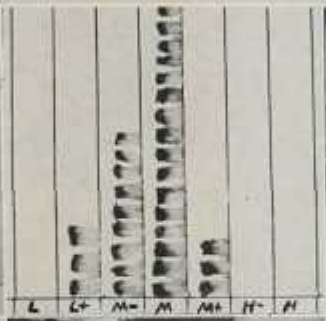
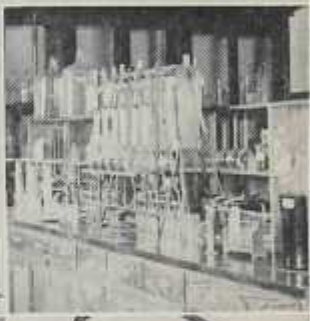


# Science Working For New Mexico Farms And Ranches








FIFTY-NINTH ANNUAL REPORT, 1947-48 OF THE AGRICULTURAL EXPERIMENT STATION, NEW MEXICO COLLEGE OF AGRICULTURE AND MECHANIC ARTS, STATE COLLEGE, NEW MEXICO.

State College, New Mexico
December 31, 1948

To His Excellency, Thomas J. Mabry,
Governor of New Mexico.

Sir: I have the pleasure of submitting herewith the fifty-ninth annual report of the Agricultural Experiment Station of the New Mexico College of Agriculture and Mechanic Arts, for the fiscal year ended June 30, 1948. This report contains brief statements regarding the progress of the several research projects which the station is conducting. There is also included a financial statement of receipts and expenditures.

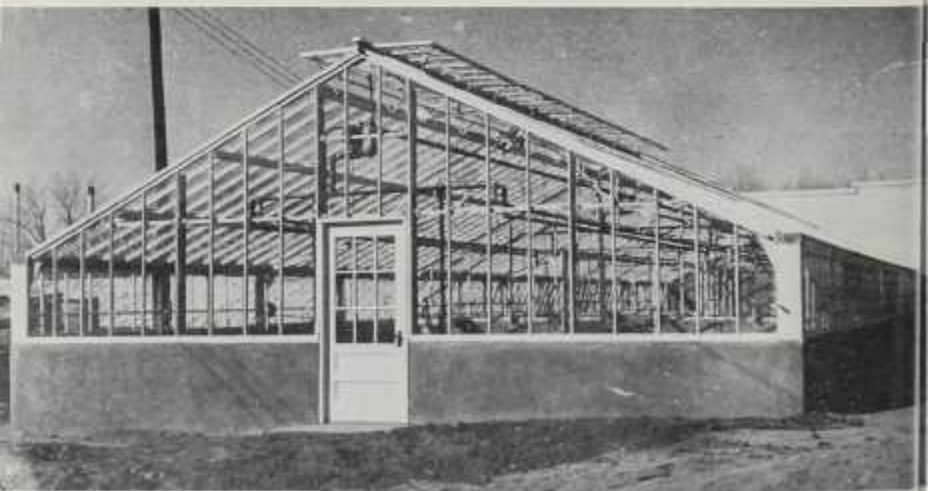
Respectfully submitted,
H. R. Varney, Director,
Albert S. Curry, Associate Director.

# TABLE OF CONTENTS


Introduction ..... 3
Beef Cattle and Sheep ..... 5
Dairying ..... 14
Economics of Agriculture ..... 18
Field Crops ..... 24
Foods ..... 43
Orchards ..... 44
Poultry ..... 53
Range Land ..... 54
Chemistry ..... 59
Vegetable Crops ..... 61
Publications ..... 65
New Projects ..... 66
Projects Closed or Revised ..... 67
Financial Statement ..... 68
Cooperative Work ..... 69
Staff Changes ..... 69
Station Staff ..... 70

Ranch Day, 1947. An annual event when New Mexico ranchers are invited to inspect experimental work on the College Ranch and the Jornada Experimental Range.

The new greenhouse, completed in 1947, is used at present for research work on alfalfa improvement, Pinto bean improvement, cotton seedling vigor, and verticillium wilt.



# SCIENCE WORKING FOR NEW MEXICO FARMS AND RANCHES

FIFTY-NINTH ANNUAL REPORT

OF THE

NEW MEXICO AGRICULTURAL EXPERIMENT STATION

FOR THE FISCAL YEAR ENDING JUNE 30, 1948

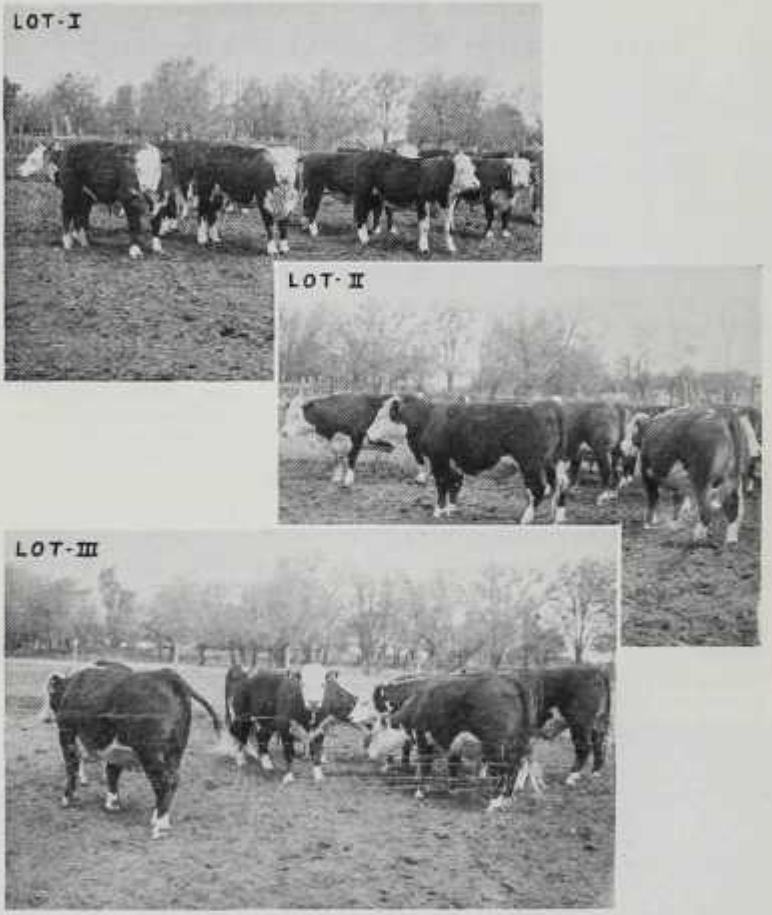
OUR successful agricultural production record during and since the war was the result of well planned and carefully executed research programs by agriculture and industry. Record yields of quality crops and high returns from livestock and livestock products were not obtained by chance. The use of modern farm machinery, the best cultural practices, adapted strains of farm crops and livestock, good soil management practices, excellent insect and disease control methods and improved marketing procedures were required for the American farmer to be of such great help in meeting the world demand for the necessities of life.

This situation was met because the American farmer had the "know how" of modern production.

Further increase in population will place even greater demands on the producers of agricultural products. This will require continual and greater efforts in experimentation and research to develop better production and more efficient insect, disease, and weed control methods, higher-yielding and higher-quality strains of field and horticultural crops and livestock. The consumer demand for highly specialized products of exceptional quality and limited use has placed a difficult burden on the producer. This situation can be met only through an extensive and efficient research program.

The American farmer has reached his present stage of high production only because he has used the results of research. Agriculture has come to depend upon the results of experimental programs, and research must be considered as one of the most important phases involved in the farmer's production and marketing procedures. Research is as necessary in our agricultural and rural-living program as is the use of good seed and proper planting, cultivation, weed-control, and harvesting procedures.

The following are reports of progress pertaining to studies made by the staff members of the New Mexico Agricultural Experiment Station. Even though they are not necessarily recommendations of approved practices, suggestions may be drawn from them. Persons interested in obtaining more complete information on a report are invited to correspond with the Agricultural Experiment Station, State College, New Mexico.




Three of the four lots of steers used in the feeding experiment. Lots I and II received small amounts of grain, but Lot II also received thiouracil for the last six weeks of the experiment. Lot III received a medium amount of grain, gained more than either of the other two lots, but sold for the same price as did Lot II.

# BEEF CATTLE AND SHEEP

## Minimum Amounts of Grain for Fattening Yearling Steers

Because grain is one of the most expensive items of feed, New Mexico livestock feeders want to feed the least amount of grain necessary to fatten cattle satisfactorily. Therefore, an experiment was begun to determine what this minimum amount of grain is for yearling steers.

Four lots of steers were fed and each received the same roughages—alfalfa hay and corn silage. Two lots received small amounts of grain, one a medium amount, and one a moderately heavy feeding of grain. One of the lots receiving the smallest amount of grain was fed thiouracil the last six weeks of the feeding period. This substance depresses the activity of the thyroid, and has been found to increase fattening in pigs and chickens.

Some of the results are shown in the table.

When the amount of grain fed was increased from light to medium, the cattle gained faster and sold for more. On the other hand, the feeding of heavy amounts of grain did not increase the gain much, and it raised the market price only 50 cents a hundred pounds.

Thiouracil did not increase the gain materially, nor reduce the cost of gain. However, the thiouracil-fed cattle were sleeker and sold for a higher price than those receiving a similar amount of grain and no thiouracil.

This experiment will have to be repeated in order to determine whether some of the differences were due to the feeds used or to chance variation.

**Comparison of Gain, Feed, Cost of Feed, and Market Price for Four Lots of Yearling Steers Fed Different Amounts of Grain**

| | Amount of Grain | | | |
|---|---|---|---|---|
| | Light | Light, with Thiouracil Last 6 Wks. | Medium | Heavy |
| Av. daily gain, lbs. | 1.97 | 2.01 | 2.20 | 2.20 |
| Feed for 100 lbs. of gain, lbs. | | | | |
| Ground maize | 216 | 213 | 306 | 422 |
| Cottonseed meal | 96 | 94 | 86 | 83 |
| Corn silage | 1,227 | 1,256 | 1,038 | 1,007 |
| Alfalfa hay | 295 | 296 | 239 | 246 |
| Cost of feed for 100 lbs. of gain, dollars | 24.41 | 24.24 | 25.89 | 29.79 |
| Market price per 100 lbs., dollars | 29.00 | 30.50 | 30.50 | 31.00 |

## Supplements for Breeding Cows on Dormant Range

For the last three years, range cows have been fed supplements during the spring months to determine whether or not such a practice would increase calf production.

The spring feed conditions have been fairly favorable and the results from this supplemental feeding have been quite consistent. The results from the 1948 test are shown in the table.

The cows receiving supplements have lost less weight during the calving season than the cows receiving no supplement other than the bonemeal-salt mixture fed to all. The calves of the supplement-fed cows also weighed more, but those in the grain-fed lot were only slightly heavier than those in the lot that did not receive a supplement. The cows and calves that received supplements lost the weight advantage by the time the calves were weaned in the fall.

Because of the apparent shortage of green feed on the range during these months, one lot of cattle was fed dehydrated alfalfa meal to provide carotene, a vitamin factor normally supplied by green range forage. An analysis of the forage and blood of the cattle showed that there was no advantage in this. However, under less favorable conditions, the cattle would probably need vitamin A supplement.

**Results of Third Season of Feeding Supplements to Breeding Cows on Dormant Range.**

| | Supplements Used | | | |
|---|---|---|---|---|
| | None | Red maize | Cottonseed cake 43% protein | Cottonseed meal, 70%; dehydrated alfalfa meal 23%; molasses 7% |
| Number of cows | 24 | 24 | 24 | 24 |
| Supplement fed per cow, lbs. | — | 153 | 153 | 175 |
| Av. gain of cows lbs. | —74 | —33 | 48 | 2 |
| Av. wt. of calves May 11, lbs. | 128 | 132 | 148 | 135 |

## Southern New Mexico Range Forage Seldom Lacks Vitamin A

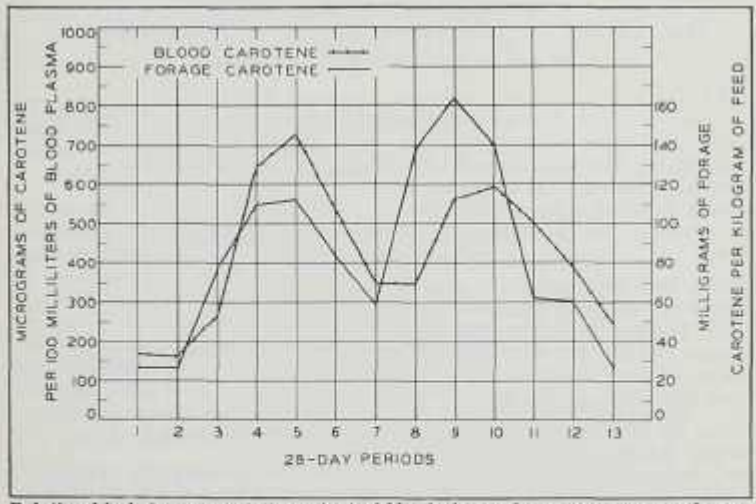
Because ranges in southern New Mexico often seem to lack green grasses and weeds, ranchers have wondered whether their cattle need vitamin A supplements. This problem has been studied since 1943 and

the conclusion is that a carotene and vitamin A shortage in southern New Mexico may occur only during severe droughts.

Every 28 days during the study, samples were taken of forage from the range and blood from the cattle. Thirty-two breeding cows were tested in the first 24 sampling periods, and 16 in the next 35 periods. The average results are shown in the chart.

Colorado workers have found that first-calf Hereford heifers need a carotene blood level of 118 micrograms per 100 milliliters of blood plasma. Older cattle require only 83 micrograms per 100 milliliters of blood plasma. Only during the first two periods of the year—in January and February — did the carotene blood levels drop to around 160 micrograms, and this is far above the requirement level. During a favorable season in March, April, and May, the annual plants grow and cause the blood carotene values to rise to a level even higher than that usually found during the growing season of August, September, and October.

In the winter and spring of 1947-48, blood carotene values fell to, and sometimes below, the level of minimum requirement for pregnant or lactating cows. The grasses, however, contained approximately the same amount of carotene as is usu-




**Relationship between carotene content of blood plasma from range cows and carotene content of range forage. Four and one-half years average; samples taken every 28 days, beginning about the first of January.**

**This portable centrifuge, which is powered by a battery, was used for preparing the blood samples taken from the cattle on the College Ranch.**

ally found between October and January.

One explanation for the lowered blood carotene is that the growth of fall weeds and annuals may have been prevented or retarded by the extreme cold and dry conditions of the earlier part of the winter. The mean minimum temperature was 4.8° F. colder than normal, and the precipitation was 58 per cent of normal.

The period of low carotene lasted about four and one-half months, but was followed in April by high blood plasma carotene, when the spring growth began. Thus, the only threat of a carotene, or vitamin A, deficiency from 1943 to 1948 did not materialize. Symptoms of vitamin A deficiency were not observed among the cows during this period.

## The Effect of Different Levels of Nutrition on Wool and Lamb Production

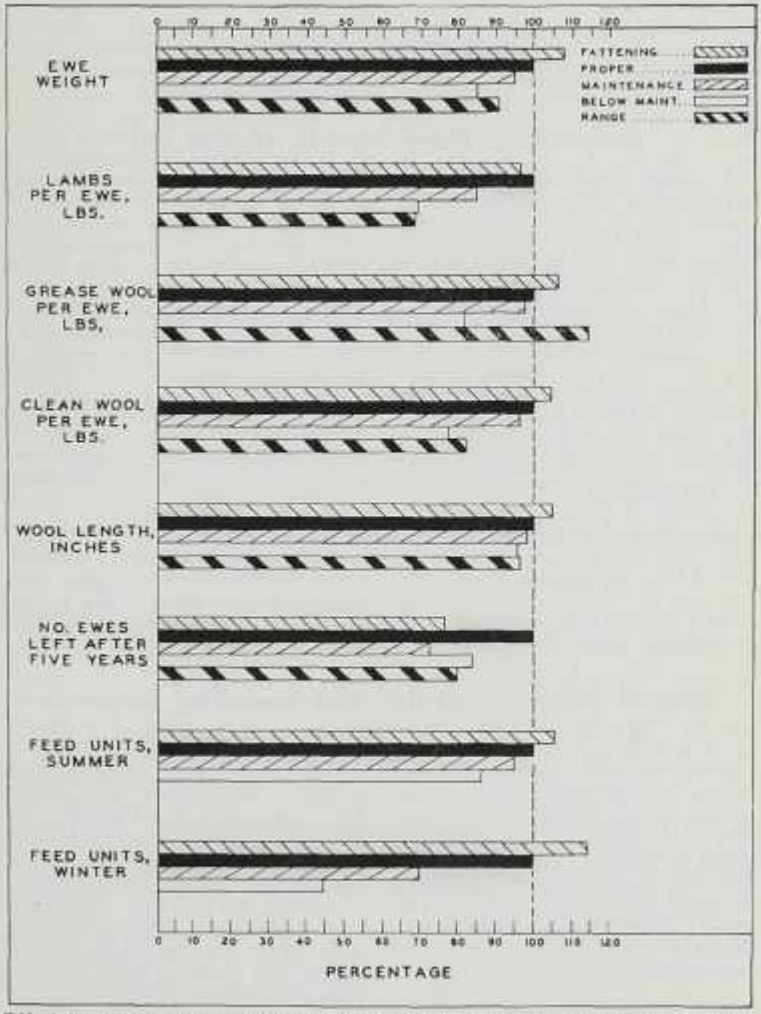
When the range is dry through the winter months, ewes will give better production if they are fed a supplement. This was one conclusion reached by the animal husbandmen after a five-year study of the effect of nutrition on production from ewes.

