a few years of cropping. Under irrigation near Carlsbad, this soil has not been seriously depleted in the lower horizons and applications of superphosphate have resulted in an increase of the phosphorus near the surface.

Although the soils studied were naturally low in nitrogen and received no nitrogen fertilizers during the forty-year period, there were no decided changes in the content of nitrogen. The Pecos sandy loam increased slightly in this element; probably as a result of the almost continual cropping to alfalfa. The balance of nitrogen was apparently maintained by the soil bacteria and the small amount of nitrogen compounds present in irrigation and rain waters.

The irrigated soils contained 13 to 26 percent more organic matter than the virgin soils, indicating that this important constituent of desert soils is increased by cropping and irrigation.

The statements above are based on analyses of the colloidal fractions. The work is being continued.

Project 1.—Spray Residue on Fruit.

The samples from the College orchard, as usual, contained excessive amounts of arsenic where 6 lead arsenate sprays were applied. With 3 sprays only, the arsenic was below the tolerance for the one variety tested. The Arkansas Blacks were also below the tolerance limits with 3 lead arsenate sprays followed by 3 of oil-nicotine, by 3 of nicotine-bentonite-sulfur, and by 3 of oil-paradichlorobenzene. If the control proves satisfactory these nonarsenical substitutions may provide a method of control that will not require a cleaning of the fruit.

The samples from other orchards confirm the results obtained in previous years; indicating that fruit receiving 3 or more sprays will exceed .01 gram of arsenic per pound at harvest time and will therefore require cleaning; that where two early sprays of lead arsenate are sufficient, washing will probably not be necessary. This year for the first time a number of the washed samples exceeded the tolerance, showing that greater care is necessary in the operation of the washing machines.

Project 2.—The Protein Content of New Mexico Wheats.

Analyses were made of the protein and moisture content of samples of wheat from the 1934 crop. The percentages obtained and those for the previous six years were made the basis of Bulletin 230, entitled "The Protein and Moisture Content of Wheat Grown in New Mexico."

MISCELLANEOUS

The Department cooperated with C. L. Englehorn, Assistant Agronomist, and C. P. Wilson, Associate in Range Plant Investigations, in a survey of the alkali in the soils and waters of the Estancia Valley. This information was desired in connection with experiments on the growth of alfalfa, grasses, chamiza, and winter fat and was published in Press Bulletin 747.

Alfalfa roots were found penetrating soils in the Estancia Valley containing 1.2 percent of alkali. About one-third of this soluble matter was found to consist of calcium sulfate, which is not toxic; the remainder being largely sodium sulfate. The abnormal solubility of calcium sulfate is attributed to the rather high concentration of sodium sulfate. There is evidence of the formation of a double sulfate of calcium and sodium. Where these salts are present in these proportions it is probable that plants will tolerate a higher concentration of soluble matter.

In addition to the work previously mentioned, the Chemist has replied to 347 letters, giving advice and information on chemical questions, and with his assistants has analyzed the following samples for citizens of the State:

Kind of sample	Number of samples
Foods and feeds	2
Minerals	15
Miscellaneous samples	20
Poisons and insecticides	16
~~Minerals~~	~~15~~
Soils	242
Waters	94
Total	389

DAIRY HUSBANDRY

Project XXXI.—The Physiological Effect of a Hegari Fodder and Cottonseed Meal Ration on Dairy Cows.

The cows in this experiment produced 35 calves, all but two of which were apparently normal, while receiving the regular herd ration and before being placed upon the experimental ration of cottonseed meal and the ground whole hegari plant plus salt and water. After being fed the experimental ration for one or more lactation periods the cows have produced six normal and nine abnormal calves. There have been various abnormalities, such as abortions, calves born blind at birth, calves weak and showing muscular in-co-ordination, and calves apparently normal at birth that died within two or three days from no apparent cause.

The experimental ration for one group of cows is being supplemented with calcium carbonate and that for two other groups with Haliver oil as a source of vitamin A, to ascertain, if possible, the cause of the production of abnormal calves.

Project XXXIII.—The Effect of a Hegari Fodder and Cottonseed Meal Ration on the Vitamin A Content of Butterfat Produced by Dairy Cows.

(In cooperation with the Department of Home Economics Research.)

This cooperative project is supplementary to and is being run in conjunction with Purnell Project XXXI. Rats are being fed to determine the amount of vitamin A activity in the butterfat produced by the cows in the different lots of Purnell Project XXXI at various stages of the experiment.

The preliminary data secured indicate that the butterfat produced by the cows on the hegari and cottonseed meal ration is low in vitamin A.

Project I.—Milk Goat Improvement.

The data secured in the first fifteen years' work on the project have been published in Bulletin No. 229, "Milk Goat Breeding." The project is being continued on a revised basis. The data in Bulletin 229 include the records for the daughters of the first three bucks used in the experiment.

During the past year, records, made at two years of age, have been completed of eleven daughters of a fourth buck. The eleven daughters were from nine dams, and all but two of the eleven produced more 4% milk than their dams. The potential producing ability of the fourth buck, Buster Big King 39389, was found to be 1642.1 pounds of 4% milk as calculated by Yapp's formula.

ADVANCED REGISTRY TESTS COMPLETED IN THE COLLEGE HERD DURING THE FISCAL YEAR ENDED JUNE 30, 1935

Cow	Class	Age			Days milked	Milk	Fat
		Years	Months	Days		Pounds	Pounds
GUERNSEYS							
NMAC Ultra Rosita 369833	G	2	3	17	365	8903.2	415.5
NMAC Ultra Lolita 369831	P	2	6	21	295	5621.0	298.8*
NMAC Ultra Fancy 369832	F	2	7	3	275	4713.8	252.0*
NMAC Rose Absolute 314372	DD	4	9	17	365	12518.5	631.0
HOLSTEINS							
NMAC Teewie Julius 1507658	B	1	11	5	184**	7199.6	252.5
NMAC Tritomia Netherland 1570706	B	2	4	4	305	13039.3	471.3
NMAC Allie Netherland 1570707	B	2	4	29	305	10603.9	398.1
Tehee Ollie Pontiac 1722480	B	2	5	26	299	13267.0	442.5
NMAC Segis Netherland 1570705	B	2	7	4	305	14899.6	512.4
NMAC Barbara Netherland 1508240	B	2	9	24	305	14769.0	503.7
NMAC Hallie Koendyke 1334025	B	3	3	4	305	18030.4	570.7
Gillett Merdu Hengerveld 1427718	B	3	3	6	305	13525.2	474.1
Herd Improvement, 12 cows	B				325	13199.8	461.7
JERSEYS							
NMAC Agnes Oxford 982662	AAA	1	9		305	5831.0	312.2
NMAC Maggie Oxford 982660	AAA	1	9		305	8490.0	430.2†
Rose Oxford 98924	AAA	1	10		305	5889.0	313.9
NMAC Lucy Oxford 982661	AAA	2	0		305	7500.0	449.4†
NMAC Bertha Oxford 982658	A	2	4		365	8509.0	529.0
Herd Improvement, 13.04 cows					324	6306.0	378.0

*Did not meet Advanced Registry requirements.
**Died.
†Silver medal.

The potential producing abilities of the first three bucks, when used in outcrossing, were found to be 1509.0 pounds, 1157.5 pounds, and 1642.0 pounds of 4% milk, respectively.

MISCELLANEOUS

The Dairy Husbandry Department conducted official tests for the Advanced Registry and Herd Improvement tests, in three herds, in addition to the College herd, during the fiscal year.

The Advanced Registry tests completed during the year in the College herd are shown in the accompanying table.

HOME ECONOMICS RESEARCH

Project XIV.—A Study of the Losses Incurred in Cooking and the Factors Affecting the Palatability of the New Mexico Pinto Bean; with a later similar Study of the Bayo and Other Varieties of Beans.

This project was completed during the past year. The data were compiled and published as Bulletin No. 231, entitled "Pinto Beans: Their Preparation and Palatability."

Additional work was done to determine the effect of aging upon the palatability of New Mexico Pinto beans.

