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Whether a sheepman will make more money by selling his lambs on the ranch or taking them to market will depend on individual circumstances. Average prices are the same.
roads, livestock were driven to market by producers or by men to whom they sold. In either case the stock were sold by growers bargaining directly with buyers.

After 1850 railroad terminals grew important as livestock marketing centers. Public stockyards were organized to handle the concentration of animals at these points. Commission firms also were organized to buy and sell livestock for their customers. Until the late 1920's these central markets dominated livestock marketing in the United States.

Since the late 1920's, direct sales have increased relative to sales in the central market. Improved roads, trucks, refrigeration, news services, and rural communications have contributed to the shift. Producers and buyers are as close to market information as their telephones or radios. These and other factors have tended to decentralize livestock markets. Utah livestock industries have participated in these changes along with the rest of the country.

Advantages claimed for direct marketing

In a study of range lamb marketing in 1955, Utah ranchers were asked to explain why they chose the marketing technique used. Reasons most often expressed for marketing range lambs by direct means were (1) higher net prices were realized, (2) convenience, (3) satisfaction in bargaining, and (4) reduced risk of price changes.

Net price: By far the most important reason expressed for marketing range lambs direct was the feeling that net returns were higher than if central markets had been used. Sometimes higher net returns were felt to be the result of

What Research Shows

Results from a recent study of sheep ranching in Utah and related studies in other areas show:

- That the average rancher realizes no net price advantage by selling lambs either by direct or central market methods.
- That prices are less variable for lambs sold direct, thereby reducing price uncertainty.
- That about 70 percent of Utah's range lambs are sold direct.
- That convenience and bargaining flexibility are important reasons why ranchers sell lambs direct.
- That lambs sold either way are of equal quality grade for grade.
- That buyer competition is real in direct bargaining because of the wide use of modern communication services.
- That direct lamb selling does not generally depress sales prices below those established by market supply and demand.
- That each rancher needs to look closely at his particular cost-price-bargaining position before deciding on a marketing method. One is not guaranteed to give him an economic advantage over the other just by the nature of the method.
lower marketing costs and sometimes the results of higher prices for lambs. It should be noted that ranchers selling at central markets also felt net returns were higher than if they had sold direct. A Wyoming Agricultural Experiment Station study indicated that 75 percent of ranchers questioned in that state who marketed by either method felt that they had realized a higher net price than if they had used the untied method.

Is it possible that both views were right? Comparison of tried and untied techniques are difficult for the individual rancher. Possibly the experiences of many ranchers using both marketing techniques can clarify the relation.

Evidence from the Utah study supports the conclusion that grade for grade, ranchers in general realized no difference in net prices for range lambs sold by either central market or direct methods in 1955 (table 1). However, the equality of net prices for lambs in the specified year is not the whole story on price. Most ranchers who sold direct felt that they had the advantage and acted as though it was realized.

In some cases a net price advantage for direct marketing may be real. A rancher may realize a net price advantage one year and not the next. He remembers that he did it once and is confident that he can do it again. Also the news of his good fortune spreads. A rancher's particular situation may be such that he can realize a net price advantage over a period of years by using one or the other method of selling his lambs. Some ranchers have better than average bargaining ability and may always realize a net price advantage through direct marketing. Those ranchers who have less than average costs and get average or better prices by using one or the other marketing method will realize a net price advantage. Though averages (table 1) cover up individual differences, they should cause ranchers to look more closely at their felt price or cost advantages, for on the average none was realized in 1955.

Conveniences: Some ranchers included in the Utah study sold lambs direct in 1955 because the method was more convenient. They contracted their lambs in advance of delivery date or just waited for buyers to come and make an offer. Usually they did not have the responsibility and worry of delivering lambs to some distant point before selling. Convenience is a rational reason for marketing direct provided there is a feeling of satisfaction realized. Only the individual knows this. He may actually be willing to sacrifice some income for convenience.

Bargaining: Most ranchers included in the Utah study who sold lambs direct realized some satisfaction in the bargaining process. Satisfaction was felt through more bargaining flexibility. Shrinkage deduction, transportation time, condition of the lambs, and weight, as well as price become bargaining points. A rancher selling direct also has increased freedom to turn down all offers if he feels so inclined. Once his sheep are in the terminal market, his ability to hold for a higher price is restricted by cost, space, and control pressures. However, when selling direct a rancher must be prepared to assume the consequences of his decisions.

(Continued on page 23)

| Table 1. Average gross selling price, market and transportation costs, and net selling price for Utah lambs sold direct and at central markets, 1955 |
|---|---|---|---|
| Animal class | Gross sales price | Market costs | Transportation costs | Net sales price |
| | Direct | Central | Direct | Central | Direct | Central |
| | dollars per 100 pounds | dollars | dollars | dollars | dollars |
| Unsorted lambs | $17.61 | $18.97 | $0.02 | $0.28 | $17.34 | $18.29 |
| Fat lambs | 15.84 | 18.4 | 0.02 | 0.28 | 15.5 | 18.12 |
| Feeder lambs | 17.36 | 17.69 | 0.02 | 0.28 | 17.68 | 17.93 |

*These include charges for commissions, yardage, feed, and inspections. †Net sales price less market and transportation costs.

| Table 2. Sources of market information ranked by Utah sheep ranchers, 1955 |
|---|---|---|
| Source of market information | First choice | Second choice | Third choice |
| | percent | percent | percent |
| Local buyer | 12.9 | 6.9 | 1.7 |
| Mailed reports | 12.9 | 15.5 | 8.6 |
| Radio | 8.6 | 22.5 | 13.8 |
| Newspapers | 33.6 | 19.0 | 8.6 |
| Magazines | 5.2 | 10.3 | 13.8 |
| Market contact | 20.7 | 3.3 | 6.0 |
| None | 6.1 | 22.5 | 47.5 |
| Total | 100.0 | 100.0 | 100.0 |

FARM AND HOME SCIENCE

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Gladys L. Harrison, Editor
For increased livestock production

Improving foothill ranges

C. Wayne Cook
L. A. Stoddart

The inadequacy of suitable spring range in the Intermountain Area limits successful livestock production. Most livestock men of the area are aware of this shortage, and are increasingly interested in improving their foothill ranges.

The Utah Agricultural Experiment Station has, likewise, recognized the importance of this problem and for the past several years has conducted spring grazing trials on seeded wheatgrass pastures.

Cows and calves were grazed on

Dr. Stoddart is head of the department. The studies at Benmore were conducted on the experimental area controlled by the Forest Service. Studies at the Tintic Valley experimental area were in cooperation with the Bureau of Land Management.

Above, calves on introduced wheatgrass pastures at Benmore. Below, ewes and lambs on improved foothill ranges on the Tintic experimental area
introduced wheatgrass pastures at the Benmore (Tooele County) experimental area from May 28 until July 19 during 1956 and 1957. The calves were born before the animals entered the pastures. Four introduced wheatgrasses were grazed, namely, crested, intermediate, tall, and pubescent.

Ewes and lambs were grazed on wheatgrass pastures at the Tintic Valley (Juab County) experimental area from May 19 until July 1 during 1956 and 1957. The lambs were born in the pastures between May 1 and May 19. Pubescent wheatgrass was not included in the grazing trials with sheep.

Cattle gains

Calves showed much less variation in gain when grazing the different grass species than did cows. Presumably this is because cows rob their own bodies of nutrients in order to supply their calves. So poor feed conditions show up first in cows (table 1).

Cows early in the spring gained best (2.4 pounds per day) on pubescent wheatgrass, and poorest on tall wheatgrass (0.9 pounds per day). But in midspring and late spring pubescent wheatgrass was poor, whereas tall wheatgrass was the best of all four grasses. Intermediate wheatgrass was second best of the four grasses during all three grazing dates. In late spring, crested wheatgrass was the poorest grass of all. The uniformly high quality of intermediate wheatgrass as cattle forage was reflected in the calf gains also. On this grass, calves gained substantially more after June 14 than on any other grass tested. For the entire grazing season, gains of both cows and calves were decidedly better on the intermediate and tall wheatgrasses.

Sheep gains

At the Tintic Valley experimental area, intermediate wheatgrass produced better gains of both ewes and lambs throughout the spring grazing season than tall or crested wheatgrass (table 2).

Lactating ewes lost weight during all spring grazing periods on both crested and tall wheatgrass pastures; whereas they gained on intermediate wheatgrass pastures during all periods (table 2). Weight losses on both crested and tall wheatgrass pastures were heaviest in late season. Weight gains were somewhat less on intermediate wheatgrass during late spring. Lamb gains, like ewe gains, were somewhat less during the late spring.