They have kept five lots of ewes on different levels of nutrition since 1943. There were twenty-eight ewes in each lot, and the only ones to be taken out were the non-breeders and those that died.

One lot of ewes was kept on the range. Another lot was fed a "proper" ration, which was planned so that the ewes remained in good condition, but did not store much fat. The other three lots were fed variations of the "proper" ration, so that one lot was fattened, one lot barely maintained its weight during pregnancy, and one lot lost weight.

The chart shows the average production of lambs and wool from these ewes over the past five years. Production from the ewes on the "proper" ration was considered 100 per cent. The variation in feed affected lamb production more than wool production. It affected the weight of clean wool more than wool length or grease weight; and it affected wool length least of all.

From the average ewe weights and wool production, it appears that the range ewes were on a ration close to maintenance. They did not overgraze




**Effect of the level of nutrition on the production of lambs and wool from ewes. The proper ration was considered 100 per cent, the effect of the other rations are shown in percentages of proper.**

the range, because the ewes on the "below maintenance" ration received, as winter feed, all the range hay they would eat. Therefore, the records indicate that, when feed is particularly scarce on the range, the ewes will give better production if they are given supplemental feed.

## Estimating Wool Length in the Fall

If a rancher were to consider buying breeding stock in the fall, he would have no definite way to tell what he could expect in the way of wool length. Therefore, research is underway to establish a method a rancher can use to tell, by measuring the wool, how long it will probably be at shearing.

During 1947-48, the animal husbandmen measured the length of wool from 400 rams and 150 ewes, sampling the wool from the rams every two months, and that from the ewes every month.

They found that the wool seems to grow at about the same rate for the first four to six months after shearing, and then it grows more slowly, with a gradual reduction in the rate of growth. This may be partly explained from the fact that the range feed is always better in the summer, during the first six months after shearing. However, the wool growth rate for ewes that were kept on fattening ration all year also dropped off some after the eighth month. This drop in growth rate might be caused by the last three or four months of pregnancy.

The measurements for the first four months after shearing were not exact, possibly because of an error in sampling and measuring such short samples.

Because of the effect of environmental conditions and sampling error, average curves for wool growth may be off as much as one-fourth inch when used to estimate growth for one sheep.

## Season Affects Fertility and Breeding Behavior of Rams

A study of the influence of season on the fertility of rams was initiated to gain information on three things: (1) the possibility of producing lambs at various times of the year; (2) the possibility of improving methods of artificially inseminating sheep; and (3) the possibility of increasing the lamb crop in usual operations.

The natural breeding season for sheep is in the fall. Ewes of most of the mutton breeds do not come into heat at other times. Some breeds, however, particularly the Dorset Horn and, to a lesser degree, the fine wool breeds, have somewhat extended breeding seasons. Rambouillet ewes at State College become inactive in late February, and remain so through March. However, a few ewes begin to come into heat in April, and by July, most ewes are coming into heat regularly.

The results obtained at this station indicate that the breeding behavior

of the rams tends to parallel that of the ewes. Rams that are separated from ewes are apparently aggressive at all times, but their ability to copulate is greatest during fall and winter. It is reduced during the spring to the point that it is difficult to secure semen samples either by artificial vagina or by recovery from a ewe. Ability to copulate begins to increase in May and steadily increases until fall. Sperm are produced at all times by rams, but the level of production has not been ascertained because of the difficulty in securing samples during the spring months. However, there is little doubt that sperm production is greatest during fall and early winter.

Research workers in other areas have reported that the high temperatures of summer result in lowered fertility of rams. This has not been exactly the case at State College.

For a number of years, ewes have been bred successfully here during July and August, the hottest months of the year. For three out of four years of the experiment, there has been no noticeable laboratory evidence of reduced fertility of the rams. However, in 1947, eight of ten rams in the experiment became completely sterile in July. The volume of semen obtained was lowered, and contained only dead sperm, many of which were degenerated. These symptoms suggested that high temperatures may have been the cause. However, the temperature that summer was not higher than usual, and the heat had obviously not induced sterility before nor did it in 1948. Humidity and other such factors may influence the effects of temperature on the condition. Temperatures at State College during the day are higher than those that have induced sterility elsewhere. However, the temperature at night drops markedly, and may afford protection from the day-time temperatures.

## Corn Silage For Lambs Saves Land and Water

During 1947-48, one part of a lamb-feeding experiment resulted in a saving of both land and water.

The experiment was a comparison of corn silage with coarse alfalfa hay for fattening lambs. Ten lots of twenty-four lambs each were fed. One lot received only alfalfa hay and grain. The other lots received all the alfalfa hay the lambs would eat, and were also given corn silage. Lambs in Lot 2 were fed 0.66 pound of corn silage, and those in each succeeding lot were given amounts increased by 0.33 pound. Therefore, the lambs in Lot 10 received 3.33 pounds of silage. The same amount of concentrates was fed to each lot. But as the amount of silage increased, the amount of protein supplement was also increased, and sorghum grain was decreased an equal amount.

The results indicated that as much as 2.75 to 3 pounds of silage in the ration did not lower gain or carcass grade below that of the lambs receiving only alfalfa hay for roughage. Silage replaced hay in a ratio of about 3 pounds of silage to 1 pound of hay.

With an acre yield of 5 tons of alfalfa hay and 20 tons of corn silage,

and a water requirement for irrigation of 4 acre-feet for alfalfa, and 2 acre-feet for corn, it required 2.62 acres of land and 10.48 acre-feet of water to feed 100 lambs where silage was not used, and 1.78 acres of land and 5.86 acre-feet of water where 2.75 pounds of silage was used.

## Cross-bred and Straight White-Faced Lambs Compared

Many sheepmen believe that cross-bred lambs are superior to the straight white-faced ones for market. Buyers seem to prefer those that show some mutton breeding, and it is frequently claimed that cross-bred lambs are hardier and more efficient producers. As a result, many producers have used rams possessing Suffolk or Hampshire blood on their fine wool ewes to produce market lambs. They use these breeds because the rams are large, growthy sheep, and also because they are black-faced, and leave no doubt about their offspring having mutton breeding in their ancestry.

Unfortunately, should any of the offspring become mixed with fine wool breeding herds, they would introduce short, coarse wool, and occasional black fibers. Also, the production of black-faced lambs reduces the opportunity for selecting better fine wool replacements. To determine whether the advantages of the black-face cross-breds are enough to offset these disadvantages, records were kept on the relative growth rate, feed lot performance, and carcass grades of lambs of different breeding. These records were used to evaluate the production from cross-bred lambs and compare it to that from straight white-faced lambs.

The lambs in this study were lambed in April and May, weaned at five months of age, placed in feed lots in October, and shipped as fat lambs in February. The ewes were grade Rambouillets. Four rams were used. Number 1 was purebred Rambouillet—a small ram with a moderate number of wrinkles and a fair body conformation. Number 2 was a grade Rambouillet. He was a little larger than average, had a long fine fleece, and was nearly free of wrinkles. Number 3 was a large Suffolk of good conformation. Number 4 was a Hampshire of good mutton form. He was only average size for Hampshires, and was considerably smaller than the Suffolk.

The table shows that, at weaning, there was no significant difference between lamb weights, although the lambs from the smaller of the Rambouillet rams were, on the average, about 6 pounds lighter than the average of those from the other bucks. Since the ewe provides the major part of the nourishment for the lamb, weaning weights are naturally more affected by ewes than by rams.

Feed lot gains were influenced more by size of the rams. The cross-bred lambs gained an average of 4.5 pounds more than the straight Rambouillets. But they also undoubtedly ate more, and therefore it is questionable whether the gains were any cheaper. Growth rate of lambs depends largely on the size of the parents. The final weight of the lambs corresponded to the weight of their sires. None of the lambs showed any hybrid vigor.

In carcass grade, the Hampshire

cross-breds showed a definite advantage. The Suffolk cross-breds scored intermediate between the two Rambouillet groups. There was no difference in the selling price of the lambs. Therefore, it appears that good fine wool bucks will sire lambs with enough quality to market without discrimination.

Because the cross-bred lambs in this and earlier trials showed little, if any, economic advantage over the straight white-faced lambs, the advisability of using black-faced rams in fine wool herds is questioned. The use of black-faced rams could result in clips of short wool and occasional black fibers that would more than offset the doubtful advantage of black-faced, cross-bred lambs.

**Weaning Weight, Feed Lot Gain, and Carcass Grades of Lambs from Rams of Different Breeds, Bred to Grade Rambouillet Ewes.**

| Rams | Number of Lambs | Weaning Weights | Feed Lot Gain | Finished Weight | Carcass Score* |
|---|---|---|---|---|---|
| | | Pounds | Pounds | Pounds | |
| No. 1 Small Rambouillet | 34 | 81 | 28 | 109 | 5.5 |
| No. 2 Large Rambouillet | 18 | 87 | 31 | 118 | 5.9 |
| No. 3 Suffolk | 27 | 89 | 34 | 123 | 5.7 |
| No. 4 Hampshire | 14 | 86 | 36 | 122 | 6.7 |

*Carcasses were graded by government graders. The grade of cull was given a score of 0; utility minus, a score of 1; utility plus, 2, etc.; with prime being given a score of 10.

# DAIRYING

## Irrigated Pastures for Southern New Mexico

As soon as dairymen in southern New Mexico became interested in establishing permanent irrigated pastures, they faced the problem of which grasses and legumes to use. The choice rested mainly between alfalfa, Ladino clover, and a number of grasses.

To find out which of these produces best and lasts the longest under grazing, members of the dairy department seeded four one-acre pasture plots in 1942. They have grazed dairy cattle on these plots for six months each year. The grazing system was coordinated with the irrigation system so that the grazing periods on each pasture lasted six to ten days and the irrigations were made by flooding about every two weeks during the growing season.

Pasture No. 1, seeded to alfalfa and a grass mixture, now consists of about 5 per cent alfalfa with alta fescue making up the remainder of the stand. Pasture No. 2, seeded to Ladino clover and the same mixture of grasses, now contains about 20 per cent clover with alta fescue the predominant grass. Rye grass, orchard grass, Dallis grass, and weeping lovegrass were in the grass mixture, but none became well established, and all have practically disappeared from the pastures.

Pasture No. 3 was seeded to alfalfa and contains a good stand, although the original stand was killed by over-irrigation in 1945, and the pasture was reseeded. Pasture No. 4 was seeded to Ladino clover. Although the stand was rather poor for the first year after seeding, it developed to an excellent stand which has been maintained through six years of grazing.

From these test pastures, it appears that alta fescue is by far the most promising pasture grass for our soil and climatic conditions, while both alfalfa and Ladino clover are excellent legumes for grazing. As a companion legume for alta fescue, Ladino clover is able to survive under grazing somewhat better than alfalfa, but neither legume competed successfully with the grass in the test pastures. When each was seeded alone, neither appeared to suffer any ill effects from the grazing practiced in this experiment.

Frequently, some question arises about the value of irrigated pastures. As the table shows, these test pastures have a high carrying capacity in animal units per acre, and the cows grazing them produced a large amount of milk. The table also shows that the cash return per acre above feed costs from these irrigated pastures ranged between $507 and $737.

During the grazing season, the cows were fed a grain mixture at the rate of one pound for each five pounds of milk produced. This mixture cost $4.50 per hundredweight. They were also fed dry hay at night and in the morning from a manger placed near the entrance to the pasture. The hay cost $22.00 per ton.

The value of the milk produced was computed at $5.72 per hundred pounds, the price for which milk was

actually sold in Las Cruces during the summer.

Other advantages of irrigated pastures, not shown in the table, are that they improve the organic matter content and the physical structure of the soil, and they cut the labor cost of farming to a minimum.

**Carrying Capacity, Feed Used, Milk Produced, and Cash Returns, Experimental Irrigated Pastures, 1947**

| Pastures | Cows Grazed per Acre for 180 Days | Grain Fed | Hay Fed | 4 Per Cent Milk Produced | Value of Milk | Return per Acre Over Feed Cost |
|---|---|---|---|---|---|---|
| | Number | Pounds | Pounds | Pounds | Dollars | Dollars |
| No. 1 Alfalfa and grass | 3.3 | 2,128 | 7,910 | 12,065 | 690.12 | 507.35 |
| No. 2 Ladino clover and grass | 3.7 | 2,403 | 8,260 | 13,719 | 784.75 | 585.75 |
| No. 3 Alfalfa | 3.0 | 2,331 | 6,440 | 13,236 | 757.09 | 581.36 |
| No. 4 Ladino clover | 3.9 | 2,965 | 8,680 | 16,898 | 966.58 | 737.67 |

## Home-mixed Dry Starter Economical for Dairy Calves

For two years, sturdy dairy calves have been raised even though the calves were allowed whole milk for only one month. It was done with a simple dry starter, made of feeds that can be obtained almost anywhere in New Mexico.

The starter contains 300 pounds of ground milo maize, 200 pounds of cottonseed meal, 100 pounds of wheat bran, 6 pounds of salt, and 6 pounds of steamed bone meal.

The system is to begin training calves, when they are ten days old, to eat this mixture along with leafy, green alfalfa hay. After they are thirty days old, the calves are given no more whole milk. Each calf is limited to four pounds daily of the starter mixture, but has all the alfalfa hay it will eat.

This year, only one calf, a Jersey, failed to make normal growth. She refused to eat the dry starter until she was six weeks old. But when she became accustomed to the dry ration, she also made good growth.

To test the value of vitamin supplements, half of the calves were given vitamin capsules daily until they were sixty days old. The capsules contained 5,000 International units of Vitamin A, 500 International units of Vitamin D, and 50 milligrams of niacin. However, the calves receiving the vitamins grew no faster, and seemed to be better in no way, than the calves that did not have capsules.

The results of the experiment show three advantages to this system of raising calves: (1) They can be weaned by the time they are thirty days old, and require a minimum amount of saleable fluid milk. (2) The starter can be mixed at home, and, if home-grown grain is available, may cost less than a prepared

starter mixture. (3) When good green alfalfa hay is fed, the calves do not seem to need vitamin supplements.

The system appears to be practicable wherever alfalfa hay is grown or can be readily purchased. However, unless a dairyman can obtain good quality hay, he will not get as favorable results as those of the experiment.

## Judging Future Milk Production of Dairy Calves

Several years ago, the Bureau of Dairy Industry of the United States Department of Agriculture proposed a method for judging the ultimate milk production of dairy heifers when they are only four or five months old. To test this method, the dairy departments here and at several other state experiment stations are trying it out.

The method involves grading calves, when they are three, four and five months old, according to the stage of development and the size of their mammary glands. The heifers will be kept until they reach production age, and the relation between the calfhood grade and the actual production of milk and butterfat will be determined.

In New Mexico, the experimental dairy heifers, which are Jersey, Guernsey, and Holstein, and the heifers in McCarty's dairy herd in Las Cruces, which are Holstein, are being used.

If the method seems practical, it should allow the dairymen to cull most of the poor producing heifers from his herd before he goes to the expense of raising them. It should also help him recognize superior transmitting ability in his herd sires when they are comparatively young.

## Johnin Tests Reveal No Reactors in Experimental Herds

For many years research on improving milk goats was conducted at this station. The research was interrupted in 1942 when most of the goats in the experimental herd became sick and emaciated.

Diagnosis revealed that the animals were infected with **Mycobacterium paratuberculosis**, the bacteria that cause Johne's disease. This is an intestinal disease. The symptoms are severe diarrhea and extreme emaciation. The bacteria cause a thickening of the mucous membranes of the small intestine, and the lymph nodes are permanently affected. Death usually results, but even if the animal lives, it never returns to normal health.

After the disease was discovered, all of the goats in the herd were tested regularly with intradermal injections of johnin. The reacting animals were killed, and laboratory analyses were made to determine specifically whether they had Johne's disease. This work was done in cooperation with the Animal Pathology Laboratory, Bureau of Animal Industry, United States Department of Agriculture, at Auburn, Alabama.

Non-reacting goats were isolated

and kept from contact with the diseased animals. By May, 1945, the disease had apparently been eliminated from the herd; but the herd had been reduced from seventy animals to less than ten. Because of the small number of animals in the herd, no further breeding experiments have been made.

Regular intradermal tests are still made on the goats. Since cattle are also susceptible to Johne's disease, all of the animals in the college dairy herd are also tested. Two reactors were discovered among the dairy cattle, but were disposed of before the disease spread further.

## Feed Requirements of Milk Goats

Little information is available on feeding milk goats under year-round, dry-lot conditions. Such information would be particularly valuable in New Mexico, because of the number of farmers and ranchers who keep goats in their dry-lots.

This year, the dairy department started work on the problem. It is planned that the work will supply information on the amount of grain and roughages required to maintain milking does and to raise kids from birth to one year of age. The feeding value of whole and ground sorghum grains will also be compared, so that more will be known about the profitableness of grinding grain for goats.

## Vitamin A in Goat's Milk

New work was also begun this year to determine the amount of vitamin A and carotene in goat's milk. This will be done by testing the milk from the experimental herd at certain times throughout the year.

Milk from Holstein and Jersey cows will also be assayed. This should give us further information as to the comparative vitamin A potency of milk from the two species.

## The Flavor of Goat's Milk

Objectionable flavors are frequently found in goat's milk, and the producer who sells the milk is placed at a disadvantage when it occurs in the milk from his herd. Since no research on this problem has been reported, little is known about the origin, or the character, of such flavors.

Preliminary studies with the experimental goat herd indicated that the flavor of the milk varies considerably with the individual goats. Therefore, work was begun to find out how frequently undesirable flavors occur in the milk from the experimental herd. Also to be studied are the questions of what causes the flavors, and what methods can be used to eliminate them.

Dairying was profitable in southern New Mexico during 1947–48.