Project XXIII.—The Vitamin B and G Content of New Mexico Pinto Beans, the Effect of Different Methods of Cooking, and the Effect of Aging upon the Content of these Vitamins.

The work to determine the vitamin B content of raw Pinto beans was completed. The data were compiled and published as Bulletin No. 232, "The Vitamin B Content of Raw Pinto Beans."

Additional rats were fed, employing slight changes in technique to effect, if possible, a reduction in the variability of the results.

The work to determine the effects of two different methods of cooking on the vitamin B content of Pinto beans was completed. The two methods tested were M2D-P and M5D-P of Project XIV.

Method M2D-P may be outlined as follows:

One hundred grams of beans were washed and soaked in 400 cc. of distilled water, which had been heated to the boiling point for 16¾ hours. This water was poured off, 400 cc. of fresh distilled water were added (additional water was added as necessary), and the beans were boiled gently for 2¾ hours. They were then dried before an electric fan at room temperature and ground to a fine powder.

Method M5D-P may be outlined as follows:

One hundred grams of beans were washed and soaked for 17½ hours in 400 cc. of distilled water to which 2 grams of sodium bicarbonate had been added (a 0.5% solution) and which had been heated to the boiling point. This water was poured off, 400 cc. of fresh distilled water were added (additional water added as necessary), and the beans were boiled gently for 2 hours. They were then dried before an electric fan at room temperature and ground to a fine powder.

Only a few animals were available for the determination of the vitamin

G content of raw Pinto beans, for the reason explained under Project XXXIII.

Project XXXIII.—The Effect of a Hegari Fodder and Cottonseed Meal Ration on the Vitamin A Content of Butterfat Produced by Dairy Cows.

Nothing more than the preliminary work could be done on this project, since only a limited number of rats were available. A severe lung infection that resulted in the loss of a number of animals developed in the stock colony. Several of the rats that developed the infection were given to the Department of Biology to see whether or not the cause of the trouble could be isolated. Platings of the lungs were made and several different species of bacteria and molds were isolated. The head of the Biological Department stated that the "bacteria isolated belong to the Hay Bacillus group, and the species found were chiefly *Bacillus subtilis* and *Bacillus mycoides*. Both of these species occur in great numbers in surface soil and find their way with dust into the air." He thought it not likely that these bacteria had anything to do with the infection. The molds isolated belong to the genus *Aspergillus*. "The species found in the lungs of all the rats was *Aspergillus famigatus*. This species has been reported as producing a fatal type of pneumonia in birds of many kinds, especially barnyard fowls. A similar disease has been found to occur in man and animals, particularly the horse, when forced to breathe air containing the spores of this organism in large numbers." These molds are probably at least partially responsible for the diseased condition of the rats.

The source of the mold could not be determined. So far as is known, all the food fed to the rats was clean and dry, as was also the laboratory.

In addition to the losses due to lung infection, a great many newborn litters were lost because of the refusal of the mothers to nurse their young, despite all efforts to induce them to do so. Since the work of Sure at Arkansas and others has indicated that increased amounts of vitamin B are necessary for lactation, it was thought it might be well to add some vitamin B concentrate to the diet, though two thirds of the diet was made up of whole wheat, which should have furnished sufficient of this vitamin. Both wheat germ and brewers' yeast were tried as supplements, with seemingly little effect.

Young rats seem to require a warm temperature but the laboratory is equipped with an automatic temperature control that does not allow the temperature to fall below 75° F. The rats were finally bedded heavily with shredded crepe paper, and the cages covered with a black cloth to give a feeling of security to the mother rats. This appeared to help to some extent, though the trouble was even then not entirely overcome. The losses were greater in the fall and winter, indicating that the difficulty was at least partially seasonal.

It was thought best to introduce new stock into the colony. Rats were very generously supplied by the University of Arizona and were also obtained from the Albino Supply Company of Philadelphia. The lung infection appears now to be well under control and it is hoped that young in sufficient numbers will be produced throughout the coming year.

HORTICULTURE

Project 1.—Phenological Fruit Investigations.

The apple crop in 1934 was especially heavy throughout the Mesilla Valley and all varieties on the Horticultural farm were thinned, with the exception of the Stayman Winesaps and Arkansas Blacks in the young orchard. These two varieties had no fruit in 1933 because of frost injury, a very light and irregular crop in 1934, for some unknown reason, and a very light crop in 1935. The apple crop in 1935 was exceptionally small as a result of the heavy crop in 1934, but the failure of the Blacks and Staymans to set in 1935 could not be explained on this basis; nor could the failure of the Delicious and Black Bens to set a crop in 1935 be attributed to overproduction in 1934, as they were heavily thinned in the spring of 1934. All stone fruits bloomed heavily and set a good crop of fruit in 1935.

Project 4.—Variety Test with Fruits.

A few additional varieties of peaches and plums were planted in 1934 and 1935. Data were secured on several of the new varieties that began to bear.

Figs.—A few Mission, Magdalen, and Kadota figs were planted in the spring of 1935 to add to the variety test started in 1933. While these varieties are still small, they have withstood the winter temperatures well.

Project 5.—Smudging Experiments.

The heaters were placed in the orchard in the spring of 1935 and on several occasions the temperature went to within a degree of the danger point, but at no time was it necessary to light the heaters to save the fruit. A heavy crop of stone fruit was produced in the Valley and the experimental varieties were all thinned.

Project 13.—Tomato Experiments.

(In cooperation with the Department of Biology.)

Several varieties of tomatoes were planted in the spring of 1934, in order that their resistance to disease might be studied. A number of these were grown from certified seed, which should have been more resistant than the stock seed commonly purchased. However, for the first time in the history of this experiment, the seedlings were attacked by disease before they were an inch high. The trouble appeared to be damping-off, or rhizoctonia. Plantings were made of the Improved John Baer, Marglobe, Norton, Break O'Day, and Pritchard for the disease study. A few other hybrids, secured from the Idaho Experiment Station, were tested. These included Idabaer x Dwarf Champion; Idabaer x Marglobe; 3/1-1/3-3/1 Selection of John Baer; Idabaer x Earliana C2; 3/1-1/3-3/1-11/4 Selection of John Baer; and New Stone. Practically all of these varieties were quite uniformly affected by the damping-off condition which destroyed the little plants, causing them to be very spindling and drop over and die before they were more than half an inch high. The losses were so heavy that it was necessary to replant three times and to do considerable transplanting in order to secure a stand. As the seed was limited in quantity, many of the replantings had to be made by substituting

other varieties; which made it practically impossible to keep very accurate data on the yields of the different varieties and also interfered with the disease resistance records. However, the Biological Department secured some data on the disease feature.

After the tomatoes had developed to normal healthy vines, they set a very good crop of fruit, but were so late that the yield was far below normal. The Norton was rather outstanding in its blight and curly-top resistance. However, this variety is so late in production that it would be necessary to plant the seed very early in order to secure as large yields as would result from some of the earlier ripening varieties. The certified Marglobe seed produced an exceptionally smooth, nice tomato, while the John Baer did not appear to be quite so good as the Bonny Best. The Idaho hybrids did very poorly, but the season was so unfavorable that conclusions could not be drawn as to the value of these varieties.

Project 14.—Cabbage Fertilizer Experiment.

The cabbage fertilizer experiment was continued in 1935 the same as in 1934 and on the same plots. In the Mesilla Valley, the season of 1935 proved to be unfavorable for all kinds of vegetables and the marked decrease in the yields of the cabbage in 1935, as compared with 1934, may be partly accounted for in this way. However, the yield of cabbage in this experiment was abnormally high in 1934 and the production in 1935 was good, for an early variety. The highest production was secured from a 600-pound application of ammonium sulfate. The average per acre yield for these plots was 30,810 pounds. The complete fertilizer plots came second, with an average yield of 30,405 pounds; a combination of manure and ammonium sulfate produced 29,035 pounds; manure alone, 29,010 pounds; a 400-pound application of ammonium sulfate, 25,935 pounds; while the untreated plots produced an average of 23,300 pounds to the acre.

Project 17.—Variety Test with Sweet Cherries.

