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- Farms in Utah are too small!
- They are inefficient producers!
- Farm incomes are lower than in most other states!

Assertions such as these are often heard. Just how are Utah farmers making out? How do our farm incomes stack up? Are our farms able to meet the increased needs for machinery? What are the effects on agriculture of greater opportunities to work off the farm? How does your farm compare with other farms in the state? How efficient are Utah's farms?

We have some clues to these questions and others from the U.S. Census. In trying to arrive at answers we checked statistics for 1949 and preliminary data for 1954. These statistics give some idea of the changes that have occurred in farm incomes.

Farms are classified in the census on the basis of farm products sold. If we look at figure 1, we will see the dollar values that determine in which class a farm is. Class VI is an exception. Operators on these farms must work less than 100 days off their farms and must have farm sales that are greater than non-farm income. Otherwise, farms with less than $1,200 worth of sales are part-time farms. Fewer farms are reported in 1954 than in 1949 in each group except No. 2; more farms sold between $10,000 and $25,000 worth of products in 1954 than in the earlier census year.

In Which Income Group is Your Farm?

Fig. 1. Commercial farms in Utah by income classes...1949 and 1954

How Many Farms?

In 1949, Utah had about 24,000 farms. But of this total 7,000 farms were part-time and residential. This left about 17,000 commercial farms or farms supplying the main source of family income. Many of the commercial farms in Utah have low incomes from sales of crops and livestock.

Utah had fewer farms in 1954 than in 1949. Preliminary census data show a decrease of more than 1,300 farms of all kinds. The number of commercial farms decreased about 2,000 and numbers of part-time and residential farms increased about 700 in these 5 years.

One of the reasons for fewer commercial farms is lower incomes in 1954. Lower incomes place many smaller farms in the part-time class.

Some farmers increased their acreage by buying other farm land between 1949 and 1954. This is suggested by the increase in the number of class II farms. Large farms continued to have high gross farm incomes through 1954.

On the basis of averages for all farms, Utah farms did fairly well. Our commercial farms had sales of $7,700 per farm in 1949. The United States average was only $5,800. Iowa farms averaged $8,600.

The picture is not quite so favorable when we look at the different classes of farms. This is because Utah had a larger percentage of farms in class I than Iowa, for example. These class I farms greatly influenced the average. Without them, the average gross farm income was only $5,200 in Utah.

Forty-one percent of our farms had sales valued at $5,000 or more (fig. 1). In the United States as a whole, this percentage was only 32. But in Iowa, 63 percent of the farms were in the three largest farm income classes.

Fig. 1. Commercial farms in Utah by income classes...1949 and 1954
Compare with Farms
Parts of the States

Our few large farms did remarkably well—The income of the average farmer was above that in the United States as a whole—Our many small farms find it difficult to compete in mechanized agriculture.

More than 31 percent of Utah's commercial farmers had less than $2,500 gross farm sales in 1949. Farm incomes were not large on many farms even in the years around 1950 when prices were high. Class IV ($2,500-4,999) contained more farms than any other class.

What Was Sold?

Livestock and livestock products have been more important sources of cash income than have crop sales (fig. 2). Range livestock and poultry furnish most of the income on class I farms. More than half of our large farms are of "other livestock" type. More than a fourth of our farms in this class are poultry farms and about 6 percent are cash grain farms. These three types comprise 85 percent of our largest group of farms.

Dairying is important on class II farms. But poultry and other livestock are still the most important farm types in class II. Dairying gains importance in a relative sense as farms become smaller.

Farms also are more diversified as size decreases. In the smaller size classes, general crop and livestock farms predominate. Small specialty fruit and vegetable farms also occur in relatively large numbers.

What Were the Operating Costs?

The 1950 Census shows us what happens to part of the cash from sales of farm products. We know that many people share these gross returns.

Hired labor is much more important on the larger farms. More than 20 percent of gross receipts on class I farms went for hired labor. In contrast, only 7 percent of the income on class V farms was used for this purpose. Nearly 70 percent of the farmers in class I hired labor; only 6 percent hired labor on class V farms. Expense figures are not available for class VI farms.

Purchased feed held about the same relative position in all classes of farms except class I. This latter group used rangeland as the main source of feed. This is an expense for land ownership, renting, and public grazing fees.

Livestock purchases and machinery repairs take about the same proportion of the income on all classes of farms. Expenses for fuel and oil were relatively more important on the smaller farms.

How High Are Investment Values?

Land and buildings in the largest income group were valued at $79,000. This value decreased to about $9,000 per farm on the smallest farms. But in terms of gross income and costs, the picture is reversed. Interest on land and buildings at 5 percent is only 8 percent of sales in the high income group. But it is 55 percent of sales on the low income farms.
These values do not include a value of public land used under grazing permit. But some people think that part or all of the value of these permits is capitalized into private land values.

A difference in relative investment in land among groups has significant implications. It means that the larger farms have relatively greater assets in livestock and machinery. Apparently the rate of return on investment is greater on these farms. Studies in recent years have shown that rates of return on operating capital usually are greater than rates of return on land.

We have calculated ratios between land and building values and crop and livestock sales. On Utah farms, the ratios ranged from 1.6 for class I to 11.0 for class VI farms. In other words, on our farms, the values of land and buildings in 1950 were from 1.6 to 11.0 times as great as the sales. In the upper three income groups these ratios are slightly lower for Utah than for Iowa farms. But in the three smallest income groups the ratios are considerably greater for Utah than for Iowa farms.

Land investment per farm in Iowa was greater than in Utah except for classes I and VI farms. But within the lower income classes, incomes were also larger in Iowa. The ratios between investment and sales for all farms were 3.2 for Iowa and 3.0 for Utah. Overall, Iowa had a slightly greater investment in land and buildings per dollar of gross farm income than did Utah.

The large proportion of public land in Utah may place some limitations on comparisons with Iowa, for example. We must also recognize that production expenses on irrigated farms are usually greater than expenses in humid areas. Net incomes may change the relations. But the above figures based on gross income suggest that land values in Utah may not be inflated as much as is frequently asserted. We need more study of this problem.

How Mechanized are Our Farms?

Class I and II farms average more than one tractor, motor truck, and automobile. The other classes have less than one of each machine per farm. In some instances, the average per farm is less than one-half machine.

