UTAH IN 1980
OUR LAND, OUR WATER, AND OUR AGRICULTURE

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The year 1980 will come regardless of our actions, but Utah can be a much more pleasant and prosperous place in which to live at that time if we anticipate our needs and prepare for them. The Experiment Station is giving particular attention to needs and adjustments involving land, water, and agriculture during the next twenty years. A preliminary view of the situation for the state is presented here. More detailed information will be released in the future.

Utah's population is increasing rapidly, new industries are developing, people's habits are changing, especially in relation to food, recreation, and travel. Water supply and arable soils are limited. Recreation is competing for water and watershed lands. Production on our arable lands, our ranges, and our forests can be increased, but Utah is moving rapidly toward becoming a deficit production area. As we face the future of increasing competition for land, water, forests, and wildlife resources, plans are needed to provide the fullest benefits possible to man for both now and the future.

The function of research is to develop data on which decisions can be based and to explore as far as possible the consequences of different courses of action. This is the light in which this issue of Farm and Home Science has been prepared. An informed public should agree on policies that will enable it to meet best the situations ahead. Utah State University is dedicating a part of its research effort toward assisting Utah in preparing for the future.

More People to Feed and Clothe

Since agriculture produces food and fiber, one of its major concerns is how many people must it feed and clothe. During the past decade, population in the United States increased by about 28 million compared with slightly less than 9 million during the 1930 and 19 million during the 1940 decade. Students of population have estimated that by 1980 there will be about 244 million people in the continental United States, an increase of about 64 million over the 1960 population.

During the past 10 years population in Utah and the Western States increased proportionately more than for the nation (fig. 1) and this more rapid increase is expected to continue. Utah's population increased from 688,862 to 890,627 or 29.3 percent from 1950 to 1960. During this same period population in the Western States increased more than 7.5 million, and in California alone it increased more than 5 million. By 1980 the population in Utah is expected to be about 1,414,000 and 26 million in California and about 44 million in the eleven Western States. These projections represent increases of 59, 67, and 61 percent, respectively, for Utah, California, and the eleven Western States. This means many more people to be fed in Utah and the adjoining states. One effect of the past growth of population on the West Coast has been to shift the out-of-state markets for Utah farm products from the East and Middle West to California. The home market has, however, been consuming a larger and larger part of our total production.

Increased Purchasing Power

The average net income per capita for the nation has markedly increased over the past two decades. It rose from $595 in 1940 to $1,491 in 1950 and $2,166 in 1959. The comparable amounts for Utah were $487, $1,283, and $1,848, or about 15 percent less than the national average. The Rocky Mountain States as a group are below but the Far Western States are above the average for the nation. Projections have placed the 1980 per capita income for the nation at $2,900 at the 1957 price level.

Kinds and Form of Food

Higher incomes are among several factors associated with changes in the kinds, quality, and form of
the food consumed. The long-time trend is in the direction of fewer pounds of food and less calories per person. Decreases have occurred particularly in cereals and potatoes, while increases have been noted in livestock products. These trends are expected to continue. Of the total food less and less is consumed on farms where produced. Also, more of it undergoes processing. More is being served in public and institutional eating places. For ready marketing more of it must meet quality specifications.

Patterns of Living

Changes in place and patterns of living are also taking place. During the past 15 years there has been a decline of about four and a half million people living on farms in the United States. The percentage of all people on farms has declined from 18.5 percent in 1944 to less than 12 percent now. Many workers in non-agricultural enterprises live on farms or in farming areas. Distances traveled to work are being extended, as is travel for recreational purposes. Home conveniences are being multiplied. Automobiles, television, automatic kitchen equipment, refrigeration are considered necessities by most people. Many women, including those living on farms, are working outside the home. All of these factors influence the demand for the kinds, amount, quality, and form of food consumed. Consumers make the final decision on what is profitable for farmers to produce. The farm population has joined with non-farm people in these changes in consumption patterns. In fact, the shift of many farm people to other industries and services has contributed much to the general high level of consumption throughout the country.

Size of Farm Up, Number of Farm Laborers Down

While changes in consumption patterns have been large, equal or even greater changes have taken place in farm production. Since 1950, the number of farms in the United States and in Utah has decreased about 20 percent, but the average size of farms has increased whether measured in acres or in capital invested. However, the acres of cropland harvested in the nation declined by nearly 10 percent and the number of farm workers by about 30 percent. In Utah harvested crop acres declined by approximately 10 percent and in the Mountain States the number of farm workers decreased 16 percent during the same period. In 1959 one farm worker produced enough food and fiber to support 23.7 persons as compared with 14.6 persons in 1950.

Many agencies have collaborated in furnishing data and recommendations for the material presented. Special acknowledgment is made to the U.S. Department of Agriculture, particularly the Agricultural Research Service, the Soil Conservation Service, and the Forest Service. Information has also been obtained from the Bureau of Land Management, and the U.S. Geological Survey of the Department of the Interior. State agencies such as the State Engineer's Office and the Water and Power Board have made additional information freely available. Anticipating the future is a basic task of research, and the complex problems involved require wide cooperation. The Experiment Station is grateful to all who have given assistance in this important task.
Farm Output Up

Although significant decreases have taken place since 1950 in crop acres harvested and in number of farm laborers, the total farm output in the United States increased about 25 percent during the past ten years compared to about 8 percent in Utah. In the nation production of crops increased less and livestock products more than 25 percent. Utah crop production during the same period remained at about the same level but livestock output increased about 18 percent. Higher rates of production accounted for most of the increased output. Increases in percent of calf and lamb crops, in milk produced per cow and eggs per hen, and in wool shorn per sheep were significant in Utah and the nation. Yields for most major crops increased also, though the upward trend was broken some years by unfavorable weather. Greater farm output with fewer crop acres and less labor has been possible by use of more mechanical power and allied equipment, chemical fertilizer, improved seeds and feeds, and other yield-increasing factors.

Shift of Labor from Farm to Factory

A pronounced shift from inputs of farm to inputs of non-farm origin has taken place during the past 10 to 20 years. Factory-produced power represented by tractors, trucks, and gasoline has almost completely replaced farm-produced horses and hay and grain. Factory-mixed and processed feeds have supplanted much of the feeding of whole or farm-processed grains. The use of commercial fertilizers as a supplement to farm-produced fertilizers has been greatly expanded. New chemicals for weed eradication and the control of insects and diseases of plants and animals have largely replaced home remedies and labor. Specialized factory-made machines, combined with electric or petroleum power have replaced human and farm-produced animal power.

Production and Marketing Integrated

In certain farm enterprises such as chickens and eggs, turkeys, hogs, sugar beets, fruit, and canning crops there has been a trend toward integrating production and marketing. Most often this has been done through a contract which binds the purchaser to buy the produce on a specified basis but also gives him the right to share in some of the decisions pertaining to production methods. Sometimes the buyer also advances credit or provides some of the inputs used in production. Volume, uniform and good quality, and timeliness of availability for the market are important objectives of this form of operation.

Get It At The Store

Home baking and canning are rapidly being replaced by products of commercial factories. Homemade butter and cheese are now rare as is home frozen ice cream, and only in isolated ranching areas are meat animals slaughtered and processed on the farm. Every-other-day deliveries of pasteurized and homogenized milk and of half and half and whipping cream are made to dairy farmers as well as people living in urban areas. Eggs, chickens, and home garden products are purchased at the market. Production and consumption require greater cash investments but reduced amounts of farm labor. Labor is being transferred from farm to factory.