Several of the trees in this experiment which were planted near a windbreak of large shade trees have made practically no growth and many of them continue to die, in spite of the fact that the nearest row is at least 50 feet from the windbreak. These trees having been fertilized with manure to supply the needed plant food, it is difficult to explain their poor growth and the loss, other than to attribute it to the effects of these large shade trees; as these varieties were grown in a former variety test and were as vigorous as any other variety. The trees in the middle of this young orchard have made good growth and a few of them bloomed this year. They should produce a fair crop of cherries another year. Some of the missing trees in the poorer growing section were replaced with varieties that are making more vigorous growth, to aid in determining the cause of the continued failure near the shade trees.

Project 19.—Pecans and Walnuts.

The pecans had a very good crop in 1934 and the walnuts also had a normal set of fruit. While the season of 1934 seemed particularly favorable for a good set of fruit and the fall killing frost was late, permitting

TABLE 1.—PLAN OF CABBAGE FERTILIZER TEST, SHOWING YIELDS FOR SEASON OF 1935.

Rate, per acre, of fertilizing materials used

	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11
	Manure 12 tons annually; ammonium sulfate 200 pounds	Manure 12 tons annually	Unfertilized	Ammonium sulfate 400 pounds, 1 application	Ammonium sulfate 600 pounds; 2 applications	Ammonium sulfate 400 pounds, superphosphate 400 pounds; 1 application	Ammonium sulfate 400 pounds, superphosphate 400 pounds potash 200 pounds; 1 application	Manure 12 tons, ammonium sulfate 200 pounds	Manure 12 tons annually	Unfertilized	Ammonium sulfate 400 pounds; 1 application

Yield in pounds and number of heads cut, per plot*

Dates of harvesting	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads
May 31	51	25	115	49	59	27	39	15	71	29	69	31	104	45	147	67	63	27	35	20	66	29
June 6	446	244	595	222	472	180	450	171	500	244	698	241	825	335	803	293	770	275	775	266	738	289
June 17	809	396	982	326	944	323	998	366	1042	371	903	321	878	310	985	290	924	320	533	250	758	299
June 25	394	186	311	124	337	138	379	154	407	160	343	126	399	74	293	81	162	64	162	81	129	61
Total	1699	851	1953	721	1802	668	1866	706	2025	804	2013	713	2306	724	2028	721	1919	686	1455	617	1691	679

Calculated yield per acre

	25485	12765	29295	10815	27030	10020	27990	10605	30375	12060	30495	10695	34605	10860	30420	10815	28785	10290	21825	9255	25365	10185

Rate, per acre, of fertilizing materials used

	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	
	Ammonium sulfate 600 pounds; 2 applications	Ammonium sulfate 400 pounds, superphosphate 400 pounds; 1 application	Ammonium sulfate 400 pounds, superphosphate 400 pounds, potash 200 pounds; 1 application	Manure 12 tons, ammonium sulfate 200 pounds	Manure 12 tons	Unfertilized	Ammonium sulfate 400 pounds; 1 application	Ammonium sulfate 600 pounds; 2 applications	Ammonium sulfate 400 pounds, superphosphate 400 pounds; 1 application	Ammonium sulfate 400 pounds, superphosphate 400 pounds, potash 200 pounds; 1 application	

Dates of harvesting	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads	Yield	Heads		
May 31	52	25	73	32	100	40	101	39	87	33	52	17	92	37	69	30	38	15	39	7		
June 6	887	348	941	353	1221	425	965	343	925	328	378	228	662	258	835	303	440	176	462	182		
June 17	876	350	512	196	570	204	896	291	839	280	791	295	738	274	990	381	724	374	602	235		
June 25	235	97	242	102	317	45	129	54	99	46	102	42	188	65	193	70	165	88	240	106		
Total	2050	820	1773	682	2208	714	2091	727	1930	687	1503	582	1630	634	2087	784	1367	653	1324	530		

Calculated yield per acre

	30750	12300	26595	10020	30135	10740	31200	10605	28950	10035	22545	8730	24450	9510	31305	11760	20505	8595	19860	7950		

*Each plot was 1/15 acre in area.

the varieties to reach full maturity, nevertheless, the pecans probably filled poorer than they had during any past season of their production. This was the first season that such varieties as Texas Prolific, Money-maker and Success had failed to fill. The Burkett and some of the Western Schley, which had shown such good promise in past years, were also poorly filled in many of the pecan groves. Since the problem of properly filling appeared to be one of the most important in connection with commercial pecan production, cracking tests were made on several varieties and they were carefully scored to determine their comparative values. This scoring was based on outward appearance, shelling qualities, kernel qualities, kernel percentage, and number per pound. The following is the average score given for nine of these varieties: Stuart, 72.4 percent; Texas Prolific, 83.25; Success, 70.83; Onliwon, 92.67; Burkett, 81.25; Western Schley, 83.75; Eastern Schley, 90.25; Alexander, 89.5; Pabst, 76.25. Some of the varieties were so poorly filled that they were not scored. These included College No. 1, Frotscher, and Money-maker. The Western Schley, Onliwon, Success, Texas Prolific, and Eastern Schley appear to be the most popular varieties according to the new plantings that are being made in the southern part of the State. The San Saba Improved and Squirrel's Delight are varieties which have just come into bearing and show promise of success as shellers. The following yields of pecans were harvested the last of November, 1934: Stuart, 2 trees, 85 pounds; Moneymaker, 3 trees, 233 pounds; Pabst, 1 tree, 77 pounds; Van Deman, 1 tree, 31 pounds; Halbert, 1 tree, 43 pounds; Schley, 2 small trees, 15 pounds; Texas Prolific, 1 tree, 81 pounds; Colorado, 1 tree, 4 pounds; Frotscher, 2 medium sized trees, 18 pounds; Indiana, 1 tree, 21 pounds; Delmas, 2 trees, 66 pounds; Seedling No. 2, 1 tree, 139 pounds; Seedling No. 1, 1 tree, 219 pounds; Onliwon, 1 tree, 167 pounds; Success, 2 trees, 182 pounds; Niblack, 1 tree, 8 pounds; Kentucky, 1 tree, 26 pounds; Western Schley, planted in 1931, 4 nuts per tree; Warrick, 1 tree, 14 pounds; Mayette walnut, 1 tree, 20 pounds; walnut Seedling No. 7, harvested October 1, 15 pounds; No. 11, 6 pounds.

Project 20.—Grapes and Small Fruits.

Many new varieties of grapes came into bearing in 1934 and descriptive notes on the quality, yields, and prospective values were recorded. The Youngberries planted in 1933 failed to produce fruit in 1934 or 1935. The vines looked quite hardy and should have borne in 1935 but only a few small berries were produced.

Project G.—Codling Moth Investigation.

(In cooperation with the Department of Biology.)

The heavy crop of apples that was produced in 1934 furnished ideal conditions for carrying on the codling moth work, which included the testing of a number of spray materials in an effort to determine their control values, particularly as supplemental sprays following the first sprays with arsenate of lead. The supplemental sprays being nonpoisonous to man, an effort is being made to secure satisfactory control without the necessity of washing the fruit. Many additional data were secured

on the effectiveness of various moth baits, poison bands, electric traps, and the attractiveness of different colored lights. The results of this work are reported in detail by the Biological Department.

Project I.—Irish Potato Experiment.

(In cooperation with the Department of Biology.)

This experiment was conducted in 1935 in much the same manner as in 1934, with the exception of the irrigation feature, which was discontinued. The same sandy loam soil used in 1934 was planted but the area was materially enlarged to accommodate the extensive spraying experiment with plots running in quadruplicate. In the progress of this experiment all features except disease control have been eliminated and it is hoped that sufficient data will be secured along this line during the coming season to justify the closing of this project. Two bulletins will probably be written on this subject during the coming year. Detailed data on the results secured from the spraying experiments in 1935 are given in the report of the Biological Department. Comparison of the results from certified Irish Cobbler seed and seed grown at the Bluewater experiment field from certified Colorado seed, but which was not rogued or certified in 1934, was made in the 1935 experiment, and the yields were decidedly better from the certified seed. Most of the experimental area produced a good grade of commercial potatoes, with quite satisfactory yields.