From studies to date, it appears that cattle use crested and tall wheatgrasses better than sheep, since at no time during the spring grazing period on these species did lactating cows actually lose weight; whereas lactating ewes grazing these species lost weight during both spring grazing periods (tables 1 and 2).

Grazing grass mixtures

Both sheep and cattle grazing on introduced wheatgrass mixtures made gains approaching the average of these grasses grazed separately. However, after three to five years of grazing, the highly palatable intermediate wheatgrass in the mixed stand had been killed out to an alarming extent. This was true in both the Benmore experimental area where cattle were grazed and the Tintic Valley area where sheep were grazed. Tall wheatgrass has, likewise, decreased in the mixtures at both areas. However, at the Tintic Valley area where sheep were grazed, this was probably a normal death loss as a result of the 1956 summer drought, since pure stands of tall wheatgrass were also reduced in number of plants. At the Benmore area, the loss of tall wheatgrass was somewhat higher because cattle preferred tall wheatgrass late in the season.

Consequently, researchers have concluded that pure stands of these wheatgrasses are more suitable and more adapted to good range management and livestock husbandry than mixtures.

Grazing management in spring

Crested and pubescent wheatgrasses grow early in the spring. They also mature early. In contrast, intermediate and tall wheatgrasses start growth later and are substantially later in their development and maturity.

Since crested and pubescent wheatgrasses begin growth a week to two weeks earlier, they should be used during early spring or until about June 8 for greatest effectiveness. Following this, animals could be grazed on intermediate or (Continued on page 18)
Design your irrigation system to

IRRIGATE THE SOIL

L. S. WILLARDSON

Every irrigation system should be designed to fit the soil on which it is to be used. If the soil is not properly irrigated, then crops can not produce their maximum. It is important that we learn to irrigate the soil efficiently and then irrigate it when the crops need water.

We understand much more than our grandfathers did about the principles of irrigation. Yet many farmers are using the same methods their grandfathers used. We have new methods of applying water, new methods for land preparation, and we know more about the water needs of crops. But it will be a long time before our irrigation practices approach what we now know and there is still much to be learned.

When we irrigate, what we are really doing is irrigating the soil according to the needs of the crop. The realization of the simple fact that we irrigate soils, not crops, is an important step toward the improvement of irrigation practices.

From the point of view of the plant, the soil has three purposes: (1) to provide mechanical support, (2) to store and provide necessary nutrients, and (3) to store water. The first two purposes are indirectly related to irrigation. The third purpose is the object of irrigation. When we irrigate successfully, we store the proper amount of water, at the proper time, and at the proper place in the soil.

Soil characteristics that affect irrigation practices

Since the primary objective of irrigation is to store water in the soil, some consideration should be given to the characteristics of soil which affect irrigation practices. These factors include water absorption rate or infiltration characteristics, structure, stability, texture, depth, and drainability. Climate,

(Continued on page 24)

LYMAN WILLARDSON is an agricultural engineer employed by the Agricultural Research Service of the U. S. Department of Agriculture who works cooperatively with the Utah Station.

This irrigation system will irrigate the soil uniformly. Any suitable crop will thrive in the resulting environment of adequate moisture.
What Should We Do With Utah's Carp?

WILLIAM F. SIGLER

At times carp move into areas where they may be readily taken with a drag seine.

POUNDED per pound, carp are probably more abundant than any other fresh-water fish in the United States. Following extensive stocking, carp demonstrated their adaptability by spreading into all 48 states. In Utah they are abundant in most of the warm-waters and present in many of the trout waters.

They were stocked in Utah late in the 1800's; reportedly to meet a demand for high protein food for harvest hands. Today, they are harvested in only limited numbers; and in some areas populations are reduced at a considerable economic loss to the state or federal agency involved.

Carp in small numbers are probably not detrimental to either fish or waterfowl habitat. This should be emphasized because sportsmen and other groups sometimes agitate for their removal in areas where only relatively few are present. Large carp populations, on the other hand, may be extremely detrimental. However, this does not mean that an extensive removal program is justified from either a biological or an economic basis. In order to be beneficial biologically a high percentage of the carp must be removed from an area before

DR. SIGLER is head of the Department of Wildlife Management. He has made extensive studies of carp in Utah over the past number of years. These have recently been printed in Station Bulletin 405, The ecology and use of carp in Utah.
Fishing traps are most effective at spawning time. Loading fish trap in carp harvesting studies. Removing carp from a fish trap.

Improvement in habitat can be expected, and it must be realized that even a small number of carp can and often does produce a large number of young; and that carp in a good habitat and without competition from other fish grow rapidly. In many instances, this means that there may be as many pounds of carp per acre, a few weeks after a seining operation, as there was before the operation, even though the number of individuals is fewer. Carp control by seining is often difficult and expensive. Carp removal by other methods, particularly in many Utah waters, has a number of annoying problems.

Carp feed on small animals

Contrary to popular opinion, carp feed primarily on small animals rather than on plants. Carp are quite selective in their diet, when given an opportunity; they eat insects and small crustaceans primarily. Although they prefer to feed on midge larvae and small crustaceans, they are able to take many other forms of animal life and will even shift to plant diet if animals are in short supply. Large carp at the Bear River Refuge fed on carp 2 to 3 inches long in 1949, but charges that they feed on fish eggs have not been substantiated. The plant material eaten is largely debris, green fragments, aquatic seeds, and algae. However, this material makes up a small part of the total diet of the carp. Sand and fragments of snail and clam shells appear in many carp stomachs, but it is assumed that they are taken incidental to the other food.

Carp movement governed by water temperature

The movement of carp is governed by water temperature, natural spawning activity, and migrating tendencies. A study of water temperatures shows a trend toward explaining localized carp movements. In near-freezing water carp are quite inactive. At temperatures above 60°F, they are active and when the water reaches 80°F, they are extremely active. Water temperatures of 92°F are definitely harmful and sometimes lethal. In winter many lake waters are warmest at the bottom and carp remain in this deeper, warm water. The first few warm days in the spring bring them into the shallow water which is then generally warmer than the deep water. This movement into the shallow water is presumably associated with pre-spawning activities and increased feeding. Later in the season these in-shore movements may be only at night.

Predators of carp

Although man is the only effective predator of carp over much of its range there are nevertheless factors exercising negative influences on carp populations. These factors include the disappearance of spawning areas, predation by fish eating birds and other fish, pollution, silting, parasitism, and disease. The partial draining of carp waters or the drawing down of the water level at spawning time is particularly harmful to carp. As a matter of fact this has been used as a successful technique in destroying carp eggs in some of the Missouri main-stem reservoirs.

Carp suffer from predation by fish-eating birds such as cormorants, herons, pelicans, mergansers, and occasionally ducks. Most large fish presumably eat small carp if the carp are in a vulnerable position. Carp are subject to parasitism and disease as are many other fish; although the North American wild carp seems to be considerably more resistant to disease and parasites than is the European domestically reared carp. Parasites on carp affect primarily young fish and do not as a rule persist on the larger fish for long periods of time. It is periodically suggested, by various persons, that carp be controlled by introducing parasites and diseases specifically lethal to carp. At present none of these controls has proved itself and it would appear dangerous to try to introduce, as a means of control, diseases or parasites specific to carp.

Utah studies

For the past ten years carp have been studied in five areas in Utah. The poorest habitat for carp is Bear Lake and the best is the Ogden Bay and Bear River Bird Refuges. Carp live to be as old as 13 years in these areas, (carp in captivity live to be much older) but most of the fish studied were (Continued on page 25)
Good cows fed high quality roughage need only LIMITED AMOUNTS OF GRAIN FOR ECONOMIC PRODUCTION

GEORGE Q. BATEMAN
C. H. MICKELSEN

Higher level than ever attained in past years. This high level of production was reached by feeding an abundance of quality roughage with a reduced amount of grain. The production for 1958 is reported in table 1 as taken from the Utah Dairy Herd Improvement Association's IBM Computing Service records.

Production records are also reported for all purebred Holstein and Jersey cows that completed a 305-day lactation period in the herd during 1958. The 305-day records are the basic records used for evaluating production in the breeding project. These records are different in that they represent the production of an individual cow for the period, and a herd average based on 305-day unselected records is a better measure of the herd's producing ability than the cow year record which always includes records of some cows for only part of their lactation periods.

The average production for 69.9 cow years, shown in table 1, includes the lactation or part of lactation of 88 cows that were milked in the herd during 1958.

The 305-day records for the Holsteins is given in table 2. They include production by age groups, actual production, and production calculated to a mature basis.