Many Part-Time Farmers

In spite of the larger average farm size and the increased total production, many farms are too small to make full-time use of the farm operator and his family help. Many farms are operated in conjunction with either full or part-time employment away from the farm. The preliminary report of the 1959 Agricultural Census for Utah shows that 60 percent of all farmers work away from their farms for pay and that 47 percent work away 100 or more days per year. It further shows that 48 percent of the farm families receive less than half of their total income from the sale of farm produce. The 1954 Agricultural Census reported that in 5 counties of the state more than half of all farm families received more income from non-farm sources than from the sale of farm produce. Recent mechanization of agriculture has made many farms too small for economically efficient operation and too small to produce sufficient income to provide an acceptable level of living. The 1959 Census shows that 30 percent of all farms have sales of products from $50 to $2,499. These operators worked away from the farm 100 or more days or had an annual income from other sources greater than the value of farm products sold. Many farm operators have full-time jobs away from the farm. The question is often asked whether the farm adds to the family living or whether the job is necessary to maintain the farm. Equally important is the effect that a full-or-major-time off-farm job has on the type of farm production and the efficiency with which the farm resources are used. Obviously farm operations will...
need to be such as to minimize labor requirements, and observation leads to the conclusion that efficiency in the use of land and other resources is low.

**Agriculture in 1980**

Small farms and fragmented farms have been a problem in Utah for many years. Recent encroachments of urban, industrial, and public developments on the limited farmland and water have intensified these problems. Social and economic changes mentioned above, and others within and without agriculture have created problems for the industry. These changes and problems affect not only the economic security and well-being of farm people but also of non-farm people. The quality, the variety, the form, and the cost of farm products are affected by the changes and these are of concern to everyone not only now but in the future.

Public interest may justify a few questions concerning agriculture in Utah in 1980. Among the important ones are:

1. What will be the requirements of Utah's population for food? Where will it come from? In what form will people want it?
2. How much land and water will be available for agricultural use?
3. What will be the important crops and livestock products produced?
4. How much can rates of production be increased, and what problems need be solved and what practices changed to bring about the increase?
5. How many farms will there be, and how will they be distributed as to size, and as to part-time and full-time?
6. How important will agriculture be in relation to the total economy of the state, first as a producer of raw materials and second as a market for the products of industrial and service organizations?

This issue of Farm and Home Science is devoted to furnishing preliminary answers to these questions on a state-wide basis.

**AVAILABLE LAND RESOURCES**

Utah has an approximate land area of 52,700,000 acres. An earlier incomplete survey indicated that 3,250,000 acres of this land are arable. During the past two years a more complete inventory of soil resources has been made by the Soil Conservation Service and the Experiment Station. From the data obtained a generalized map has been prepared showing areas of presently irrigated cropland, dry-farmed land, and areas containing significant proportions of potentially irrigable land if water becomes available (fig. 2). The more complete inventory of soils indicates Utah has a total of 5,395,000 acres of arable land. More detailed studies will probably modify this figure, but it is sufficiently accurate for planning purposes. The map shows five areas where arable lands have major differences in crop suitability based on soil and climatic conditions. The general conditions in each of these areas are indicated in table 1. The 1959 census gives figures on land and use in the state (table 2).

The Soil Conservation Service-Experiment Station survey based on actual measurements from recent aerial photographs indicates there are 1,436,000 acres irrigated and a total of 2,219,000 acres used for cultivated crops. The discrepancies between these data and the Census data are presently unresolved. Recent information does indicate that

<table>
<thead>
<tr>
<th>Table 1. General conditions in the five major areas shown on the soil map—figure 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area Elevation</td>
</tr>
<tr>
<td>feet</td>
</tr>
<tr>
<td>I</td>
</tr>
<tr>
<td>II</td>
</tr>
<tr>
<td>III</td>
</tr>
<tr>
<td>IV</td>
</tr>
<tr>
<td>V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2. Uses of land in Utah*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land use</td>
</tr>
<tr>
<td>Approximate land area</td>
</tr>
<tr>
<td>Cropland</td>
</tr>
<tr>
<td>Harvested</td>
</tr>
<tr>
<td>Pastured</td>
</tr>
<tr>
<td>Idle</td>
</tr>
<tr>
<td>Land irrigated (census)</td>
</tr>
<tr>
<td>Land dry-farmed</td>
</tr>
<tr>
<td>Total arable soils†</td>
</tr>
<tr>
<td>Approximate area undeveloped arable land‡</td>
</tr>
</tbody>
</table>

*U.S. 1959 Census
†U.S. Soil Conservation Service and Experiment Station data
Fig. 2. Utah's land resources showing presently irrigated cropland, dry cropland, and potentially arable lands.
more than 10 percent of the land area of Utah is arable and that only about 37 percent of the arable soils are now cropped. Knowledge that Utah possesses a large surplus of arable lands in comparison with water resources places increasing importance on the wise and efficient distribution and use of water.

Urban Uses of Land

About 160,000 acres of land were used for urban purposes in 1960. Based on an average of one acre for each 10 people population increase, urban areas will occupy about 213,000 acres by 1980. If one-half of the land taken over by urban development during the next 20 years comes from presently irrigated land, this will represent a loss of 26,000 acres. An additional 210,000 acres are currently used for transportation. New interstate highways and other developments will increase this amount significantly with the amount coming from cropped land being presently unknown. Removals from cropped land by encroachment of all special uses may amount to 40,000 acres by 1980.

Considering proposed Bureau of Reclamation projects, the development of land with underground water, and other current or prospective developments, it is probable that there will not be a decrease in cropland by 1980 in any county with the possible exception of Salt Lake. Irrigation developments may bring as many as 100,000 new acres under cultivation by 1980.

The Critical Water Supply

The amount of water available in Utah annually and its uses are summarized in table 3.

Water supply is frequently more critical than is reflected in average or total figures. Flow in streams fluctuates widely and so considerable cropland can be irrigated only in the early season or during brief periods of high streamflow. Only one-third of presently irrigated land has an adequate water supply. Shortages have been particularly acute in recent years in the Sevier River Basin and areas to the south. With few exceptions the trend in Utah’s water supply has been steadily downward from 1943 to the present.

The bulk of the 51,391,000 acre-feet of water consumed within the state each year is in the form of evaporation and transpiration. Of the total supply available it has been estimated that it is consumed as follows: irrigated land 4.6 percent (fig. 3), dry-farmed land 1.0 percent, wasteland, national parks and monuments 6.4 percent, water surfaces 9.5 percent, outflow in interstate streams 4.3 percent, arable non-cropped land 1.9 percent, grazing and watersheds 72.1 percent, and municipal and industrial uses 0.2 percent.

Water Needs to 1980

Utah’s future water supply problem can be met in part by more efficient use of present supplies and in part by developing additional supplies. The key to both parts of the problem is largely water storage so that use can be planned in terms of need.

Water is now diverted for irrigation to provide about 4 acre-feet per acre. This is adequate for full use of presently irrigated land if the water could be made available as

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**Table 3. Estimates of Utah’s water resources and use**

<table>
<thead>
<tr>
<th>Source</th>
<th>Acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total supply from precipitation</td>
<td>53,000,000</td>
</tr>
<tr>
<td>Entering Utah in Bear River</td>
<td>725,000</td>
</tr>
<tr>
<td>Leaving state (Colorado, Snake, Virgin, Upper Bear)</td>
<td>2,334,000</td>
</tr>
<tr>
<td>Net annual consumed in Utah</td>
<td>51,391,000</td>
</tr>
<tr>
<td>Appearing in streams</td>
<td>10,000,000</td>
</tr>
<tr>
<td>Added to underground reservoirs</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Used from underground reservoirs</td>
<td>366,000</td>
</tr>
<tr>
<td>Diverted for agriculture</td>
<td>5,000,000</td>
</tr>
<tr>
<td>Consumptively used on croplands</td>
<td>3,000,000</td>
</tr>
<tr>
<td>Lost from lakes, ponds, and land by evaporation</td>
<td>8,000,000</td>
</tr>
<tr>
<td>Used for municipal purposes</td>
<td>200,000</td>
</tr>
<tr>
<td>Used for manufacturing</td>
<td>200,000</td>
</tr>
</tbody>
</table>

*Source: Water for Utah. Utah Water & Power Board and records of the State Engineer’s Office.*
needed. A major portion of the presently planned new water storage is needed to provide an adequate supply throughout the growing season.

On the basis of expected population growth and the associated industrial development, estimates of the changes in water requirements are shown in table 4.