Project XXVI.—Fertilizer and Irrigation Experiment with Onions.

(In cooperation with the Department of Irrigation.)

The onion fertilizer experiment was continued in 1935 the same as in 1934 and on the same soil. Considerably more root rot developed in 1935, which makes it advisable to shift to a new soil for the 1936 crop.

The seed was planted in an open seedbed September 27, 1934, and the seedlings transplanted to the fertilizer plots on March 4, 1935. The onions were dug June 26 to 28 and the yields are given in Table 2. The field was divided into two sections, one of which received commercial fertilizer only and was designated as Series A; and the other, designated as Series B, received the same commercial fertilizer as Series A but had in addition an application of 10 tons of manure per acre. The plots were run in triplicate.

TABLE 2.—EARLY GRANO ONION FERTILIZER TEST, SHOWING YIELDS PER ACRE FOR 1935.

Plot Nos.	Commercial fertilizer per acre	Yield per acre, by grade					
		Number 1		Number 2		Culls	
		Series A	Series B	Series A	Series B	Series A	Series B
		Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
6, 11, 16	Ammonium sulfate 400 lbs.	36,466	34,600	1,080	1,760	1,453	1,700
2, 7, 12	Superphosphate 220 lbs.	25,800	31,746	1,650	1,766	520	833
3, 8, 13	Ammonium sulfate 400 lbs. Superphosphate 220 lbs.	36,946	35,286	826	1,326	1,220	1,313
4, 9, 14	Superphosphate 220 lbs. Ammonium sulfate 400 lbs. Potassium sulfate 200 lbs.	38,306	36,466	326	1,660	1,460	1,306
5, 10, 15	Series A, no fertilizer; Series B, manure only	32,980	34,826	1,000	1,426	1,293	1,480
	Average yield per acre	34,126	34,385	1,016	1,596	1,189	1,324

The yields in 1934 showed a soil variation in favor of Series A, which received commercial fertilizer only. It was thought that the reduced yields in 1934 on Series B might also have been partially due to the fact that the manure had not become sufficiently decomposed and available to give results and that with the additional application in the fall of 1934, the 1935 crop would be materially increased. While there was an average yield increase of 680 pounds per acre on Series B in 1935, there was also an increase of 5022 pounds on Series A. Although the average yield on Series B was slightly higher in 1935 than on Series A, the difference was entirely from the superphosphate plots.

Superphosphate continued to give adverse results when used alone but was distinctly beneficial when combined with nitrogen and potash. A good grade of commercial onions was produced in 1935.

Project XXXIV.—Vegetable Seed Production.

The work in this project was begun in June, 1934, and plantings of onions, carrots, cabbage, and celery were made at various intervals to determine the best time to plant in order to secure large yields of high quality seed. Field seeded onions to produce seed the following season were compared with fall planted bulbs. Carrots were planted both on ridges and on the level to determine the best method of securing a stand and the final yields. Cabbage was planted in the coldframes and transplanted to the field in the fall to be hilled up during the winter for frost protection, in order to have it bloom during the cool season of early spring. Later plantings were made in the coldframes and transplanted to the field in the spring. Celery planted in the coldframe under cloth and transplanted to the field in the spring bloomed very late, after the hot weather had begun. Some fertilizing work was done to determine the fertilizer requirements of vegetable seed crops when planted very thickly. Many interesting data will be included in next year's report on this seed experiment.

Project 15.—Pimiento Peppers.

The work of selection for improvement of the type of peppers was continued in the hope of securing a more uniform product and higher production.

Project 18.—Sweet Potato Experiment.

A spacing experiment with sweet potatoes to determine the possibility of increasing the yield, particularly with the Porto Rico, by closer plantings, was conducted in 1934. A small planting of Nancy Hall was made using the standard planting distances, for comparison with the other variety. Since the Porto Rico sets a light crop of tubers, that apparently accounts for their smaller production. It was thought that closer plantings would result in a larger number of potatoes and increase the yields. Interesting results which seem to substantiate this supposition were secured.

The yields recorded in Table 3 are the average of the combined yields of each similarly treated series of plots. In the first group of plots with plants set 15 inches apart in the row the highest yields resulted from setting 2 plants in the place, or an average distance of 7½ inches per plant. In

TABLE 3.—YIELDS OF SWEET POTATOES OBTAINED WITH DIFFERENT RATES OF PLANTING

Variety	Plants to the place	Distance apart in the row*	Yield per acre by grade	
			No. 1 potatoes	No. 2 potatoes
		Inches	Pounds	Pounds
Porto Rico	1	15	10,410	4,739
Porto Rico	2	15	11,233	6,110
Porto Rico	3	15	10,363	4,418
Porto Rico	1	12	11,186	4,770
Porto Rico	2	12	15,204	5,386
Porto Rico	3	12	11,726	6,697
Porto Rico	1	4	12,175	4,808
Porto Rico	1	5	12,411	5,781
Porto Rico	1	6	11,303	5,121
Porto Rico	1	7½	16,473	4,465
Nancy Hall	1	15	12,358	4,636

*All the rows were 4 feet apart.

the next group, planted 12 inches in the row, 2 plants to the place also gave the highest yield, with an average distance of 6 inches per plant. In the third group, 1 plant to the place spaced 7½ inches in the row gave the highest yields in the experiment—an increase of 58.24 percent over 1 plant every 15 inches, the usual planting distance in the Mesilla Valley.

Project 21.—Experiments with Flowering Bulbs.

Experiments begun in 1933 to determine the commercial possibilities of bulb production and the best methods of handling the bulbs to secure an increase and desirable blooming, gave some very interesting results in 1935; particularly in the performance of bulbs left in the ground as compared with those removed in the early summer for storage and replanting in the fall.

The King of the Blues, L'Innocence, and Yellowhammer hyacinths, and the Golden Spur narcissus began to bloom on February 24, 1935. The Yellowhammer came out just as well and bloomed as nicely from the bulbs left in the ground as from those stored. The King of the Blues produced only about one half a stand from those removed during the summer and the Grand Maitre had only three plants that grew in the six-foot rows left undug, and none of these produced blooms; while those which were lifted in the early summer and replanted in the fall produced a nice crop of large blooms with long stems. Those stored and replanted showed a good multiplication of bulbs. Only about two thirds of a stand of plants of the L'Innocence appeared in the spring of 1935 on the section of the row left in the ground. However, there was about as good a stand on the unlifted section of this variety as came from replanted bulbs and they bloomed just as well. About three fourths of a stand of the Gertrude came on the undug section and they bloomed nicely.

None of the narcissuses was lifted and stored in 1934 but all were left in the ground. These records may show the necessity of lifting and storing a few of the fine varieties that fail to hold over satisfactorily in the ground. However, this bulb experiment was given one or two heavy irrigations through mistake during the summer when they were supposed to be left dry. No doubt this contributed materially to the loss in bulbs through decay. Bulbs remaining in the ground should not be irrigated at any time during the heat of the summer. Von Sion bloomed nicely but

contained too much green to be pretty. The plants came back well and showed good multiplication of bulbs. King Alfred multiplied and bloomed well; the flowers being attractive and with long stems. Emperor, a good large narcissus, produced many blossoms but only about one half of the plants came up in the spring of 1935. However, those that did grow showed a fairly good increase of bulbs. Spring Glory bloomed a little earlier than the Emperor. It was probably the prettiest daffodil in the experiment but about four fifths of them failed to survive the winter of 1934-35, leaving a very poor stand. Those that did live were in bunches, showing a good increase of bulbs and indicating the possibility of selecting an acclimated strain that will prove to be hardy.