The average actual production for the sixty 305-day lactations was 11,895 pounds of milk, 455 pounds of butterfat, at an average age of 4 years and 3 months. The average production of the nineteen 2 and 3-year olds was 414 and 450 pounds, respectively. These ages represented 63.4 percent of the records completed. The mature equivalent production for all cows was 13,511 pounds of milk and 517 pounds of butterfat.

The number of Holstein cows producing at the different levels of milk and butterfat and the mean production for each age group are

<table>
<thead>
<tr>
<th>Cows</th>
<th>Grain fed lbs.</th>
<th>Production (actual)</th>
<th>Grain consumed lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Milk lbs.</td>
<td>Butterfat</td>
</tr>
<tr>
<td>Holsteins registered</td>
<td></td>
<td>Holsteins</td>
<td>69.9</td>
</tr>
<tr>
<td>Jerseys registered</td>
<td></td>
<td>Jerseys</td>
<td>19.9</td>
</tr>
<tr>
<td>Weighed mean both breeds</td>
<td></td>
<td>Weighed mean both breeds</td>
<td>1</td>
</tr>
</tbody>
</table>

The Holsteins milked 69.9 cow years for an average production of 12,623 pounds of milk containing 485 pounds of butterfat.
The Jersey production averaged 7547 pounds of milk and 417 pounds of butterfat for 19.0 cow years.

<table>
<thead>
<tr>
<th>Cows</th>
<th>Grain fed lbs.</th>
<th>Production (actual)</th>
<th>Grain consumed lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Milk lbs.</td>
<td>Butterfat</td>
</tr>
<tr>
<td>Holsteins</td>
<td></td>
<td>1958</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1957</td>
<td>54</td>
</tr>
</tbody>
</table>

Professor Bateman is associate professor of dairy husbandry and in charge of the Dairy Experimental Farm. CHARLES H. MICKELSEN is research associate of dairy husbandry and manager at the farm.
Alfalfa hay furnished 27 percent of the nutrients consumed at a cost of 30 to 37 cents per pound of butterfat produced from the hay with the cost of hay at $16.00 and $20.00 per ton.

During 1958 pasture furnished 39 percent of the total ration consumed by the dairy herd during the year. The feed production cost per pound of butterfat produced from pasture was calculated to be 17 cents as compared to 62 cents per pound when produced from grain costing $2.50 per hundredweight. Grain was fed at the rate of 1 pound to 10 pounds of milk produced and furnished about 14 percent of the total nutrients consumed during the pasture season.

During 1958 pasture furnished 39 percent of the total ration consumed by the dairy herd during the year. The feed production cost per pound of butterfat produced from pasture was calculated to be 17 cents as compared to 62 cents per pound when produced from grain costing $2.50 per hundredweight. Grain was fed at the rate of 1 pound to 10 pounds of milk produced and furnished about 14 percent of the total nutrients consumed during the pasture season.

CONCLUSIONS

Conditions under which records were made

The milk and butterfat production as reported were made under the system of open shed housing and on a winter ration of alfalfa hay, corn silage, and a grain mixture of barley, wheat, molasses dried beet pulp, salt, and bonemeal. The mixture contained approximately 76 percent total digestible nutrients. The grain consumed by the Jersey herd was 1 pound to 3.9 pounds of milk and 4.5 pounds for each pound of butterfat produced. The Holstein herd was fed 1 pound of grain for each 5.7 pounds of milk and 4.6 pounds of grain for each pound of butterfat.

During the summer the cows grazed irrigated pastures and were supplemented with grain at the rate of 1 pound to each 10 pounds of milk produced by Holstein cows and 1 pound to approximately 8 pounds of milk produced by Jerseys. No grain was fed during the dry period. The average amount of grain consumed, 2102 pounds for Holsteins, and 1654 pounds for Jerseys, during 305-day lactation periods, furnished approximately 20 percent of the total nutrients consumed per cow during the lactation period, the other 80 percent was supplied by the alfalfa hay and corn silage during the winter period. During the summer ap-
Hardy Tomato Transplants
Produce Higher Yields

ALVIN R. HAMSON

HARDENED tomato transplants with well developed roots with some soil adhering to them withstand transplanting well, grow better, develop faster, and produce higher yields of tomatoes than small succulent transplants with poorly developed roots, or larger transplants with no soil adhering to the roots. Hardy transplants require only a few additional plants for replacement.

Experiments conducted at the Farmington Station and cooperative trials with tomato growers indicate the relative value of the various types of plants. These experiments were initiated in 1956 when many of the plants being grown in the Moapa Valley of Nevada for shipment to Utah were pulled from the fields with thick stands which included small, succulent plants with poorly developed root systems. Though the laborers were instructed to leave the small plants in the field, many of them were included with the plants pulled for shipment.

With care it is possible to select plants of large diameter with well developed roots. These were called no. 1 plants. The small, succulent plants with poorly developed root systems were called no. 2 plants. These two types were checked with field run plants, as pulled by the laborers which contained both large and small, succulent plants. A number of plants of those three treatments were selected in the Moapa Valley to be planted at the Farmington station and on the farms of Ken Uchida at North Ogden, and Tony Antonino at Spanish Fork. Yields at Farmington are shown in table 1.

The total yields indicate a definite advantage for the no. 1 plants as compared to the no. 2 plants. It is entirely possible that larger differences would be observed under field conditions because the poorer plants in this experiment were given every advantage with immediate irrigation applied after transplanting.

Differences in the recovery after transplanting and early growth of the no. 1, no. 2, and field run plants were readily apparent for several weeks. No. 1 plants began growing almost immediately after transplanting. No. 2 plants made little growth the first two weeks. The field run or check plants were variable in their recovery. The larger of these plants began growing immediately whereas the smaller plants were slow to establish root systems and make any appreciable growth. This delay in growth of the small, succulent plants is an important factor to consider because of the short growing season in Utah. Early yield and peak production were delayed with these small plants.

Similar results were obtained by
Uchida and Tony Antonino. In addition to these observations a survey was conducted on the farms of a number of growers who had obtained large, stocky plants that had been thinned several weeks before pulling in Nevada. There was general agreement that a real advantage is achieved by thinning the plants in Nevada and by obtaining only plants of larger diameter with good root systems for transplanting in Utah. Though accurate yield comparisons were difficult to make between the large and small plants in the field survey, growers generally concluded that the larger plants produced higher yields. Many indicated that they preferred the thinned plants if for no other reason than the ease of transplanting since so few replacements were required.

Similar results were observed in an experiment at the Farmington Station in 1957, again designed to compare performance of the three grades of plants as shown in table 2. Differences in yield of tomatoes among the types of plants were greater in 1957 than in 1956. Again there was evidence of delay of maturity and peak production in the no. 2 plants.

Experimental evidence and practical experience indicate the advantage of the large diameter plants with well developed root system over the small, succulent plants.

**Pulling the transplants**

Other experiments comparing pulling of plants in dry soil as compared to pulling in moist soil, and shaking soil from roots as compared to leaving a small amount of soil on the roots indicate the advantages of proper methods of pulling. The large diameter plants were used for the comparisons of methods of pulling. As indicated in table 3 best yields resulted from pulling in moist soil with a small amount of soil left on the roots.

Growers of tomato plants in Nevada endeavor to pull plants in

(Continued on page 18)

**Table 1. Yield of marketable tomatoes in tons per acre for each picking date and total yield in 1956**

<table>
<thead>
<tr>
<th></th>
<th>August 20</th>
<th>Sept. 4</th>
<th>Sept. 14</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1 plants</td>
<td>2.70</td>
<td>9.05</td>
<td>10.95</td>
<td>22.70</td>
</tr>
<tr>
<td>No. 2 plants</td>
<td>1.22</td>
<td>7.24</td>
<td>9.67</td>
<td>18.13</td>
</tr>
<tr>
<td>Check - field run</td>
<td>1.93</td>
<td>8.30</td>
<td>11.12</td>
<td>21.35</td>
</tr>
</tbody>
</table>

**Table 2. Yield of marketable tomatoes at each picking date and total yield in 1957**

<table>
<thead>
<tr>
<th></th>
<th>August 26</th>
<th>Sept. 7</th>
<th>Sept. 16</th>
<th>Sept. 27</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1 plants</td>
<td>1.98</td>
<td>3.26</td>
<td>7.29</td>
<td>9.89</td>
<td>22.42</td>
</tr>
<tr>
<td>Check - field run</td>
<td>1.43</td>
<td>2.42</td>
<td>7.21</td>
<td>8.78</td>
<td>19.84</td>
</tr>
<tr>
<td>No. 2 plants</td>
<td>0.80</td>
<td>2.14</td>
<td>5.97</td>
<td>7.47</td>
<td>16.38</td>
</tr>
</tbody>
</table>