The estimate shown in table 4 for municipal water needs is based on the present consumption projected at an annual increase of .0005 cubic feet per second per connection. This is the approximate increase in consumption per connection over the past 10 years. Water needs for industrial uses by 1980 were estimated by projecting present use at a rate equivalent to the amount of industrial growth anticipated to support the projected population in Utah.

### Table 4. Estimated present and projected 1980 water requirements in Utah*

<table>
<thead>
<tr>
<th>Item</th>
<th>Present use</th>
<th>Projected needs 1980</th>
<th>Percent increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal uses</td>
<td>200,000</td>
<td>375,000</td>
<td>87</td>
</tr>
<tr>
<td>Industrial uses</td>
<td>200,000</td>
<td>800,000</td>
<td>300</td>
</tr>
<tr>
<td>Irrigation</td>
<td>5,000,000</td>
<td>5,500,000</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>5,400,000</td>
<td>6,675,000</td>
<td>24</td>
</tr>
</tbody>
</table>

*Estimates of Utah Agricultural Experiment Station personnel by making reductions in estimates of the State Engineer based on lower population projections.

Where Will Additional Water Come From

Practically no additional water in Utah can be developed by direct diversion of natural streamflow resulting from rainfall and the melting of snow. The natural late season flow was appropriated in all of Utah's streams years ago and is being fully used. Additional supplies of water must come from storage of run-off and diversion from interstate and intrastate streams, development of underground water supplies, and more efficient use of existing water supplies.

Underground water. A map of the principal underground water basins of Utah is shown in fig 4. The estimated annual usage and the potential annual supply in each area so far as known are shown in table 5. A comparison of the location of underground water basins with the arable undeveloped soils indicates that there are significant possibilities for irrigating additional cropland with underground waters. Some possibilities include up to 20,000 acres in Cache County, additional lands in Weber, Davis, Box Elder, Salt Lake, Utah, Juab, Millard, and other counties. In several areas such as the Beryl-Enterprise Area of Iron County water tables are falling because of excessive pumping above the annual recharge. It is estimated that about 200,000 acre-feet of water are being pumped each year out of an estimated potential supply of at least 1,000,000 acre-feet. It is not known, however, what proportion of the
total underground water contains too much salt for irrigation purposes. Maximum use of underground waters will also require changes or more favorable interpretations of Utah's ground water laws.

Interstate and intrastate streams. A summary of present and proposed sources of water for Utah was published by the Utah Water and Power Board in 1948 as shown in table 6. These data, although revised in some cases as a result of more recent studies, indicate possible additions to our present supplies that may be developed to meet our increasing demands for water. Development of these projects would increase water to the state by 75 percent over present available supplies.

By means of storage and trans-basin diversion, primarily from the Colorado River system, a major stride towards achieving Utah's agricultural potentials can be accomplished. With water developed from proposed projects, 406,800 acres of land now insufficiently supplied with water plus 607,400 acres of new land could be irrigated (table 7). This would bring Utah's potential total to 1,722,500 acres which is approximately 50 percent more than the amount now under irrigation. This is an ultimate figure and will not be attained by 1980.

On the basis of interstate streams, undeveloped water that could be made available for use includes the following supplies:

1. Colorado River:
   a–Initial phase 394,000 acre-feet
   b–Ultimate phase 800,000 acre-feet.

2. Bear River: Of the total 1,500,000 acre-feet annually, 700,000 acre-feet flows into Great Salt Lake unused. Additional water planned from within the Bear River Basin amounts to 378,000 acre-feet and 410,000 acre-feet from transbasin diversion from the Colorado Basin. Recent studies and plans by the Bureau of Reclamation that may materialize by 1980 include the Bear River project to increase present supplies by 237,000 acre-feet and the Woodruff-Cokeville project by 30,100 acre-feet.

3. Virgin River: Current consumption requirements amount to 44,776 acre-feet of water. Estimated additional supplies amount to 130,224 or a total of 175,000 acre-feet planned in potential projects.

4. Columbia River (Upper Snake River Basin): Total present run-off amounts to 135,000 acre-feet with

Table 5. Inventory of known ground water basins, utilization, and conditions in Utah

<table>
<thead>
<tr>
<th>Area no.</th>
<th>Area</th>
<th>Estimated annual pumpage or utilization</th>
<th>Estimated annual supply</th>
<th>Quality of water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ashley Valley</td>
<td>Little use</td>
<td>20,000</td>
<td>Generally fair</td>
</tr>
<tr>
<td>2.</td>
<td>Bear Lake Valley</td>
<td>Little use</td>
<td>Not known</td>
<td>Generally good</td>
</tr>
<tr>
<td>3.</td>
<td>Beaver Valley</td>
<td>1,000</td>
<td>6,000</td>
<td>Generally good</td>
</tr>
<tr>
<td>4.</td>
<td>Blue Springs Valley</td>
<td>Not known</td>
<td>Not known</td>
<td>Not known</td>
</tr>
<tr>
<td>5.</td>
<td>Cache Valley</td>
<td>20,000</td>
<td>Not known</td>
<td>Suitable</td>
</tr>
<tr>
<td>6.</td>
<td>Cedar City</td>
<td>15,400</td>
<td>Not known</td>
<td>Generally suitable</td>
</tr>
<tr>
<td>7.</td>
<td>Cedar Valley</td>
<td>2,500</td>
<td>4,000</td>
<td>Generally suitable</td>
</tr>
<tr>
<td>8.</td>
<td>Central Sevier Valley</td>
<td>Not known</td>
<td>Not known</td>
<td>Not known</td>
</tr>
<tr>
<td>9.</td>
<td>Chicken Creek</td>
<td>Not known</td>
<td>Not known</td>
<td>Not known</td>
</tr>
<tr>
<td>10.</td>
<td>Dugway Valley-Skull Valley</td>
<td>3,000</td>
<td>80,000</td>
<td>Generally suitable</td>
</tr>
<tr>
<td>11.</td>
<td>East Shore</td>
<td>30,000</td>
<td>50,000</td>
<td>Generally good</td>
</tr>
<tr>
<td>12.</td>
<td>Escalante Valley</td>
<td>91,300</td>
<td>Not known</td>
<td>Generally suitable</td>
</tr>
<tr>
<td>13.</td>
<td>Fremont Valley</td>
<td>Not known</td>
<td>Not known</td>
<td>Not known</td>
</tr>
<tr>
<td>14.</td>
<td>Goshen Valley</td>
<td>Not known</td>
<td>Not known</td>
<td>Not known</td>
</tr>
<tr>
<td>15.</td>
<td>Grass Valley</td>
<td>Not known</td>
<td>Not known</td>
<td>Suitable</td>
</tr>
<tr>
<td>16.</td>
<td>Grouse Creek</td>
<td>Not known</td>
<td>Not known</td>
<td>Not known</td>
</tr>
<tr>
<td>17.</td>
<td>Jordan River Valley</td>
<td>40,000</td>
<td>150,000</td>
<td>Good</td>
</tr>
<tr>
<td>18.</td>
<td>Juab</td>
<td>1,000</td>
<td>Not known</td>
<td>Suitable</td>
</tr>
<tr>
<td>19.</td>
<td>Kamas Valley</td>
<td>Not known</td>
<td>Not known</td>
<td>Good</td>
</tr>
<tr>
<td>20.</td>
<td>Lisbon Valley-Montezuma Creek</td>
<td>Not known</td>
<td>Not known</td>
<td>Not known</td>
</tr>
<tr>
<td>21.</td>
<td>Malad-Lower Bear River Valleys</td>
<td>8,000</td>
<td>10,000</td>
<td>Suitable</td>
</tr>
<tr>
<td>22.</td>
<td>Moab</td>
<td>Not known</td>
<td>Not known</td>
<td>Not known</td>
</tr>
<tr>
<td>23.</td>
<td>Morgan</td>
<td>Not known</td>
<td>Not known</td>
<td>Not known</td>
</tr>
<tr>
<td>24.</td>
<td>Ogden Valley</td>
<td>15,000</td>
<td>25,000</td>
<td>Suitable</td>
</tr>
<tr>
<td>25.</td>
<td>Pahvant Valley</td>
<td>20,000</td>
<td>50,000</td>
<td>Suitable</td>
</tr>
<tr>
<td>26.</td>
<td>Park Valley</td>
<td>Not known</td>
<td>Not known</td>
<td>Not known</td>
</tr>
<tr>
<td>27.</td>
<td>Parowan Valley</td>
<td>11,400</td>
<td>4,800</td>
<td>Suitable</td>
</tr>
<tr>
<td>28.</td>
<td>Provo</td>
<td>Not known</td>
<td>Not known</td>
<td>Not known</td>
</tr>
<tr>
<td>29.</td>
<td>Rush Valley</td>
<td>2,000</td>
<td>20,000</td>
<td>Suitable</td>
</tr>
<tr>
<td>30.</td>
<td>Sanpete Valley</td>
<td>6,000</td>
<td>50,000</td>
<td>Suitable</td>
</tr>
<tr>
<td>31.</td>
<td>Sevier Desert</td>
<td>3,500</td>
<td>40,000</td>
<td>Not known</td>
</tr>
<tr>
<td>32.</td>
<td>Snake Valley-Deep Creek</td>
<td>30,000</td>
<td>50,000</td>
<td>Generally suitable</td>
</tr>
<tr>
<td>33.</td>
<td>Tooele Valley</td>
<td>16,000</td>
<td>30,000</td>
<td>Suitable</td>
</tr>
<tr>
<td>34.</td>
<td>Uinta</td>
<td>Not known</td>
<td>Not known</td>
<td>Localized saline water</td>
</tr>
<tr>
<td>35.</td>
<td>Upper Bear River Valley</td>
<td>Not known</td>
<td>Not known</td>
<td>Suitable</td>
</tr>
<tr>
<td>36.</td>
<td>Upper Sevier Valley</td>
<td>Not known</td>
<td>Not known</td>
<td>Suitable</td>
</tr>
<tr>
<td>37.</td>
<td>Utah Lake Valley</td>
<td>50,000</td>
<td>200,000</td>
<td>Suitable</td>
</tr>
</tbody>
</table>