Tulips.—The Ocilis salis (species) tulip bulbs planted in the fall of 1934 began to bloom March 16, 1935. This was a beautiful scarlet-colored tulip with stems 10 to 12 inches long. They were satisfactory for cutting until about March 25. William Copeland is a beautiful lavender tulip which bloomed the first of April, with stems from 8 to 10 inches long. The bulbs of the William Copeland, Don Pedro, and Pride of Haarlem left in the ground came up fully as well and bloomed as well as those taken up and stored during the summer. The Prince of Orange is an attractive large dark red to bronze tulip which produced about half as many plants in the spring of 1935 from the bulbs left in the ground as came from those that were stored and replanted in the fall. Only about half a stand of the Couleur Cafe came up in 1935 from the bulbs that were replanted in the fall of 1934 and only 2 blossoms developed on the six feet of row where the bulbs were left in the ground. The Inglescombe Yellow tulips left in the ground came up perfectly, showed an excellent increase of bulbs, and bloomed just as well as those lifted and fall planted, but the blooms on those left in the ground were about a week later than the others. The Afterglow, which is probably the most attractive of the tulips, did not do well when left in the ground; as only 3 bunches came back on the 6 feet of row unlifted but they showed fair increase of the bulb, with two attractive flowers to the bulb. Those lifted and replanted came up and bloomed nicely.

The Spanish irises were in full bloom March 22. They produced beautiful blue flowers on stems 15 inches long. Every plant came up and bloomed nicely. The peonies all made good growth and bloomed well.

The 1935 results with the narcissuses, hyacinths, and tulips show that some of them may be successfully left in the ground, while others may not; and some of those stored through the summer did not keep well. Among the important factors to be studied are the best time to lift bulbs in early summer, storage conditions, time of fall planting, and watering.

The most important factor in successfully holding bulbs in the ground is, no doubt, proper irrigation; particularly withholding moisture during the dormant period. The 6.49-inch rain that occurred on August 29 and 30, 1935, may result in considerable decay of the bulbs that were left in the ground.

Project XII.—State Cooperative Experimental Plots.

On account of the extreme and prolonged drouth, the yields obtained in the potato variety test at Tres Piedras were below normal. The Irish Cobbler produced the best of all varieties tried.

Results from the Las Vegas plots were very unsatisfactory. There were little rainfall during the growing season and no water in the Storrie Reservoir for irrigation.

The yields from the experimental plots at Bluewater were also very low for the Green Mountain, Peachblow, and Brown Beauty varieties.

Fig. 1.—Experimental plots of Irish Cobbler potatoes in 1935, at Bluewater, N. M., produced at the rate of 12,829 pounds of No. 1 potatoes per acre.

The early maturing varieties gave the best yields for the year. Again the Irish Cobbler produced the largest and best crop. The following table gives the results of the potato work at Bluewater for 1934:

Variety	Number of rows	Area	Actual yield		Computed yield per acre		
			No. 1	No. 2	No. 1	No. 2	Total
		Acre	Pounds	Pounds	Pounds	Pounds	Pounds
Irish Cobbler	4	.11772	594	220	4313	1597	5910
Irish Cobbler*	4	.11772	193	180	1401	1302	2703
Irish Cobbler	29	.99847	4720	1259	4727	1252	5979
Bliss Triumph	6	.20658	510	165	1566	798	2298
Idaho Rural	5	.17215	78	135	453	784	1237
Green Mountain	7	.24101	0	0	0	0	0
Peachblow	8	.27544	0	0	0	0	0
Brown Beauty	8	.30807	0	0	0	0	0

*The Irish Cobblers of this plot were severely burned by the Bordeaux mixture used in spraying.

IRRIGATION

Project 2.—Duty of Water Investigations.

(In cooperation with the Department of Horticulture.)

This experiment at the present time is concerned with the measuring of irrigation water on cabbage. These investigations have been continued for several years and have dealt with the application of water on various crops. The field used for the irrigation of cabbage in 1935, as well as in 1934, is located on the Horticultural farm about one mile west of the campus. The particular field in question is immediately west and south of the field designated in some of the previous reports as No. 2. In general this field has the same soil characteristics as the old one, although the surface soil probably has a little less clay in it. This is the second

successive year during which cabbage has been grown in this field. After the 1934 crop of cabbage was removed the field was plowed, after which a very thick stand of weeds (principally pigweeds) was allowed to grow. When the weeds were about 4½ feet in height, and still immature, they were plowed under. It is believed that this growth makes an excellent green manure crop.

The soil is a sandy loam with an occasional intermingling of thin clay strata. The excessive loss of irrigation water is prevented by a tight impervious clay layer at a depth of about 5 or 6 feet. This layer would probably be more advantageous to cabbage production if it were located a little nearer the ground surface, as the root zone of this plant is relatively shallow.

In 1935 the irrigation season for this crop extended from March 14 to June 14, a period of 93 days. Although the growing season was the same length as in 1934 it was somewhat later, as was evidenced by the fact that the transplanting was done on March 14 instead of on February 23, and the last irrigation was applied about 20 days later than during the preceding year. During the season the field received 8 irrigations. The decreased number was because of a desire to save water, as the Irrigation District officials announced at the beginning of the season that only 18 acre-inches of water per acre would be distributed to the farm lands during the growing season unless an increased amount should become available. During the season this allotment, owing to favorable indications, was increased to 30 inches. Irrigations were applied to the cabbage field on March 14 (transplanting time) and 25, April 13 and 26, May 17 and 27, and June 8 and 14. The applications varied in depth from 1.1 inches to an estimated amount of 3.5 inches, with a total of 17.3 acre-inches per acre. The precipitation during the irrigation season amounted to 1.37 inches and fell on eight different days. Precipitation of this nature is probably of little benefit to the crop. The treatment that this field received resulted in a yield of 27039 pounds to the acre.

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

In this project a study is being made of the fluctuations of the ground water in a portion of the valley in the vicinity of Mesilla Park and Las Cruces and west across the valley to the river. The field work on the project has been completed.

Project 1.—Irish Potato Culture.

(In cooperation with the departments of Horticulture and Biology.)

This project has been carried on for several years with each department assuming the responsibility in connection with its particular line of research. The Irrigation Department has investigated the effect of various irrigation treatments on the yield of potatoes. The work has progressed to such a point that the results indicate rather clearly that further irrigation work is unnecessary until other phases of the problems involved have been more thoroughly studied.

Project VI, revised.—The Effect of Different Irrigation Treatments on Maturity, Lint, and Yield Factors of Acala Cotton, and Labor Requirements for Production.

This project is a revision of the old Purnell project No. VI. Some of the results obtained during the first year's investigations are shown below in Table 1. The cotton was planted in the dry ground in all the comparisons and was "irrigated up" on April 30. The flooding method of irrigation was used in all instances.

Five irrigation treatments were used, which resulted in the various groups receiving from 4 to 9 irrigations, with a total seasonal application of 14.4 to 30.2 acre-inches per acre. The group which received water at "frequent" intervals was irrigated in such a manner as to maintain the plants in a vigorous growing condition at all times. The "infrequent" treated plots were permitted to suffer for moisture preceding each irri-

TABLE 1.—IRRIGATION TREATMENTS, YIELDS, AND OTHER DATA 1918

Plot numbers	Irrigation treatment	First irrigation	Last irrigation	Total number of irrigations	Acre inches per acre	
					Per application	Total
1, 6, 11, 16	Frequent	April 30	Sept. 17	9	3.36	30.2
2, 7, 12, 17	Infrequent	April 30	Aug. 20	4	3.60	14.4
3, 8, 13, 18	Frequent then infrequent	April 30	Aug. 20	6	3.30	19.8
4, 9, 14, 19	Infrequent then frequent	April 30	Sept. 17	7	3.13	21.9
5, 10, 15, 20	Commercial	April 30	Sept. 17	7	3.21	22.5

TABLE 1 (Continued.)

Plot numbers	Yields of lint cotton per acre				Percent of total			Percent of lint
	First picking	Second picking	Third picking	Total picked	First picking	Second picking	Third picking	
1, 6, 11, 16	726	209	17	951	76.3	22.0	1.8	42.8
2, 7, 12, 17	359	80	1	441	81.4	18.1	.2	45.4
3, 8, 13, 18	471	103	2	576	81.8	17.9	.3	47.2
4, 9, 14, 19	659	310	15	984	67.0	31.5	1.5	42.4
5, 10, 15, 20	683	224	9	916	74.6	24.5	1.0	42.6

TABLE 1 (Continued.)