# ECONOMICS OF AGRICULTURE

## Farm Prices and Incomes in Southern New Mexico

When agricultural prices change, they do not all change in the same degree. Some fall more than others. Some rise when others fall. Therefore, a farmer can make the best possible income if he adjusts his crops and livestock, in other words, his farm organization, to the price changes.

To illustrate the possibilities of such adjustments, the 1947 incomes were calculated for five types of irrigated farms, each of a different organization or a different size, in southern New Mexico.

In 1947, cash crop farming expense was about 4 per cent higher than it was in 1946. The price of alfalfa hay decreased about $2 a ton. Sorghum grain sold for $1.50 per hundredweight more that it did the year before. The price of cotton remained almost the same.

This combination of price changes meant that the net farm income of a 160-acre farm, from which alfalfa, cotton, and grain sorghum were sold, did not change much from the 1946 income. The increased price for grain sorghum offset the decreased price for alfalfa hay and the higher operating expenses. On a 40-acre farm where only cotton and alfalfa were grown, the net farm income decreased 5 per cent from what it was in 1946.

However, if the operator of the 40-acre farm had marketed the major part of the alfalfa hay through 15 dairy cows and sold whole milk, his net farm income would have been twice as large as it would have been

**Cattle feeding was also profitable, after the sale price for good grade slaughter cattle at Kansas City advanced from about $24 per hundredweight in 1946 to $31.70 per hundredweight in 1947.**

if he had sold the hay for cash. Even though concentrate feeds advanced in price, his net farm income would have increased because the price of butterfat advanced from $1.35 a pound in 1946 to $1.52 a pound in 1947.

On farms where alfalfa was fed to dairy cows in both 1946 and 1947, this advance in butterfat price was the major factor accounting for an 11 per cent increase in net incomes.

In recent years, farmers in the Pecos Valley have fed fewer cattle because of the risk involved. Feeder cattle prices have advanced and feed prices have been high. In 1947, the price of feeder cattle was 29 cents a pound, or one-third more than it had been in 1946. Because of that, and the advance in grain sorghum prices, the prospect of profits from feeding cattle were not favorable. However, when the price for good grade slaughter cattle at Kansas City rose to $31.70 per hundredweight, an advance of $7.70 per hundredweight over 1946, feeding cattle was more profitable than it was in 1946.

The farmer who fed cattle on a 160-acre farm found the enterprise 21 per cent more profitable in 1947 than in 1946. By marketing his alfalfa and feed grains through cattle, he made 89 per cent more than the farmer who sold them as cash crops.

If he had marketed his feed through lambs, the net farm income would have been only 4 per cent more than it would have been if he had sold the feed. And compared with 1946, the net farm income was only 72 per cent as large. Factors affecting the profits of lamb feeding in 1947 were higher prices of feeder lambs and grain and a sharp drop in fat lamb price in February and March.

The table shows the net income from these five types of farms, and compares the gross income, total expense, and net income to those of 1946.

**Calculated Incomes on Typical Irrigated Farms in the Pecos Valley, 1947**

| Type of Farm | Size of Farm | Net Income | Percentage of 1946 | | |
|---|---|---|---|---|---|
| | | | Gross Income | Total Expense | Net Income |
| | Acres | Dollars | Per Cent | Per Cent | Per Cent |
| Cash crop | 40 | 3,233 | 99 | 104 | 95 |
| Cash crop—dairy | 40 | 6,493 | 108 | 105 | 111 |
| Cash crop | 160 | 13,191 | 101 | 103 | 100 |
| Cash crop—cattle feeding | 160 | 24,976 | 125 | 127 | 121 |
| Cash crop—lamb feeding | 160 | 13,745 | 100 | 116 | 72 |

**Calculated Incomes on Typical Wheat Farms in Eastern New Mexico**

| | Size of Farms (Acres) | | | | |
|---|---|---|---|---|---|
| | 320 | 640 | 960 | 1280 | 1600 |
| | Dollars | Dollars | Dollars | Dollars | Dollars |
| **Southern Portion** | | | | | |
| Total cash income | 7,023 | 12,778 | 20,031 | 29,890 | 33,611 |
| Total expense | 2,048 | 3,345 | 4,105 | 5,393 | 5,969 |
| Net farm income | 4,975 | 9,433 | 15,926 | 24,497 | 27,642 |
| **Northern Portion** | | | | | |
| Total cash income | 6,720 | 13,627 | 20,028 | 30,327 | 32,391 |
| Total expense | 2,085 | 3,345 | 4,190 | 5,721 | 6,042 |
| Net farm income | 4,635 | 10,282 | 15,838 | 24,606 | 26,349 |

**Calculated Incomes on Typical Row-Crop Farms in Eastern New Mexico**

| | Size of Farms (Acres) | | | | |
|---|---|---|---|---|---|
| | 160 | 320 | 640[1] | 800[2] | 800[3] |
| **Southern Portion** | Dollars | Dollars | Dollars | Dollars | Dollars |
| Total cash income | 1,624 | 4,176 | 4,984 | 6,242 | 5,115 |
| Total expense | 1,491 | 2,341 | 3,108 | 2,995 | 3,177 |
| Net farm income | 133 | 1,835 | 3,876 | 3,247 | 1,938 |
| **Northern Portion** | | | | | |
| Total cash income | 2,087 | 4,457 | 8,279 | 7,967 | 7,036 |
| Total expense | 1,470 | 2,204 | 3,657 | 3,940 | 3,518 |
| Net farm income | 617 | 2,253 | 4,622 | 4,027 | 3,518 |

1. Wheat was included in the cropping system of all the farms in this group.
2. In the northern portion, this group was 640 acres, with no wheat. The southern portion farms had some wheat planted on them.
3. The farms in this group had no wheat planted on them.

## . . . And in Eastern Dry-Farming Areas

A study similar to the one for the irrigated valleys of southern New Mexico was also made in the dry-farming area of eastern New Mexico.

This study showed that, in 1947, farm incomes in the dry-farming area varied extremely as a result of weather conditions.

Drought in 1946 prevented the usual acreage of row crops. Consequently, many farmers seeded their land to wheat that fall. The weather was favorable for wheat production, and a record crop was harvested. Incomes of the farms where wheat was grown were larger than they have ever been.

The drought in 1947 was another story, however. It started in the spring, and prevented normal row-crop plantings. It continued, and caused the yields from row crops to be only fair on some farms and a total failure on the others. The incomes from these farms were only moderate or were actual losses. The drought continued late into 1947, and affected 1948 incomes by preventing the seeding of wheat.

## Little Profit in Chickens in New Mexico

Many people like to think of having a small acreage and raising chickens. They particularly like to think of raising chickens in New Mexico, because of the favorable climate and other conditions. Therefore, the economists of the experiment station have made a study of the possibilities. Their conclusions are not very encouraging.

New Mexico poultrymen receive more for their eggs and chickens than do poultrymen in nearby states, but the feed costs are so high that profits are less. Laying mash and scratch grain cost more in New Mexico than in any adjacent state, except Arizona. The price of scratch grain is higher in Arizona. New Mexico poultrymen receive less for their chickens, after they pay for their feed, than do poultrymen in any adjacent state. They receive less, when the feed price is subtracted, for their eggs than do Arizona and Colorado poultrymen, but more than do Kansas, Oklahoma, and Texas poultrymen.

The farm price of eggs is higher in New Mexico than in any of the other southwestern states except Arizona. Sometimes, New Mexico eggs sell for as much as 10 cents a dozen more than Kansas and Colorado eggs. This makes it profitable for Kansas and Colorado poultrymen to ship eggs into New Mexico. The situation with chickens is the same. Only in Arizona is the farm price for chickens higher than in New Mexico. Poultrymen in the other states have received, on the average, from 1 cent to 8 cents less apiece for their chickens over the past 17 years.

The study showed that people raise chickens in New Mexico largely for home use. From 1937 through 1947, 56 per cent of the chickens produced in this state were consumed on the farms where they were produced, and 36 per cent of the eggs were used at home for food. In adjacent states, poultry consumed at home ranged from 33 to 38 per cent, and eggs used at home for food ranged from 17 to 23 per cent, of production.

## New Mexico Livestock Producers Pay High Freight Rates

Because New Mexico shippers have to pay high freight rates, a study has been made to determine what could be done to reduce the costs. In 1947-48, the study was concentrated on livestock freight rates.

One reason freight rates for livestock are high in this state is because of the long distance to the central market. Another is that the rate zones in which New Mexico is located are high. Whatever the reason, however, New Mexico shippers have to pay more for shipping their livestock to market than do shippers in Colorado and Wyoming at stations that are about the same distance from market as the New Mexico stations. This is illustrated in the table.

At the present time, agricultural prices are inflated, and freight rates have also risen. Historically, agricultural producers have a low buying power for transportation services in the years immediately following a period of inflated prices. This was the case in 1921, 1932, and 1940. In 1921, the average price of all agricultural products had fallen 42 per cent from the high point during World War I, but freight rates had fallen only 2 per cent. In 1932, the prices for farm products reached a low point that was 68 per cent below World War I prices; freight rates had been lowered only 20 per cent. In 1940, when prices were about equal to those of 1913-14, freight rates were 41 per cent above the 1913-14 rates.

Therefore, if for no other reason than to keep their purchasing power for transportation, New Mexico producers have a vital interest in maintaining the greatest possible stability for agricultural prices.

**Carlot Freight Rates on Feeder Cattle to Kansas City, Missouri, From Shipping Points in Colorado, Wyoming, and New Mexico, 1947**

| From | Distance | Rate per Cwt. | Rate per Ton-mile |
|---|---|---|---|
| | Miles | Cents | Cents |
| Vaughn, N. M. | 708 | 53 | 1.50 |
| Denver, Colo. | 687 | 47 | 1.37 |
| Roswell, N. M. | 769 | 54 | 1.40 |
| Greeley, Colo. | 787 | 47 | 1.19 |
| Albuquerque, N. M. | 887 | 59 | 1.33 |
| Craig, Colo. | 887 | 52 | 1.17 |
| Las Cruces, N. M. | 987 | 63 | 1.28 |
| Casper, Wyo. | 1,015 | 55 | 1.08 |

## New Land on Tucumcari Reclamation Project Presents Problems

When the Tucumcari Reclamation Project is completed, about 44,000 acres of newly-developed land will be under irrigation. In 1947-48, about 7,000 acres of crops were grown under the project; the plan for 1948-49 is to bring 10,000 additional acres under cultivation.

The development of this land presents several economic problems. Questions that have not yet been answered include those on costs of developing the land, the kinds of crops and livestock enterprises that best suit the area from an economic standpoint, and the most profitable organizations of different sized farms.

To help answer these questions, the economists of the experiment station made a survey last year of farm operators on the new land to obtain data on crop acreage, yields, livestock numbers, and size of farms. They also obtained information on cultural practices in crop production, and on farm income and expense. They used these data to prepare tentative farm budgets for various farm enterprises and for farms of different sizes.

These budgets were given to the agricultural representatives in the area for use as a guide in planning the agricultural production for 1948. The results are preliminary in nature and such surveys will have to be made each year for several years before the results can be considered reliable.

## A New Livestock Marketing Study Begun

Can the marketing of livestock be made more efficient? A study of this question was begun last year.

Information was obtained on how ranchers sell feeder and stocker cattle, and the movement of livestock was traced from this state to the various markets outside the state. When the study is completed, the results will show, for each lot, such things as the number, age, weight and sex of animals sold, terms of sale, types and cost of transportation used from the ranch to the delivery point, type of buyer, and destination of the livestock.

The results will also show the shifts in livestock movement from the state over the past twenty-five years. For example, in 1927, 95 per cent of all cattle shipped from New Mexico to California came from the southwestern counties. In 1947, only 37 per cent came from these counties. In 1927, the counties in the eastern half of the state shipped very few cattle to California; but last year, they were shipping more west than were the southwestern counties. Union and Colfax counties shipped 18 per cent of the cattle that went from New Mexico to California in 1947, and Curry County, with its sales ring, was finding California an important outlet for cattle.

This study is serving as a pilot study for the Western Livestock Marketing Research Committee. During 1948-49, Colorado, Montana, and Nevada plan to make similar studies. The work of these four states comprises a regional research project under Public Law 733.

# FIELD CROPS

## Tropical Alfalfa Not Recommended for Commercial Production

Although, during the 1947 season, two tropical types of alfalfa, Indian and African, produced the highest yields in a test of 70 strains and varieties, they cannot yet be recommended for commercial production.

The spring-seeded test was composed of new strains, poly-crosses, and varieties from many parts of the United States. During this first season, the tropical types produced high yields because of their rapid establishment and recovery after cutting and because their growth period extended into the fall and winter.

The reason these tropical alfalfas cannot as yet be recommended is that they survived the 1947-48 winter in a very weakened condition, and, as a result, produced very low yields for the first two cuttings of the 1948 season. This reaction is apparently due to the fact that the tropical Indian and African varieties possess no dormancy. They were frozen back during each freeze which occurred after several comparatively warm winter days and thus lost the reserves of food stores in the roots.

Two New Mexico strains produced outstandingly high yields in the test. They were New Mexico 6-277-0 and 5-65-0.

Further tests will be conducted on all the varieties.

## Standard Alfalfa Varieties Differ in Stand Reduction and Aphid Infestation

In a two-year-old variety test of six standard alfalfa varieties in commercial production, Atlantic showed a significantly lower aphid infestation than any of the others. However, Atlantic also showed the greatest reduction in stand. New Mexico Common showed the least reduction and Buffalo, Ranger, and the others were intermediate in this respect. Loss of stand was due to bacterial wilt and also to crown rot. No significant differences in total hay yields for two seasons were secured.

## More Aphid-Tolerant, Wilt-Resistant Stocks in Alfalfa Breeding Work

Data from the alfalfa breeding program indicated a slow but definite increase in the number of available aphid-tolerant, wilt-resistant stocks. A greater number of strains survived the aphid evaluation test, and consequently, more strains were available to be included in the bacterial-wilt nursery. However, only a few of the lines exhibiting aphid tolerance also possessed wilt tolerance. Variation in the material is indicated by the

range in the wilt-resistance index of zero to 56.8.

The results indicated that it may be entirely possible to combine both aphid tolerance and wilt resistance, but the experience to date has shown that developing large numbers of stocks having this desirable combination will be a very slow process.

## Alfalfa Produces High Yields of Hay in Irrigated Pastures

Irrigated pasture trial plots have been planted each year since 1942, and the production from them has been measured by the amount of forage harvested when the plots are mowed regularly.

These tests have demonstrated the importance of alfalfa in all the pasture compositions.

In 1947, eleven pasture compositions, which included alfalfa and Ladino clover alone and in various mixtures with grasses, were planted. Alfalfa alone gave the highest yields. Alfalfa planted with alta fescue and perennial ryegrass produced yields just short of alfalfa alone, and maintained a good grass-legume balance all season. Mixtures low in alfalfa gave poorer yields, and the plots containing no alfalfa were the lowest producers.

The forage yields of Ladino clover were low because the stands were poor, and the succulent forage could not be mowed satisfactorily. More frequent irrigations would probably have increased the total yield from the plots planted to this valuable legume. However, the stands of Ladino clover were killed during the winter of 1947-48 by drought and low temperatures.

Three lovegrass species were planted in a grass seed production trial on marginal sandy soil. The general objective was to determine if these species might have possibilities for seed production on land retired from crop production. Seed yields of the second cropping season were 126 to 296 pounds to the acre, with sand lovegrass producing the highest yield.

## Partial Control for Damping-off, or Sore Shin, of Cotton Found

Sore shin, or damping-off, of cotton seedlings is no doubt the most important seedling disease of cotton in the irrigated Southwest. It is caused by the soil-borne fungus, **Rhizoctonia solani**. Little has been known about the cultural practices which may affect the disease.

Last year, a pre-planting irrigation, which allowed the soil an "incubation period" of 3 to 4 weeks prior to planting, significantly reduced the occurrence of damping-off in the cotton seedlings below that planted in dry seedbeds and irrigated at planting time. The results were first noted in a field experiment and were later verified in a greenhouse test.

The probable explanation of the

results lies in the fact that the preplanting irrigation allows natural enemies of the soil-borne fungus to bring it under partial control. Therefore, the principle should apply to other crops, such as sugar beets, which are affected by the same disease.

Further details of this experiment are reported in **Phytopathology**, 38-8, pp. 661-664.

## Cotton Aphis, Thrips, and A Mirid Attack Cotton in Mesilla Valley

Infestations of cotton aphis are usually not severe on cotton in the Mesilla Valley, but last summer, the outbreak of aphis **(Aphis gossypii)** was severe and occurred throughout the valley. Approximately 1,500 acres were dusted or sprayed with various aphicides, particularly benzene hexachloride and tetraethyl pyrophosphate. Ground machines were used. Both mixtures gave excellent control of the aphis.

Local outbreaks of thrips also occurred on early cotton. Some of the infested acreages were dusted by airplane with DDT.

A mirid, **Leucopoecilia albofasciata** Reuter, was again abundant on cotton and several vegetable crops. It caused some injury to the seedlings. Since the species has become more abundant and injurious during the past several years, the entomologist is making a study to determine its weed hosts and overwintering habits.

## Fertilizing Cotton

A field that produces above-average cotton yields is not likely to produce still larger yields if commercial fertilizer is applied to it. This is one of the conclusions reached as a result of the cotton fertilizer tests at State College.

In 1947, ammonium sulfate and 20 per cent superphosphate alone and in combination were applied to cotton planted on double-row beds. The fertilizers were applied in three treatments: inside the bed, outside the bed, and half inside the bed with half outside the bed.

No significant differences were noted. The field used was of high fertility and unfertilized plots produced an average acre yield of 3,185 pounds of seed cotton. This result has been obtained before, and confirms previous findings that commercial fertilizers are not likely to increase yields on soils that normally produce above-average yields.

Results would undoubtedly have been different on lighter soils where normal expected yields are one bale or less to the acre.