Map and table compiled from information from U.S. Geological Survey, State Engineer's reports, and other sources.

Table 6. Summary of annual present and proposed future water supply by drainage basins in Utah *

<table>
<thead>
<tr>
<th>Item</th>
<th>Upper Bonneville Basin</th>
<th>Upper Colorado River Basin</th>
<th>Virgin River Basin</th>
<th>State total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,000 acre-feet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present supply</td>
<td>2,277.5</td>
<td>552.9</td>
<td>45.0</td>
<td>2,875.4</td>
</tr>
<tr>
<td>Proposed additions</td>
<td>665.9</td>
<td>1,441.2</td>
<td>56.3</td>
<td>2,163.4</td>
</tr>
<tr>
<td>Present and proposed additions</td>
<td>2,943.4</td>
<td>1,994.1</td>
<td>101.3</td>
<td>5,038.8</td>
</tr>
<tr>
<td>Percent increase</td>
<td>29.0</td>
<td>261.0</td>
<td>74.0</td>
<td>75.0</td>
</tr>
</tbody>
</table>

about one half leaving the state. Utah is maintaining the right to use the other half of the total amount produced in the state or acre-feet of additional water for this area.

A recent report by the Utah Water and Power Board to the Select Committee on National Water Resources of the United States Senate estimated that 12 federal projects planned to 1980 would provide total additional storage of 1,954,160 acre-feet of water for Utah. Also, 71 non-federal projects would provide an additional 179,882 acre-feet. This amounts to a total of 2,134,042 acre-feet to be provided by 1980. From 1980 to 2000, additional federal projects would provide 1,093,900 acre-feet for the state, and non-federal projects another 28,786 acre-feet of water for a total of 3,256,728 acre-feet more than at the present. This would provide a full irrigation supply of water to an equivalent of 445,759 acres of new land.

Data collected from the Bureau of Reclamation recently (table 8) show the additional amount of water to be provided by projects planned for the near future.

**Increased efficiency of use.** Although surface run-off is fully appropriated, some of this water could be salvaged by increasing efficiencies of use. It is estimated that the water diverted in Utah 35 percent is “lost” before it reaches the farm. Few farmers obtain application efficiencies as high as 50 percent. Potential increase in water from greater efficiency of use is tremendous. Measurements and estimates are needed of water losses each year through evapotranspiration from open lakes, swamps, and wet areas fed by surface waters and underground sources. It is estimated that a total of nearly 8 million acre-feet of water is lost from the Great Basin area from evapotranspiration from lake surfaces and marshy and high water table areas.

In total, Utah may have a potential water development of 1% million acre-feet from the Colorado River, and from the Great Basin an estimated 9 million to nearly 12 million acre-feet. These figures do not consider quality conditions or the economic feasibility of developing these unused waters for use. Numerous institutional, physical, and economic problems must be resolved before ultimate development of the state resources can be made.

### Problem of Development for Future Needs

From estimates of water available from all sources there are seemingly considerable quantities to meet future requirements—certainly the needs of 1980. These estimates, however, are in terms of physical supplies, and before full development will be made, they must become a subject of economic demand. The actual development of physical supplies to meet future needs is fraught with problems of overall planning, physical diversion and use of water, legal disputes and arrangements, various governmental responsibilities, and economic problems. All these factors cause some duplications, competition, and waste of our resources.

### Physical problems

Utah has more than 3 million acres of land suitable for irrigation lying dormant because of lack of water and nearly two-thirds of our presently irrigated land with only a partial supply. Yet we have over 2½ million acres of land suffering from too much water. Land contemplated for irrigation will likely increase the drainage problems of existing irrigated acreages. Usually our programs on land drainage are left to the individual farmer while our water development is on a valley or drainage basin basis. Shortages may be apparent in water supply, yet many irrigators apply excess water to their land and allow heavy seepage through unlined ditches.

Plants are the major consumers of water. Research on water relations of plants and soils is needed to find how crop production can be carried out with a minimum of

---

**Table 7. Area of land now irrigated and areas proposed to benefit from future development of additional water supplies**

<table>
<thead>
<tr>
<th>Item</th>
<th>Bear river area</th>
<th>Weber river area</th>
<th>Central Utah area</th>
<th>Misc. areas</th>
<th>Virgin river area</th>
<th>Total Utah</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate supply</td>
<td>77.0</td>
<td>68.0</td>
<td>231.2</td>
<td>27.8</td>
<td>3.5</td>
<td>407.5</td>
</tr>
<tr>
<td>Partial supply</td>
<td>163.0</td>
<td>57.0</td>
<td>398.0</td>
<td>119.4</td>
<td>20.2</td>
<td>757.6</td>
</tr>
<tr>
<td>Total irrigated</td>
<td>240.0</td>
<td>125.0</td>
<td>629.2</td>
<td>147.2</td>
<td>23.7</td>
<td>1,165.1</td>
</tr>
</tbody>
</table>

**Table 8. Federal reclamation and state projects and amounts of water they will provide**

<table>
<thead>
<tr>
<th>Projects</th>
<th>Amount of water to be diverted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal</td>
<td>acre-feet</td>
</tr>
<tr>
<td>Central Utah—Vernal*</td>
<td>19,500</td>
</tr>
<tr>
<td>Central Utah—(initial phase):†</td>
<td>394,000</td>
</tr>
<tr>
<td>Woodruff-Cokeville</td>
<td>30,100</td>
</tr>
<tr>
<td>Bear River project‡</td>
<td>237,000</td>
</tr>
<tr>
<td>Emery County project</td>
<td>51,000</td>
</tr>
<tr>
<td>Gooseberry project</td>
<td>13,800</td>
</tr>
<tr>
<td>Weber Basin</td>
<td>285,000</td>
</tr>
<tr>
<td>De Beque (estimated)</td>
<td>300,000</td>
</tr>
<tr>
<td>State</td>
<td>179,882</td>
</tr>
</tbody>
</table>

*Includes 1,600 acre-feet for municipal and industrial uses.
†Includes 49,000 acre-feet for municipal and industrial uses. Ultimate phase will provide 1,630,000 acre-feet of water.
‡Includes 25,000 acre-feet for municipal and industrial uses but excludes 264,000 and 112,000 acre-feet for power and bird refuge uses, respectively. Source: U.S. Reclamation Service and Utah Water and Power Board.