Plot numbers	Percent germination	Number of fruiting branches	Number of vegetative branches	Number of blooms	Number of sheds	Percent of shed	Number of bolls	Weight per boll; grams
1, 6, 11, 16	76.4	320	74	580	288	54.0	262	7.56
2, 7, 12, 17	71.9	287	47	367	245	67.4	96	5.09
3, 8, 13, 18	72.5	287	60	474	310	66.4	160	6.03
4, 9, 14, 19	68.9	317	54	592	114	52.6	268	7.52
5, 10, 15, 20	74.2	312	80	606	328	54.4	266	7.56

gation. In the third group the plots received "frequent" irrigations until about the middle of July and then water was applied at "infrequent" intervals. The treatment was reversed in the fourth group. In the last one, water was applied when the plants seemed to be capable of utilizing moisture.

The infrequently irrigated group returned the lowest yield, with early maturity. The third group ranked a little higher in yield and about the same in maturity when based on yield. The other three groups were about the same in yield but were slower in maturing than was the first. Curves were prepared showing the date of blooming and opening of bolls, and they indicate that all treatments had a boll opening peak at about 75 days

after the first bloom, or near the middle of September; and in the first, fourth, and fifth groups there was a second peak of opening about 95 days after the first bloom. This was probably brought about by the lateness of the last irrigation applied to these three groups. The effect of the lack of water was reflected in the percentage of lint, number of fruiting and vegetative branches, number and size of bolls, and the percentage of sheds; but apparently the resulting seed was not affected in so far as germination was concerned.

Project XXVI.—A Study of the Effect of Fertilizers and Frequency of Irrigation on the Yield and Keeping and Marketing Qualities of the Early Grano Onion.

(In cooperation with the Department of Horticulture.)

This experiment is carried on in cooperation with the Horticultural Department on a farm located about one-fourth mile northwest of Mesilla Park. The soil is a sandy loam but is not uniform in profile, as it is intermingled with thin layers of sand and clay. At a depth of about 5 feet there appears a layer of impervious clay which practically prohibits water losses by deep percolation. After the onions were removed from this field in the 1934 season, weeds (pigweeds) were allowed to grow. They were plowed under when they had reached a height of four and one-half feet, and served as a green manure crop. The field was divided into two groups of ten plots each. Five treatments of four distributed plots each were used in this study.

As a means of giving the plants an even start, all groups were treated in the same manner until about the middle of April; after which the scheduled irrigation treatments were given.

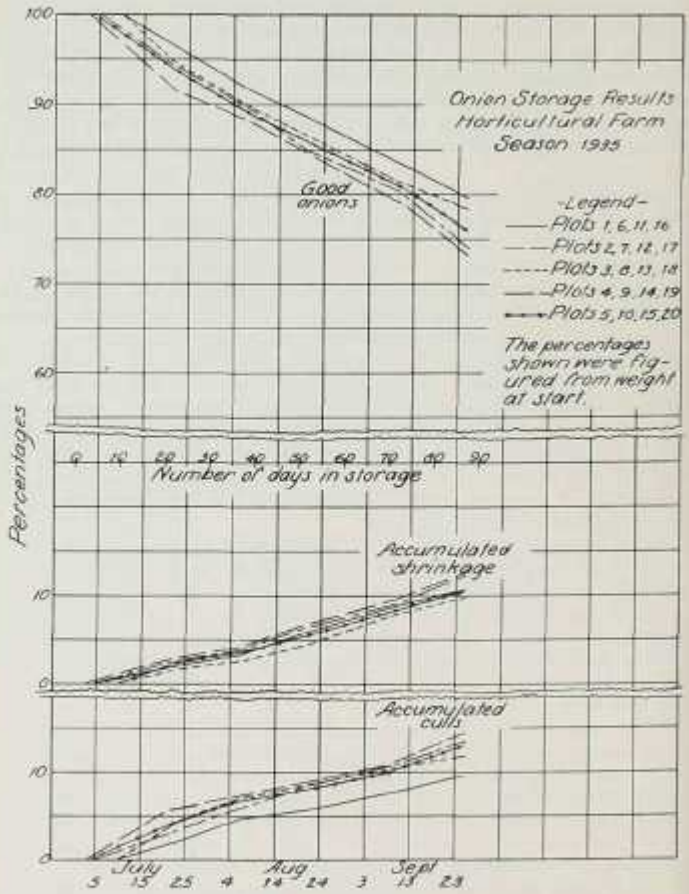
In Group I the plots were irrigated when the plants seemed capable of utilizing moisture. The second differed from the first only in that irrigations were discontinued two weeks earlier at the end of the season. Groups III, IV, and V were irrigated at intervals of one week, ten days, and two weeks, respectively.

The onions were transplanted on March 5. The growing conditions were not so favorable as they were during 1934, and consequently the onions did not develop so uniformly nor mature so early as during preceding years. Pink root rot affected a majority of the plants but it did not develop to a sufficient extent to decrease the yield. Only a very few bulbs had decayed by harvest time. After the onions were placed in storage there was considerable loss because of this disease.

Seed stalks developed to a greater extent in 1935 than in 1934, probably because of the unfavorable season. The plots planted to the white variety had more seed stalks than the ones planted to the yellow variety. None of the plots had its yield affected because of this condition.

The maturity of the plants was not greatly affected by the treatments, although the second series of plots, those on which the irrigations were discontinued rather early, matured first. The plots irrigated with the greatest frequency matured the latest, by about 5 or 6 days.

The harvesting was done in the same manner as during 1934, that is, the digging was done with a garden tractor. The tops were cut off in the



field, and the bulbs were permitted to dry 3 or 4 hours. They were then removed to the shed for curing. They were spread in layers 4 or 5 inches thick and allowed to remain for a few days. They were then sacked in 50-pound sacks for shipment.

The plots receiving water at weekly intervals after the middle of April returned the largest yield. The yields from the other treatments were practically the same regardless of the irrigations. The third treatment also produced a high percentage of No. 1 bulbs.

As a means of determining the effect of the different irrigation treatments on the keeping qualities of the Early Grano onion, 2 crates, of about 42 pounds each, per plot, were placed in storage in the adobe storehouse at the Horticultural farm. Only No. 1 bulbs were used for this purpose. These onions were stored at about 2-week intervals, to determine the loss attributable to shrinkage and rots. The chart on page 52 shows the results obtained from storage.

MISCELLANEOUS

The Department has cooperated rather extensively during the past fiscal year with outside agencies connected with some of the New Deal adjustments. Considerable time has been spent in assisting the State Land Use Consultant in an advisory capacity concerning land and water problems in various sections of the State. Office space was furnished several of the men in connection with this work. Assistance was given the Agricultural Economist of the Land Policy Section of the Agricultural Adjustment Administration in the capacity of consultant and by means of two field trips. Data concerning land and water conditions in various parts of the State were furnished these agencies. Many local conferences and meetings were attended in connection with the above line of work.

Owing to the anticipated shortage of irrigation water for the Mesilla Valley for the 1935 growing season, the College and Experiment Station considered it advisable to install two pumping plants to provide water in case of emergency. This required practically all of the time of the one man in the Department during the months of May and June, 1935.

In addition to the above miscellaneous duties, the Department has assisted in the study of Regional Adjustment in Farming Methods and has furnished office space and equipment for draftsmen. Assistance was given the Extension Service by making a field trip with the Horticulturist to inspect drainage conditions at Ft. Sumner and Estancia. Another trip, of about a week's duration, was made with the Agronomist. Talks on soil moisture and home water systems were made for the Service during Farmers' Week. One short field trip was made with a representative of the Soil Conservation Service to assist him in locating a proposed soil conservation project.

IRRIGATION WELLS

The drouth situation had decreased the supply of irrigation water in the Elephant Butte Reservoir to such an extent by the spring of 1935 that the district officials believed that there would be insufficient water for crop production for that year. They informed the public that probably only 1½ acre-feet per acre would be available during the season. Considering the fact that the College requirement is about 4 feet, the experimental work and crop production would be severely handicapped under such conditions. For these reasons the authorities decided to install two new pumping plants to provide water for the experimental plots and crops. Plants had been installed several years ago but they were either obsolete or unsatisfactory and could not be used. One of the new plants

was located on the Horticultural farm northwest of Mesilla Park and the other was installed on the old College farm.