**Table 3. Yields of marketable tomatoes on plants of root pruning experiments**

<table>
<thead>
<tr>
<th></th>
<th>1956</th>
<th>1957</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants with lateral roots (soil on roots)</td>
<td>23.09</td>
<td>19.05</td>
</tr>
<tr>
<td>Plants with lateral roots (no soil on roots)</td>
<td>22.89</td>
<td>17.93</td>
</tr>
<tr>
<td>Plants with few lateral roots (pulled in dry soil)</td>
<td>18.38</td>
<td>17.14</td>
</tr>
</tbody>
</table>
Homesteading in the Nineteen Fifties

A revival of the Desert Land Act in Utah

CLYDE E. STEWART

Since World War II, a greatly accelerated demand has arisen to develop public land for agricultural uses and to acquire private ownership of this land. One of the most active demands has been based on ground water development for irrigation under the Desert Land Act. Many applications have been made in Utah under the act during the last 10 years. A small acreage has been irrigated and patented. Some people have developed new land in the state and have used this means of getting started in farming. Much additional land can be transferred to private ownership under the act if water supplies can be developed.

However, high capital requirements, uncertain and inadequate ground-water supplies, low basic production potentials, and isolation of most tracts of land have created problems for many applicants. Many failures have occurred; costs and losses have been high in numerous instances.

Large numbers of applications, lack of information by applicants, and difficulties of development have created serious problems and high costs in administering the desert land legislation. Questions have been raised as to the adequacy of the legislation and administrative policies. Water-right problems have arisen. Other problems are evident.

Apparently similar problems will occur in the future unless measures are taken to alleviate them. A study of this program was made recently by the U. S. Agricultural Research Service and the Utah Agricultural Experiment Station. This article presents some results of this study.

The Desert Land Act

The Desert Land Act, passed March 3, 1877, was intended to facilitate development of family farms through development of private irrigation in the Western States. Between passage of the act and 1923, about 10 million acres were patented and transferred from public to private ownership under this legislation. Nearly half a million acres of this land was in Utah.

From 1920 to 1945, there was little activity under the act. Opportunities for development of irrigation within the scope of private enterprise appeared to be exhausted. By 1945, the Desert Land Act was viewed as dead, although the legislation remained in effect.

Since World War II, however, a great deal of land has been filed on and patented under the Desert Land Act. In some states, new irrigation development under this program apparently has exceeded
the acreage developed by publicly
financed programs. This develop-
ment has been based on ground
water supplies. High farm prices
and incomes for a time after World
War II and improved technology
of ground water pumps have been
two leading stimulants to this ac-
tivity.

The Desert Land Act as amended
provides that residents and
citizens of Utah over 21 years of
age can obtain patent and owner-
ship to 320 acres of public land by
meeting certain requirements. Ap-
lications are made to the U. S.
Bureau of Land Management.

Public land available for home-
steading was withdrawn from
settlement by the Taylor Grazing
Act of June 28, 1934. The stated
purpose of this act was “to pro-
mote the highest use of the public
land pending its final disposal.”
Section 7 of the act authorizes the
Secretary of Interior “to examine
and classify any lands withdrawn
... which are more valuable or
suitable for the production of agri-
cultural crops than for the produc-
tion of native grasses and forage
plants ..., and to open such lands
to entry ...” Thus, the Bureau of
Land Management must classify
the land as suitable for disposal
before entry can be made.

After an application is allowed,
the applicant must invest at least
$1.00 per acre each year for 3 years.
This amount has little relevance in
terms of total capital requirements
as much larger costs are incurred
in water development. This is espe-
cially true for ground water pump-
ing. The applicant must also pay
$0.25 per acre when his application
is submitted and $1.00 per acre
when final proof is made.

An applicant under the Desert
Land Act must provide evidence
that he has acquired a water right
and a water supply sufficient to
irrigate and reclaim all of the irri-
gable portion of the land. Devel-
opment of a water supply has been
a major obstacle in Utah because
of the large capital requirements
and the uncertain, inadequate, or
poor quality water supplies.

Proof also requires clear evidence
that the applicant has developed
water and an irrigation system suf-
ficient for all irrigable land in the
tract. Actual tillage and irrigation
on one-eighth of the total acreage
must be shown.

Residence on the land is not re-
quired. As compared with the
Homestead Act, this feature is

<table>
<thead>
<tr>
<th>Table 1. Number and size of applications under the Desert Land Act, by areas, Utah, 1948-57</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area or county</td>
</tr>
<tr>
<td>Beaver</td>
</tr>
<tr>
<td>Grouse Creek</td>
</tr>
<tr>
<td>Leetah-Utah</td>
</tr>
<tr>
<td>Millard</td>
</tr>
<tr>
<td>River Bed</td>
</tr>
<tr>
<td>San Juan</td>
</tr>
<tr>
<td>Skull Valley</td>
</tr>
<tr>
<td>Snake Valley</td>
</tr>
<tr>
<td>Other*</td>
</tr>
<tr>
<td>All applications</td>
</tr>
</tbody>
</table>

*Located in 17 other counties.

| Land Office Serial Register, Salt Lake City, Utah. |

<table>
<thead>
<tr>
<th>Table 2. Number and size of applications under the Desert Land Act, by status as of December 1957, Utah, 1948-57</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
</tr>
<tr>
<td>Filed only</td>
</tr>
<tr>
<td>No action since filing</td>
</tr>
<tr>
<td>Rejected or withdrawn</td>
</tr>
<tr>
<td>Filed and allowed</td>
</tr>
<tr>
<td>No annual proof</td>
</tr>
<tr>
<td>One or more annual proofs</td>
</tr>
<tr>
<td>Final proofs made</td>
</tr>
<tr>
<td>Patent issued</td>
</tr>
</tbody>
</table>

| Land Office Serial Register, Salt Lake City, Utah. |
unique. This provision for non-residence has resulted in several distinct characteristics of the program. Applications are made by many people who would not apply if they had to live on the land part or all of several years. Many people have supplied capital and developed land who would not have done so under residence requirements. Frequently, capital has been supplied by persons other than the entrant. The nonresidence provision of the legislation has not encouraged family-type farms.

Extent and location of activity

From 1948 to 1957, about 400 applications were made under the act in Utah (table 1). These applications, which were scattered widely over the state, covered about 100,000 acres of land (fig. 1).

Several areas of concentrated interest stand out. Skull Valley in Tooele County has been the scene of most activity in terms of numbers of applicants. Other important areas are San Juan County, River Bed area in Tooele and Juab Counties, Snake Valley in western Millard County, Grouse Creek, Leota-Ourai, and Pavant Valley.

The applications were concentrated to some extent by years (fig. 2). Nearly 50 percent of all applications were made in 1952 and 1953.

Size of applications

The average size of all applications was about 250 acres, substantially less than the legal maximum of 320 acres (table 1). Classifications for 104 tracts show about 200 acres per application as suitable for cultivation.

Applications in the major areas of activity approached or exceeded 300 acres as averages. These areas are situated in open, unsettled regions of public grazing land. But in the Leota-Ourai area, some tracts contained less than 30 acres; apparently these tracts were small areas of public land interspersed with private or public land not available for entry.

In effect, many applications were for more land than the averages indicate. Family developments often occurred. Of the total of 399 applications, 118 were made by 59 men and their wives. Apparently, 30 pairs of brothers or other close relatives also applied for tracts situated near each other. These 89 pairs, or 178 applications, amounted to 45 percent of all applications. Of course, these family combinations could have led to extra financial burdens in meeting development requirements. But efficiencies of size may be accomplished in this manner, especially in terms of pumping facilities.

Status of desert-land applications

The responsibilities of applicants and public administrators concerning individual applications are generally outlined in the legislation. Usually, a set sequence is followed from filing the original application for entry to termination of the application. This sequence may be terminated by patent of the land or by rejection, withdrawal, or closure of the entry for other reasons.

The 399 applications were filed with the Bureau of Land Management as a necessary first step. Sixty-two applications, or 16 percent of all cases during the last 10 years, were in the "filed" category at the time of the study (table 2). One or more other actions had been taken on the remaining 84 percent.