Less than half the farmers in the two small income groups own a tractor. On large farms there are more trucks and tractors than automobiles; the reverse is true on the smaller farms.

These items of machinery require a high investment. This is especially true on our small farms. Small-scale farmers have a real problem if they keep up with mechanization changes and increases.

What Are Our Operators Like?

Eleven percent of our operators of commercial farms were more than 65 years old in 1949. More than a fourth of the operators in the smallest income group were more than 65. Apparently our older farmers often operate small acreages that they can care for without assistance. This is characteristic of the family farm cycle.

The younger operators appear to be in classes II and III. Only 7 percent of these operators were over 65. But the 9 percent who were over 65 in class I may not be significantly greater. Many owners of large farms are older men who have accumulated large amounts of capital over the years.

Half the operators on the large farms own all the land they farm. On the small farms, about a fourth of the farmers rent part or all of their land.

Utah's commercial farms have an average of 1.7 family workers. In general, the number decreases as the size of farm decreases. Classes II and III farms have somewhat more family workers than class I. About 70 percent of the operators in class I hired farm labor. This percentage was only 4 on class VI farms.

About 20 percent of all operators of commercial farms in the state worked off the farm more than 100 days in 1949. Nearly 40 percent of the farmers in class V did at least this much work off their farms. Eleven percent of the farmers in class I worked more than 100 days off their farms.

Conclusion

Apparently Utah's larger farms compare favorably with farms in other sections of the country. We do have a large proportion of small farms which do not furnish full-time jobs. The operators of these small farms often do not have sufficient capital to acquire and use efficiently a full set of machinery. Custom hiring and exchange of equipment offer a partial solution to this problem.

But operators of these small farms often do a great deal of off-farm work to increase their income. In other words, many farms classified as commercial are still essentially part-time farms. It is mainly a matter of definition. Without off-farm work, many of our families on these small farms would be in real financial trouble.

The census data discussed may suggest some inefficiencies in Utah's agriculture. But adjusting to larger operating units often presents serious obstacles.

FARM AND HOME SCIENCE

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New Noxious Weed Found in Sevier County

Invasion predicted some nine years earlier when it was declared noxious

LOUIS A. JENSEN and ARTHUR H. HOLMGREN

Another new weed pest has been found in our state. It is the much feared Austrian field cress. This adds one more to our long list of noxious weeds. The weed was declared noxious by the State Department of Agriculture some nine years ago, although it had not then been found in the state. In other states where this weed is common, farmers find it difficult to control. This is because it spreads rapidly by both seeds and underground rootstocks.

The first patch was discovered this summer near the town of Monroe in Sevier County. E. L. Guymon, county agent, and the Sevier County Weed Committee became alarmed about it and sent it to the College. Here it was identified in the Intermountain Herbarium. Later the identification was verified by Dr. Reed C. Rollins of Harvard University.

Austrian field cress (Rorippa austriaca (Crantz) Bess.) was introduced into this country from southeastern Europe. The first American record of this weed was in the state of New York in 1910. Since that time, Austrian field cress has spread into New Jersey, Minnesota, Wisconsin, Iowa, California, Saskatchewan, North Dakota, and is now found in Utah.

Description—Austrian field cress is a member of the mustard family. The plants look much like a robust whitetop. The main differences are that the flowers are yellow instead of white and the seed pods are somewhat rounded instead of heart-shaped. The weed is a perennial with heavy rootstocks similar to those produced in whitetop, a close relative. Plants up to 36 inches in height are common. The lower leaves are stalked and usually coarsely toothed on the margins. The upper leaves are without stalks and partly surround the stems. The yellow flowers are tiny with petals only about an eighth of an inch long. Austrian field cress is usually found in wet places in fields and often reaches its best growth along ditchbanks. This is exactly the situation where it is

(Continued on page 84)
Cooperation

Speeds Increase of Vernal Alfalfa Seed

John W. Carlson

Farm and Home Science
Within a year after Vernal alfalfa seed was released for commercial use, seed was on sale in seed stores. More than two million pounds of certified Vernal seed was produced commercially in 1954. Estimates for 1955 are not available. Never before in history has there been such fast production of seed of a new variety of alfalfa as there has been with Vernal. It took 6 years to increase Ranger alfalfa to a million pounds. During that period Ranger seed sold at a dollar or more (mostly more) a pound because it was wanted but scarce.

This remarkable increase of seed was made possible through close cooperation of workers at the Wisconsin and Utah Agricultural Experiment Stations with the U.S. Department of Agriculture and commercial seed growers in Utah, California, and some of the other western states. The Department of Agriculture's Foundation Seed Project contributed greatly to the rapid increase.

Back in 1942 when Ranger was released there was no National Foundation Seed Project to finance and to facilitate the production of certified seed from which all certified seed of Vernal alfalfa is produced. Also, at that time, DDT and other of the newer more effective insecticides were not available to control the lygus bug and other harmful insects. Extensive programs of seed increase of northern adapted winter hardy and wilt resistant varieties in California, Arizona, and New Mexico did not come into being until the late 1940's, and were well established by the time the variety Vernal was released.

Work on this wilt resistant, winter hardy alfalfa was started in Wisconsin some 25 years ago. It was released for seed increase to seed producers in 1953. The first plantings in small plots were made in 1948 at Madison, Wisconsin. Thirty-five pounds of seed were produced. This initial seed was used for evaluation purposes and in 1951 and 1952 part of it was sown for increase under contract with the Utah Station on a total of 13 acres in Cache County. From these fields came the breeders' seed of Vernal alfalfa that the National Foundation Seed Project used to produce the foundation seed which it supplied to growers for commercial outputs of certified seed.

While Vernal is recommended for a seed crop in Utah, it has not been tested long enough to make definite recommendations for a hay crop.

NEW PUBLICATIONS


This bulletin discusses the problems connected with obtaining reliable labor for herding sheep and suggests ways to make such work more attractive.


This report discusses some of the problems of drainage in the central Cache Valley area connected with lands overlying an artesian aquifer. It describes some successful drainage systems in the area and suggests general plans for drainage of the entire area.

Copies of these publications will be sent on request to the Utah Agricultural Experiment Station, Logan, Utah.

Dr. John W. Carlson works for the Agricultural Research Service on alfalfa improvement in cooperation with the Utah Station at Logan. It was through his efforts in cooperation with the farmers in the area that it was possible to increase the seed of Vernal alfalfa in such record time.