HORTICULTURAL FARM WELL NO. 3

To eliminate confusion with irrigation plants that had been installed previously by the College, this well is designated as indicated above. Well No. 1 on this farm was installed about 1905. It was equipped with a vertical centrifugal pump mounted in a concrete pit about 16 feet in depth. The discharge was approximately 1000 gallons a minute. In time this well deteriorated to such an extent that it failed to supply the usual amount of water, so it was discarded. It was replaced by Well No. 2, located about 75 feet distant. This well was equipped with a vertical centrifugal pump and an electric motor, belt connected. The water supply was inadequate, as only about 250 gallons a minute were obtained. The plant was seldom used and was practically discarded.

Fig. 1.—Rig used in drilling the two wells described in this report.

Horticultural farm Well No. 3 was drilled and equipped for pumping during May 1935. It was located about 2 feet from Well No. 1 in the concrete pit, which, in the meantime had been filled and concreted over as a part of a floor for an adobe building. This pit was cleaned out, the concrete bottom was dynamited, and a part of the building was torn away so that the new well (No. 3) could be made. This location was selected because Well No. 1 was satisfactory when new, and Well No. 2 failed to supply sufficient water, for unknown reasons.

Well No. 3 was drilled by R. D. Sidey, an experienced well driller. The drilling was done with a 14-foot sand bucket operated from a 30-foot mast mounted on a modern all-steel machine, all of which equipment was in excellent condition. Second-hand standard 12-inch casing was used. All except the top 15 feet of casing was perforated before installing. Perforating was done by means of a torch. Perforations were 8 inches long, $\frac{3}{8}$ of an inch wide, and 8 inches apart. They were cut lengthwise the casing.

The bottom or first length was 22 feet long and was equipped with 8 rows of perforations. The second length of 20 feet and the third of 11 feet contained 4 rows of slots. The top length, 15 feet, was not perforated. The well was drilled to a depth of 68 feet and was plugged at the bottom with several rocks about 6 or 8 inches in diameter. Considerable difficulty was experienced in drilling because of quicksand falling in around the sand bucket and binding it to the casing. At one stage it became necessary to pull the casing about 3 feet to dislodge the bucket. While drilling was in process, rocks from 1 to 3 inches in diameter were poured into the cavity around the casing to replace the sand removed by the sand bucket and to serve as a strainer. Approximately 15 yards were used for this purpose. It is doubtful if this gravel extends sufficiently far down the casing to serve as a satisfactory screen. About 20 yards of sand were hauled away from the well after it was finished.

After the well was drilled it was developed with a temporary pump. When pumping was first begun the discharge was about 300 or 400 gallons a minute. Continuous surging for about 30 hours increased the discharge to 1100 gallons a minute. It is believed that additional developing would increase the discharge to 1500 or 1600 gallons a minute.

The pump used in this well was a Peerless 12-inch single stage turbine. The pump is direct connected with a 20-horsepower electric motor. The original plan called for setting the pump at the 30-foot level, but due to the facts that some of the casing became slightly warped in cutting the slots, that small blisters of metal stuck to the inside edges of the slots, and that the well was not perfectly straight because of difficulties encountered in working over the old pit, it was impossible to lower the pump as far as desired. The pump was therefore set at the 20-foot level, using two lengths of column, and was equipped with 32 feet of suction pipe. This left the lower end of the suction pipe 14 feet above the bottom of the well. The end of the suction pipe was perforated with two collars of slots, ¼ inch by 4 inches in length; the slots being about 1 inch apart. The open end was covered with ⅛-inch strips of iron, crisscrossed, to leave openings about ¾ inch wide.

Fig. 2.—Perforating the casing used in Horticultural farm well No. 1.

It was impossible to obtain a satisfactory and accurate log of this well,

especially for the first 40 or 45 feet, because of its being in the same place as well No. 1. The log, however, as obtained is shown below.

LOG OF HORTICULTURAL FARM WELL NO. 3

Depth in feet	Materials
9 to 16	Concrete pit for old well (No. 1)
16 to 28	*Sand and trace of gravel
28 to 32	*Rock
32 to 36	Rock, gravel, sand
36 to 40	Sand
44	**Good water gravel
45	Clay and gravel
46 to 58	Pure sand
58 to 71	Gravel and rock—good water formation
71	Sand

*It is probable that the small amount of gravel encountered above the 40-foot layer was placed there in developing the first well.

**The gravel found at about the 44-foot level was probably natural formation since a domestic well being drilled about ¾ mile distant showed gravel at that depth.

IRRIGATION DEPARTMENT WELL NO. 3

About 1903 the College installed a six-inch well approximately 150 feet east of the building known as the College Seed House, about halfway between State College and Mesilla Park. This well was 48 feet deep and discharged 1000 gallons a minute. It is known as Irrigation Department Well No. 1. A few years later, about 1915, a second and larger well was drilled. Well No. 2 was approximately 40 feet west of well No. 1. It was 12 inches in diameter, 43 feet deep, and discharged about 1400 gallons a minute.

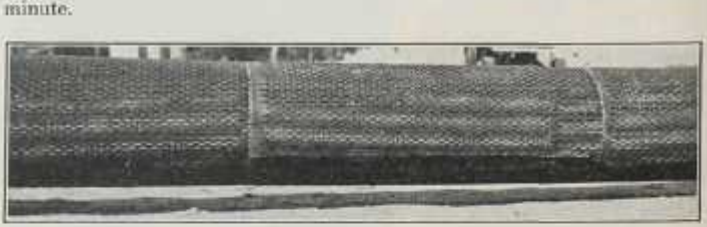


Fig. 3.—Porcher strainer used in Irrigation Department well No. 1. The strainer is 13 inches in diameter and made of 10-gage galvanized iron.

Well No. 3 was installed in June, 1935, for the reasons mentioned above. It was located to the north and about 35 feet from Wells 1 and 2, thus forming a triangle. It was hoped that this location would make it possible at least partially to utilize the underground reservoirs created by the first two wells. The drilling was done with the same rig and by the same operator as in the case of the well previously referred to. Standard 16-inch second-hand casing, almost as good as new, was used. The casing was not perforated. After the well was drilled to the desired depth, 50 feet, a 13-inch 10-gage galvanized iron Porcher strainer was dropped to the bottom. Sixteen feet of the strainer were perforated or slotted and three and one-half feet were left blank to lap over the casing. The slots were ⅛ inch x 1¼ inches. Approximately 40 percent of the

metal was cut away, thus providing adequate space for the entrance of water. The end of the strainer was closed. After the strainer was placed, the casing was withdrawn 16 feet and cut off at the surface of the ground.

A temporary pump was installed for developing purposes. Three impellers were worn out in bringing these two wells up to the desired capacity. The sand encountered in both places was rather coarse and sharp and apparently exists in practically unlimited quantities. When pumping was first begun on this well (Irrigation Department Well No. 3) the discharge was only about 250 gallons a minute. No record was kept of the exact amount of time and details concerned with the developing, as it was assumed that the behavior would be about the same as for the Horticultural Farm well No. 3; but such proved not to be the case. After the pump was started it was permitted to run until the water became clear. The pump was then shut off and started immediately. This operation was repeated continuously for about three days and nights. Each time the pump was started it would discharge a heavy load of sand, and occasionally some clay, for two or three minutes. During this time the discharge increased to about 500 gallons a minute, but not to the desired quantity.

Fig. 4.—Showing method of installing pump and motor for development of the wells referred to in the report of this Department.

At this stage the pump was equipped with another set of impellers, and pumping and surging were resumed. In the meantime a small reservoir was constructed in such a manner that the water could be run back into and around the casing. The reservoir was filled and then permitted to drain back into the well. The procedure was then repeated. This method was tried for several days, but apparently had no advantage over the preceding method. However, each time the pump was started the discharged water carried a heavy load of sand for about a minute or so, and then became very clear. After about two weeks' time had been expended in developing the well the discharge was increased to about 1400

gallons a minute. A new pump, better suited to the conditions, was installed and the discharge at final test was 1625 gallons a minute, with a drawdown of 18.5 feet from a standing water table of 13 feet. Entrance, velocity, and friction losses caused this pump to operate against a total head of 38.05 feet while discharging 1625 gallons a minute. In drilling and developing this well only a small amount of gravel was used. The formation was such that apparently the gravel was not permitted to settle down to lower depths.