Of particular significance is the fact that 255 cases, or 64 percent of all applications, were closed because the land resources were not suitable for irrigation or because the applicant failed to meet the provisions of the Desert Land Act. These actions have been costly in many instances to both applicants and the federal government, although the land remained essentially in its original condition. Frequently, because of difficulties encountered in meeting specifications, as many as 15 or 20 actions are recorded on the serial register before a case is closed or even allowed. Often these difficulties arise because of lack of understanding by the applicant as to what he needs to do.

Only 17 entries were in the "allowed" status. These persons had been given permission to proceed with development. But to the end of 1957, they had not filed reports of any investment on the land.

Forty entrantmen had filed one or more annual proof statements as specified by law. Data from 31 of these statements covering 7,593 acres have been summarized. During the first year, these 31 applicants certified that they spent an average of $13 per acre on this land; nearly $10 of this total was invested in the water supply. The minimum requirement of $1.00 per acre was far exceeded in these cases. Actually, the minimum is significant to the applicant only if he wishes to delay development for the first year or two.

Final proof usually must be made within 4 years after the application is allowed. Note is made of a recent exception. On July 30, 1956, a law was passed by the Congress which permitted some outstanding entries a moratorium until March 1, 1959. Under this moratorium, development operations could be suspended until that date.

Only 25 applications in Utah reached patent or final proof stages from 1948 to the end of 1957. This point is significant in terms of the difficulties and problems associated with the desert-land program.

It is not feasible to relate specifically size of application to success because of the many factors involved. The more successful cases appear to contain smaller acreages (table 2). However, success and closed cases appear to be related more to geographic areas than to size of application.

Dr. S. W. Edgcombe, former head of the Department of Horticulture, Utah State University, and dean of the College of Agriculture of the American University at Beirut, Lebanon, died suddenly February 5 in Beirut.
Which barley shall I grow?

Yield tests throughout the state give the answer

R. F. Nielsen
G. A. Van Epps
L. A. Jensen

BONNEVILLE barley is the best variety for planting on the majority of our irrigated farms where plantings can be made early and a good level of fertility and moisture can be maintained. Velvon and Trebi are best adapted where earlier maturing varieties are required. Trebi appears to be specifically adapted to areas where adverse growing conditions such as poor soil, low fertility, and drought are encountered.

These recommendations are based on the results of an extensive testing program conducted throughout the state during the past two years to evaluate the principal barley varieties grown on irrigated land. In these tests Bonneville, Velvon, and Trebi were grown on quarter acre plots. The plantings were made with a conventional grain drill in commercial barley fields and received the same treatment as the rest of the field. Fields were owned by local farmers and the tests were made in cooperation with the county agent. Certified seed of each variety was supplied to growers by the Experiment Station to eliminate variation in seed.

Samples were harvested from each location and detailed notes were taken on stand, lodging, disease, insect damage, and general appearance. The cropping history and fertilizer practices were also

One of the authors, Louis Jensen, and Uintah County agent, Bill Farnsworth, check a field of barley

For March 1959
recorded. Samples were taken to Logan for threshing. Information was collected on 54 separate tests in 18 counties during the two-year period.

1957 growing season

The 1957 growing season was unusually favorable for barley and yields in excess of 100 bushels an acre were obtained from the majority of the tests.

1958 growing season

The 1958 season was probably the poorest season for barley during the past ten years. A cold, wet spring which delayed planting, high temperatures early in the growing season accompanied by drought, and high insect populations caused low yields.

It is probably fortunate that the testing program was conducted during these two years so extremely different, as it was possible to measure performance under both favorable and unfavorable seasons.

Yield differences

Yield differences inherent in the varieties did not show up except under favorable conditions. Where fertility was low, moisture lacking, and season short, little difference was found among varieties. Early plantings yielded higher than later plantings. This was true regardless of variety. Bonneville was more adversely affected by late planting than either Velvon or Trebi.

Bonneville yielded the highest of the three varieties tested both years. However, in 1958, it produced the highest yields in only 52 percent of the trials compared to 76 percent in 1957 (table 1). This reflects its inability to adjust to adverse growing conditions. Velvon and Trebi behave similarly under favorable conditions. Under adverse conditions, Trebi appears to be better adapted than Velvon.

There was no evidence in the two years of testing to show that any of the three varieties was specifically adapted to a given geographical area of the state.

Other agronomic characteristics

Bonneville was the most resistant of the three varieties to lodging. Velvon and Trebi are both susceptible to lodging, Trebi being more so than Velvon.

There was little difference among the varieties in their susceptibility to insect damage or disease.

Trebi matures earliest, followed by Velvon, then Bonneville.

The effect of management on yields was very evident throughout the area tested. Bonneville produced a low of 30 bushels an acre in 1957 at one location compared to a high of 145 bushels an acre at another site. The yield potential of Bonneville appears to be about 150 bushels an acre with early planting, good fertility, and adequate soil moisture. This is considerably higher than the potential of either Velvon or Trebi.

Table 1. Percentage of trials where each variety yielded highest

<table>
<thead>
<tr>
<th>Variety</th>
<th>1957</th>
<th>1958</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonneville</td>
<td>76</td>
<td>52</td>
</tr>
<tr>
<td>Velvon</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>Trebi</td>
<td>12</td>
<td>32</td>
</tr>
</tbody>
</table>

TOMATO TRANSPLANTS

(Continued from page 13)

moist soil when orders for plants permit time for irrigation. Every effort should be made to coordinate orders for plants to permit irrigation before pulling and laborers should be instructed to leave a small amount of soil on the roots.

The problem of pulling only large diameter plants cannot be satisfactorily solved by selecting these plants from a thick stand of plants of variable size. Since the development of a good root system on transplants directly influences production in Utah, this should be an equally important consideration along with size of plant. Roots will not develop normally if plants are too crowded. This will require adequate thinning as early as possible after a stand of plants is established. The thinning of plants in Nevada has helped considerably to improve the quality of plants received in Utah, though the problem of producing ideal plants is not entirely solved. Refinements in planting and establishing a well spaced stand of plants might further improve the quality of tomato transplants received in Utah.

IMPROVE FOOTHILL RANGES

(Continued from page 6)

tall wheatgrass. In the case of sheep, tall wheatgrass is not nearly as suitable as intermediate wheatgrass for late spring grazing. However, for lactating cows, tall wheatgrass is suitable for grazing as late as midsummer if not too heavily grazed or if the summer is not too dry.

There appear to be two alternatives in correcting the deficiency of spring range in Utah. First, livestock men can seed some of their foothill ranges to an early-growing grass such as crested or pubescent wheatgrass for early spring grazing, and other areas can be seeded to a late-maturing grass such as intermediate or tall wheatgrass for late spring grazing. Second, livestock men may have good native sagebrush-grass range which would satisfy the need for early spring grazing. However, these low-elevation native ranges usually are not suitable for late spring grazing and livestock should be moved either to seeded grass pastures more suitable for late grazing or to native mountain brush ranges at higher elevations.

Crested wheatgrass is a particularly early growing grass and a good pasture of this species can be grazed at least a week earlier than native sagebrush-grass range.
To avoid contamination of fruits and vegetables

control drosophila

Drosophila (Drosophila melanogaster) or fruit flies are of great value to scientists in the study of heredity because of the large size of their chromosomes. They are bred in large numbers for use in biological laboratories. But they are becoming an increasingly serious pest of fruits and vegetables in Utah. They contaminate cracked, crushed, or bruised produce. You see them in large numbers flying around fruit stands, orchards, and processing plants, especially if spoiled fruits or tomatoes are left around. These flies are also known as vinegar gnats, sour flies, and pomace flies.

The adult

Adult drosophila are yellowish, clear winged flies, about \( \frac{3}{4} \) inch long. They increase rapidly in numbers; a generation may be completed in 10 to 12 days in summer. Egg laying may begin during the second day of adult life, and a single fly may lay as many as 2000 eggs. Flies breed in cull fruits and vegetables that are discarded. They are later attracted to fields of vegetables and fruits where they lay their eggs in cracks of these products when the protective skin has been broken. In this way the eggs and larvae may contaminate processed fruits and vegetables.

Eggs

Eggs are pearly white, elongate, and about 1/14 inch long, too small to be observed readily with the unaided eye. They are usually attached to plant materials with several tube-shaped structures. These structures make the egg difficult to remove by any known washing process.

The larvae or worm

The time required for eggs to hatch varies with the temperature. In summer many eggs hatch in less than 24 hours. The larvae when first hatched are cream colored and are about 1/30 inch long. When fully grown, they are about \( \frac{3}{4} \) inch long. The larval period varies from six to eight days.

Pupae

The pupae (resting period) are white at first, later they turn brown. They are about 1/16 inch long and have two breathing tubes at each end. The pupal stage is completed in from 4 to 5 days.