The distinguishing feature of Vernal alfalfa is its yellow flowers.
Management Practices
made the difference between profit and loss
in producing turkeys in 1954

HOW DID PRACTICES OF TURKEY PRODUCERS WHO MADE
MONEY DIFFER FROM THOSE WHO DID NOT?

PRODUCERS WITH HIGH NET RETURNS
(1) Had costs of 36.3 cents per pound
(2) Fed 4.9 pounds of feed per pound of eviscerated turkey
(3) Had feed costs of $4.06 per hundredweight
(4) Had death losses of 9 percent with half of this in brooding period
(5) Paid 78 cents for day old poults
(6) Used 1.7 hours of labor per 100 pounds of turkey
(7) Sold turkeys at average weight of 12.5 pounds for hens, 22.7 for toms

PRODUCERS WITH LOW NET RETURNS
(1) Had costs of 47.6 cents per pound
(2) Fed 6.4 pounds of feed per pound of eviscerated turkey
(3) Had feed costs of $4.31 per hundredweight
(4) Had death losses of 23 percent with 37 percent of this in brooding period
(5) Paid 79 cents for day old poults
(6) Used 2.2 hours of labor per 100 pounds of turkey
(7) Sold turkeys at average weight of 11.0 pounds for hens and 19.5 for toms

Some turkey producers in Utah made money on their enterprise in 1954 in spite of the unfavorable price-cost relations which existed. Of 85 flocks studied by the Utah Agricultural Experiment Station, 30 percent made a profit above all costs (fig. 1). Ten percent of the flocks making the highest profit returned 5.4 cents per pound to the producer. On the other end of the scale, 10 percent of the flocks with lowest returns lost 11.6 cents per pound raised. In seven out of ten flocks the receipts from turkeys failed to cover all the costs of production.

The turkey producers studied lost an average of $1400 per flock or 2 cents per pound of turkey raised (table 1). Producers received 38.5 cents a pound for turkeys. They paid out 6.7 cents for processing and hauling costs and turkey federation dues. The 31.8 cents remaining failed by 2 cents per pound to cover their production costs.

Refunds to patrons of cooperative feed organizations and processing plants are not included as receipts because they had not been received prior to this survey of producers. Net returns to producers who patronized such associations are greater than indicated by the amount of such refunds.

Fig. 1. Variation in net returns among 85 Utah turkey flocks (Each bar represents 10 percent of the flock)

Fig. 3. Distribution of flocks by selling price for hen and tom turkeys, 85 Utah turkey flocks, 1954

R. H. ANDERSON

FARM AND HOME SCIENCE
Importance of Cost Items

Feed was the greatest expense item. It amounted to two-thirds of the total costs (fig. 2). It required 5.5 pounds of feed to produce one pound of eviscerated turkey. Mash made up 60 percent of this feed and cost an average of $4.79 per hundredweight. Scratch grains made up the balance and were valued at $3.19 per hundredweight. In this study the investigators valued home grown grains at prices equivalent to purchased grains. Cost for range was balanced against the fertility value of manure left on the range land.

Poult cost was the second largest cost representing 5.5 cents per pound or 16 percent of the total cost. Cost of day-old poult averaged 78 cents and did not vary greatly among the various flocks. Death loss, which has a direct bearing on poult cost per pound raised, averaged 13.7 percent of the number started.

Labor cost two cents per pound of turkey raised or about 6 percent of the total cost. About one-third of an hour of man labor was required for each turkey raised. The average rate allowed for labor was $1.02 per hour. About one third of the labor used was hired and two thirds was supplied by the operator and his family.

The costs for use of building and equipment were estimated at 1.4 cents per pound of turkey raised or 4.2 percent of the total costs. On the average, producers had 93 cents invested in buildings and equipment for each bird started. Interest on this investment at 5 percent plus the cost for depreciation, repairs, insurance, and taxes made up the building and equipment costs.

Interest on operating capital accounted for one half cent per pound of turkey raised or 1.4 percent of the total cost. During the production period, an average of

Dr. Roice H. Anderson is associate professor of agricultural economics. Dr. Anderson spends most of his time devoted to research on regional poultry marketing projects.

FOR DECEMBER 1955
$5.24 of operating capital was required for each bird raised. An interest cost of 6 percent was charged for operating capital for the period used whether the capital was supplied by the producer or a financing agency. If the capital belonged to the operator then this interest charge is not a cash expense.

Costs of truck and tractor amounted to one-half cent per pound of turkey raised or 1.5 percent of the total cost. Trucks were used primarily for hauling feed to turkeys and an average of about one-half truck mile was used per turkey raised. Tractors were used for such work as moving range shelters. Only 78 hours of tractor work were required per flock.

All other costs including fuel, electricity, water, litter, and miscellaneous costs amounted to 1.1 cents per pound or 3.2 percent of total costs. Most of the medicines for treating turkey diseases were added to the feed and the costs could not easily be separated. Some charges for medicine and veterinary service, however, were included in the miscellaneous expenses.

Variation in Prices and Costs

All of the variation in net returns per pound can be attributed to the two things, selling price and cost of production. Both of these varied considerably among the 85 flocks studied. Except in unusual situations of short duration, hen turkeys sell for higher prices than tom turkeys. Hens from these flocks studied in 1954 sold for an average of 43.9 cents per pound eviscerated compared with 35.7 cents for tom turkeys.

Prices received for hen turkeys varied from 41 to 48 cents per pound with hens in about one-fourth of the flocks selling for 42 cents and those in another fourth selling for 45 cents (fig. 3). Tom prices varied from 33 to 40 cents with those from more than half of the flocks selling for 35 or 36 cents.

Costs of production varied even more than selling price. The greatest number, representing about one-third of the flocks, had costs in the range from 36 to 40 cents per pound (fig. 4). Production costs for about 8 percent of the flocks were less than 32 cents and a similar percentage had costs in excess of 48 cents.

Factors Related to Net Returns

Regardless of the amount of variation in selling price and costs of production these factors are important in explaining net returns only insofar as their variations are associated with the variations in net returns. In order to determine and measure the factors related to the variations in net returns the 85 flocks were grouped into four groups by net returns and various cost and efficiency factors were calculated. The average selling price for both hen and tom turkeys was found to be practically the same among the four income groups (fig. 5). This means that producers whose flocks made a profit did so because of some reason other than selling price. The average price received by producers with high profits was slightly higher than the other groups because there was a larger percentage of hen turkeys in these flocks.