## Improvement in Physical Condition of Soil Increased Cotton Yields

Cotton planted on furrow-irrigated, double-row beds produced significantly higher yields with a correspondingly superior physical condition of the soil than flood-irrigated cotton planted on flat seedbeds. The soil type was Gila clay adobe, and the results apply to heavy soils of this or similar nature.

Average yield of the flat seedbed, flood-irrigated plots was 2,644 pounds of seed cotton to the acre; the average yield of the furrow-irrigated double-row bed plots was 3,098 pounds of seed cotton to the acre—an increase in yield of 17 per cent. The data indicate that the increase in yield is due largely to an improvement in physical condition of the soil as measured by percentage of water-stable aggregates, these values being 27.99 and 34.79 per cent, respectively, for the flat and double-row bed type of seedbed preparations. The improvement in soil structure occurred after the initial irrigation in early spring when the soil in the beds had an opportunity to dry slowly under a mulch.

The data indicate the extreme importance of proper management of soils of this type. When properly aggregated, such soils are friable, well aerated, and provide a good media for plant growth as compared to the compacted, puddled, poorly aerated soil.

## Light Irrigations More Efficient in Water Use

In tests last year, much more efficient use of water was made when it was applied in five light irrigations instead of five heavy irrigations to cotton on heavy adobe clay soil 2.5 to 3.0 feet deep. The irrigations were applied on both furrow-irrigated, double-row beds and flood-irrigated, flat seedbeds.

The five light irrigations used a seasonal total of 19.8 acre-inches of water to the acre, and produced 2,828 pounds of seed cotton to the acre. This is the same as 142.8 pounds of seed cotton to the acre-inch of water applied. The five heavy irrigations used a seasonal total of 29.1 acre-inches of water to the acre, producing an average acre yield of 2,914 pounds of seed cotton, or 100.1 pounds of seed cotton to the acre-inch of water. Thus, while no significant differences in total yield were secured, a very great difference was found in production of cotton for each acre-inch of water applied. No differences were found in effect of light and heavy irrigations on physical conditions of the soil.

The most probable explanation of the above results is that, with the light irrigations, the greater portion of the water was held in the soil profile within the root zone of the plants. In contrast, with the heavy irrigations, more water was applied at each irrigation than the soil could hold and the excess water percolated through to the water table below where it was not available for plant use.

The results suggest that, on soils having a shallow profile, a much more efficient use of water can be made by applying lighter irrigations and adjusting the frequency as needed.

**Progeny test of the cotton breeding program.**

## The Cotton Breeding Program

Since 1928, this station has conducted a program of cotton breeding to provide New Mexico growers with improved strains of cotton. The work has resulted in the development of 1517, a strain of upland cotton that produces large yields of cotton with long, strong staple.

1517 has other desirable characteristics, but many things about it can be improved, and the breeding program is continuing. The system used to develop improved strains is that of selecting outstandingly good individual plants and testing the seed from them in a series of field tests.

In 1947, the cotton breeding work at this station consisted of: a progeny test of about 500 rows in which both regular line-bred and hybrid progenies were planted; a preliminary strain test of 25 strains; four advanced strain tests of 12 strains each at State College, Carlsbad, Hagerman, and Roswell; and increase-selection blocks at State College, Malaga, Artesia, Hagerman, and Roswell.

The increase-selection blocks were planted to a new strain, 5563. This strain has been outstanding in the tests because its yield of lint was superior to that of 1517 WR and 2815, its uniformity of length is greater than 1517, and it has given comparatively satisfactory results in spinning tests. Seed of 5563 may be available for commercial planting in 1949.

In the advanced strain tests, significant differences in yields were obtained between the strains at both State College and Roswell. At State College, 5563 again produced the highest yield (845 pounds of lint per acre) of the 12 strains. It yielded significantly more than 1517 WR.

In the preliminary strain test, all of the 21 new strains produced more lint cotton to the acre than the old strain, 1517 WR, and all except three made significantly higher yields. The

strain with the highest yield produced 1,537 pounds of lint to the acre which was 32 per cent more than the yield of the check, 1517.

Material for the progeny test was selected from about 1,500 individual plants grown in 1946. In this test, many individual progenies were found to be exceptionally uniform in fiber length. In some, as much as 30 per cent of the fibers were $1^1/_8$ inches long. Some of these progenies also produced finer and stronger fiber than the average. These fiber properties were accompanied, in many cases, by high percentage of lint, lint index, and boll weight; and many of the progenies showed high germination percentage and strong seedling vigor.

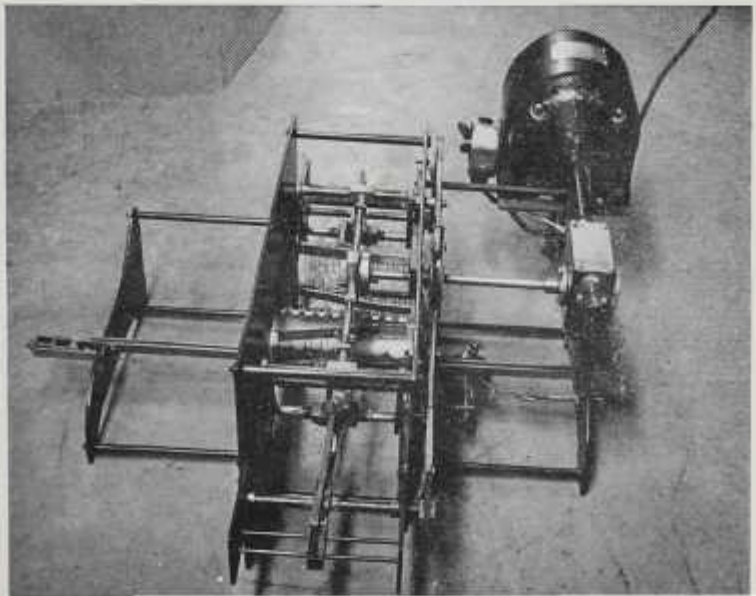
In the fall, about 3,000 individual plants were selected for the 1948 progeny test. They were selected from the 1947 progeny test and from the increase-selection blocks, grown in both the Mesilla and the Pecos valleys. This was twice as many progenies as were grown in 1947. It was possible to process this large number because of a new mechanical comber, designed and constructed in the engineering shop of the college.

## Seedling Vigor of Cotton

During the year, as a part of the Regional Cotton Genetics and Breeding Project, financed by funds from the Research and Marketing Act of 1946, a study was begun of the inheritance of seedling vigor of cotton.

Some 20 families, known to be heterozygous for color characters

**This mechanical comber for cotton samples was designed and built at the college and has enabled the processing of twice as many samples as before.**



such as dark greens, light greens, greenish yellow, and yellow, were grown in the field. About 25 plants from each of the families were harvested and seed of the most promising of those was planted in the greenhouse to determine the segregation procedure. From the results, it appears that 5 to 7 genes are responsible for the seedling characters mentioned. In the spring of 1948, the seed of certain individuals with the most promising genotypes were planted in the field to test the genotypic segregation, to isolate the genes, and to determine the interrelation of the genes.

## New Crops For the Southwest

As part of a regional project supported by funds from the Research and Marketing Act of 1946, a new study is being started on the various native large-seeded plants in the Southwest. These plants, under cultivation, might produce profitable yields of concentrate feed for livestock and might contain valuable oils for industrial and other purposes. This study will include locating desirable plant material, studying the environmental and ecological conditions under which the material grows, and obtaining seeds or plant material for propagation.

## Five Corn Hybrids Recommended for Southern New Mexico

In the 1947 corn variety test, the agronomists tested twenty-seven varieties for yield, damage, shelling percentage, earliness, and growth habits.

Two hybrids produced the highest yields in the test. They were Texas Hybrid 9W, a white corn which yielded 89.3 bushels to the acre, and Texas Hybrid 20, a yellow corn which yielded 89.0 bushels to the acre. Mexican June corn, an open-pollinated variety, yielded 84.7 bushels to the acre, which is not significantly lower than the two highest-yielding hybrids.

A summary of the variety tests for the past three years indicate that five corn hybrids can be recommended for southern New Mexico. These are Texas Hybrid 9W, Reid National 134 T, Funk's G 711, Texas Hybrid 20 and Funk's G 716. Other than the Texas Hybrid 9W, these hybrids are all yellow-grained and should produce yields equal to, or slightly higher than, Mexican June. The lower-growing ears are easier to harvest and the yellow grain generally commands higher prices as feed grain.

Mexican June corn still remains without equal as a silage crop.

## Winter Barley Varieties in Southern New Mexico

Oklahoma selection 1-35-108 yielded more than any other variety in the winter barley variety test last year. It produced 115 bushels to the acre. The four-year average yield of this promising type is 107 per cent of that of New Mexico Winter, which was second in yield in the current test.

Since much of the winter cereal is grown for winter pasture in southern New Mexico, forage yields are important in the evaluation of the varieties. Three New Mexico varieties, 4-4, 15-31, and New Mexico Winter, were outstanding in this respect, producing an average of 0.9 ton dry forage to the acre from the time of planting, October 2, to February 3. The Oklahoma selection produced only 0.25 ton per acre.

Balboa rye was included in the test because several growers have reported it to be the almost ideal winter pasture. While it remained fresher and greener throughout the winter than the barley varieties, it produced only 0.34 tons of dry forage to the acre. In addition, it started booting much earlier in the spring than any of the barleys. This indicates that the rye could not be grazed so late in the spring as the barley types. Therefore, for both grain and forage production, an adapted winter barley variety, such as New Mexico Winter, is much more desirable than the rye in southern New Mexico.

## Tests with 2,4-D

In 1947, 2,4-D was tested on bindweed in growing crops of corn and sorghum. The chemical was sprayed in growing corn and sorghum without injuring the crops. It reduced bindweed infestation, and increased grain yields. The most satisfactory 2,4-D preparations, from a cost standpoint, were the sodium salt forms. However, the esters were used with no crop damage.

The weed killer was also tested as a pre-planting spray. When the soil was sprayed with 2,4-D immediately before planting, the chemical affected the germination and seedling growth of alfalfa, beans, Sudan grass, and grain sorghum. It did not affect corn. When the soil was sprayed 30 days before planting, the chemical did not affect the germination of grain sorghum or Sudan grass, but it severely reduced alfalfa germination.

Land to be used for either alfalfa or cotton should not be sprayed with 2,4-D. The chemical should never be used in the vicinity of cotton. At a distance of 800 feet, cotton was injured by 2,4-D ester which had volatized and drifted to the field. One-third pound of parent acid, applied 200 to 400 feet away from a cotton field, severely damaged the cotton.

## Fertilizers for Sugar-beet Seed

Earlier fertilizer tests have shown that phosphorus alone does not increase yields of sugar-beet seed, but that in combination with heavy applications of nitrogenous fertilizers, it gives beneficial results.

In 1947, the sugar-beet fertilizer test was planned to determine the effects of various amounts of nitrogen fertilizers with and without phosphate fertilizers. Ammonium sulfate was applied at rates of 250, 500, and 750 pounds to the acre, alone and with 150 and 300 pounds of 0-30-0 phosphate. All fertilizer applications were made in March just before spring growth was well started.

All the yields were high, and no significant effects of any phosphate application were noted on yield of seed, percentage of germination, number of seed balls to the pound, or percentage of seed passing through a 7/64-inch screen.

The highest yield was obtained from an application of 750 pounds of ammonium sulfate to the acre, and the lowest yield was from the plots that received no fertilizer treatment.

## Sugar Beets in Mesilla Valley

Curly top, a virus disease that attacks sugar beets and other crops in the West, is particularly prevalent in the Mesilla Valley. That is why this location is a good place to test varieties and strains of sugar beets for resistance to curly top.

Last year, eight varieties and strains of sugar beets, furnished by the Division of Sugar Plant Investigations of the United States Department of Agriculture, were tested for curly top resistance. Two varieties, S. L. 52 and S. L. 622, produced the highest yields—almost 20 tons of beets to the acre. In contrast to this, a curly top susceptible variety, 4-1029-0, was almost completely killed. It yielded barely 0.25 ton to the acre.

The high yields of curly top resistant varieties indicate that sugar beets could be grown in this area, despite the heavy infestation of the disease.

Leaf spot, which has never been a serious plant disease in this valley except when the weather in the late summer and early fall is unusually rainy, did little damage to the sugar beets in 1947.

Besides this variety test, there were other experimental plantings.

From one of these, 15 selections of mother roots were made for further testing in plantings isolated to prevent cross pollination. From another, more than 10,000 pounds of foundation seed were produced. The seed was mostly shipped to Oregon for commercial seed production.

## Varieties for the Middle Rio Grande Area

Farmers always face the question of what varieties to plant. To find out which varieties of corn, grain sorghum, winter wheat, alfalfa, Irish potatoes, and tomatoes produce the best crops in the Middle Rio Grande area, the agronomists planted a series of variety tests. They also tested sugar beet varieties for resistance to curly top and leaf spot, in cooperation with the Division of Sugar Plant Investigations, United States Department of Agriculture.

**Corn.** Eleven hybrid corn varieties, selected for high yields from previous tests, were compared with an open-pollinated check variety, B & B Yellow Dent. Yields of shelled corn ranged from 76.8 to 89.9 bushels to the acre. There were no significant differences in mean yields between the varieties. The varieties that produced the highest yields, in bushels per acre, were as follows:

| Variety | Yield |
|---|---|
| Funk's G80 | 89.9 |
| Funk's G57 | 88.2 |
| Funk's G29 | 87.4 |
| Funk's G94 | 86.9 |
| B & B Yellow Dent | 86.0 |

B & B Yellow Dent is a Mexican June X Reid's Yellow Dent open-pollinated cross. It is mostly a silage corn, and will not produce consistently good grain yields in the Middle Rio Grande Valley because of the short growing season. However, since the variety has the Mexican June type of stalk with the yellow dent grain similar to Reid's Yellow Dent, it is an excellent silage corn.

The hybrids can be recommended for grain in the Middle Rio Grande area. To produce satisfactory yields, however, they must be planted early enough so that they will have from 110 to 120 days in which to mature.

**Grain Sorghum.** The first seeding of the combine-type grain sorghum variety test did not come up to a good stand, and the tests were reseeded late in the season. Therefore, some of the varieties that require a long growing season failed to mature and make satisfactory yields. Some of the earlier-maturing varieties, however, made satisfactory yields even though they were seeded late and the stands were imperfect. The yields, in bushels of mature grain to the acre, were:

| Variety | Yields |
|---|---|
| 7078 Milo | 52.6 |
| Double Dwarf Yellow Sooner Milo | 50.6 |
| Double Dwarf White Sooner Milo | 47.4 |
| Midland | 43.9 |
| Martin's Milo | 43.7 |

When these varieties are seeded late, they are good late catch grain crops. When they are seeded early, they produce good yields of early fall grain.

**Winter Wheat.** The winter wheat variety tests were planted in single plots. The yields, in bushels to the acre, were:

| Variety | Yield |
|---|---|
| Wichita | 67.0 |
| Westar | 66.5 |
| Comanche | 65.0 |
| Triumph | 62.1 |
| Turkey Red No. 60 | 48.4 |

In this test, Wichita matured earlier than the other varieties, and Turkey Red No. 60 matured later.

**Alfalfa.** Three new wilt-resistant varieties of alfalfa were tested along with three commercial varieties. There were no significant differences in the yields; but the New Mexico Common, a commercial variety, and the Ranger, a wilt-resistant variety, began growing earlier in the spring, and recovered more quickly after cuttings than did the other varieties. The hay yields, in tons per acre, were:

| Variety | Yield |
|---|---|
| Ranger | 4.6 |
| New Mexico Common | 4.5 |
| Atlantic | 4.4 |
| Oklahoma | 4.4 |
| Buffalo | 4.3 |
| Cimmaron Hardy Common | 4.2 |

**Irish Potatoes.** In the Irish potato variety tests, Pontiac potatoes yielded significantly more than the other varieties. The yields, in 100-pound bags to the acre, were:

| Variety | Yield |
|---|---|
| Pontiac | 305.8 |
| Kasota | 217.3 |
| Irish Cobbler | 211.0 |
| Menominee | 207.1 |

As for dates of maturing, the Irish Cobbler matured about two weeks earlier than the Pontiacs and Kasotas, and the Menominees matured about two weeks later.

The Kasota is potato wilt resistant, and the Menominee is scab resistant; so should either of these diseases become prevalent in the Middle Rio Grande area, these varieties would perhaps be more desirable. At the present time, the Pontiac potato produces better yields, and is more profitable to grow.

**Tomatoes.** Yields, in bushels to the acre, from the tomato variety tests were:

| Variety | Yields of Ripe Tomatoes | Yields of Green Tomatoes |
|---|---|---|
| Pritchard | 647.8 | 98.0 |
| Marglobe | 533.0 | 220.2 |
| Rutgers | 505.2 | 198.9 |
| Earliana | 460.8 | 32.5 |

Besides producing the smallest yield in the test, the Earliana produced a high percentage of sunscalded tomatoes because of its scanty foliage growth.

**Sugar Beets.** Yields of from 10.6 to 20.2 tons of beets per acre were obtained. Selections were made for seed increase and further agronomic testing of a new and promising variety that seems to be resistant to both curly top and leaf spot.

## Fertilizing Land in the Middle Rio Grande Area

Does it pay to fertilize land in the Middle Rio Grande area? That depends on the benefits obtained from the fertilizer. To find out more about the possible benefits, the agronomists applied phosphate and nitrogen to small grains, irrigated pastures, and corn.

The phosphate was applied at the rate of 40 pounds of available phosphoric acid to the acre; the nitrogen, 60 pounds of available nitrogen to the acre. When the two were applied in combination, they were still used at the same rate.

Sulfur was also tested on the corn and small grains. It was applied at the rate of 200 pounds to the acre.