The log of this well as obtained while drilling is shown below.

LOG OF IRRIGATION DEPARTMENT WELL NO. 3

Depth in feet	Materials
0 to 5	Soil
5 to 20	Sand
21	*Sand with trace of gravel
21 to 24	Sand
25	Sand with trace of clay
25 to 30	Sand
30	Thin layer of clay
30 to 50	Gravel and sand

*The sand from 21 to 29 feet carried traces of gravel.

POULTRY HUSBANDRY

Project 2.—Poultry Breeding.

This project consists of a study of some of the characteristics that contribute toward high egg production. The object in this case is to determine the relative values of the characteristics of high winter rate of lay and persistency as guides in selecting breeders. This problem appears to be of special interest in New Mexico, where the climate, in most sections of the State, is relatively favorable for winter production but unfavorable for persistent production.

Briefly, the method of procedure has been to use as breeders hens which could be classified into 4 groups as follows:

Group 1 contains hens which showed no winter pause but which stopped laying early in the summer.

Group 2 contained hens which showed a winter pause but laid late into the fall of the year.

Group 3 contained hens which showed no winter pause and also laid late into the following fall.

Group 4 contained hens which showed a winter pause and also stopped laying early in the summer.

An attempt has been made to measure the relative value as breeders of the birds represented in each group by keeping a record of the average egg production of the daughters produced by each group. The data obtained thus far do not seem to be very conclusive and probably are not sufficient in number to warrant the drawing of conclusions in a study of this kind. One fact has stood out consistently, however, and that is, the daughters produced by the hens in Group 3 are decidedly superior in egg production to the daughters produced by Group 4.

Project XXX.—A Study of the Influence which Different Range Crops and Rations Exert upon Net Returns from the Laying Flock through their Influence on Egg Quality, Number of Eggs Produced, and Flock Mortality.

The purpose of this study is to show the comparative influence which different range crops and rations exert upon the net return from the laying flock when their effect upon egg quality, annual production, and flock mortality is taken into consideration.

Five pens, each containing sixty Single Comb White Leghorn pullets, were used in this study. The pullets were free-range raised from the Experiment Station's breeding flock. At the start of the experiment they were divided into five groups of equal quality, based on physical development. The range they were allowed and the rations fed were as follows:

Pen	Ration	Range
1	Basal	Year-round green alfalfa.
2	Basal	Flock confined to barren yard but allowed year-round alfalfa range for two hours in the late afternoon of each day.
3	Basal	Winter wheat for the months November to May; Sudan grass June to October.
4	Basal	Barren yard. Succulent green feed, fed chopped at the rate of 5 pounds per 100 birds daily. Sprouted oats, fed when other succulent feed is not available.
5	Basal plus dried buttermilk, alfalfa leaf meal, cod-liver oil	Barren yard, no green feed.

The basal ration contains the following ingredients:

Scratch grain		Mash	
Wheat	100 pounds	Wheat bran	100 pounds
Cracked yellow corn	100 pounds	Wheat shorts	100 pounds
Kafir	100 pounds	Pulverized oats	100 pounds
		Yellow corn meal	150 pounds
Total	300 pounds	Meat and bone scraps	150 pounds
		Fine oystershell	12 pounds
		Salt	5 pounds
		Total	617 pounds

The ingredients in the rations for Pen 5 are as follows:

Scratch grain		Mash	
Wheat	100 pounds	Wheat bran	100 pounds
Cracked yellow corn	100 pounds	Wheat shorts	100 pounds
Kafir	100 pounds	Pulverized oats	100 pounds
		Yellow corn meal	150 pounds
Total	300 pounds	Meat and bone scraps	90 pounds
		Dried buttermilk	60 pounds
		Alfalfa leaf meal	30 pounds
		Fine oystershell	12 pounds
		Salt	5 pounds
		Cod-liver oil	6 pounds
		Total	653 pounds

The following records have been kept on each pen:

1. Feed consumption.
2. Egg production.
3. Mortality.
4. The market grade of eggs produced by each pen.
5. Total sales value of the eggs produced per pen.
6. Net income over feed cost per pen.
7. The keeping quality, when placed in cold storage, of the eggs produced by each pen.

A summary of the first year's results is given in the table on page 61.

MISCELLANEOUS

The study of the value of ground chile powder in the laying ration is being continued as previously reported. The first year's results did not show any advantage in favor of the chile powder; in fact, an unfavorable effect on yolk color continued to be observed, as reported last year.

A study of the value of hybrid birds is being made, with special regard as to whether or not these birds will show a lower mortality in the laying pens. The cross used is Single Comb White Leghorn males on Rhode Island Red and Barred Plymouth Rock hens. No data have been collected on this study as yet.

A progeny test is also being started on a number of Single Comb White Leghorn males. The annual egg production of the daughters from as many males as possible will be kept each year, in order to have a progeny record on these males. It is too early, at this time, to make a report on this work.

SUMMARY OF DATA ON FIRST YEAR'S RESULTS, PROJECT XXX

Pen	Total number of eggs produced	Total value of eggs produced	Cull eggs produced	Total feed consumed	Total feed cost	Income above feed cost	Number of hens at beginning of year	Number of hens at end of year	Average number of hens for year	Storage quality (Average value of eggs per case on being removed from storage.)
No. 1. Alfalfa range	10,256	$296.42	Percent 19.9	Pounds 4126	$69.84	$126.58	60	42	53.6	$7.54
No. 2. Alfalfa range 2 hours daily	10,690	295.88	14.1	4148	69.96	138.12	60	46	56.4	7.87
No. 3. Barren yard; green feed daily	10,032	195.60	8.6	4052	68.82	126.98	60	42	55.2	7.87
No. 4. Wheat range, Sudan grass	8,218	164.46	9.1	3603	60.76	103.70	60	38	49.4	7.66
No. 5. Barren yard, green feed sub etimes	11,658	216.72	10.3	3956	74.12	142.60	60	44	53.0	7.67

FINANCIAL STATEMENT

RECEIPTS

	Hatch Fund	Adams Fund	Purnell Fund	Supplementary Fund
Balance on hand July 1, 1934	None	None	None	$35,175.61
Appropriation from State Treasury				5,400.00
Receipts from sales				15,673.73
Receipts from Treasurer of the United States, as per appropriation for fiscal year ended June 30, 1935, under acts of Congress approved March 2, 1887 (Hatch Fund), March 16, 1906 (Adams Fund), and February 24, 1925 (Purnell Fund)	$15,000.00	$15,000.00	$60,000.00	
	$15,000.00	$15,000.00	$60,000.00	$56,249.34

EXPENDITURES

Salaries	$7,553.86	$8,997.95	$30,352.08	$6,373.46
Labor	4,088.46	2,558.79	10,356.62	3,251.40
Stationery and office supplies	140.66	7.95	387.84	39.58
Scientific supplies, consumable	190.90	955.31	643.91	127.68
Feeding stuffs			5,004.33	2,483.03
Fertilizers		154.56	104.09	
Sundry supplies	300.61	171.37	594.06	130.48
Communication service	46.38	53.98	455.24	184.91
Travel expense	182.20	265.25	3,809.25	313.32
Transportation of things	33.66	192.75	365.00	135.67
Publications	1,199.90		1,222.20	360.55
Heat, light, water, power	288.69	300.51	692.56	1,277.34
Contingent expenses	37.79		30.13	71.76
Furniture, furnishings, fixtures	267.55	60.60	1,633.54	61.31
Library	11.26	7.77	123.83	326.38
Scientific equipment	91.03	469.47	418.23	34.38
Tools, machinery, appliances	377.64	537.54	1,224.67	421.33
Livestock			468.00	
Buildings and lands	189.41	266.20	2,114.42	817.12
Balance				39,839.64
	$15,000.00	$15,000.00	$60,000.00	$56,249.34