Effect of Cost of Production on Net Returns

When the flocks were grouped by net returns those flocks with high net returns had costs of 36.6 cents per pound compared with 47.6 cents for the flocks with low net returns. From this relation and the lack of relation between net returns and selling price it can be concluded that producers made high net incomes because they kept their costs low, not because they were "lucky" and hit the peak of the market.

(Continued on page 82)
Lamb from tilbetril treated group. This lamb developed urinary trouble and died from uremic poisoning the day following completion of trial.

MILTON A. MADSEN

Stilbestrol implants are not recommended for fattening lambs by the Utah Agricultural Experiment Station at the present time. Stilbestrol is a synthetic product having properties similar to ovarian hormone. In preliminary feeding trials using stilbestrol implants, lambs failed to gain significantly more than the controls that were not given stilbestrol. But the lambs did exhibit harmful effects from the use of the implants.

Increased knowledge concerning the role of endocrine glands and their secretions in regulating body functions has stimulated an interest in the possible use of these materials, or chemically related substances, for fattening livestock. Of those tried in livestock rations, the ovarian hormones or synthetic substitutes have produced the greatest response.

Trials conducted at several midwestern experiment stations have shown that subcutaneous implants of stilbestrol will increase rate of gain and feed utilization of lambs and steers. A reduction in carcass grade was reported in practically all these studies. In some instances death losses of lambs occurred from blocking of the urinary tract and prolapse of the rectum.

Seventy-Two Lambs Used in Tests

Most of the tests reported have been conducted with cornbelt rations. For this reason it was deemed advisable to study the effect of stilbestrol in fattening rations commonly used in this area. Accordingly, the Utah Agricultural Experiment Station initiated a feeding trial in the fall of 1954. Seventy-two weanling lambs consisting of equal numbers of Columbias, Rambouillets, and Targhees were used.

During the first two-week period of the trial the lambs received a ration containing 25 percent grain mixture and 75 percent alfalfa hay. At the start of the second two-week period the ration was changed to a mixture of 50 percent grain and 50 percent alfalfa hay (table 1). All rations were pelleted. The size was ⅛ inch diameter and from ½ to ¾ inch long. Lambs were bedded with wood shavings rather than straw so they would not eat their bedding. A

(Continued on page 81)
CONTROL OF BROWN MITES

Spray Recommendations for 1956

1. A delayed dormant spray should always be applied. This spray is directed against the eggs and must cover them in order to kill them. A complete soaking is needed, especially on the undersides of the twigs.
   a. Of the older materials, the mixture of 3 gallons of lime sulfur solution and 1 gallon of actual oil seems to give the most consistently good results. The other mentioned materials are also good.
   b. If the newer materials are preferred, chose between 1½ pounds of Ovotran or 1½ pints of Genite 923. Mitox is not yet on the market.
2. If a knockdown treatment is needed during the summer, use one of the following materials: TEPP ½ pint, parathion 1 to 1½ pounds, or malathion at 2 to 3 pounds per 100 gallons. Malathion at the 3 pound dosage seems to be most effective.
   a. Residual materials such as Ovotran or Genite 923 are too slow in their action for use as knockdown sprays.
   b. For a combined residual and knockdown spray, the combination of 1 pound of Ovotran with 1 pound of parathion is recommended.
3. Systox is spectacular in its results. Because of the nature of the material it should be used only where necessary, and then the directions for use should be followed closely. Systox at 1½ to 1½ pints per 100 gallons of spray can be used on pears and apples but at this time has not been approved for use on stone fruits. It is effective as either a knockdown spray or an early treatment. Some foliage should be showing on the tree before Systox is applied for best results. The labels on the containers carry the latest government approved uses for Systox. As new uses are worked out they may add to or modify the above information.

THE BROWN or clover mite (Bryobia practiosa Koch) has injured orchards in all major fruit growing areas of the state during 1954 and 1955. It injures all kinds of fruit trees. Apples and peaches are usually most severely injured.

Because of this widespread importance, field experiments to test miticides for brown mite control were conducted during the past two seasons. These tests were made in Cache, Weber, and Washington Counties. Observations were also made in commercial orchards inBox Elder and Utah Counties.

Damage Caused by This Mite

These mites are first seen in the spring on the opening leaf and flower buds. Most of the egg hatch is at this time of the season. The injury is minor at first and is in the form of minute light colored stippling of the leaves. As the season progresses this stippling runs together and the entire leaf becomes greenish-white. In severe cases all the leaves on a tree or even in the whole orchard take on this bleached color. Usually one season of mite damage is not too serious but when damage occurs year after year the end result can be disastrous. The obvious injury is non-functioning leaves, small leaves, early leaf drop, and scarring of the fruit itself. If the trees are injured for several seasons they fail to grow and may eventually die. Trees with severe damage bear few or no fruit, or at best small fruit, and the tree becomes a liability.

Life History Studies

Before control methods can be developed the life history of a pest must be known, so that control measures may be applied when the pest is most vulnerable.

The mite spends the winter in the egg stage. The small red eggs are laid on the twigs, usually on the undersides in the rings formed by the seasonal growth. The masses of eggs can be seen with the naked eye, but single eggs require magnification. The winter is the only time when all the mites on a tree are in the egg stage. This fact is important in control practices. The eggs start hatching about blossom time and continue for several weeks. About six weeks after bloom the first generation of mites grows up and starts laying more eggs. There are probably only three generations of this mite each season in northern Utah. During hot weather many of the eggs stay dormant. This means that growers often think that the mites have disappeared from the orchard, but later on there may be more mites than before.

Spray Tests, 1954 and 1955

Tests to find best methods to control these mites were conducted on both peaches and apples (Table 1). Most of the miticides were applied just before or during the time of egg hatch in the spring. These applications are called delayed dormant sprays. The sprays applied during the summer when mites of all stages were on the trees are called summer sprays.

Results of Tests

All of the delayed dormant treatments gave at least fair control, and many of them gave excellent results. The control on peaches was nearly always better than it was on apples. On apples the delayed dormant sprays were effective for at least six weeks. On peaches some of the treatments controlled the mites for the entire season. All treatments listed excellent in the table were good for the entire season. In those marked very good there was some mite injury late in the season, but in most cases it was not serious enough to require retreatment. The treatments marked good were considered highly effective for about two months but required retreatments to control the moths later in the season. Fair results showed some control but fell short of what was desired.