**For Small Grains.** Sulfur increased yields only slightly. Phosphate alone increased the yields more than did either nitrogen alone or the mixture of nitrogen and phosphate. All three treatments, however, increased the yields somewhat, as the table shows. The phosphate applications also hastened maturity of all three grains from seven to ten days.

**For Hybrid Corn.** None of the fertilizers, which were applied as commercial fertilizer treatments side-dressed on the corn when the plants were about one foot high, increased the yields of corn significantly.

The 40 pounds of available nitrogen to the acre did produce one ton more silage to the acre than did the check treatment.

**For Irrigated Pastures.** In this test, the mixture of nitrogen and

**The fertilizer that increased barley yields the most in trials at the Middle Rio Grande Substation was phosphate alone. The pictures show two trial plots before the grain headed. The plot on the left received superphosphate, which contains 45 per cent available phosphate, at the rate of 135 pounds to the acre. The plot on the right received 200 pounds of ammonium sulfate.**

phosphate increased the forage production more than either fertilizer did when it was applied alone. Each fertilizer alone did increase forage yields, but the combination of the two increased forage yields on two pasture mixtures 0.85 and 0.89 ton of air dry forage an acre.

**Additional Small Grain Yield, in Bushels to the Acre, Resulting from the Application of Fertilizer in the Middle Rio Grande Valley**

| Fertilizer Application | Barley | Wheat | Oats |
|---|---|---|---|
| 40 pounds of available phosphoric acid per acre | 7.3 | 12.3 | 15.6 |
| 60 pounds of available nitrogen per acre | 3.7 | 5.4 | 5.4 |
| Combination of the phosphate and nitrogen | 6.6 | 3.1 | 5.0 |

## Sorghums, Winter Wheat Tested at Mosquero

To evaluate sorghums for plant type, time required to reach maturity, and adaptation to the Mosquero area, the agronomists planted a nursery of 22 varieties of both grain and forage sorghums.

Two droughts reduced the yields, but Early Hegari yielded more than the other five kafir-type grain sorghums. It produced 8.8 bushels an acre. However, over a six-year period, Sedan Kafir has produced the highest average yield, 10.4 bushels an acre.

Of the combine-type milos, Martin produced the largest yield, 5.5 bushels an acre. Midland, Double Dwarf Yellow Sooner, and 7078 Milo ranked next. Combine milos have been tested here for only three years. In those three years, 7078 Milo, Martin, and Midland have produced the highest average yields.

A winter wheat nursery was also planted. This nursery is maintained through the cooperation of the Hard Red Winter Wheat Improvement Program of the Great Plains Region. Its purpose is to test the newer varieties and strains in this winter wheat area.

Eight different varieties of wheat were seeded last year, but because of a drought in the winter and high winds in the spring, the test was a failure. This test was also a failure the year before. However, from 1940 to 1945, an average of 16 bushels of wheat an acre was produced.

## . . . And in Curry County

Three varieties of winter wheat, Wichita, Comanche, and Tenmarq, were planted for foundation seed at the Curry County Substation. Two hail storms almost ruined the crop. The first storm, which occurred in June, caused an estimated loss of 40 per cent of the wheat. Wichita, an early maturing variety, was harvested before the second storm, and thus escaped further damage. The yields were: Wichita, 10.5 bushels an acre; Comanche, 9.9 bushels; and Tenmarq, 7.3 bushels.

Tenmarq seemed to be damaged more by the storms than were the

other two varieties. When it was harvested, it was so full of immature heads that it was not suitable for seed. Of the other two varieties, 175 bushels of Wichita and 150 bushels of Comanche were sold as foundation seed.

These three varieties were planted again in the fall of 1947. They came up to a good stand, but did not tiller enough to cover the ground. Consequently, wind erosion became a problem during the early spring months of 1948.

Grain sorghums were planted in late June. Because of the drought, however, they did not grow much until the middle of August. Of these sorghums, Plainsman milo yielded 10.8 bushels of grain an acre; Hegari produced 1,209 pounds of air dry forage in bundle feed to the acre.

## Sorghums Tested at Clayton

Since the Clayton Experimental Field is located on deep sandy soil, not suitable for winter wheat because of soil erosion hazards, it is devoted exclusively to sorghum crops.

In 1947, it was planted partly to a sorghum nursery that consisted of new varieties and new hybrid strains from sorghum breeders in Texas, Oklahoma, Kansas, Nebraska, and Arizona. Observations were made on plant type and adaptation to this high-altitude, short-season area. Out of 40 varieties and hybrid strains, 11 were selected for further testing in a preliminary strain test during the 1948 growing season. One hybrid strain, Early Combine 7009-1, has given much promise in the nursery rows for the past four years and will be moved into the yield tests in 1948. These nurseries are also maintained to give sorghum breeders an opportunity to observe earliness of maturity and other things about the new strains under this climatic condition.

Kafir-type (bundle feed), combine milo grain sorghums, and forage-type sorghums were also tested, in plots, on this field in 1947.

Of the kafir type, Sedan Kafir yielded highest with a yield of 22.2 bushels per acre. Bonita and Early Kalo ranked next in yield. Sedan Kafir, a variety well-adapted to this area, has averaged 16.5 bushels to the acre over the six-year period, 1942-1947. This variety makes a very good bundle feed for livestock, and it produces good yields when used as a grain crop.

Of the combine milo varieties, 7078 Milo yielded the most—21.4 bushels to the acre. Midland, Martin, and Double Dwarf Yellow Sooner ranked next in order. In the three-year averages (1945-1947), 7078 Milo, Martin, and Midland have also yielded highest. Double Dwarf Yellow Sooner has been in this yield test block only two years. Both 7078 Milo and Double Dwarf Yellow Sooner offer a great deal of promise to this area of New Mexico.

Leoti Red yielded 2.7 tons to the acre, which was the highest of the forage sorghums. Early Sumac and Fremont ranked next in order. Leoti Red also gave the highest average yield over the six-year period, 1942-1947.

Increase plots were seeded to Sedan Kafir, 7078 Milo, and Double Dwarf Yellow Sooner, and 200 heads were selected and bagged for pure seed. This bagged seed is being

**Clayton sorghum nursery in 1947. The varieties and strains shown are, from left to right: Sweet Sudan Grass, Sooner Resistant, Edwards White Combine, Double Dwarf Yellow Sooner 5155-36, Double Dwarf White Sooner 5155-5, Texas Double Dwarf Milo 25242.**

grown in isolated fields in 1948 and will serve as foundation seed to be distributed through the New Mexico Crop Improvement Association. The remainder of the increase plots were rogued severely, harvested separately, cleaned, and sold as open-pollinated seed to the farmers to serve as a seed supply of these varieties until pure seed can be made available. Approximately 5,000 pounds of this open-pollinated seed was distributed for planting in 1948.

**Study has shown that a grassy ditch bank and an adjoining bean field is a favorable location for bean beetle hibernation.**

## Mexican Bean Beetles in Southern New Mexico

Mexican bean beetles often damage from 10 to 50 per cent of the bean plants in New Mexico, depending on the variety of the plant and the degree of infestation. Before the most effective control method can be found, much has to be learned about the life habits of the beetle.

For three years, the station entomologist has studied the beetle in the Mesilla Valley. He is looking for the answers to such questions as: How does the beetle live through the winter? When does it emerge? What are its feeding and breeding habits? Are there any differences in the progeny of beetles over-wintering in different environments?

To find out how the pest lives through the winter in the Mesilla Valley, he caged beetles in several different locations. In 1947, the percentage of the beetles that emerged in the cages, and the date on which they emerged, were:

| Location | Percentage of Overwintering Beetles that Emerged | Date of Emergence |
|---|---|---|
| Trash in or near the bean fields | 41.5 | May 12 |
| Grasses and weeds along neighboring irrigation ditches | 22.2 | May 11 |
| Yellow pine-juniper forest in Organ Mts. | 9.1 | May 19 |
| Grove of conifers on college farm | 4.6 | May 20 |

This was the third year that the beetles have overwintered most successfully under trash in or near the bean fields. Since the soil moisture in all four locations was about the same, and quite low, it appears that the beetles can hibernate in low soil moisture. However, further studies of these relationships are now being made in the greenhouse.

As in previous years, the beetles emerged after a light rain. They were not active, however, until the temperature had reached an average of 62° F. in terms of daily effective temperatures.

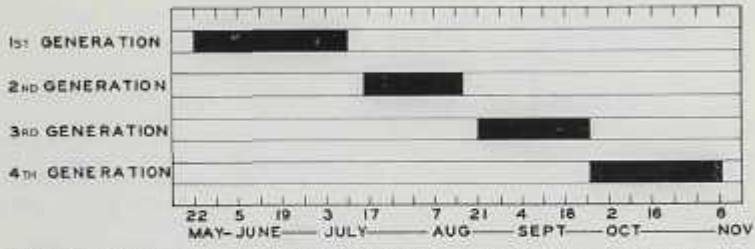
In 1947, as in the other years, three complete generations and a partial fourth were raised before frost. The approximate dates for these generations, from egg to adult, are shown in the chart. The first generation of beetles developed earlier than had the first generation the year before; and more adults of the late third and fourth generations developed in the mild fall weather during September and October.

In the fall of 1947, 1,000 beetles were placed, 100 to the cage, in the bean field trash. By December 5, 97.55 per cent of the beetles had entered hibernation. Two and one-half per cent remained active all winter. The percentage that survived and emerged in the spring of 1948 varied from 4 to 32 per cent, which was considerably less than the percentage emerging in 1947.

The beetles that hibernated emerged from April 23 to June 9, and the first egg laying was recorded on May 18. A small percentage of adults did not enter hibernation, but remained active, crawling about the cages on warm days, and disappearing at night and when temperatures were low. One pair was observed mating on November 5. This indicated that complete quiescence is not universal

(1) Possible hibernation locations for bean beetles in Organ Mountains. Left, east slope of mountains is sparsely vegetated, and offers little shelter for bean beetle hibernation. Right, west slope, with medium cover of Juniper, Yellow Pine, and Gamble Oak, is moderately favorable.

(2) Conifer grove adjoining bean field: only moderately favorable to hibernation.




**Approximate dates of each Mexican bean beetle generation, from egg to adult, State College, 1947.**

with this species in the southern part of the state.

No differences, such as fecundity of adults, number of eggs laid, length of developmental stages, or numbers of generations, were shown by larvae reared from adults hibernating under different environmental conditions. However, most of the fourth generation larvae from adults which overwintered in the conifer groves were killed by the November freeze.

To test the susceptibility of the larvae from different environments to insecticides, the entomologist used four lots of larvae reared from adults which had overwintered under bean field trash, and four lots from those overwintering in the Organ Mountains. The insecticides used were those customarily recommended for controlling bean beetles, i.e., rotenone, cryolite and an arsenical.

The results are shown in the table.

In order to know the best time to dust for the bean beetle, the farmer should know when the beetles and their larvae are feeding most actively. If the dust can be applied just before the larvae from each generation are hatched, then they will be killed upon hatching, and the plants will be protected.

But it is difficult to know when

**Comparison of Insecticide Susceptibility of Mexican Bean Beetle Larvae From Different Environments**

| Insecticide | Source of larvae | Percentage dead after 3 days |
|---|---|---|
| 0.75% rotenone with talc | State College | 94.74 |
| | Organ Mountains | 92.31 |
| 60-40 cryolite with talc | State College | 100.00 |
| | Organ Mountains | 81.82 |
| 25% basic copper arsenate with talc | State College | 100.00 |
| | Organ Mountains | 100.00 |
| Untreated | State College | 4.55 |
| | Organ Mountains | 9.10 |

the largest number of beetles of each generation are most active. One way to tell is to operate bait traps in the bean fields. The entomologist has been experimenting with Japanese beetle traps, baited with different organic aromatic materials. So far, the two most attractive materials tried were powdered vetch leaves and dl-phenyl alanine, processed as a solid bait with sawdust and gum arabic.

These baits must be placed at the bottom of the bait container so that the rising air currents, provided for by the design of the trap, will diffuse them properly. In the tests, baits placed in the upper part, or above the traps, failed to attract the beetles.

## The Pinto Bean Breeding Program

For many years, members of the agronomy department have conducted a Pinto bean breeding program in a search for strains of Pinto beans that produce greater yields of easier-to-cook beans than do the commercially grown strains. This program has resulted in two strains —295, which is grown in southern New Mexico, and 641, which is grown in the northern part of the state.

In 1947, a progeny test, a yield test, and an advanced strain test were planted at Clayton. Of 28 individual plant selections planted in the progeny rows, only 14 were harvested for yield after plant selections had been made. In the yield test, six strains of hybrid origin were tested along with 641. All the strains produced satisfactory comparative yields, but they all showed some tendency to segregate.

In the advanced strain test, 641, 1283, 1272, and 295 outyielded the locally grown strain, which was used as a check. This result conforms to that of the preceding five years, and shows conclusively the superiority of these improved bean strains over local pinto strains. Pinto 641 is recommended for the northern half of the state because it is somewhat earlier and better adapted for the shorter growing season than is 295. Fifteen hundred pounds of foundation seed of 641 were released to farmers for the growing season in 1948.

At Deming in 1947, 100 rows were planted to progenies which had been selected from both hybrid and linebred stocks the year before. Many whole rows were harvested for laboratory tests on their cooking and marketing qualities. One strain had an average cooking index of 60. This means that it is much easier to cook than 295, which had an average cooking index of 122.6. Because this progeny cooks so easily, it will be tested further for yield.

Another progeny, which had been selected from the regular 295 strain, outyielded its parent strain by 508 pounds to the acre. This was a significant difference, and the strain will be tested further. A third outstanding progeny yielded 191 pounds more to the acre than did 295, and although this was not a mathematically significant difference, the strain will be tested further.

# FOODS

## Cooking Quality of Pinto Beans

For many New Mexico families, Pinto beans are a staple grocery. There are disadvantages in cooking the beans, however, because it takes a long time, and they do not always cook evenly. If a strain of Pinto beans could be found that cooks easily and also yields well, it would be of considerable value to both the housewife and the bean grower.

In the Pinto bean improvement work of the station, the department of home economics is cooperating with the agronomy department by testing, for cooking quality, the beans grown in the strain tests. When the tests were started, the home economists found that the Calico beans cooked more easily than the Pintos; but that certain Pinto-Calico crosses cooked as easily as the Calicos. Unfortunately, these crosses did not resemble Pinto beans in markings or color.

Out of hundreds of samples tested during 1947-48, only one had the cooking quality of the Calico and the appearance of the Pinto. This hybrid will be tested further for yield and other characteristics.

Some of the Pinto-Calico crosses that do not resemble the Pinto bean have commercial possibilities because of their good cooking quality. One, a large white bean, shows particular promise and will be tested further.

As in past years, the tests this year indicated that cooking quality of beans varies with the place where the beans were grown. The chemical composition of the beans also varies. So far, no cause has been found for these variations, and no relationship has been established between them.

## Variety Makes a Difference in Home-frozen Peaches

New Mexico housewives have shown considerable interest in freezing peaches at home. To find which varieties make the best home-frozen peaches, the home economists tested thirty-five in a home-freezing unit in the laboratory.

When they judged the frozen peaches by appearance and flavor, they found five varieties that were outstandingly good. These were Red Haven, Halberta, Golden Elberta Cling, Golden Globe, and J. H. Hale.

None of the varieties turned brown in the freezing process. Uneven ripening, however, made several of the varieties undesirable for freezing. These peaches were soft ripe on one side and hard on the other. Consequently, some of the slices were firm and others were soft in the mixture. Freezing also emphasized the underripe flavor of the peaches that were not fully ripe.

Their study of the ascorbic acid, vitamin C, in the frozen peaches showed that the fruit does not lose

the vitamin during freezing. Loss in the frozen peaches during storage was gradual. After one month, the peaches had lost only about 7 per cent; after six months, they had lost 15 per cent; and after nine months, they had lost 35 per cent of the vitamin.

### . . . It Also Affects Food Value

Last year, tests showed that the average amount of ascorbic acid in fresh, peeled peaches of all varieties was 12.3 milligrams per 100 grams of fruit. This is practically the same amount as was found in the 1946 peach crop.

In both years, the Early Wheeler variety contained more ascorbic acid than any of the others. It contained 22 milligrams per 100 grams in 1946, and 19 in 1947. This is a white peach that ripens late in June. The varieties that ripened in June, or in September, contained more vitamin C than those that ripened in July or August.

Eleven of the thirty-five varieties tested contained more than 15 milligrams of ascorbic acid per 100 grams of fruit. They were Early Wheeler, Salberta, Hiley, Dr. Burton, Giant Snowball, Halate, Frank, Late Elberta, Burbank Giant, July Elberta, and July Gold. Twelve others contained more than 12 milligrams per 100 grams—Red Haven, President Roosevelt, Elberta, Alton, Frankie, Golden Globe, Erly-Red-Fre, June Elberta, Golden East, Valiant, Colora, Rio Oso Gem.

The yellow-fleshed peaches contained from 0.2 to 0.8 milligrams of carotene per 100 grams of peeled fruit.

## ORCHARDS

### Varieties of Stone Fruits for New Mexico

Spring frosts in 1948 destroyed the entire peach crop except for the fruit from the June Elberta, J. H. Hale, and Southhaven varieties. Therefore, no data were recorded on the performance of the many varieties being grown in the experimental orchard.

Tests in previous years have shown that the following peach varieties appear to be most desirable for New Mexico conditions: Erly-Red-Fre, Fisher, President Roosevelt, Golden East, July Elberta, Halehaven, Fireglow, Valiant, Vedette, Hardy Berta, and Halate. These varieties are listed in the approximate order of their ripening.

Despite the cold spring, the Stanley plum and the Royal Duke cherry bore heavy crops of high quality fruit this year. These two varieties seem well adapted to New Mexico conditions.