1948.
water. We are also faced with the question as to whether watersheds can be managed to yield more water in surface streams. Much of our native vegetation brings small returns. Can this be replaced with more desirable plants?

The physical and financial problems associated with handling water are major. Any developments that will make these facilities more efficient and less costly will contribute in an important way to the future of the state. The water users of the state have recently made an inventory of our urgent needs. This shows that we need 130 miles of flow pipe to be installed in our canyons and in communities. As of today’s prices, this would cost about $2,435,550. We need 931 miles of canal lining on our major and main canals at a cost of $14,500,000. We need 684 miles of canal realignments and alterations at a cost of $2,500,000. We need 210 permanent diversion dams installed at a cost of $693,000; 2,512 control structures at a cost of $336,000. This amount of development makes a total estimated cost of $20,300,000. In addition to this, there is needed, to improve irrigation, many hundreds of miles of canal lining and diversion structures on head ditches of our many farms.

Public problems. Fully developing ground-water basins often conflict with early rights to the use of water from flowing or low lifting wells. Most of Utah’s 32,000 wells are in areas where considerable acreage of wet lands is found. People feel strongly about their rights to the continued use of this water delivered under pressure, even though many thousands of gallons of water are wasted to evaporation and transpiration for every one gallon used from the well.

Obviously, these and other problems must be solved before Utah can meet the potential state of development of which it is capable. To insure the future development and prosperity of Utah the state should immediately adopt a long-range program for land and water including the following:

1. A complete inventory of water and land resources including evaluations of quality and adaptations for various uses.
2. A careful projection of water and land needs and uses by areas, by decades, over the next fifty years.
3. The development of a state plan for the optimum use of these resources and ways in which this can be accomplished, and adoption of the plan.

4. A concerted research program on these resources and their use including (a) efficient use and reuse of water; (b) improved procedures and practices for storing and transporting water; (c) ways in which watersheds can be managed to increase water supply; (d) meteorology and climatology of the state including weather modification; (e) the suitability of lands for various uses and practices to give optimum returns; and (f) laws that will provide for best uses of these resources.
seem likely as demands for hunting increase. The summer range areas in the mountains are becoming increasingly important for water supply, and pressures are increasing to manage these lands with first priority as watersheds.

The anticipated decreases in grazing permits on federal lands will result in either reduction in livestock numbers or increasing pressure on private lands, particularly irrigated croplands.

With increased quality of livestock, more ranchers are unwilling to place these animals on public ranges where lack of fences, numerous predators, poisonous plants, and impossibility of close supervision and breeding control make production hazardous and low in efficiency. Year-long dependency of Utah's livestock industry upon rangeland can be expected to lessen somewhat.

**Forage Production on Rangelands Can Be Increased**

Research shows greatly improved range production to be feasible through artificial and natural rehabilitation of deteriorated ranges. Seeding improved grasses, fertilizing, brush control, and improved livestock distribution offer real hope. It has been shown that cattle in Rich County gained two pounds per day on crested wheatgrass compared to no gain on native sagebrush-grass-range. In Tooele County, 170 pounds of calf were produced per cow on intermediate wheatgrass compared to 93 on native range during three months of spring and early summer. Sheep in Juab County produced lamb crops of 130 percent and weaned 87 pounds of lamb per ewe when grazed on intermediate wheatgrass pastures in the spring, compared to lamb crops of 112 percent and 75 pounds of lamb from ewes on unimproved land.

Control of mule ear dock on national forests and Bureau of Land Management districts for the period 1951 to 1959.
summer ranges in northern Utah increased forage production for livestock as much as 800 pounds per acre and control of the invasion of sagebrush in seeded foothill ranges in central Utah increased forage production as much as 900 pounds per acre. Much more research of this nature is needed if range livestock production is to keep abreast of the changing times. Further progress in increasing efficiency of range production can be expected.

This increased efficiency made possible by better range management, will result in higher meat yields per animal on the range.

Future years will see a shift from small, often sub-marginal and part-time ranch operations, to larger operations. A 10 percent increase in yield from present numbers of breeding stock on the range appears attainable. But this will require more research on range management methods.

FOREST LANDS ARE ASSUMING IMPORTANCE

APPROXIMATELY 16 million acres or 31 percent of Utah's land area is considered forest land. However, only about one-fifth of this amount, or 3 million acres, is commercial forests, the remaining 13 million are forest-bearing trees of presently unusable quality or too scattered to make economic harvesting feasible.

Utah has never been considered an important timber-producing state, but the picture has been changing in the last two decades. Wartime and postwar demands, accompanied by rising prices and decreasing quality of lumber shipped in, have caused an accelerated increase in lumber production in Utah.

More than 85 percent of the commercial forests in the state are owned or managed by the federal government. About 2 percent are owned by the state of Utah, and the remaining 13 percent are privately owned or managed.
The composition of Utah's forests by stand size class in 1953 is shown in table 9, and the distribution by species in table 10.

It is estimated that the saw timber in Utah's forests is putting on growth at the rate of about 90 million board feet a year (fig. 6). This is well above the annual harvest of about 70 million board feet, but insects, disease, and fires in these old stands cause an additional mortality of about 52 million board feet, leaving a deficit each year.

Utah consumes annually about 180 million board feet of lumber, including the various softwoods, hardwoods, and other specialized types. This means that production is only about 40 percent of consumption. This relation is further reduced when exports of lumber (about 15 percent of the total production) are subtracted.

Projections Into The Future

The demand for timber in Utah is expected to increase considerably by 1980. The per capita demand will not change markedly, but a rapidly expanding population will increase demand for all timber products by 37 percent, as estimated by the United States Forest Service. The possibilities for further expansion of the lumber industry in Utah to meet this increased domestic need seem good. New access roads are opening up forest areas previously unavailable for harvest, and new uses are being found for species of trees heretofore considered almost valueless commercially. Cottonwood and aspen are cases in point; both of these species have taken on considerable commercial value in recent years.

In the two decades from 1940 to 1960 lumber production in Utah increased fourfold, and considering the expected demand increases, it is not unreasonable to expect the next two decades to 1980 to see a doubling of our present production of 70 million board feet.

If the lumber industry is to be stabilized in Utah, information and well planned action programs are needed in a number of areas. Systematic harvesting of old timber stands is needed along with improved methods for reducing the present high mortality and deterioration of mature trees. Better practices are needed to regenerate desirable timber species after cutting. Best management practices such as planting, thinning, and pruning to obtain optimum lumber returns are not known for Utah conditions. We need to know more about soil, climate, and general site characteristics in relation to tree adaptation and rate of growth. The harvesting and marketing of timber under Utah conditions are not well understood. Many present practices are wasteful and not favorable for re-establishing desirable tree species.

LAND USE FOR RECREATION IS BECOMING INCREASINGLY COMPETITIVE

Recreation is becoming increasingly competitive with grazing, lumber, and other uses of Utah's non-cropped or wildlands. The expanding demand for recreation is requiring adjustments in
land-use patterns in order to be compatible with water yield, grazing, and timber production.

Wildland recreational needs are skyrocketing in Utah. This results from such sociological and economic factors as: population increase, increase in per capita income, a shorter work week, more vacation time, better transportation facilities, and the trend toward urbanization and the resulting demand for wildland recreation as a release from the tension of modern urban living.

Wildland recreational demand in Utah is unknown; however, two federal agencies have made fairly reliable estimates of the number of visitors to their areas for recreation. In 1959, visits to the national parks, national monuments, and national forests of Utah numbered 5,800,000 (fig. 7).