Chlorobenzilate, TEPP, parathion, and malathion killed the active mites but did not kill the eggs. For this reason they are more fitted for late season sprays where residual control is less essential. More tests will be made with Chlorobenzilate, as other workers have

FARM AND HOME SCIENCE
Spray Fruit Trees Early
For Brown Mites

Best results occur when trees are sprayed during the dormant or delayed dormant period. Best material to use depends on a number of factors.

DONALD W. DAVIS

had better results with this material.

With the exception of Systox, all the best results were obtained by starting mite control early, preferably during the dormant or delayed dormant period. This has been borne out in commercial spray applications throughout the state. With few exceptions the brown mite problem exists in orchards where these sprays were left out. The early sprays used in these experiments all look good. The older materials such as lime sulfur, lime sulfur plus oil, and oil are effective, are cheaper, control a number of kinds of insects, and have stood the test of time. The newer materials such as OvoTRAN, Genite 923, and Mitox are nearly as effective, show less plant injury, can be combined with more types of spray materials, are less corrosive to spray equipment, but are more expensive and control only mites. There are probably cases when one type of spray should be used and cases when the other type should be used. These sprays will not control the two spotted mites.

Aramite was consistently ineffective against brown mite in all the tests conducted. Similar results have been obtained in many other parts of the country.

Systox was the only material which controlled a severe mite population on apples at Roy. Systox is extremely poisonous and is expensive. As a delayed dormant treatment on peaches it outlasted all other treatments, and as a foliage spray on apples it gave nearly complete control for the season. There is no question that it was the most effective material used this past season. In some areas of the country mites have become resistant to Systox. Use

F OR D E C E M B E R 1 9 5 5

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Control Deer Damages

Methods developed to control damage to orchards, ornamentals, and farm crops

Damage to orchards, ornamental shrubbery, and other crops occurs mainly in winter time when deep snow and cold weather force the deer away from their normal winter ranges into contact with agricultural lands or into cities along the foothills. Types of controls for damages include:

- Frightening devices.
- Chemical repellents.
- Mechanical controls.
- Feeding to keep the deer from entering possible damage areas.

- Herding the deer from damage possibilities.
- Removing the damaged crops.
- Shooting the deer.

Different situations call for different treatments; no one method is effective for all types of damage. The use of measures other than shooting should be tried first. Chemical repellents are fairly easy to use and show promise, particularly where other feeds may be near by. Damaged trees and shrubs will often recover if given time and careful pruning.

The Problem

Our pioneer forefathers were not afflicted with deer damages when they came to the Salt Lake Valley. Rather, they might have been glad had there been more deer for food during the first few years. For the past couple of decades, deer have damaged ornamental shrubs, orchards, and other agricultural crops in an increasing degree as the herds have grown. The opportunities for damage have increased as the deer, aided in many places by excess livestock numbers, have reduced native feeds on their ranges. Damages have become more apparent as agricultural croplands have displaced the native browse plants along the foothills and as cities and towns have sprung up or spread out during the past several decades taking over former deer and elk winter ranges.

Fig. 1. Arborvitae on the Utah State Agricultural College campus browsed by deer during the winter of 1938-49

Fig. 2. Commercial nurseries are sometimes severely damaged by deer in winters of heavy snows

Dr. Jessop B. Low is leader of the Utah Cooperative Wildlife Research Unit and professor of Wildlife Management at USAC.
First Damages Reported in Early Twenties

In Utah the first noticeable damages by big game herds, according to R. L. Turpin of the Utah Fish and Game Department, date back to 1928 or before, when hay stacks were eaten by elk in the winter near Salina in Sevier County, at Nephi in Juab County, and in Cache and Emery Counties.

Deer damages started not far behind the elk troubles. Deer were reported first damaging hay stacks in isolated canyons, and then shortly afterwards deer were found in orchards along the foothills in the northern and central parts of the state.

Of more recent attention are those damages to growing crops in summer, fall, and early spring, again associated with poor range conditions, excessive numbers of deer, and agricultural operations close to the deer herds. These summer damage complaints have been largely in the southern half of the state. Spring damages, however, date back as far as 1931, when, for example, alfalfa was reported eaten and trampled.

Extensive Damage in Some Areas

Starving deer in times of abnormally heavy snows and extremely cold weather become tame and are forced to eat available feeds whether the feed be ornamental shrubs below a well lighted window or the trees in fruit orchards on adjacent farms.

Deer have sometimes nibbled young fruit trees down enough to kill them; they have nipped the fruit buds of other fruit trees or pulled down and broken larger branches. They have browsed ornamental shrubs around both urban and rural residences as high as they can reach until only stems remain; they have damaged both ornamental shrubbery and commercial fruit stocks in nurseries.

Most extensive are the wintertime damages to stored crops, orchards, or ornamental shrubbery, although farmers complain of damages to strawberries, watermelons, squash, alfalfa hay and seed, grain crops, and other crops in summer. In many instances, ornamentals and orchard trees have been damaged so severely that citizens have had to remove or extensively prune them. In some instances the damage is beyond repair, particularly in small trees; however, large orchard trees or ornamentals often are not damaged to the extent that they appear to be. If farmers and home owners properly prune trees following browsing by deer much of the so-called deer damage is removed.

Fig. 4. After pruning
Investigators have made many studies across the country to find ways to keep big game from doing damage. However, they made most of these studies in summer on tree and crop damages when feed is abundant and when the plants are green and growing. They have done comparatively little work to test methods and materials for winter time or dormant season damages.

Methods of Control

Starving deer during severe winter conditions will eat almost anything that looks like feed, even poisoned feeds. The pet cures for discouraging deer are many and include such things as placing dirty socks in strategic places or hanging mothsballs on a wire around the tree or field. These obviously do not work, but there are several different control measures that show promise.

The Utah Fish and Game Department and private individuals have used all these methods with varying degrees of success. The Utah Cooperative Wildlife Research Unit at the Agricultural College has experimented with several chemical repellents and mechanical devices. None of the methods is entirely satisfactory, some are expensive, and all are time consuming.