**Stanley plum tree, in college orchard, with full crop.**

## 1948 Winter and Spring Unfavorable for Southern New Mexico Stone Fruits

An extremely cold winter, such as the one in 1947-48, damages stone fruits in two ways: first, the low winter temperatures kill varying percentages of buds on all trees; and secondly, spring frosts damage the earlier-blooming varieties.

Last winter, the temperature reached a low of —6° F., and killing frosts were recorded as late as March 23. Because of the cold weather, crops of peaches, nectarines, apricots, and sweet and sour cherries were extremely small. However, Duke cherries and European plums bore normal crops.

Of the peaches, Southhaven and June Elberta bore full crops, and J.

H. Hale bore a partial crop. The varieties that were damaged by winter bud injury were:

| Severe | Moderate |
|---|---|
| Elberta | Burbank Giant |
| July Elberta | Late Elberta |
| Early Elberta | Southhaven |
| Golden Jubilee | |
| Hale | **Light** |
| Halehaven | Frankie |
| Hiley | Early Wheeler |
| Halberta | |

Late-blooming peach varieties are desirable for New Mexico, where late frosts are a continual menace.

The two apricot varieties in the college orchard, Wilson's Delicious and Stark Crimson, suffered moderate winter bud injury. However, spring frosts killed the blossoms on these early-blooming trees.

Among the plums, Stanley, a late-blooming European variety, bore a full crop, but Methley had its blooms killed by late frosts.

The Flaming Gold nectarines bore a light crop, while the Royal Duke cherries bore a full crop.

## Grapes in New Mexico

Even though the severe winter of 1947-48 seriously injured a number of grape varieties in the experimental vineyard, many were unharmed and yielded full crops this summer. The most severely damaged were Ribier, Dattier of Beyruth, Flame Muscat, Flame Tokay, and Muscat of Alexander. Those that yielded full crops were Black Muscat, Black Monukka, Thompson Seedless, Black Hamburg, Grenache, Palomino, Armalaga, Lenoir, Goethe, Improved Concord, Kenka, Worden and Westfield.

Grapes of two of these varieties—Thompson Seedless and Black Muscat—were used for making good quality sun-dried raisins. Samples of table wine were prepared from grapes of the Grenache, Palomino, Armalaga, Concord, Lenoir, Kenka and Worden varieties.

A number of grape and muscadine vines were set out in the fall of 1947. The following muscadines survived the winter: Dulcet, Burgaw, Top-Sail, Orton, Cape Fear and Tar Heel.

Of the grape vines set out, all those of French-American crosses, developed in France for wine production, survived. These varieties, which include Delicatessen and different numbered varieties of Baco, Seibel and Coudere, are reputed to be able to withstand sub-zero weather for relatively long periods of time.

Three other new varieties of grapes—Scarlet, Perlette, and Delight—were planted last fall. These varieties were developed by the California Experiment Station, and do not seem particularly well adapted to Mesilla Valley conditions. Only one vine of Delight survived. Delight is an early-maturing, seedless grape.

Chlorosis appeared among the American grapes, but the disease was checked by two applications of iron sulfate at the rate of one-fourth pound per mature vine. Each application cost about three cents per vine.

**Black Hamburg vine with full crop. Leaves removed. Mature vines yield from 25 to 30 pounds in college orchard.**

## The New Experimental Apple Orchard

The trees in the apple orchard planted in 1947 grew from 18 to 36 inches during 1948. This is considered excellent for the trees, which were mostly one-year-olds when they were planted.

One Jon-a-red and five Red Rome Beauty trees died during 1947. These were replanted in the spring of 1948.

The deshooting method of training these trees to the modified leader system has been very satisfactory on all except the smaller trees.

## Insecticides and Trap Baits Tested for Codling Moths

We have divided the problem of codling moth control into two parts —what insecticide to use, and when to apply it. Work is being done on both of these.

Because one insecticide, used throughout the entire season, leaves harmful residues on the fruit or damages the foliage of the tree, tests are being made with what are called

"split spray schedules." In these schedules, different insecticides are used alternately in the same season.

Last year, we reported that six split spray schedules tested in the experimental apple orchard resulted in 94 per cent to almost 100 per cent of the fruit being marketable. The insecticides used in these schedules were lead arsenate, cryolite, DDT, and nicotine bentonite. This year,

**Comparison of Spray Schedules for Codling Moth Control on Arkansas Blacks State College, 1947**

| Spray Schedules | | Percentages Wormy | |
|---|---|---|---|
| Spray | Materials per 100 gal. water | Harvested | Dropped |
| Calyx | Lead arsenate, 3 lb. with a proprietary casein-type spreader | | |
| 1st & 2nd Cover | Lead arsenate, 3 lb. with summer oil, ½ gal. | | |
| 3rd & 4th Cover | 50% DDT, 2 lb. with summer oil, ½ gal. | | |
| 5th & 6th Cover | Nicotine bentonite and DDT,[1] 1½ lb. with summer oil, ½ gal. | 7.17 | 61.72 |
| Calyx | Cryolite, 4 lb. with a proprietary casein-type spreader | | |
| 1st & 2nd Cover | Cryolite, 4 lb. with summer oil, ½ gal. | | |
| 3rd & 4th Cover | 50% DDT, 2 lb. with summer oil, ½ gal. | | |
| 5th & 6th Cover | Nicotine bentonite and DDT,[1] 1½ lb. with summer oil, ½ gal. | 12.45 | 87.25 |
| Calyx | None | | |
| 1st to 3rd Cover | DDT, 2 lb. with summer oil, ½ gal. | | |
| 4th Cover | 50% DDT and nicotine bentonite | | |
| 5th & 6th Cover | Nicotine bentonite[2] | 14.72 | 86.54 |
| Calyx and 1st 3 Covers | DDT, 2 lb. with summer oil, ½ gal | | |
| 4th Cover | 50% DDT and nicotine bentonite | | |
| 5th & 6th Cover | Nicotine bentonite[2] | 17.88 | 78.19 |
| Calyx and 6 Covers | Nicotine bentonite and DDT[1], 1½ gal. Summer oil, ½ gal. | 27.86 | 89.80 |
| Calyx | Lead arsenate, 3 lb. with a proprietary casein-type spreader | | |
| 1st to 6th Cover | Methoxy DDT,[3] 2 lb. with summer oil, ½ gal. | 25.95 | 81.63 |
| Calyx | Lead arsenate, 3 lb. with a proprietary casein-type spreader | | |
| 1st to 6th Cover | Chlorinated camphene,[4] 2 lb. with summer oil, ½ gal. | 29.45 | 95.37 |
| Calyx and 1st 2 Covers | Lead arsenate, 3 lb. with summer oil, ½ gal. | | |
| 3rd to 6th Cover | Phenothiazene-lead arsenate,[5] 6 lb. | 36.03 | 70.43 |
| Difference needed for significance | | 5%-11.65 1%-16.17 | 5%-15.34 1%-21.29 |

1. A proprietary blend, containing 2% nicotine and 17% DDT.
2. A proprietary blend, containing 14% nicotine.
3. Commercial "Methoxy chlor", containing 50% tri (methoxy phenyl) trichlorethane.
4. Commercial "Toxaphene", containing 25% chlorinated camphene.
5. A proprietary compound, containing 37% phenothiazene and 56.6% lead arsenate.

the tests included the same insecticides that were used last year, and several new ones—chlorinated camphene, methoxy DDT, a proprietary mixture of nicotine bentonite and DDT, and a mixture of phenothiazene and lead arsenate. The results of these tests are shown in the table.

Because this was an "off" year for the apple varieties that bear every other year, comparisons were possible only on the Arkansas Black variety. And because the crop was light, the infestation of the codling moth was heavy.

Better control resulted from the split schedules than from the straight ones, in which the new insecticides were used. The smallest amount of wormy fruit, 7.17 per cent, resulted from the schedule in which lead arsenate was used in the calyx and the first two cover sprays, DDT in the third and fourth, and the DDT-nicotine bentonite mixture in the fifth and sixth cover sprays. A similar schedule in which cryolite was used instead of lead arsenate was second best.

One difficulty with DDT and the DDT-nicotine bentonite blend was that, in combination with summer oil, they injured the foliage considerably. The lead arsenate and cryolite did not do this.

Trap baits were used to time the sprays throughout the season. By watching the number of moths caught in these traps, an orchardist can tell when the largest number of moths in each generation is active, and can spray accordingly.

Because cane syrup in water does not attract moths well in extremely hot weather, several baits, processed into a solid form, have been tested. During July, one of these baits, containing safrol as the attractant, apple pomace as the carrier, and Thiokol WD-2 as the binder, attracted more moths than did the syrup. The picture shows the results from using this bait compared with that of syrup. Otherwise, one part syrup in nine parts water, which was used as the control in the experiment, attracted more moths.

For years, corrugated bands treated with beta napthol have been recommended for killing codling moth larvae during the winter. Re-

**Catch of codling moths with solid safrol bait, left, compared to mixed catch of flies and other Lepidoptera with cane sirup, right.**

cently, in the Pacific Northwest, 4,6 dinitro-o-cresol has shown considerable promise as a bark spray. In tests at State College last winter, the dinitro-o-cresol did not give as satisfactory results as the beta napthol treated bands.

It is possible, however, that the dinitro-o-cresol compounds can be improved by the use of different penetrating and emulsifying agents, or heavier oils as carrying agents. Further work with the compounds is underway this winter.

## Pecan Variety Test in Mesilla Valley

In summarizing data on pecan varieties for the past thirteen-year period, comparisons of yield were made by classifying varieties according to the age of the trees and the land area they occupy.

The trees that were 30 years old and occupied about 3,000 square feet of land yielded an average of 139.7 pounds of nuts. Those that were 30 years old and occupied approximately 1,000 square feet of land yielded an average of only 41.6 pounds — less than a third of the average yield of the other group. Furthermore, the trees occupying the larger area showed an average yearly increase in yield of 7.5 pounds, but those on the smaller area showed almost no yearly average increase in yield. The trees on the larger area grew almost 64 per cent more than those on the smaller area.

These comparisons indicate that, for pecan trees 20 to 30 years old, higher yields per unit of land may be obtained from the wider spacing of the trees. Those that occupied the 3,000 square feet of land were spaced about 55 feet apart by the square system of planting.

When the yields were compared within the groups, it was found that the highest yielding variety of 30-year-old trees on 3,000 square feet of land was Onliwon. Over the thirteen years, it averaged an annual yield of 181 pounds per tree. This is far above the average yield from other varieties.

In the group of 30-year-old trees occupying 1,000 square feet, the following varieties produced the largest yields: Success, with a yield of 62 pounds per tree annually; Stuart, with 57 pounds; Texas Prolific, with 54 pounds; and Delmas, with 54 pounds.

In the group of 16-year-old trees, the mean average production was 40.7 pounds per tree. The highest yielding varieties were: Burkett, with 72 pounds annually; Oklahoma, with 69 pounds; and Western Schley, with 65 pounds.

Pecan trees show some tendency for biennial bearing, i.e., a high yield of one season is followed by a lower yield the next season. Not all the varieties in the tests bear biennially, however. The varieties which seem to bear more definitely on the biennium are: Mahan, Williamson, Harbin, and Schley.

## Walnut and Black Pecan Aphis on Pecans

One of the worst pests on pecan trees in southern New Mexico is the walnut aphid. Last year, we reported that benzene hexachloride gave excellent control of the pest. However, some newer insecticides showed possibilities, so these were compared with benzene hexachloride.

When they were applied early in June, the trees were rather heavily infested with both black pecan aphis and walnut aphis. The insecticides were applied as sprays to mature, producing pecan trees, and a special pecan spray gun with approximately 500 pounds pressure was used. Excellent coverage, particularly in the lower parts of the trees, was secured.

The results are shown in the table. Weekly examinations until August 1 showed that the populations of the aphis did not increase. Apparently, all three materials are effective in immediately reducing infestations to almost nothing, and all afford protection over a long period of time.

**Comparison of Insecticides for Control of Aphis on Pecans, 1948**

| Materials per 100 gallons of water | | Black Pecan Aphis | | | Walnut Aphis | | |
|---|---|---|---|---|---|---|---|
| | | Avg. No. per Leaf Before Spray | 3 Days After Spray | Per Cent Control | Avg. No. per Leaf Before Spray | 3 Days After Spray | Per Cent Control |
| Diethyl p-nitrophenyl thiophosphate, 15 per cent wettable powder | ¾ lb. | | | | | | |
| Wettable sulfur | 4 lb. | 5.13 | 0 | 100 | 9.60 | 0 | 100 |
| 14 per cent nicotine concentrate | 3 lb. | | | | | | |
| Wettable sulfur | 6 lb. | 7.40 | 0 | 100 | 13.30 | 0.13 | 99.02 |
| Benzene hexachloride (10 per cent gamma isomer) wettable powder | 1¼ lb. | | | | | | |
| Summer oil | 1 qt. | 3.53 | 0 | 100 | 9.27 | 0.47 | 94.93 |

# POULTRY

## Egg Albumen Quality Depends on Breeding

New Mexico poultrymen want their flocks to produce eggs with firm albumen, because firm albumen is a mark of high interior egg quality.

Experiments have shown that pullets inherit, from their dams, some ability to lay such eggs. Little is known, however, about the influence of the sire. Therefore, experiments are underway to establish a strain of birds that lay eggs with firm albumen, and to determine what influence the sire does have in transmitting the ability to lay eggs with firm albumen.

From the start of the experiments, breeding hens have been selected according to the score of the albumen in the eggs they produce. Those hens producing the eggs of the best quality are selected to establish a superior strain. As a check, those with the lowest albumen score are selected to establish an inferior strain.

The males used in each group are selected according to the albumen quality of their dams and sisters, and, after they have been tested, according to the albumen quality of their pullets.

In 1947-48, almost 400 pullets were raised in the experiment. The average albumen score of these from the high-quality strain was 1.7, which would make the eggs grade either A or AA quality on firmness of albumen. The average albumen score of the pullets from the low-quality strain was 3.04, which would give the eggs a grade of B on the market.

The influence of the sire was tested by the mating of two males with the same group of hens. The hens used belonged in the low-quality strain. One of the males came from the low-quality strain, while the other came from the high-quality strain. The pullets sired by the male from the low-quality strain produced eggs with an average score of 3.1. Those sired by the male from the high-quality strain produced eggs with an average score of 2.6. Evidently the male from the high-quality group transmits to his pullets some factors which make for more firm egg albumen.

## Hatching Pullets Too Early May Reduce Annual Egg Production

The date when a pullet is hatched makes a difference as to the number of eggs she will lay in the first year. To determine which hatching time in the spring is most favorable for high egg production, the poultry department kept records on birds hatched in March, April, and May. The birds hatched in each month were divided into two groups. One

group was placed in laying cages, and the other group was housed in floor pens.

The annual average egg production for each group was:

| Month | Floor Pens | Cages |
|---|---|---|
| March | 192.4 | 209.5 |
| April | 208.1 | 214.2 |
| May | 201.9 | 200.4 |

The group that was hatched in March and kept in floor pens laid the fewest eggs. Many of these pullets went through a winter molt; nearly half of them were out of production during part of December and January. On the average, the March-hatch pullets in the floor pen were out of production for one month. But the caged pullets continued to lay from September 1, when the first record was made, until August 31, one year later.

The birds hatched in April started their record on October 1. Neither these birds nor the May-hatched birds molted during the winter. The May-hatched birds did not begin to lay until November 1, but they continued laying through October of the following year and thereby completed a 365-day laying period.

# RANGE LAND

## Mesquite Invasion

The results of a mesquite invasion study show that more work must be done to develop practical, artificial methods of controlling mesquite.

On the experimental ranch, mesquite (Prosopis spp.) has been invading productive grassland for a number of years. To determine the rate of this invasion, a belt transect was established across the mesquite type range land and the adjoining black grama grassland, about half in the mesquite type and the other half in the grassland. This transect was established in 1940, at which time the location of each mesquite was charted, and its crown spread measured. In the summer of 1947, the transect was re-charted. The results are shown in the table.

**Results of Charting and Measuring Mesquite Growth on a Transect of a Mesquite Dune Area and Adjoining Black Grama Grassland, 1940 and 1947**

| Location | 1940 | 1947 | Increase 1940-1947 | Increase per acre | Dead Plants[1] |
|---|---|---|---|---|---|
| Mesquite Type | | | | | |
| Number of plants | 81 | 173 | 92 | 145 | 2 |
| Total crown spread, sq. ft. | 1,451 | 2,626 | 1,175 | 1,861 | — |
| Grassland | | | | | |
| Number of plants | 72 | 155 | 83 | 129 | 9 |
| Total crown spread, sq. ft. | 415 | 723 | 308 | 483 | — |
| Total Transect | | | | | |
| Number of plants | 153 | 328 | 175 | 137 | 11 |
| Total crown spread, sq. ft. | 1,867 | 3,350 | 1,483 | 1,168 | — |

[1]Plants charted in 1940 not appearing in 1947.

As the data show, the mesquite on the entire transect increased by 137 plants per acre, and the crown spread increased 1,168 square feet. This increase intensifies competition with the palatable grasses for the very limited moisture supply and for light. It also intensifies damage to the grasses by inducing greater rodent populations and severe wind erosion immediately surrounding the mesquite plants. In the grassland, enough mesquite plants have become established so that it is only a matter of time until mesquite dominates there, and excludes the perennial grasses. Furthermore, the mesquite has increased at such a rate that control, even by the least expensive methods, would be economically questionable.

The grassland half of the transect has three and a half times the carrying capacity of the mesquite type. Therefore, when the mesquite plants now established in the grassland become large enough to dominate, a large part of the productive capacity will be lost. Death loss by mesquite plants by no means balances the establishment of new plants.