In a study of potential wildland recreational demand for the United States, it is argued that the factors of population increase, income per capita, leisure, and mobility are multiplicative factors. Assuming an increase to the year 2000 of twice as many people, twice as high per capita incomes, half again as much travel per capita, and half again as much real leisure time, then by 1980 we could expect an increase of five times the present demand, or a demand to supply wildland recreation for 30,000,000 visitors on the national forests, national parks, and monuments in Utah. Probably a 25 percent greater demand is being made, and will continue to be made, on other federal lands and on state and private lands in Utah. This could amount to a total of 37,000,000 visitor demands on the wildland recreational areas in the state.

These visitors desire campgrounds, picnic sites, winter sports areas, organized camps, hotel sites, resort and summer home sites, historical sites, and general scenic areas. This potential demand may never be quantitatively or qualitatively realized because: (1) regardless of the demand, other competing uses may have high priority over

Utah is rich in recreation resources. Her forests, her mountains, her streams, her national parks and monuments furnished recreation for nearly 6 million visitors in 1959.
recreational sites, and (2) increasing human occupancy of recreational areas tends to destroy some of the quality for which the sites were selected and developed.

This potential demand, however, forces us to take a closer look at the land-use adjustments in Utah. Some steps have already been taken. The Utah Park and Recreation Commission was created in 1957 and charged with the responsibility of a comprehensive long-range plan for a state park and recreation system. The U.S. Park Service adopted a "Mission 66" program and the U.S. Forest Service, an "Operation outdoors" program to help meet the increased demand.

**THE OUTLOOK FOR CROPS AND LIVESTOCK**

The estimated increase in population of 59 percent in Utah, 61 percent in the Western States, and 36 percent in the nation by 1980 does not necessarily imply a shortage of food. On the national level it has been estimated that with full use of production and marketing technologies now available the present land and water resources are adequate to produce the food requirements. However, this estimate implies more complete use of the presently developed land and water and higher yields. It also means considerable shifting of sources of supply, markets, and types of production within the country. Population, however, will continue to increase beyond 1980. By the year 2000 additional land and technologies will be needed if the people are to have adequate diets.

The agricultural production in Utah in 1959 was near typical of recent years. Assuming the production of that year, the population of 1960, the projected population for 1980, and also assuming that the per capita consumption of the basic foods in Utah is the same as has been estimated for the nation, the relation between 1959 production and the 1960 and 1980 requirements has been determined (table 11). Currently, consumption exceeds production within the state for pork, chicken, vegetables, and fruit. Unless production is increased by 1980 the state will also have additional deficits in beef, eggs, and milk.

It is not likely, and probably not desirable, that the state become self-sufficient in the production of every kind of food. With improved rail and highway transportation, and with incomes high enough to command foods from foreign countries as well as other states, the tendency will probably be to produce those products in which we have the largest comparative advantages. The more rapid growth of population in the Western States may improve the marketing advantage for bulky and perishable products. For the economic welfare of the state it is more important to work toward maintaining its relative position in total agricultural production than to plan to be self-sufficient in food production.

To accomplish this will require many adjustments in the organization of farms and farm-centered businesses. It will also require a much wider adoption of modern technology and the development of new solutions to existing production problems. To remain com-

**Table 11. Production of selected farm products in 1959 and requirements for 1960 and 1980 in Utah**

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Production (1959)</th>
<th>Requirements (1960)</th>
<th>Surplus or deficit (1980)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef and veal*</td>
<td>1000 lbs. 114,732</td>
<td>74,398</td>
<td>132,916</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1960 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>40,335</td>
<td>-11,183</td>
</tr>
<tr>
<td>Lamb and mutton*</td>
<td>1000 lbs. 32,888</td>
<td>4,010</td>
<td>6,363</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1960 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>28,878</td>
<td>26,525</td>
</tr>
<tr>
<td>Total*</td>
<td>1000 lbs. 162,502</td>
<td>138,996</td>
<td>245,329</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1960 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>23,506</td>
<td>-82,827</td>
</tr>
<tr>
<td>Chicken†</td>
<td>1000 lbs. 8,637</td>
<td>21,384</td>
<td>38,178</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1960 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-12,747</td>
<td>-29,541</td>
</tr>
<tr>
<td>Turkey†</td>
<td>1000 lbs. 37,944</td>
<td>4,010</td>
<td>7,353</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1960 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>33,934</td>
<td>30,591</td>
</tr>
<tr>
<td>Total†</td>
<td>1000 lbs. 46,581</td>
<td>25,294</td>
<td>45,521</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1960 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>21,187</td>
<td>1,050</td>
</tr>
<tr>
<td>Eggs, number</td>
<td>1 million 397</td>
<td>339</td>
<td>570</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1960 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50</td>
<td>-213</td>
</tr>
<tr>
<td>Milk†</td>
<td>1 million lbs. 765</td>
<td>622</td>
<td>1,018</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1960 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>143</td>
<td>-253</td>
</tr>
<tr>
<td>Wheat</td>
<td>1 million lbs. 321</td>
<td>156</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1960 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>146</td>
<td>95</td>
</tr>
<tr>
<td>Sugar</td>
<td>1 million lbs. 166</td>
<td>85</td>
<td>132</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1960 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>81</td>
<td>34</td>
</tr>
<tr>
<td>Potatoes</td>
<td>1 million lbs. 149</td>
<td>87</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1960 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>62</td>
<td>29</td>
</tr>
<tr>
<td>All vegetables</td>
<td>1 million lbs. 181</td>
<td>190</td>
<td>339</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1960 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-9</td>
<td>-158</td>
</tr>
<tr>
<td>All fruit</td>
<td>1 million lbs. 64</td>
<td>192</td>
<td>255</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1960 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-128</td>
<td>-271</td>
</tr>
</tbody>
</table>

*Carcass weight.
†Eviscerated weight.
‡Whole milk equivalent of all milk products.
§These data assume production to continue at the 1959 rate. Actually great increases are possible in many of these products as demand increases.
petitive will require continuous re­
search, study, and teaching.

Dairying Will Remain An
Important Industry

If the dairy industry of Utah is
to continue to meet the demand for
fluid milk and dairy products in the
next 20 years it must maintain a
steady growth.

Currently about 8,000 dairymen
are milking about 101,000 cows pro-
ducing about 765 million pounds
of milk. Of this about 60 percent
or 447 million pounds is sold as
grade A milk to plants and about 30
percent or 235 million pounds is
sold as manufacturing milk. Most
of the remaining 10 percent is used
on the farm with some being re-
tailed and some sold as cream.

We currently consume in the
state the milk equivalent of about
622 million pounds of fluid milk
and dairy products (fig. 8). Thus,
we now have a surplus and are able
to sell more fluid milk and manu-
factured dairy products to other
states than we buy from them.

With the increase in population
expected we will consume the milk
equivalent of about 1,018 million
pounds of fluid milk and dairy
products in 1950. To produce as
much as we consume we will have
to increase production of milk about
250 million pounds.

There is little question but what
we will produce all of the fluid
milk and cream we require in 1980
and perhaps some for surrounding
states which will have a short sup-
ply. Fluid milk and cream are
bulky and perishable and are more
economical to produce and market
near consuming centers. We are
currently producing an ample sup-
ply of milk eligible for fluid use—
using only about two-thirds for
fluid milk and cream and the rest
for manufacturing. Sufficient fluid
milk and cream are foreseen to meet
demands during the foreseeable
future with supply increasing more
rapidly than demand during the
last decade.

While the production of grade A
milk has been increasing, the pro-
duction of manufacturing milk in
Utah has been decreasing. The
total production of manufactured
dairy products in Utah has remain-
ed about the same, however, be-
because an increasing amount of
grade A milk has been diverted to
manufacturing use. As we begin
to use a larger proportion of our
grade A milk for fluid purposes,
we may have to import more manu-
factured dairy products.

By 1980 production per cow will
have increased by about 20 per-
cent. Even with the same number
of milk cows as we now have and
the trend from production of manu-
facturing to grade A milk, we will
have no difficulty in producing an

Fig. 8. Production of
dairy products in
Utah 1950-59
with present and projected
consumption to 1980
ample supply of milk to meet the demand for fluid milk and cream.

In order to have the same supply-consumption balance we now have, however, with respect to consumption of fluid milk and cream and manufactured products as well as exports, we will have to increase cow numbers between 30 and 50 percent.