Frightening Devices

Devices individuals most frequently use to frighten deer from orchards, ornamentals, or crops are: (1) automatic carbide exploders, (2) fireworks, (3) firearms, (4) road flares, (5) dogs; and (6) cars with spotlights, and (7) scarecrows. The automatic carbide exploder operates on carbide, the gas of which explodes at frequent intervals making a noise similar to that of a gun report. The interval of explosion can be varied and the machine will operate over a 24 hour period. The attention needed by the mechanism and the initial expense are disadvantages to its use. The Utah Fish and Game Department has not used the machine too frequently. However, in Cache County a cherry orchard of two acres being extensively damaged by deer was relieved by one exploder which kept the deer away for more than two weeks.

Individuals have used exploding rockets and other fireworks under special permits but since it is unlawful to use them in Utah, this method is not recommended.

The state and individuals have used firearms, principally shot guns, with success. Deer, however, soon get accustomed to the firearm noise and so it is effective only for relatively short periods at a time.

Road flares around fields have not been successful, probably because they could not be placed close enough together to effect a barrier. Flares next to an ornamental shrub, however, should repel with some efficiency. Game wardens have used bonfires but report poor success as the deer come close to the fires.

An effective method is running deer with dogs. These dogs should be under close supervision since dogs running loose result in crippled and killed deer, broken fences, and poor public relations. Often uncontrolled dogs run deer further into, rather than away from, the cities.

Some landowners have found scarecrows that move in the wind produce better results than scarecrows which are stationary.

In general, frightening devices are time consuming and expensive.

Chemical Repellents

Investigators have experimented with many chemical repellents. In a study carried out by the Utah Cooperative Wildlife Research Unit during the severe winter of 1948-49, they tried nine different chemicals as repellents. To date, however, they have found none that will effectively repell starving deer. Some show promise, however, of keeping deer away from orchard trees or ornamentals when other acceptable feeds are available.

Among the repellents most promising are three commercial products all available from dealers:

1. Goodrite Z. I. P., consisting of 30 percent zinc dithiocarbonate-amine complex; 10 percent polyethylene polysulfide, and 60 percent inert ingredients.
   a. For use during the dormant season: 1 gallon to 20 gallons of water.
   b. For use during the growing season: 1 gallon to 40 gallons of water.

2. Diamond "L" brand deer repellent.
   This repellent is mixed with water as follows:
   a. 8 ounces to 12 gallons of water
   b. 1 quart to 50 gallons of water
   c. 1 gallon to 200 gallons of water

Use soft water if possible. If hard water is used add proper water softener before adding deer repellent.

3. B. H. C. Insecticide consisting of 12 percent strength of benzene hexachloride.

The B. H. C. powder is mixed with water as follows: 1 pound to 25 gallons of water. Two ounces of detergent can be added to the water to aid the material in adhering to the trees.

These products can be sprayed on trees or ornamental shrubs by low pressure hand or pack sprayers or by larger higher pressure commercial sprayers. The Goodrite Z. I. P. and Diamond "L" brand have a "sticker" added to make them adhere better to the foliage or plant stems. However, all are soluble in water and therefore, rain, heavy dew, or snowfall may largely wash away the spray. Thus, to be effective, investigators recommend repeated sprayings following each rain or snow storm that melts and washes off the spray.

Of the other repellents tested, blackleaf 40, emulsifiable animal bone oil, gamtox, tar oil emulsion, and lime sulfur showed some repellency but not as much as the previously mentioned compounds.

FARM AND HOME SCIENCE
Mechanical Controls

In many cases fencing is the most economical solution to the problem from a long range viewpoint. Particularly is this true when cultivated areas of small acreage are located within the heart of deer concentration areas. Generally fencing has been limited to small, isolated orchards or other crops of high value per acre. The Fish and Game Department has furnished some materials. However, private landowners have erected most of such fencing.

Fencing to be effective should be eight feet high and six inch or less square mesh wire for orchard protection. For hay stacks or small areas, farmers have found fences of slab boards, either nailed or woven with wire, successful.

Farmers have used commercial electric fences around orchards, fields, and haystacks. However, on fields they have not proved effective since the animals frequently break the wires when they hit them. Electrical fences with two or more strands of wire placed within a few inches of the hay stacks have been much more effective.

Cache County farmers have used drift fences eight feet high, constructed of heavy gauge netting, to keep the deer from farmlands and communities. Farmers have found the ten miles of fencing extending from Logan to Blacksmith Fork canyons highly successful. The fence has eliminated many damage complaints which have plagued the Fish and Game Department for many years. High costs of materials, labor, and maintenance, however, are disadvantages to this type of damage control.

Wire cages and small pieces of snow fence placed around individual trees in a growing orchard or around small ornamentals protect them from deer browsing.

Wrapping Trees

Home owners can eliminate damage to ornamental shrubs by wrapping the entire plant with burlap as high as the deer can reach.

Heavy cord should be used to hold the burlap in place. Further protection is afforded if the burlap is sprayed with a repellent. In addition to protecting shrubs from deer damage, the burlap will protect them from frost and prevent them from being pushed out of shape by heavy snows. Although not as easily applied, heavy tared paper can also be used to wrap trees and shrubs. The burlap or paper should be removed as soon as warm weather comes to prevent damage to the tree. Burlap, being porous, is more extensively used.

Luring Deer Away

One of the more humane ways to control potential damage has been feeding the deer to lure them away from the potential damage areas or to keep them from leaving their normal ranges and invading areas where damage could take place. Although not satisfactory, this approach alleviates some damages and keeps the deer from being killed. The supplemental feed does more to keep the deer from doing damage than supplying food for them. It has long been recognized that trying to supplement deer feed is not an economical nor practical solution to save starving deer too plentiful for their range, particularly during prolonged periods of deep snow and extremely cold weather.

Herding

One of the oldest methods and possibly used most extensively has been that of herding the deer from orchards, croplands, and rural or urban spots where damage could be acute. Farmers have used cars and trucks equipped with spotlights and sirens to run deer from agricultural areas back to the foothills. Men on foot and horseback have also herded deer from areas where damage could occur.

Purchasing Isolated Property

Where small farms or other lands have been extensively damaged and are located in the heart of deer range land the Fish and Game Department has purchased such properties to stop the damage complaints. Although not stopping the damage it alleviates the complaint of the landowners.