## . . . And Mesquite Control

Because mesquite invasion is a problem on many southwestern ranges, a study was begun in the spring of 1947 to develop practical control measures. So far, no practical method of control has been developed.

Among the sprays tried, 2,4-D in the ester form gave best results, but these were erratic. Some few plants were completely killed, but others were only slightly affected. In some cases, the tops were killed back to the ground, but dormant buds at or below the soil surface escaped damage and growth from these buds restored the tops. Differences in reaction to the same spray applications by different plants are thought to be due, in part, to physiological differences between plants.

Of the soil injections, diesel oil and kerosene fortified with unsaturated hydrocarbons gave best results. The kill was not great enough to be considered satisfactory. Of the immersion trials, root immersion in sodium arsenite solution gave good results, but the method is too laborious to be practical.

Although none of the methods tested in 1947 were successful, results on a few individual plants were promising enough to warrant further work in 1948.

## Stocking Rate Determination, 1947-48 Grazing Year

As part of a long-time study of grazing capacity of black grama grassland range, the stocking capacity of the 1947-48 forage crop in a 2,470-acre pasture was determined. The pasture is representative of excellent black grama grass range; the determination was made from the actual grazing use and a forage utilization survey.

Mature cows and their calves were used to graze the pasture. From July 1, 1947, to July 2, 1948, the stocking

amounted to 30.97 animal unit years. Stocking was light in the summer and early fall of 1947, reduced to nothing in the late fall and winter, and was heavy during the spring of 1948.

Actually, the animals consumed 22 per cent of the weight of the grass vegetation, which comprises the greater part of the forage in this pasture. The average proper use is computed at 32 per cent of the grass vegetation. This is a weighted average, which takes into account the very heavy utilization on the area lying close around water and the light utilization on the large outlying area up to two and a half miles from water. Use of the forage, the part of the vegetation regarded as properly useable, was 69 per cent.

From the actual stocking the forage utilization percentage, the stocking required to have obtained full proper use of forage is computed at 45 animal units or at the rate of 11.6 animal units to the section.

Most of the forage used was produced by seasonal rainfall in the summer of 1947. It totaled 4.44 inches, which was a little lower than the long-time average of 4.91 inches for the area. This rainfall came in good, well-timed showers, however, and produced good forage growth despite the slight deficiency in total amount received.

## Effects of Rodents, Rabbits, and Cattle Grazing

Since 1940, a record has been kept of the damage done by rabbits and rodents to desirable grasses on three different types of range land, representing the following vegetation types: deteriorated mesquite-snakeweed **(Prosopis-Gutierrezia)**, fluffgrass-threeawn **(Triodia pulchella - Aristida** spp.), and black grama **(Bouteloua eriopoda)**. The desirable grasses include dropseed **(Sporobolus cryptandus** and **S. flexuosus)**, threeawn, black grama, bush muhly **(Muhlenbergia porteri)**, and plains bristlegrass **(Setaria macrostachya)**. The table shows the record for 1948.

In the mesquite-snakeweed type, the effect of rodent pressure is shown by a suppression in yield for the rodent-grazed plot. This plot yielded 230 pounds less to the acre than did the plot receiving full protection from all grazing. Effect of additional pressure from rabbits is expressed by a further suppression in yield. Since no cattle were allowed to graze on the deteriorated mesquite-snakeweed type, two plots were open to rodents and rabbits. When the forage yield on these two plots are averaged, they produced 94 pounds less to the acre than did the rodent-grazed plot. Expressed in percentage of yield of the fully protected plot, rodent pressure alone brought about a 62 per cent reduction. Additional pressure by rabbits further reduced yields by 25 per cent.

In the fluffgrass-threeawn type, the plot closed to cattle, open to rodents and rabbits produced considerably more forage than the other three. This difference is believed to be due to site differences in the plots and not to treatment. There was no significant difference in the yields from the fully protected plot and the

rodent-grazed plot. This indicated that rodent and rabbit control in this vegetation type is not justified.

A similar picture exists in the black grama grassland type. The fully protected plot yielded only slightly more than did those with rodent, and combined rodent and rabbit grazing. The yield from the plot open to rodents, rabbits, and cattle is considerably less than that from the other three, mostly because the plots are within one-half mile of water in the pasture and the plots are adjoining so that cattle drift down fences and across the open plot, exerting a higher degree of use and trampling than prevails in the pasture as a whole.

It appears from these data that, in deteriorated mesquite - dominated areas, rodent and rabbit pressure is heavy enough to prevent vegetation improvement even though cattle are excluded. Rodent and rabbit control is of little significance in open grassland types. However, rabbit populations have been at low levels during the years of study, and a few years of large populations may alter this situation. Methods of controlling rodents and rabbits require study to develop systems which are economically practical in brushy areas.

**To the right of the fence, vegetation was protected from rodents and rabbits, 1936 to 1948. To the left of the fence there was no protection.**

**Computed Yields per Acre of Desirable Grasses on Three Types of Range Land When Cattle, Rabbits and Rodents Were Excluded, 1948.**

| Treatment Plot | Vegetation Types | | |
|---|---|---|---|
| | Mesquite-Snakeweed | Fluffgrass-Threeawn | Black Grama Grassland |
| | Pounds | Pounds | Pounds |
| Closed to cattle, rabbits, and rodents | 371 | 387 | 755 |
| Closed to cattle, rabbits, open to rodents | 141 | 314 | 647 |
| Closed to cattle, open to rabbits and rodents | 34 | 513 | 679 |
| Open to cattle, rabbits, and rodents | 68* | 234 | 294 |

*This plot had 2½ times as great a stand of grass in 1940 as the other three.

## Artificial Revegetation

Reseeding trials on depleted desert grassland range were continued during the year on a small plot species test and extensive planting basis. Testing of seven species (**Eragrostis lehmanniana, E. lehmanniana** var. **ampla, E. chloromelas, E. superba, E. bicolor, Sporobulus flexuosus,** and **Atriplex canescens**) in snakeweed type on good soil resulted in complete failure in all cases. Seven species (**E. lehmanniana, E. chloromelas, S. airoides, S. flexuosus, Muhlenbergia porteri, Bouteloua rothrockii,** and **A. canescens**) tested in a creosote bush type on a poorer soil type also failed except for fair stands of the last named species. Extensive planting of 33½ acres of Boer and Lehmann lovegrasses (**E. chloromelas** and **E. lehmanniana**) also failed completely. This planting was drilled at a rate of 1.5 pound of mixed lovegrass seed to the acre on a snakeweed type which had been double-disked to remove competition from annual weeds and snakeweed. Total cost of planting was estimated at about $1.37 per acre.

Failure of all plantings is believed to be due to the exceptionally poor season. Rainfall on the seeded area during July, August, and September was only 3.83 inches, compared to eight-year seasonal average of 5.44 inches. The seventeen-year seasonal average at a gauge three-fourths mile away is 4.76 inches. Annual rainfall on the seeded area was 7.34 inches, compared to eight-year average of 10.29 inches. Only two rains of any consequence fell during the 1947 growing period and these were too far apart to bring about germination and continued growth. These failures emphasize the difficulty of reseeding in semidesert grassland where seasons vary widely, and bear out observations that success with about 50 per cent of plantings is the best that can be expected.

# CHEMISTRY

## N D G A In Creosote Bush Leaves

What is probably the best preventive of rancidity in lard and in other fats and oils has been found in the leaves of creosote bush (**Larrea divaricata** Cav.), a shrub that grows abundantly in the Southwest. One-hundredth to one-thousandth of one per cent of this compound, nordihydroguaiaretic acid (N D G A), will preserve these food materials for as long as eighteen months. The compound was used by the armed forces during the war to preserve both fats and oils.

By improving the method of analysis, the experiment station chemists have found that the leaves contain about two per cent more N D G A than was formerly reported, and that it should be possible to increase the yield of N D G A in commercial extraction.

Tests on the distribution of the N D G A in the plant gave percentages as follows: green leaves (dry), 12.3; dead leaves (somewhat weathered), 6.1; green stems (dry), 9.6; seed, 0.36; bark, 0.28; and wood, 0.35. It is evident that, if the plant were used as a commercial source of N D G A, only the leaf would be harvested, and the bush could be left in the field to grow a new crop of leaves.

It takes at least one growing season for the leaves to grow again, but under favorable moisture conditions, regrowth is rapid and the foliage is abundant. The percentage of N D G A in the regrowth is similar to that of other leaves.

The geographical location within the state does not appear to affect the amount of N D G A in the leaf. The plant seems to make the best growth at moderate altitudes where there is a loose, rather deep, sandy gravelly soil, but only when there is sufficient moisture. It is rather dormant, but green during the winter season. It becomes yellowish and brown in severe drouth. The growing period may occur any time during the warmer season when there is sufficient moisture, usually following effective rains. The leaf growth is followed by yellow blossoms and these by seed in a few weeks.

The maximum N D G A content may be as high as 12 per cent toward the end of the growing period. Since this is the time of maximum foliage, it is evidently the best time for harvesting to secure the maximum of N D G A.

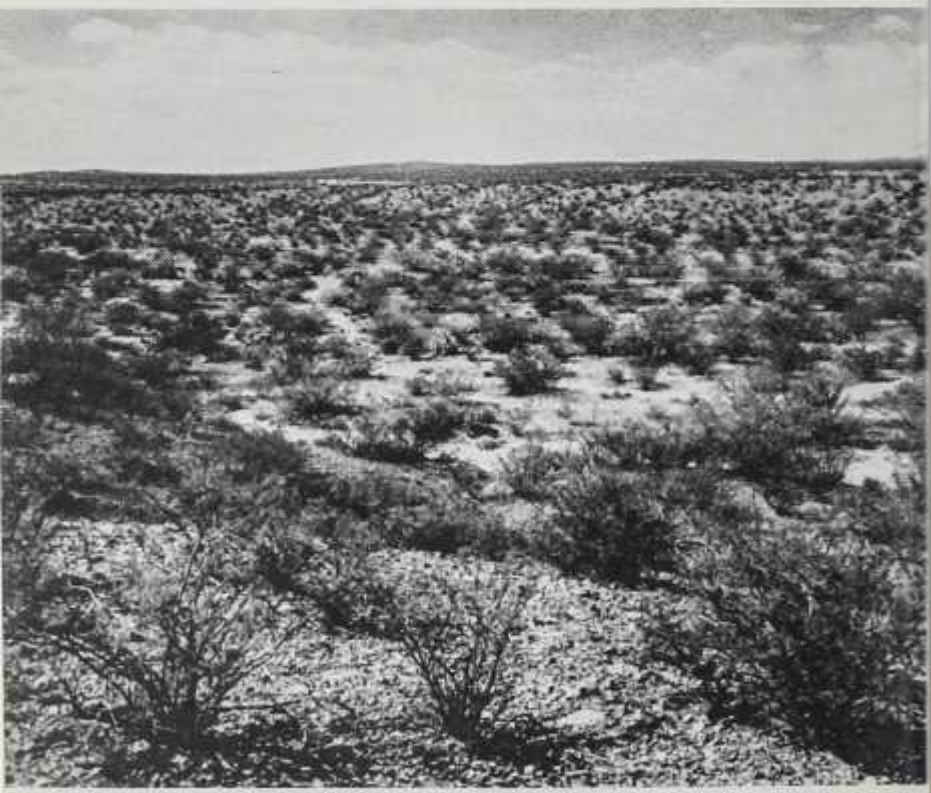
The minimum content of N D G A may be as low as 7 per cent at the end of the winter season or of a severe drouth. At this time there is also a minimum amount of leaf, often less than 40 per cent of the maximum. But during almost any month, some places in New Mexico can be found where creosote bush growth is good.

A general average of about 9 per cent N D G A was found for 150 samples collected from a number of rather widely separated localities within the state at all seasons over a period of four years.

When the harvested leaf was al-

lowed to cure in the field, it did not lose any appreciable percentage of N D G A. A small amount of rain did not harm it either, but the percentage was much lower in the old dead leaves that had fallen and weathered on the ground. The percentage did not appear to be influenced by the storage of dry samples in glass bottles for a number of years.

The protein content of the dry leaf was found to be as high as 14 to 16 per cent, and work on this constituent is being done with the hope that it may be utilized for feed or plasties.



Creosote bush occupies large areas in New Mexico.

# VEGETABLE CROPS

## Improvement of Chile

The market for chile grown in New Mexico would be wider if the chile were of better quality. Therefore, the horticulturists are working to improve the College No. 9 variety, which is one of the more productive varieties grown in the state.

In the spring of 1948, they planted 30 progenies selected from the 1947 tests. The basis for selection had been such economic characteristics as pod yield; earliness of maturity; resistance to wilt **(Fusarium annuum)** and to a Phytophthora disease, **P. capsici**; pod size, shape, and uniformity; and curing qualities of the pod. They also planted other selections from commercial stocks of chile. Two of these strains showed outstanding seedling vigor, and were three or four weeks earlier maturing than the College No. 9 variety. But the pods on these two strains were smaller than those of the College No. 9.

Several varieties of chile-type peppers, imported from Mexico and South America, were also grown. Some of these varieties exhibited superior qualities of plant and pod, and were crossed with the No. 9 chile.

In studying the pod characteristics of College No. 9 chile, the horticulturists found that the size and shape of the pod are influenced by several environmental factors as well as by heredity. Correlations between parent and progeny were highly significant for both length and width of pod. However, the higher correlation of +0.74 for pod width, compared to +0.58 for pod length, indicates that environmental factors influence pod length more than width.

College No. 9 chile varies widely in the degree of pungency of the pod. This is caused by heredity, and in the improvement program, the most desirable degree of pungency will be selected.

## Molds in Sun-Dried Chile Pods (Capsicum annuum L.)

The quality and desirability of New Mexico dried chile is greatly reduced by molds that are often present inside the sun-dried pods. Sometimes, the mold can be detected by an outward discoloration of the pod, but more often, the mold is not found until the pod is broken open.

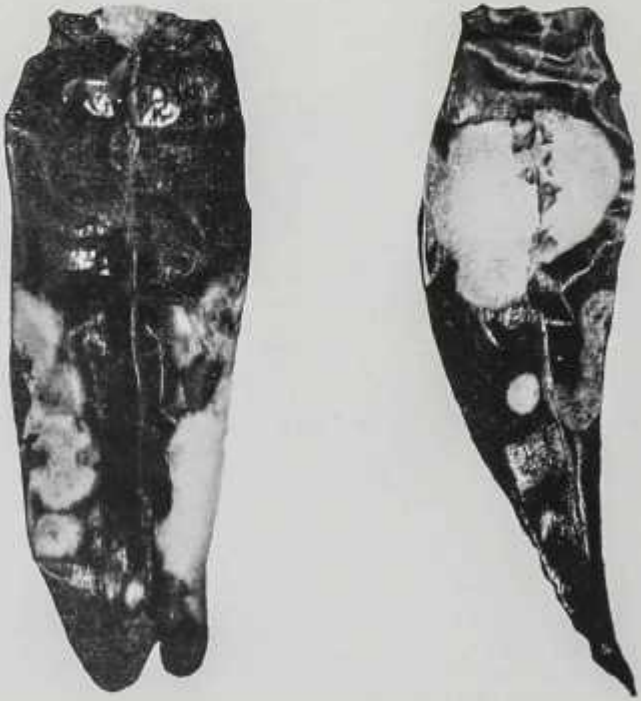
In 1946, the plant pathologist of the experiment station began work to find what molds grow inside the pods and how they get there, in order that a control program may be developed.

From the 1946 dried chile crop, in the Mesilla Valley, he isolated fifteen different molds. He did not find all of the molds in equal amounts, however. Some of them appeared more frequently than others. Further study in 1947 showed that three species of molds are responsible for most of the internal damage in dried chile. They are **Fusarium roseum**

(I.K.) S.&H., **F. moniliforme** Sheldon, and **Alternaria tenuis** Nees. Two of these are shown in the picture.

Moldy pod counts made during 1947–48 indicated that a greater percentage of infected pods occur after the first killing frost. It was observed that, after the frost, the succulent pod wall pulls away from the placenta and leaves a space for airborne spores to enter. At this time, most of the pods are still succulent enough to provide good growing conditions for the spores.

About 15 to 20 per cent of the total chile production is affected following frost, and accounts for most of the moldy pods. A few pods may be punctured by insects, or broken during harvest, to allow spore entrance. But only a small part of the total crop is damaged this way.



**Typical moldy pods of chile. Left, Alternaria tenuis; right, Fusarium roseum.**

## Breeding for Improvement of the White Grano Onion

Seed from approximately 240 lines, including both selfed and open-pollinated material, was planted in the field during October, 1947. An excellent stand of plants was obtained from all lines, but the open-pollinated seed germinated quicker and produced stronger, more vigorous plants than did the selfed seed.

The severe winter of 1947-48 caused considerable injury to many of the young seedlings. It was very apparent that the seedlings from the inbred lines were more susceptible to low temperatures than were the plants from open-pollinated seed. Within the inbred lines, many plants were killed outright and others severely damaged. This resulted in the complete loss of a number of inbred lines. Those inbred lines which were not killed were set back considerably, and produced small, late-maturing bulbs.

Selections for maturity were made at weekly intervals, beginning May 27 and continuing until June 10. All bulbs which were not mature by June 10 were considered late-maturing.

All bulbs were placed in common storage for the summer and at the end of the storage period, data were recorded for each of the progenies on: number and weight of bulbs, percentage of yellow and pink bulbs, percentage rots, percentage doubles, and percentage of off-type bulbs. A majority of the lines were discarded because of various defects. From the remainder, the best bulbs were selected for massing or for further inbreeding.

## Producing Tomato Seedlings in the Mesilla Valley

Because of the eastern tomato canning industry's demand for early tomato plants, the horticulturists have experimented with raising tomato plants of different varieties, planted at different times, in the Mesilla Valley. To compete successfully with plants from other areas, these plants would have to be ready for shipment by May 1.