Overwintering

In Utah, drosophila have been observed to pass the winter as pupae or larvae in protected areas where relatively dry, decaying, fermented plant material is available. Entomologists believe they also overwinter as adults in protected places.

Control

- To control these insects, the farmer or processor of fruits or vegetables should bury all cull

HOWARD E. DORST is entomologist with the Entomology Research Division, Agricultural Research Service, U. S. Department of Agriculture. He works cooperatively with the Utah Station on vegetable insect control.

Vegetables and fruits or treat cull produce with lindane, diazinon, malathion, BHC, dieldrin, heptachlor, or aldrin in granular insecticide or dust to eliminate breeding insects. Single applications of granular insecticides will usually be effective. Dust treatments are less effective and require at least two applications. Sprays have been less effective. Produce should be thoroughly covered.

- Control weeds that provide shade in orchards or vegetable fields. Drosophila do not survive in numbers at temperatures above 95 degrees F.

- Minimize farm operations which produce crushed fruits and vegetables. Avoid holding picked fruits and vegetables in the field.

- Control grasshoppers, hornworms, tomato fruitworms, armyworms, and other insects that may damage produce; these injuries are attractive to flies for egg-laying.

- Use clean containers for fruits and vegetables; freshly crushed vegetables or fruit material on the sides of the containers will attract flies.

- In orchards or tomato fields where crushed fruits are present, (Continued on page 24)
Special Programs for Special People

In this second report of the survey of radio and TV listening and viewing habits of farm people, Mr. Brower presents findings in eight north central counties in Utah

STEPHEN L. BROWER

When do farmers and homemakers listen to their radios? Do farmers watch TV early in the morning or at noon? What kind of radio or TV programs do farmers and homemakers like?

The answers to such questions can mean money in the pocket of the advertising agency, the commercial farm equipment and supply dealer, or any of the merchants who supply goods and services to Utah farmers and homemakers. In addition the answer to such questions give educational agencies, which seek to serve farmers and homemakers through radio and television, some valuable hints of the best time to reach their audience.

This study does not purport to give the final answer to these questions, but it is an indication of how farmers and homemakers of eight north central Utah counties answered such questions.

Ninety-four percent of the farmers and 98 percent of the homemakers reported they had one or more radios in their homes. As high as 8 or 9 radios were reported in a single home. Fifty-three percent of the farmers had one radio in their cars or trucks in addition to the radios in their homes. Sixteen percent reported two radios, and three percent had three or more radios in cars and trucks.

Homemakers also reported radios other than those in the home. Forty-five percent had one radio in the car, 30 percent had two radios, and 23 percent had three or more radios in cars and trucks.

The number of radios in barns varied a great deal with the county, apparently depending on the proportion of dairy farms. For instance, one out of every three Weber County farmers has a radio in his barn. The average for the eight counties was 15 percent of the barns with radios.

What kind of radio programs do you prefer?

Farmers and homemakers tend to prefer the same kind of programs. First choice of both male and female is news. Farm and homemaker programs were among the top four preferred by both farmers and homemakers. As would be expected, news of the weather rated second among farmers. Both farmers and homemakers rated mu-
sical programs among the first four radio program choices. Popular, not modern, music was most preferred by both groups.

When do you listen to your radio?

Radio listening patterns have changed a great deal since television, but radio is far from “dead” as indicated by the number of radios owned by people and also by the number of people who regularly listen to radio.

Homemakers continue to listen to their radios during the early morning hours. There is a smaller but still a substantial number of radio listeners among the women at noon and during the afternoon.

Farmers depend on the radio a great deal for specific information such as market reports, weather, news, and farm information. A radio station seeking to reach the largest number of farmers, therefore, should program this kind of material during the early morning, from 6 to 7, (in some areas farmers listen until 8 a.m.), and then again at noon. There is another smaller radio listening peak at about 6 p.m. for the farmers.

When do you watch television?

Daytime television viewing by both farmers and homemakers in the eight counties is limited, but farmers in these counties watch television more than would be expected. This is probably because of the large percentage of part-time farmers in this part of Utah. The television viewing pattern for both men and women during the daytime tends to be parallel after 8 o’clock in the morning. There is a small peak TV audience during the noon period, TV viewing really begins after 6 p.m.

Television distribution

Eighty-nine percent of the farmers reported having one or more television sets in the home, as compared to 94 percent of the homemakers. Farmers and homemakers

(Continued on page 27)
Mites are like peas in a pod — they look alike — but they react differently to agricultural chemicals

Mite control

DONALD W. DAVIS
GERALD L. NIELSEN

Mites found on fruit and berry crops in Utah are so much alike and so small that even the specialists have a difficult time telling them apart. But there are five of them, all often called two spotted mites. Chemical treatment that will control one is not always effective on the others. This is especially true of the McDaniel mite.

All five forms spend the winter as adult females hidden in dirt and trash near the base of host plants. They become problems during the summer months when they are present on the leaves in dense colonies, feeding within masses of webbing. Table 1 will help you tell which mite is on your crops. There is no positive method of recognizing them in the field, so use the chart as a guide only.

The McDaniel mite has been most serious around Ogden, but it is found in all the fruit growing areas of Utah and is of major concern from Box Elder County to Juab County. It infests quite a few different plants but apple, raspberries, and sour and sweet cherries are the crops most commonly injured. This mite multiplies more rapidly than related forms. For this reason injury often becomes severe before you know the mites are around. In addition to these sudden effects, several of our common miticides have failed to control this mite.

Conditions leading to attacks

The McDaniel mite starts feeding on weeds and cover crops under the trees early in the season. Among these early hosts are milkweed, wild lettuce, red clover, and curled dock. Mites breed in great numbers on these plants. About the end of June the weeds are overrun with mites. When hot weather dries up many of these weeds, mites move into nearby fruit trees in vast numbers. By this time the trees have been sprayed with DDT which kills many of their natural enemies. Miticides used before this time will not control this mite. Special control measures are needed.

Control methods

Broad-leaf weeds which harbor McDaniel mite should either be eliminated or sprayed with an effective miticide. If you use a cover crop, select a plant such as orchard grass where the mites don't breed. If you prefer clean culture, destroy the undercover growth early enough in the spring to prevent mites from becoming numerous and moving into the trees. Sprinkle irrigation, where the weeds or cover crop get wet, seems to help control the mites.

During the past four seasons experiments on the chemical control of the McDaniel mite have been conducted by the Utah Station. Most miticides have been tested under Utah conditions. The results of this work are summarized in table 2. Kelthane, demeton (Systox) and Guthion have controlled mites for nearly two months. In most cases a retreatment of the trees is necessary late in the season. Demeton and Guthion should be used sparingly. In the first place they are the only two materials effective against the McDaniel mite which are highly poisonous to man. In the second place they are chemically related to parathion and other organic phosphates, and this mite is resistant to most miticides classified as organic phosphates. In other areas the McDaniel mite has become resistant to both demeton and Guthion. We suggest that you use demeton and Guthion occasion-
Table 1. Field guide to the two spotted mite and related forms found on fruit trees and berry plants in Utah

<table>
<thead>
<tr>
<th>Mite species</th>
<th>Area of Utah affected</th>
<th>Host plants</th>
<th>Summer color of adult females</th>
<th>Fall and winter color of females</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two spotted</td>
<td>General. More severe in warmer sections</td>
<td>General. Mostly on annuals and peaches</td>
<td>Usually dull yellow to green. Two dark areas of varied size and shape</td>
<td>Orange red (variable)</td>
<td>Highly variable group</td>
</tr>
<tr>
<td>McDaniel</td>
<td>General. Usually severe from Box Elder to Juab Counties</td>
<td>Most common on apples, cherries, and raspberries</td>
<td>Dull yellow to green, two dark areas near middle and two near tail end</td>
<td>Bright orange</td>
<td>Mites more slender than two spotted. Colony generally compact. Webbing dense</td>
</tr>
<tr>
<td>Four spotted</td>
<td>Mostly around Moab, some near Provo</td>
<td>General</td>
<td>Generally green. Four dark areas</td>
<td>Greenish brown becoming orange by midwinter</td>
<td>Not well studied. Similar to McDaniel mite</td>
</tr>
<tr>
<td>Strawberry</td>
<td>General. Mostly north central</td>
<td>Low growing plants, rarely on trees</td>
<td>Usually dull yellow with two dark areas only</td>
<td>Bright orange</td>
<td>Similar to two spotted mite</td>
</tr>
<tr>
<td>Willamette</td>
<td>Largely in colder areas such as Cache, Millard, Beaver, and Iron Counties</td>
<td>Apples. Rarely on other fruit trees</td>
<td>Dull yellow, small dark areas at times</td>
<td>Bright yellow</td>
<td>Mites generally small. Colony compact and close to leaf surface</td>
</tr>
</tbody>
</table>