Shooting the Deer

In some instances when ranges are not capable of handling the excessive deer herds during the winters and no relief has been obtained from the methods previously discussed, wardens have found it necessary to shoot the animals. In the majority of such cases the State Fish and Game wardens have handled this assignment, although under regulations, they have authorized private landowners to do so.

An example of control of this type was the killing of deer in orchard lands in 1951 in Utah County. Care is taken to insure as clean and humane killing as possible.

The policy of the Fish and Game Department, however, is to encourage hunters to utilize the deer rather than to have the Department kill them. To alleviate the necessity for kills by landowners or department personnel, the Board of Big Game Control since 1951 has authorized special hunts known as "conditional hunts." In these hunts, the deer are removed post-seasonally when they are forced by deep snows to the vicinity of cities, into contact with foot hill agricultural enterprises, or on to range lands not capable of carrying large numbers of deer. The number of deer to be removed in these hunts varies with the number of deer reaching the areas. Permits are issued to hunters on a first-come-first-served basis to remove the deer which need to be killed.

Pruning

Many damages by big game are real and serious while others are quite superficial. Some appear much more severe than they actually are. Some property owners have made false charges to collect dam-
age compensation. Damaged trees and ornamentals often outgrow the damage done them. It takes several years but recovery can be speeded by trimming and pruning the trees following the deer browsing. Arborvitae at the Utah State Agricultural College severely damaged in the winter of 1948-49 showed only slight evidence of damage in 1953. Owners should not pull trees and shrubs until it is evident that trimming and pruning will not improve them.

**BROWN MITES**

(Continued from page 77)

Table 1. Summary of spray experiments to control mites in Utah during 1954 and 1955

<table>
<thead>
<tr>
<th>Material</th>
<th>Dosage per 100 gal</th>
<th>Season</th>
<th>Fruit</th>
<th>Location of tests</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lime sulfur</td>
<td>8 gal.</td>
<td>spring</td>
<td>peaches</td>
<td>Providence</td>
<td>excellent</td>
</tr>
<tr>
<td></td>
<td>10 gal.</td>
<td>spring</td>
<td>peaches</td>
<td>North Ogden</td>
<td>very good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>spring</td>
<td>apples</td>
<td>Roy</td>
<td>good</td>
</tr>
<tr>
<td>Lime sulfur plus dormant oil</td>
<td>3 gal.</td>
<td>spring</td>
<td>peaches</td>
<td>Providence (1954)</td>
<td>excellent</td>
</tr>
<tr>
<td></td>
<td>1 ½ oil</td>
<td>spring</td>
<td>peaches</td>
<td>Providence (1955)</td>
<td>very good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>spring</td>
<td>apples</td>
<td>North Ogden</td>
<td>very good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>spring</td>
<td>apples</td>
<td>Roy</td>
<td>fair</td>
</tr>
<tr>
<td>Dormant oil</td>
<td>3 % oil</td>
<td>spring</td>
<td>peaches</td>
<td>Providence</td>
<td>good</td>
</tr>
<tr>
<td></td>
<td>4 % oil</td>
<td>spring</td>
<td>peaches</td>
<td>North Ogden</td>
<td>very good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>spring</td>
<td>apples</td>
<td>Roy</td>
<td>fair</td>
</tr>
<tr>
<td>Ovotran 50 percent</td>
<td>1½ lbs.</td>
<td>spring</td>
<td>peaches</td>
<td>Providence</td>
<td>good</td>
</tr>
<tr>
<td></td>
<td>2 lbs.</td>
<td>spring</td>
<td>peaches</td>
<td>North Ogden</td>
<td>very good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>spring</td>
<td>apples</td>
<td>Roy</td>
<td>fair</td>
</tr>
<tr>
<td>Ovotran 50 percent plus parathion</td>
<td>1 lb.</td>
<td>summer</td>
<td>peaches</td>
<td>Providence</td>
<td>very good</td>
</tr>
<tr>
<td></td>
<td>1 lb.</td>
<td>summer</td>
<td>apples</td>
<td>North Ogden</td>
<td>good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>summer</td>
<td>apples</td>
<td>Roy</td>
<td>very good</td>
</tr>
<tr>
<td>Genite 923</td>
<td>1½ pts.</td>
<td>spring</td>
<td>peaches</td>
<td>Providence</td>
<td>very good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>spring</td>
<td>peaches</td>
<td>North Ogden</td>
<td>good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>spring</td>
<td>peaches</td>
<td>Roy</td>
<td>very good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>spring</td>
<td>apples</td>
<td>Hurricane</td>
<td>fair</td>
</tr>
<tr>
<td>Mitox 20 percent plus oil</td>
<td>2 lbs.</td>
<td>spring</td>
<td>peaches</td>
<td>Providence</td>
<td>very good</td>
</tr>
<tr>
<td></td>
<td>1 qt.</td>
<td>spring</td>
<td>peaches</td>
<td>North Ogden</td>
<td>very good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>spring</td>
<td>apples</td>
<td>Roy</td>
<td>fair</td>
</tr>
<tr>
<td></td>
<td></td>
<td>summer</td>
<td>peaches</td>
<td>North Ogden</td>
<td>good</td>
</tr>
<tr>
<td>Aramite 15 percent</td>
<td>2 lbs.</td>
<td>summer</td>
<td>peaches</td>
<td>North Ogden</td>
<td>poor</td>
</tr>
<tr>
<td>Chlorobenzilate 25 percent</td>
<td>1½ lbs.</td>
<td>summer</td>
<td>apples</td>
<td>Santa Clara</td>
<td>poor</td>
</tr>
<tr>
<td>TEPP 20 percent</td>
<td>¾ pint</td>
<td>summer</td>
<td>peaches</td>
<td>North Ogden</td>
<td>very good knockdown fair residual</td>
</tr>
<tr>
<td>Parathion 25 percent</td>
<td>1½ lbs.</td>
<td>summer</td>
<td>peaches</td>
<td>North Ogden</td>
<td>very good knockdown</td>
</tr>
<tr>
<td>Malathion 25 percent</td>
<td>3 lbs.</td>
<td>summer</td>
<td>peaches</td>
<td>North Ogden</td>
<td>very good knockdown</td>
</tr>
<tr>
<td></td>
<td>4 lbs.</td>
<td>summer</td>
<td>peaches</td>
<td>Providence</td>
<td>excellent knockdown</td>
</tr>
<tr>
<td>Systox 21 percent</td>
<td>1½ pts.</td>
<td>spring</td>
<td>peaches</td>
<td>Providence</td>
<td>excellent</td>
</tr>
<tr>
<td></td>
<td>2 pts.</td>
<td>summer</td>
<td>apples</td>
<td>Roy</td>
<td>excellent</td>
</tr>
</tbody>
</table>

**TURKEY PRODUCTION**

(Continued from page 74)

This does not mean that it is not important to the individual producer to get as high price for his turkeys as possible. It merely means that selling price is beyond the control of the individual producer and efficient and inefficient producers have an equal chance in getting high prices.