At the present time about 30 percent of the irrigated land in Utah is needed to supply feed for dairy cows. Although much of the foreseen increased production of milk can be obtained from feeding additional quantities of grain and other concentrates shipped in from other states, an increased amount of land will be required to produce additional roughage for dairy stock.

In the past 10 years, the number of farms reporting milk cows decreased from 16,000 to 10,000 and the number of farms reporting sales of milk and cream decreased from about 11,000 to 6,000. The number of producers shipping grade A milk is decreasing about 10 percent per year. The general trend will continue toward fewer herds.

Marketing of milk in Utah is currently handled by four large cooperatives, an equal number of nationally affiliated dairies, and a number of smaller independents. Some consolidation has occurred in recent years and consolidation is expected to continue, but no material change in the marketing structure is expected.

There may be some changes in processing with greater demands for fluid milk and with new products and processing methods. The production and distribution of fresh and sterile concentrate milk is on the horizon, but as yet no major impact is foreseen on Utah markets.

Some dairies now buy from and sell in neighboring states. With the increase in size of dairies and the continued improvement in roads and transportation facilities this trend is likely to continue. Sales of fluid milk in most surrounding states will likely increase as they develop shortages more rapidly than we do.

With industrialization and urbanization in some of the areas now used for dairying, a shift in production areas is expected. Production will tend to shift from the central to the more outlying counties. Although production is still increasing in Davis and Salt Lake Counties, it is not increasing as rapidly as in counties such as Cache, Box Elder, Sanpete, Summit, and Utah. It will likely decrease in these first two counties as population and industrialization increase.

Problems of dairy management and farmstead planning will need special attention as production areas change and as size of herd increases. More acres of irrigated farmland will be devoted to forage production. More grain and other concentrates will be fed per cow as production per cow increases. More of the concentrated feed will be shipped in from out-of-state.

As herd size increases, health problems will increase, especially in relation to mastitis. Infertility is another serious problem that interferes with economical production. Solution must be sought to these and other disease problems.

More uniformity in milk quality and control of undesirable residues of antibiotics, pesticides, and herbicides should be sought after.

Specialized calf raising could develop as an enterprise for dairymen who shift from milk production. With increased cow numbers, an increase in number of dairy animals slaughtered for beef can be expected.

If the present economic advantage of producing fluid milk and cream near the markets where they are consumed continues, dairying will remain an important agricul-

As grazing permits are cut, other sources of feed must be found for range livestock if producers are to stay in business. Among these are irrigated pastures, increased production on available range through reseeding and better management practices, and higher yields of forage crops.

FOR DECEMBER 1960
tural industry in Utah and will have first priority on feed resources.

**The Challenge Faced by Utah Livestock Producers**

Since early days Utah has been a surplus production area for beef cattle, lambs, mutton, and wool. This is because of the wide areas of range that have had value mostly for grazing. Utah ranchers have helped supply other parts of the country with cattle and sheep for finishing in feed lots as well as adequately supplying the meat needs of the Utah market. Pork has been imported into Utah from the Midwest. Whether Utah producers can produce the meat required by the home market by 1980 and at the same time maintain their hold on the present export market is the challenge posed by the future.

Demand for red meat through 1980 will increase. If the dietary habits of the people remain unchanged, the production of red meat will need to be increased approximately 25 percent to meet the demands of an increased population. However, upward trends in annual per capita consumption of meat, as experienced since 1910, are expected to continue through 1980. Real income per person is expected to increase over the next 20 years. Associated with rising incomes will come a continuing shift in demand in the direction of more meat. It has been estimated that a 10 percent increase in real income in the United States will result in an increase of 2.5 percent in red meat consumption. Because of population shifts, demand in Utah and the West will increase more than for the country as a whole.

What of the supply picture for livestock products in the future? Can livestock producers in Utah meet the challenge of supplying a growing home market and maintain the present share of a growing national market? The answer is yes if producers and researchers can improve physical and economic efficiency so Utah producers can
strengthen their advantage over competing production areas.

Most of Utah's land has had only one economic use in the past. That use has been for range livestock production. The relatively small area devoted to irrigated crops has been used largely to produce forage crops to winter sheep and cattle and to feed dairy cows. Sheep and cattle along with dairy animals will probably continue to have priority on the irrigated forage-producing areas of the state. However, pressures for other uses of grazing lands in Utah such as for recreation and water production are gradually limiting the use of public grazing lands by livestock. Permitted grazing on public grazing lands has been reduced during the 1950's. There is strong indication that continued reductions will be imposed. To maintain present levels of livestock production or to increase numbers, additional feed supply must be found. Research studies have shown that improving range-lands can add materially to the amount of feed produced per acre. Increases in irrigated forage crops through the growing of better varieties and the adoption of better management practices could add greatly to the amount of feed produced.

Because of the priority which roughage consuming cattle, sheep, and dairy animals have on feed production in the irrigated areas of the state and because of the extreme competition in the Midwest, Utah has not produced many swine. Except for localized situations, Utah producers will probably continue to concentrate on cattle, sheep, and dairy animals with the bulk of the pork needs imported (fig. 9). Utah pork consumption is expected to increase from the 1960 estimated level of 60 million pounds to about 106 million pounds by 1980. Production in Utah may increase from nearly 15 million pounds in 1959 to between 25 and 30 million by 1980 if production economies are practiced.

The ability to increase production of beef cattle to meet future demand pressures will require more
changes and improved management practices are adopted. Assuming an increase of three eggs per hen per year (the average annual increase of the past decade), egg consumption requirements of Utah could be met with an increase of 10 percent in the number of layers by 1980. This production rate, 275 eggs per hen, is now being attained by the better producers in the state although it is recognized that as the biological limit in production is approached the rate of increase will inevitably slow down.

If egg production is to keep pace with consumption requirements to 1980, research is needed which will aid producers to make the shift to more efficient integrated operation, to control diseases, and to discover and adopt improved nutritional requirements, management, and marketing practices.

Chickens. Utah producers presently produce about 40 percent of the state’s consumption requirements for chickens (fig. 13). About half of the production represents stewing hens, a by-product of the egg industry, and the other half commercial fryers. The 60 percent imported is largely fryers. Stewing hens will continue to be produced but not in materially increasing numbers.

Commercial fryer production is not likely to increase much above present levels of about 6 million pounds annually. Utah producers cannot successfully compete with the lower feed, labor, housing, and fuel costs of the South and Middle West. With increasing consumption requirements, the production deficit for chickens in Utah will approach 25 to 30 million pounds by 1980.

Turkeys. Turkey production in Utah greatly exceeds consumption requirements and has rather consistently increased during the past decade (fig. 14). In recent years about 90 percent of Utah's production has been shipped to distant markets, largely in the East.

Almost from the beginning of the industry, turkeys have been produced in relatively large units and at present nearly all are grown under large-scale integrated arrangements. Where a cooperative is the integrator some individual producers are comparatively small but the advantages of integration are passed on to these producers through the cooperative.

Unlike the egg and fryer facets of the poultry industry, turkey production in the state is still expanding. New developments include large buildings for confinement rearing of turkeys. With these will come year-round production as well as automatic lighting, ventilation, feeding, and watering.

Whether turkey production in Utah will continue to expand will depend upon the ability of producers to keep pace with changing conditions. With the present organization and structure, including hatcheries, feed plants, and processing plants, Utah will continue to produce turkey in excess of consumption requirements in the years ahead.

Crop Production Will Be Influenced by Many Factors

The amounts and kinds of crops produced during the next 20 years will be influenced by the amount of cropland and irrigation water available, the number of different kinds of livestock kept, the available

New type pens for year-round confinement rearing of turkeys

Average yields of alfalfa in the state could be more than doubled if farmers planted disease-resistant, winter-hardy varieties, practiced crop rotation, and used more fertilizers.
labor, processing facilities, prices, and public policies. As at present each farmer will tend to produce those crops that are most profitable under his particular conditions. Considering the nature of the several commodities and the markets that are expected to prevail in 1980 it is possible to indicate the general direction of the cropping pattern. It will no doubt be a continuation of present trends.