In 1947, there were no severe frosts after March 15, and the plants made excellent growth. Last spring, however, sub-freezing temperatures were recorded eleven times during March and April, and although the seedlings that survived were stocky and healthy, no variety of any planting date was large enough to be considered for shipment by May 5.

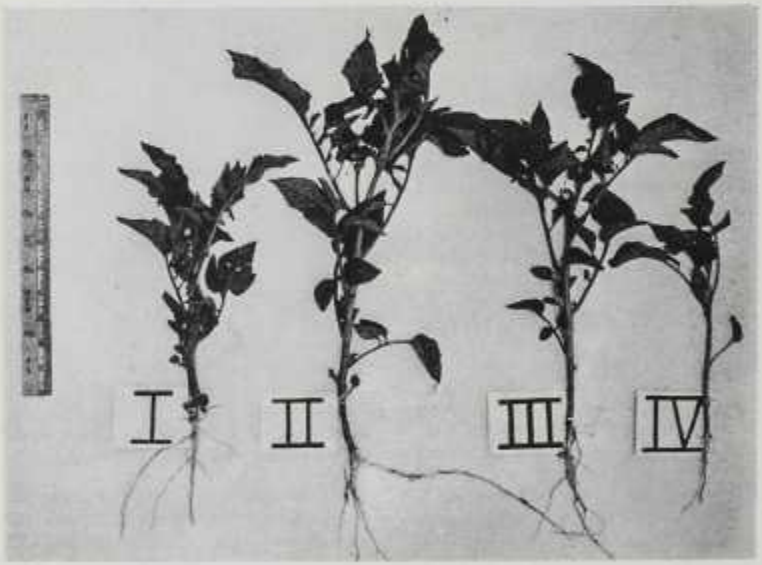
In the tests last year, Pritchard, John Baer, and Stokesdale, all standard canning varieties, were used. Red Jacket, a new potato-leaved canning tomato developed by the New York Experiment Station, was also planted. Pritchard was field-seeded March 3, and all four varieties were sown at weekly intervals from March 10 up to, and including, March 31. No protection was afforded the plants at any time; water was applied immediately after seeding, and thereafter once a week.

From the March 10 planting on, the average length of germination for all varieties varied from 16 to 21 days. Pritchard averaged 19.25 days, Red Jacket and Stokesdale 17.75 days, and John Baer 17.50 days. A

freeze on March 22-23 (19° F.) killed off most of the Pritchard seedlings which had been planted on March 3 and had begun to emerge. But after that date, temperatures as low as 24° F. had no noticeable effect on seedling plants.

The largest plants on May 5 were of the Red Jacket variety which had been planted March 17. They average 4.5 inches. John Baer, planted the same date, measured 4.0 inches. Stokesdale, planted March 10, measured 3.8 inches; and both Red Jacket and John Baer, planted the same date, measured 3.5 inches. John Baer, planted March 24, also averaged 3.5 inches.

In view of the uncertain spring weather in the Mesilla Valley, it seems that transplantable tomato seedlings cannot be produced here with any regularity by the first week in May.




**Red Jacket tomato plants grown in the Mesilla Valley in 1948. Seeding dates were as follows: I—March 10, II—March 17, III—March 24, IV—March 31. The larger sizes of the March 17 and March 24 plantings were typical in all varieties.**

# PUBLICATIONS

The New Mexico Agricultural Experiment Station has published its research results in 345 bulletins. Many of these are available and may be obtained by citizens of the state upon request. Besides these printed bulletins, the station issues, from time to time, mimeographed reports called press bulletins. These interest smaller groups of people than do the printed bulletins, but they will also be mailed upon request.

In addition to the regular publications, information on research work and results is released by staff members through the journal, newspaper and radio media.

## New Bulletins

| Number | Title |
|---|---|
| 339 | So You're Going to Raise Chickens |
| 340 | Maintaining Cotton Yields Through Fertilizer and Crop Rotation |
| 341 | Effect of Water-Retaining and Water-Spreading Structures in Revegetating Semidesert Range Land |
| 342 | Increasing Irish Potato Yields in New Mexico |
| 343 | Low Protein Roughage for Fattening Cattle |
| 344 | The Composition and Value of Piñon Nuts |
| 345 | Breeding for Interior Egg Quality |
| 58 | Annual Report of the New Mexico Agricultural Experiment Station |

## Press Bulletins

| | |
|---|---|
| 1017 | Incomes on Typical Farming Systems in Torrance County, 1946 |
| 1018 | Farm Incomes in the Pecos Valley, New Mexico, for 1947 |
| 1019 | Farm Incomes in the Mesilla Valley, New Mexico, 1947 |
| 1020 | Cotton Irrigation Tests |
| 1021 | Control of Bindweed by the Use of 2,4-D and Cultural Methods |
| 1022 | Farm Incomes in Eastern New Mexico Dry-Farming Areas, 1947 |

## Journal Articles

Koger, Marvin., Good feeding is as essential as good breeding. Western Live Stock. October, 1947.

Koger, Marvin, and J. H. Knox, The repeatability of the yearly production

of range cows. Journal of Animal Science. Vol. 6, No. 4. November, 1947.

Koger, Marvin, Selecting a good reproducing cow is not all done on looks. Western Farm Life. January 1, 1948.

Krochmal, A., Preparing the orchard for winter. Rural New Yorker. November 15, 1947.

Leyendecker, P. J., An epiphytotic of pepper blight caused by **Phytophthora capsici Leon.** in southern New Mexico. Plant Disease Reporter. Vol. 31, No. 11. November 15, 1947.

Pingrey, H. B., What about feeding cattle? New Mexico Stockman, September, 1947.

Pingrey, H. B., What about feeding sheep? New Mexico Stockman. November, 1947.

Staten, Glen, and James F. Cole, Jr., The effect of preplanting irrigation on pathogenicity of **Rhizoctonia solani** in seedling cotton. Journal of Phytopathology. Vol. 38, No. 8. August, 1948.

Valentine, K. A., Distance from water as a factor in grazing capacity of range land. Journal of Forestry. Vol. 45, No. 10. October, 1947.

Watkins, W. E., Nonprotein and carotene as an index of plant activity in range forage. Journal of Agricultural Research. Vol. 75, No. 2. July 15, 1947.

Watkins, W. E., Maturity, composition, growth influence grass palatability. Western Farm Life. January 1, 1948.

Watkins, W. E., and J. H. Knox, The blood phosphorus levels necessary for satisfactory production of range cattle in the Southwest. Journal of Animal Science. Vol. 7, No. 3. August, 1948.

## New Projects

Projects undertaken during the past year, listed by fund and project title were:

Purnell 77. Development of Formulae for Estimating Length of Wool at a Standard Age.

R & M 12. Preparation & Processing of Domestic Wools to Enhance Their Value and Increase Returns to the Wool Grower.

R & M 13. Marketing New Mexico Irrigated Cotton.

R & M 14. Marketing Cattle and Sheep in New Mexico.

R & M 16. Nutritional Status of Population Groups in New Mexico.

R & M 17. Grass and Weed Control in Irrigated Cotton Using Different Seed Bed Preparations.

R & M 19. The Testing, Multiplications and Improvement of Native New Mexico Plants of Potential Value for Industrial and Other Uses.

R & M 20A. Breeding Cotton for Verticillium Wilt Resistance, Seedling Vigor and Seed Quality.

R & M 21. Breeding Beef Cattle for Southwestern Ranges.

State Station 11. The Effect of Amounts of Concentrates and Thiouracil on Economy of Gain and Finish Obtained from Yearling Steers.

Station Sales 27. Feed Requirements and Rations for Milk Goats.

Station Sales 28. Carotene and Vitamin A in Goats Milk and Cows Milk.

Station Sales 29. Flavor Defects in Goats Milk.

## Projects Closed or Revised

During the year the following projects, listed according to fund and project title, were completed or revised:

Bankhead-Jones Research 9. Supplements for Cows on Dormant Range.

Purnell 66. Weights of Range Sheep at Critical Periods During the Annual Cycle.

Purnell 74. Raising Dairy Calves on a Simplified Home Mixed Starter.

R & M 12. Preparation & Processing of Domestic Wools to Enhance Their Value and Increase Returns to the Wool Grower.

State Station 11. Producing Tomato Seedlings in Mesilla Valley for Shipment to Commercial Users in Northeastern and Midwestern States.

Station Sales 8. Control of Johne's Disease.

## FINANCIAL STATEMENT OF NEW MEXICO AGRICULTURAL EXPERIMENT STATION FOR FISCAL YEAR ENDED JUNE 30, 1948

| | Hatch Fund | Adams Fund | Purnell Fund | Bankhead-Jones Research Fund | Research & Marketing Fund | Regional Research Fund | Non-Federal Funds |
|---|---|---|---|---|---|---|---|
| RECEIPTS | | | | | | | |
| Balance on hand July 1, 1947 | | | | | | | $ 92,799.14 |
| State appropriation | | | | | | | 64,125.00 |
| Receipts from sales | | | | | | | 52,841.75 |
| Receipts from U. S. Treasurer | $15,000.00 | $15,000.00 | $60,000.00 | $15,725.69 | $17,386.59 | $6,800.00 | |
| | $15,000.00 | $15,000.00 | $60,000.00 | $15,725.69 | $17,386.59 | $6,800.00 | $209,765.89 |
| EXPENDITURES | | | | | | | |
| Personal services | $13,184.08 | $12,844.02 | $50,410.82 | $10,998.52 | $ 2,134.99 | $1,670.45 | $ 65,291.04 |
| Travel | 519.70 | ——— | 1,611.63 | 39.00 | 1,404.47 | 137.20 | 1,777.02 |
| Transportation of things | 5.08 | 47.30 | 66.23 | 21.16 | ——— | ——— | 250.26 |
| Communication service | ——— | ——— | 114.67 | ——— | 16.10 | ——— | 309.00 |
| Rents and Utility services | 394.35 | 268.11 | 1,750.98 | 246.73 | 56.50 | ——— | 4,998.28 |
| Printing and Binding | 557.23 | ——— | 695.70 | ——— | ——— | ——— | 1,342.31 |
| Other contractual services | ——— | 234.86 | 443.35 | 259.91 | ——— | ——— | 7,226.98 |
| Supplies and materials | 240.12 | 1,344.19 | 4,370.96 | 4,054.97 | 669.54 | 6.61 | 18,688.99 |
| Equipment | 99.44 | 261.52 | 535.57 | 105.00 | 947.29 | ——— | 5,176.17 |
| Lands and structures | ——— | ——— | ——— | ——— | ——— | ——— | 40,928.05 |
| Contributions to retirement | ——— | ——— | ——— | ——— | ——— | ——— | 3,935.39 |
| Unexpended balance | ——— | ——— | ——— | ——— | 12,157.70 | 4,985.74 | 59,842.41 |
| | $15,000.00 | $15,000.00 | $60,000.00 | $15,725.69 | $17,386.59 | $6,800.00 | $209,765.89 |

## Cooperative Work

The experiment station cooperates with various other groups as a means of participating in a greater number of studies than would otherwise be possible. This cooperation is advantageous to the groups concerned because it makes available additional specialists for consultation purposes and permits the dissemination of increased amounts of research results. During the fiscal year, this station conducted cooperative work with other state experiment stations, and with the following groups:

Cotton and Fiber Branch, Production and Marketing Administration, USDA.

Division of Dry Land Agriculture, Bureau of Plant Industry, Soils and Agricultural Engineering, USDA.

Farmers and Manufacturers Beet Sugar Association.

Operations Division, Soil Conservation Service, USDA.

Research Division, Soil Conservation Service, USDA.

Southwestern Forest and Range Experiment Station, Forest Service, USDA.

Tennessee Valley Authority.

United States Cotton Field Station, Bureau of Plant Industry, Soils and Agricultural Engineering, USDA.

Western Regional Research Laboratory, Bureau of Agricultural and Industrial Chemistry, USDA.

Western Regional Salinity Laboratory, Bureau of Plant Industry, Soils and Agricultural Engineering, USDA.

Western States Sheep Breeding Laboratory, Bureau of Animal Industry, USDA.

Zoological Division, Bureau of Animal Industry, USDA.

## Personnel Changes

APPOINTMENTS

H. R. Varney, Director, July 1, 1947.
J. E. Chapman, Assistant Agronomist, July 1, 1947.
Annette Harlan, Assistant to the Director, August 1, 1947.
R. E. Harper, Assistant Horticulturist, August 1, 1947.
Arnold Krochmal, Assistant in Horticulture, September 1, 1947.
P. C. Duisberg, Assistant Chemist, September 1, 1947.
Betty J. Connelly, Laboratory Technician, September 6, 1947.
Helen Wiseman, Assistant Home Economist, October 1, 1947.
A. J. Walrath, Associate Economist, November 11, 1947.
C. W. Chang, Associate Agronomist, March 1, 1948.
C. T. Bourns, Agricultural Engineer, May 17, 1948.

RESIGNATIONS

C. A. Freeman, Assistant in Horticulture, July 31, 1947.
K. R. Frost, Agricultural Engineer, August 31, 1947.
Iris Rogers, Laboratory Technician, September 5, 1947.

# NEW MEXICO AGRICULTURAL EXPERIMENT STATION

As of June 30, 1948

## BOARD OF CONTROL

Board of Regents of the College

| | |
|---|---|
| Frank Light, President | Silver City, N. M. |
| J. A. Sweet, Secretary and Treasurer | Mesquite, N. M. |
| J. Minor Beene | Las Cruces, N. M. |
| Albert Gonzales | Santa Fe, N. M. |
| Austin Brooks | Clovis, N. M. |

Advisory Members

| | |
|---|---|
| Hon. Thomas J. Mabry, Governor of New Mexico | Santa Fe, N. M. |
| Hon. Charles L. Rose, Superintendent of Public Instruction | Santa Fe, N. M. |

## OFFICERS

| | |
|---|---|
| John R. Nichols, Ph.D. | President of the College |
| H. R. Varney, Ph.D. | Director |
| A. S. Curry, B.S.A. | Associate Director |
| Annette Harlan, B.S. | Assistant to the Director |
| Lillian J. Pankratz, A.M.L.S. | Librarian |
| R. W. Boney | Comptroller |

## STAFF

### Agricultural Economics

| | |
|---|---|
| P. W. Cockerill, M.S. | Agricultural Economist |
| H. B. Pingrey, M.S. | Associate Agricultural Economist |
| Morris Evans, M.S. | Associate Agricultural Economist |
| A. J. Walyath, M.S. | Associate Agricultural Economist |

### Agricultural Engineering

| | |
|---|---|
| C. T. Bourne, M.S. | Agricultural Engineer |

### Agronomy

| | |
|---|---|
| J. C. Overpeck, M.S. | Agronomist |
| G. N. Stroman, Ph.D. | Agronomist |
| Glen Staten, M.S.A. | Associate Agronomist |
| John Carter, Jr., B.S.A. | Associate Agronomist, Clayton |
| C. W. Chung, Ph.D. | Associate Agronomist |
| J. E. Chapman, M.S. | Assistant Agronomist |
| H. D. Jones, B.S.A. | Assistant Agronomist, Albuquerque |
| J. R. Spencer, B.S. | Assistant in Agronomy |

### Animal Husbandry

| | |
|---|---|
| J. H. Knox, M.S. | Animal Husbandman |
| P. E. Neale, M.S.A. | Animal Husbandman |
| W. E. Watkins, M.S. | Animal Husbandman |
| J. W. Benner, D.V.M., M.S. | Associate Animal Husbandman |
| Marvin Koger, Ph.D. | Associate Animal Husbandman |
| K. A. Valentine, M.S. | Assistant Animal Husbandman |
| J. J. Norris, M.S. | Assistant Animal Husbandman |

### Biology

| | |
|---|---|
| R. F. Crawford, M.S. | Biologist |
| J. R. Eyer, Ph.D. | Biologist |
| P. J. Leyendecker, Jr., M.S. | Assistant Biologist |

### Chemistry

| | |
|---|---|
| C. W. Botkin, M.S. | Chemist |
| L. B. Shires, M.S. | Chemist |
| Peter Druisberg, Ph.D. | Assistant Chemist |

### Dairy Husbandry

| | |
|---|---|
| O. C. Cunningham, B.S. | Dairy Husbandman |
| S. R. Skaggs, M.S. | Associate Dairy Husbandman |
| C. B. Reeves, M.S. | Assistant Dairy Husbandman |

### Home Economics

| | |
|---|---|
| Edith M. Lantz, M.A. | Research Specialist |
| Helen Wiseman, M.S. | Assistant Home Economist |

### Horticulture

| | |
|---|---|
| J. V. Ensie, M.S. | Horticulturist |
| R. E. Harper, B.S. | Assistant Horticulturist |
| Arnold Krechmal, B.S. | Assistant in Horticulture |

### Poultry Husbandry

| | |
|---|---|
| L. N. Berry, B.S. | Poultry Husbandman |

### Publications

| | |
|---|---|
| M. V. Watkins, B.A. | Editor |

## COOPERATORS

| | |
|---|---|
| F. A. B. MacNeil | Cotton Statistician, USDA, El Paso, Texas |
| A. B. Leding | Agronomist, USDA |
| L. B. Lytton | Senior Agricultural Aid, USDA |
| D. S. Hubbell, Ph.D. | Senior Soil Conservationist, USDA |
| J. L. Gardner, Ph.D. | Associate Soil Conservationist, USDA |
| H. J. Maker, B.S. | Soil Scientist, USDA |
| A. J. Erickson, B.A. | Assistant Soil Scientist, USDA |
| D. R. Burnham, M.S. | Associate Agronomist, USDA, Tucumcari |
| R. W. Allen, S.M. | Parasitologist, USDA |