Table 2. Average time that acaricides will control the McDaniel mite as checked in tests at Roy, Utah, over a 4-year period

<table>
<thead>
<tr>
<th>Material</th>
<th>Dosage per 100 gal.</th>
<th>Weeks of control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systox 21%</td>
<td>2 1/2 pints</td>
<td>1 2 3 4 5 6 7 8</td>
</tr>
<tr>
<td>Tedion 25%</td>
<td>1 pound</td>
<td></td>
</tr>
<tr>
<td>Thimet 48.5%</td>
<td>1 pint</td>
<td></td>
</tr>
<tr>
<td>Systox 21%</td>
<td>1 1/2 pints</td>
<td></td>
</tr>
<tr>
<td>Kelthane 25%</td>
<td>1 1/2 pounds</td>
<td></td>
</tr>
<tr>
<td>Trithion 25%</td>
<td>2 pounds</td>
<td></td>
</tr>
<tr>
<td>Guthion 25%</td>
<td>2 1/2 pounds</td>
<td></td>
</tr>
<tr>
<td>Aramite 15%</td>
<td>2 pounds</td>
<td></td>
</tr>
<tr>
<td>Dibrom 64.5%</td>
<td>1 pint</td>
<td></td>
</tr>
<tr>
<td>Chlorobenzilate 25%</td>
<td>1 1/2 pounds</td>
<td></td>
</tr>
<tr>
<td>Sulphenone 50%</td>
<td>3 pounds</td>
<td></td>
</tr>
</tbody>
</table>

ally but not every season. In this way they may serve us for several years. Aramite, chlorobenzilate, and often sulphenone have given control for periods just short of one month. If you use one of these materials you will probably need about three applications during the season. One of them can be included with each codling moth spray applied from late June into August on apples.

There are several other miticides which have looked good in experimental work, but as yet these are not available commercially. Among the more promising ones are Tedion and Thimet. These and other new materials will be tested further.

SELLING LAMBS

(Continued from page 4)

decisions; they cannot be passed on to others.

Price changes: One measure of the difference between direct and central market selling is a comparison of variation in prices. In the Utah study prices varied 2 percent more for fat lambs sold at central markets than for those sold direct. For feeder lambs sold at central markets, prices varied 78 percent more than direct sales prices, yet the average net price received by ranchers in 1955 was the same for each method. It appears that direct bargaining reduced price variation in feeder sales at least.

Some reasons why central market prices vary more than direct prices are of interest. First, lambs are sorted into more groups at central markets than when sold direct, thus prices fluctuate more. Second, contract prices in direct sales are not subject to the hour to hour or day to day fluctuations found in central market prices. Direct prices are usually average prices for large groups of lambs and are not changed once they are agreed upon.

Disadvantages claimed for direct selling

First, low quality animals are said to go to the central markets and set the prices that buyers use for purchasing the better quality animals in the country. Second, competition among buyers is said
to be reduced, hence, prices are lower and vary more among deals. There is evidence from the Utah study to support the conclusion that these objections to direct marketing are not real.

Quality: Body condition prescribed by the market determines whether a lamb is a fat or a feeder. Weight can be used as a measure of condition. The Utah study discloses that in 1955 fat lambs sold by either method averaged about 95 pounds per head. Feeder lambs averaged 75 pounds per head regardless of marketing method. Unsorted lambs averaged 85 pounds per head. The price spread between fats and feeders was the same for each marketing method. The U. S. Department of Agriculture has studied this problem in more detail in relation to other animals and found no real difference between animals sold through central market and direct methods grade for grade.

Competition among buyers: The Utah study indicated that often only one buyer showed up at the ranch at a time, yet, he knew that the rancher had a radio, a newspaper, and a telephone. His competition was real if not present in person. He could not afford to stray far from established market prices or the rancher would call in his competition almost immediately.

Utah ranchers were well supplied with available market news sources in 1955 (table 2). Only six percent failed to respond to questions asked concerning first choice for market news information. Thirteen percent relied on local buyers as their chief source; the balance liked independent sources best with 21 percent giving priority to direct contact with markets. Over half the ranchers used at least three sources of market information and many used even more.

Some argue that direct marketing reduces the number of buyers in the central markets or at least restricts the number of animals buyers take at those markets. Results are supposed to be lower prices in the central markets which reduce prices in the country also. A logical fallacy is evident in the argument. Direct buying may reduce purchases in the central market but it also decreases the number of animals offered there. Results are compensating shifts in supply and demand in the central market so that price is generally unaffected.

Less variable pricing of direct sales of lambs than central market sales and equal average net prices put in doubt the suggestions that buyers have a consistent advantage or that competition is less keen in direct bargaining.

**DROSOPHILA CONTROL**

(Continued from page 19)

Cull piles treated with poisons should not be accessible to human beings or livestock.

- At the processing plant speed the removal of cull and discarded fruits and vegetables that may attract fruit flies; either remove these waste materials from the plant immediately or place them in tight-lidded containers. These should be emptied frequently. Wash spilled juices down the sewer line. Reduce to a minimum the holding of fruits and vegetables at the processing plant. If products must be held where drosophila adults are seen, dust the products and their containers with pyrethrum.

**IRRIGATE THE SOIL**

(Continued from page 7)

Cull piles treated with poisons should not be accessible to human beings or livestock.

- At the processing plant speed the removal of cull and discarded fruits and vegetables that may attract fruit flies; either remove these waste materials from the plant immediately or place them in tight-lidded containers. These should be emptied frequently. Wash spilled juices down the sewer line. Reduce to a minimum the holding of fruits and vegetables at the processing plant. If products must be held where drosophila adults are seen, dust the products and their containers with pyrethrum.

Water supply, slope, and the crop may exert an influence on irrigation system design and operation, but the characteristics of the soil are the controlling factors.

Infiltration rate is of first importance

In planning an adequate irrigation system for a particular field, one of the first items to be investigated is the infiltration rate, or the rate at which water soaks into the soil. If the infiltration rate is high, it will indicate that the soil can only be properly irrigated with a sprinkler system. If the rate of infiltration is extremely low, the soil may not be suited to irrigation at all. If the infiltration rate is favorable, the information about it can be used as the basis for the design of the proper irrigation system. With this information, the length of furrow, border width, sprinkling rate, or basin size may be more correctly determined. Lack of information about the infiltration rate may result in an irrigation system which wastes water or distributes it poorly over the field.

An actual irrigation system trial in the field to be irrigated to determine the infiltration rate characteristics of the soil helps in designing an irrigation system. If an actual field trial can be made, it is not necessary to measure infiltration separately.

The importance of infiltration measurement or field irrigation trials cannot be over-emphasized.
There are a great many irrigation systems operating which have not been properly designed. Such systems may provide an economic return, but not a maximum return. Water, soil, and productive capacity may be wasted by a poor irrigation system. Often, slight changes in an irrigation layout, or in irrigation procedure may provide a relatively great economic benefit. This benefit is provided by water and labor saved, and by more uniform water distribution in the field. When the soil is properly irrigated, the crop will grow best.

**Slope of the land must be considered**

The slope of a field has an important influence in the design of an irrigation system. If the soil surface is irregular, it may be necessary to level it with earth moving equipment. If the soil surface is too undulating, a sprinkler system may be required. When gravity irrigation is indicated, then the natural or re-formed slope will influence border width and lengths, furrow lengths, stream sizes, and water conveyance facilities. An irrigation system which has been built without proper consideration of the soil slope is likely to be wasteful of soil and water.

**Other factors influencing design of irrigation systems**

Texture, structure, and stability of the soil also influence the design of an irrigation system by their modifying influence on slope and infiltration rate.

The water-holding capacity of the soil combined with the influence of climate and crop determines how much water can be beneficially stored in the soil. They also determine how often the irrigation system should be used to refill the soil moisture reservoir.

The water supply available has an influence on the design of an irrigation system, but the soil is the major influencing factor.