The most efficient group of producers as measured by net returns had total costs which were 11.3 cents per pound lower than the group with lowest net returns. Feed cost accounted for 7.9 cents or 70 percent of the difference. Poult cost per pound was 1.1 cents lower for the efficient producers or
STILBESTROL IMPLANTS

15 milligram pellet of diethylstilbestrol was implanted under the skin at the base of the ear one week after the beginning of the test. The trial lasted twelve weeks starting on September 22 and ending December 15, 1954.

Feed consumption and body weights were recorded at two-week intervals. Each lamb was carefully examined for gross physical abnormalities at the completion of the trial. At the end of the trial data were obtained on live weight, live grade, dressing percentage, carcass weight, carcass grade, and wool growth.

Treated Lambs Gained Slightly More

A summary of the results is shown in table 2. Average daily gain of all lambs was 0.26 pounds. Lambs receiving the stilbestrol implant gained 0.30 pounds compared to 0.21 pounds per day for those not receiving stilbestrol. This difference though not statistically significant follows the trend reported in other trials. The daily feed consumption was practically the same for both groups and averaged 2.9 pounds for all lambs.

Table 2. Average initial weight, daily feed intake, daily gain, dressing percentage, carcass score, market grade, and wool weight of lambs during fattening trial

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. of animals</th>
<th>Initial wt.</th>
<th>Feed intake</th>
<th>Daily gain</th>
<th>Dressing percentage</th>
<th>Carcass score</th>
<th>Clean wool wt.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controls</td>
<td>36</td>
<td>73.7</td>
<td>2.94</td>
<td>0.21</td>
<td>52.5</td>
<td>3.4</td>
<td>0.75</td>
</tr>
<tr>
<td>Stilbestrol (15 Mg.)/36</td>
<td>73.1</td>
<td>2.93</td>
<td>0.30</td>
<td>51.6</td>
<td>3.7</td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>Avg. all lambs</td>
<td>73.4</td>
<td>2.93</td>
<td>0.26</td>
<td>52.0</td>
<td>3.6</td>
<td>0.73</td>
<td></td>
</tr>
</tbody>
</table>

*Amount removed from area three by three centimeters.

FOR DECEMBER 1955
Kansas and indicate the possible harmful effects that may occur from the use of stilbestrol implants in fattening wether lambs. Until further information is obtained, the use of stilbestrol implants for fattening lambs cannot be recommended.

Results from oral feeding of stilbestrol appear more favorable in the limited number of experiments conducted to date. However, more information is needed to determine optimum levels for the most efficient production.

This station is conducting further research in this field and results will be published as soon as they become available.

**AUSTRIAN FIELD CRESS**

_(Continued from page 69)_

found near Monroe. Here the most vigorous plants are growing along a drain ditch with some plants spreading into the adjacent cropland.

Since the known infestation is quite small at present, every effort is being put forth to eradicate it. The patch was sprayed with 2,4-D twice during the summer. Considerable regrowth appeared after the first spraying, but the spraying prevented spreading by seeds. Tests are now being made with various herbicides in an effort to determine an effective means of eradication. These include Karmex, Ureabor, Polylbor-chlorate, D B Granular, Baron, and 2,4D.

Only this one infestation of Austrian field cress has been reported in Utah up to now. It is entirely possible that there are others. If so, it is important that they be found. Anyone finding a weed suspected to be Austrian field cress should report it to his county agent.

Louis A. Jensen is extension agronomist and Arthur H. Holmgren is associate professor of botany and in charge of the Intermountain Herbarium. Professor Holmgren identified the Austrian field cress.

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### CONTRIBUTIONS TO RESEARCH

**August 15 to November 15, 1955**

<table>
<thead>
<tr>
<th>Organization</th>
<th>Amount</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Institutes of Health</td>
<td>$10,000</td>
<td>To study the factors affecting the phytoplankton and zooplankton in Logan River</td>
</tr>
<tr>
<td>Research Corporation</td>
<td>$9,697</td>
<td>For mass spectrometric investigations of primary fragments from radiation-induced dissociation of complex solids</td>
</tr>
<tr>
<td>American Cyanamid Company</td>
<td>$5,000</td>
<td>For canal lining studies</td>
</tr>
<tr>
<td>Sharp and Dohme</td>
<td>$2,500</td>
<td>For studies of parasitic diseases of domestic animals</td>
</tr>
<tr>
<td>Ogden Grain Exchange</td>
<td>$500</td>
<td>For studies in grain breeding</td>
</tr>
<tr>
<td>Schaffhausen Corporation</td>
<td>$500</td>
<td>For canal lining studies</td>
</tr>
<tr>
<td>Maurice Warshaw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand Central Markets, Salt Lake City</td>
<td></td>
<td></td>
</tr>
<tr>
<td>California Spray-Chemical Corporation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemagro Corporation</td>
<td>100 grams</td>
<td>Systox for studies of the toxicity of insecticide residues to livestock</td>
</tr>
<tr>
<td>Donaco Company</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dow Chemical Company</td>
<td></td>
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<tr>
<td>E. F. Drew &amp; Company, Inc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geigy Agricultural Chemicals</td>
<td></td>
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<tr>
<td>Lily Research Laboratories</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monsanto Chemical Company</td>
<td>2 tons</td>
<td>Dechlorinated dicalcium phosphate for studies of supplementary feeding of range cattle</td>
</tr>
<tr>
<td>Naugatuck Chemicals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. B. Penick &amp; Company</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shell Chemical Corporation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stauffer Chemical Company</td>
<td></td>
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</tr>
<tr>
<td>Upjohn Company</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Velsicol Corporation</td>
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**FARM AND HOME SCIENCE**