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**Table 1. Rate of water application field trial, Rigby, Idaho, border irrigation**

<table>
<thead>
<tr>
<th>Time rate of application (cfs/acre)</th>
<th>Average depth of water applied (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.8</td>
<td>8.1</td>
</tr>
<tr>
<td>2.9</td>
<td>9.5</td>
</tr>
<tr>
<td>1.9</td>
<td>10.3</td>
</tr>
<tr>
<td>1.5</td>
<td>11.4</td>
</tr>
<tr>
<td>1.2</td>
<td>12.7</td>
</tr>
<tr>
<td>1.0</td>
<td>16.5</td>
</tr>
<tr>
<td>0.8</td>
<td>20.2</td>
</tr>
</tbody>
</table>

Soils which have poor drainage characteristics require a carefully designed irrigation system. Otherwise, water logging, salt accumulation, and crop failures will result.

**Changes in the rates of application**

An example of how different the irrigation might be on a field with only a change in the rate of water application can be seen in table 1.

In this field trial, water was experimentally applied at different rates to a strip of land planted to clover. Where the time rate of application was low, the amount of water needed per acre was high. Where the rate of water application was high, the amount applied was much less.

The depth of water applied is reported in the table as average inches and does not give any indication of how uniformly the water was distributed on the field.

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No runoff of water was allowed in the experiment. It is highly probable that at low rates of application, most of the water soaked into the upper end of the field. If the infiltration rate on a field is high, then the time rate of application must be high also to get good distribution if the soil is to be uniformly irrigated.

From table 1, it can be seen that if one cubic foot per second of water is applied to one acre of this land, 16.5 inches of water will be needed to irrigate the soil. The irrigation time required would be approximately 16.5 hours. If one cubic foot per second is applied to one half acre, about 5.1 inches of water will be required. That means that 10.2 inches of irrigation water can be applied in 5.1 hours. This results in a considerable saving in both time and water over the longer, slower irrigation.

Every farmer should know whether the irrigation system he has really matches the soil on his farm. With the help of government agency or extension service technicians, he can make his own field trials. He can then modify his irrigation system so that he is storing water efficiently in the soil for his plants.

Always irrigate the soil — when the crop needs it.

**UTAH'S CARP**

(Continued from page 9)

either 3, 4, or 5 years old. The fastest growing carp came from Ogden Bay and Bear River Refuges. However, older fish do not appear in these areas nearly as often as in Bear Lake. This is presumably because of harvesting and other removal operations in these two bird refuges, whereas in Bear Lake, old age and starvation are the agents that usually kill them.

Fish associates of the carp in the United States include most of the warm-water fish and some of the cold-water ones. In northern Utah the fish most commonly associated with the carp is the largemouth bass, the green sunfish, and the black bullhead.

**Carp are adaptable fish**

Carp is one of the most widely adaptable fish in North America. It is able to tolerate low oxygen, a high degree of pollution, and sudden changes in water chemistry and water temperature.

Carp start to spawn in shallow weedy areas in the spring when the water temperatures reach 58°
to 60°F. Carp are usually sexually mature when they are two or occasionally three years old. As much as 1/3 of the weight of some unspawned females can be attributed to their egg load. The number of eggs per female varies greatly and may reach as much as a million in a 15 pound carp. Spawning frequently takes place in water so shallow that the backs of the carp are exposed. The eggs are distributed at random over plant beds, debris, and rubble. The eggs are deposited in groups of five and six hundred over an area roughly six feet in diameter. They are about two millimeters in diameter and are greyish white. They hatch in a few days but the young remain in the protective custody of the weeds several days or even weeks. At eighteen days a young carp may be nearly an inch long and is moving out of the shallow water. The young fish remain in this habitat for much of the summer but move into deeper water in the fall. This particular trait of remaining in shallow water when they are small makes young carp relatively unavailable to many predacious fish. By the time the young carp leave the shallow weedy habitat they are often three to five inches long and are relatively safe.

An undeveloped resource

Carp in Utah waters total millions of pounds and provide a potential but largely undeveloped resource for the people of the state. What uses are there for this resource? There are a number of places in the United States where carp is considered a valuable sport and food fish. Unfortunately there are many other areas where its detrimental effects far out-weight its positive benefits. Several possibilities appear as solutions in the latter case. Some of these are: (1) exterminate the carp and lend support to more desirable species; (2) control carp to the point that they do not inhibit the production of more desirable fish; (3) exploit the potentials of the water and food supply, regardless of the species; that is, let the fish compete among themselves for available feed, (4) or go all out to exploit the commercial and sport possibilities of carp.

It is almost physically impossible to remove all carp from many large bodies of water; the process is also sometimes so expensive as to be prohibitive. At present, an effort is being made in many states to control carp to a limited extent by such techniques as limited seining, spot poisoning, and commercial fishing.

Since carp populations regain weight rapidly under these circumstances, this is of doubtful value from both an economic and a biological standpoint. Exploiting the potential of a habitat by “letting it alone” is being practiced today in many waters, but is often unsatisfactory from a fishery management standpoint. It is generally conceded that the exploitation of the commercial and sport possibilities of carp is the solution that offers the most promise. This involves such things as encouraging the sport fishery of carp (which is admittedly not fruitful in areas where there are more desirable fish). The use of carp as a high protein supplement offers promise but needs further technological advances before carp meal can compete with marine fish products. In order to increase human consumption of carp, it would be necessary first to increase its palatability and then to advertise the carp as a product to the general public.

Additional research in the following fields should: develop better methods of harvesting Utah carp, learn to estimate carp populations cheaply and accurately, make processing and marketing carp economically feasible. Carp populations could be reduced to a point where they would not be a destructive factor of the natural habitat of game fish or waterfowl if economically profitable methods of harvesting, processing, and marketing them were known. Unfortunately, this is not the case at present; and if the carp is to be a resource in itself or it is to be removed as a destructive factor, then technological advances, probably through research, must be made.

Except in a few areas which are controlled by the United States government, such as migratory waterfowl refuges, the title to carp is vested in the individual states; that is, carp are under the jurisdiction of state fish and game departments. This means, in effect that there are 49 separate and distinct sets of laws governing the taking of carp. This factor will undoubtedly have an influence on the future of the carp industry in the United States.

Carp are rated low as a sport fish by Utah anglers. They are an abundant source of human and domestic animal food. The high protein content and the comparatively low cost of carp appear to justify the efforts of many groups to develop a wider market for them. However, to date, the carp industry has not prospered. Research has suggested several leads: (1) control of carp populations by means of electrical devices and selective poisons, (2) determination of the correct ratio of carp to game fish as a guide to sound fishery management, (3) additional use of carp and carp by-products, (4) development of a pilot plant for processing carp.

Future research studies

Understanding future research on the fishery problems should be a more profound concept than has been reflected in many works of the past. In order to understand a species, it must be considered in relation to the total fish population and their habitat. There is a need to understand the interactions among species and how they are affected by changing environmental conditions. The problems of the Utah carp fishery are discouraging but not insurmountable. Research in recent years has solved many difficult biological and technological problems.
LIMITED GRAIN FEEDING

(Continued from page 11)

Approximately 86 percent of the nutrients were grazed from pasture, and 14 percent supplied by the grain.

Most of the cows, while making the reported records, were used on research projects, studying hay versus silage during the winter and green chop versus grazing during the summer. The cows were not mated earlier than 70 days after calving which permits a 305-day lactation period, a dry period of not less than 42 days, and a calf per year for cows that conceive at the first breeding.

Cows are milked twice each day and most of the labor is furnished by constantly changing student personnel with varied efficiency, under the supervision of the herdsman.

The amounts of milk and butterfat produced, feeds consumed, and percentage nutrients furnished by the different feeds are given on a cow per year basis and for 305-day lactation periods in table 5.

Of the total nutrients consumed forage supplied approximately 80 percent and the remaining 20 percent was furnished by grain. Of the forage, pasture supplied 38 to 39 percent, hay 27 percent, and corn silage 15 percent. Cost studies show that nutrients from pasture are the lowest, followed by increasing cost of nutrients coming from hay or corn silage, and grain. By supplying a high percentage of nutrients from pasture, hay, and silage, feed cost can be relatively low compared to costs when grain supplies a higher percentage of the nutrients.

SPECIAL PROGRAMS

(Continued from page 21)

in Box Elder, Juab, Salt Lake (only homemakers), Tooele, Utah, and Weber Counties reported more than 90 percent of their homes had television sets. The two counties east of the Wasatch Mountains had a lower proportion of homes with TV. The percentage of farm homes in Wasatch County with television was 72, in Summit County 80.

What is the best daytime hour to watch a farm or homemaker TV program

An attempt was made to obtain the answer to this question on both summer and winter viewing. During the summer a few farmers said they would turn on their television sets for a farm show if it came before 7 in the morning. A few more (11 percent) would watch at noon. Farmers TV watching during the winter was similar except that a few could watch during the morning period around 9. The largest number (23 percent) could

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