It is expected that there will be a net increase in irrigated cropland of as much as 50,000 acres and that an equal acreage of land now irrigated will receive supplemental water.

Forage crops. Forage crops are bulky and relatively expensive to transport. This makes the importing of these feeds impractical for most conditions. Because a large part of the land in Utah is used for grazing milk and beef cattle and sheep during a part of the year a large part of the arable land must be used to produce forage to feed them for the remainder. In 1959 just half of the total cropland harvested was planted to forage crops. In 1949 the percentage was 41. During this period alfalfa plantings increased from 360,000 to 411,000 acres, while wild hay decreased from 100,000 to 63,000 acres. The quality as well as the quantity of the forage is increasing. It appears likely that the production of forage crops will have first claim on a large part of the irrigated cropland in the years ahead. Only a small amount of forage is grown on dry farmed land.

To produce the forage needed to support the expected increase of dairy cows and beef cattle would require an increase of at least 25 percent in forage production. Additional amounts could be used to expand the feed lot fattening operations. It is likely that a slightly larger acreage will be used to produce forage crops in 1980 than in 1960 and a larger part of it will be alfalfa. More and more of the wild hay land is being used for pasture. Most of the increase in forage needs is expected to be obtained from increased yields of alfalfa. The average yield during the past 10 years is just a little more than 2.5 tons per acre. Many farmers, however, regularly harvest 6 to 7 tons per acre. The low average is largely attributed to inadequate irrigation water, lack of fertilization, thin stands, lack of rotation, and disease and insect damage. By the adoption of proper management practices average yields can be increased to 3.25 tons. On most lands that have a full water supply the yield can exceed this.

Feed grains. Barley is the major feed grain in Utah. Others are corn, oats, and rye. Rye production is of little importance; oat production is also declining. Most of the corn is ensiled and could be considered a forage crop. The importance of barley and corn has increased during the past 10 years. The total feed grains accounted for 15.7 percent of the acreage of all cropland harvested in 1949 and 19.7 percent in 1959. It is expected that the present acreage of feed grains will be maintained and may be increased. Yields per acre of these crops will also increase as more adequate water supplies become available and as improved varieties are developed and better production practices are adopted.

Utah's livestock is now and will continue to be dependent to a considerable extent on imported feed grains. The continued availability of this supply at a reasonable price is important to Utah feeders. With favorable conditions it could result in a considerable expansion of livestock fattening operations in the state.

Food grains. Wheat is the only food grain grown in Utah and is grown largely on dry cropland. Its future as well as its immediate past is largely dependent upon government policies. It was once an important feed, as well as food grain and may become so again. So far
Both corn silage and grain corn are of major importance to the state's dairy and beef industries. Adapted hybrids can produce 30 tons of silage an acre. Yields of grain in excess of 150 bushels an acre are produced in Weber and Davis Counties.

it has little competition on dry-farm lands.

In 1950 more than 416,000 acres of wheat was harvested, of which about 85,000 was on irrigated land. In 1959 the total acreage harvested was just slightly over 226,000 of which about 54,000 were irrigated. Apparently a considerable part of the normal wheat acreage is in the soil bank. One of the real needs is to develop a feasible alternative to wheat on these lands. The future acreage of wheat will depend upon government programs.

Probably some of the land should be seeded to forage grasses. On the irrigated land wheat enters into the rotation. Without price support, some of it would probably be replaced by barley.

Field crops. Sugar beets, potatoes, and dry beans are the major crops in this group. In 1949 the total acreage amounted to about 54,000 acres, but in 1959 only about 48,000. Sugar beets increased by about 3,000 acres while potatoes deceased by nearly 6,000 acres and beans by 8,000.

The sugar beet acreage has no doubt been affected by the sugar program of the government. The future acreage will also be influenced by what the government does. Conditions that would assure the present or higher prices in relation to alternatives would probably result in some increase in acreage planted. Capital investments are so high that some assurance of continuity of favorable prices in relation to alternative opportunities would be necessary to obtain a marked increase in acreage. It seems likely that this enterprise will continue at about the present acreage. With more adequate water supplies and the improvement of production practices, yields can be expected to increase slightly.

The lands on which potatoes have a favorable advantage over alternative crops seem restricted in area and to only a few parts of the state. These are not large enough to increase total production much. The area could change, however, in response to price changes. It is expected that the state will produce enough potatoes to supply its needs.

Dry beans are grown in only one or two areas, and most of them are grown on dry-farmed land where yields tend to be low. They compete with wheat and relative prices are important. The acreage is not expected to change much from the pattern of the past years during which it has fluctuated widely in response to price and moisture conditions. Average yields may increase some but not markedly since they are influenced so much by moisture.

Vegetable crops. Consumption of vegetables in Utah is greater than production (fig. 15). However, some vegetables are produced in...
considerable volume, processed, and shipped out of state. This is especially true for some of the canning crops such as tomatoes, peas, beans, and sweet corn. During the last ten to fifteen years total production of vegetables in the state has been decreasing. Celery and carrot production in Utah has decreased quite drastically. With the exception of canning peas, most of this decrease has been in the production for fresh market, largely as a result of subdivision of the market garden areas near the larger cities. In addition, most consumers purchase their vegetables in processed form - either as canned or frozen - rather than buying the fresh product and preparing it themselves.

There has been a marked decrease in truck farming in the state during the last ten years, no doubt because of competition from other producing areas in the west, especially California. Growing vegetables for processing is, and will continue to be, the most important type of vegetable production. The deficit in the production of vegetables that is apparent in 1960 will continue to grow in the next twenty years.

The processing industry that is associated with vegetable production in the state represents a sizeable payroll. Increased population will result in increased demand for vegetables, both processed and fresh, but it is doubtful if all of the need can be met from within the state.

**Fruit crops.** While the growing population of the state has increased the demand for fruit crops, it has had an adverse effect on the land available for such crops. Large areas, especially those adapted to growing fruit, have been taken out of agricultural production and used for housing developments. Some of this decreased acreage has been offset by the development of new irrigation projects which have brought water to some of the higher bench areas. In most cases these new areas have not made up for the losses of acreage.

Utah residents consume more fruit than is produced in the state (fig. 16). However, in the season of production there is a surplus of most all fruits and a considerable quantity of these is shipped out of the state. This situation will probably continue. However, if storage were available for apples all of the present production could be consumed locally. Some of the remaining fruits, such as sweet and sour cherries and apricots, must be processed or shipped out of the state. Processing plants to be run efficiently must have adequate volume assured from year to year. Because of late spring frosts in some years and the scattered plantings, Utah producers have difficulty in supplying a large volume of quality fruit.

There is a good potential market for increased fruit production in Utah as well as out-of-state markets. California provides a good market for early apples from Washington County as well as apples from the northern counties. Sweet cherry output in the Pacific Coast states has been reduced because of the cherry fruit fly; this provides an opportunity for Utah growers to market more cherries if they are available.

An increase in fruit planting is dependent upon the availability of suitable land for the establishment of new orchards. The high cost of land in the more densely populated counties reduces the possibility of developing new plantings in these areas. Plantings in these areas are also faced with damage from air pollution from various industries. With the development of the Colorado River Project a considerable acreage could come under cultivation for fruit production if the danger of frost damage is not too great. There is need to develop additional information on weather conditions in possible fruit areas.

There is a possibility that the fruit processing industry can be developed to a greater extent than at present. Canning in Utah is already an important outlet for apricots, peaches, and sour cherries. A considerable increase in planting of these and other fruits is possible if arrangements could be made between growers and processors for...
Fruit production in Utah is hampered by the weather, high-priced land, lack of irrigation water and suitable fruit varieties, and the prevalence of diseases and insect pests. A more intensive research program could solve many of these problems.

Acreage to be grown for processing only, provided the land and water were available in areas with suitable climate. It is no doubt correct to estimate that in the next 20 years Utah will not be able to supply its own needs for fruits and fruit products.

Washington County, because of its early season, is in a favorable position to increase its fruit production, especially if additional water can be developed by new projects.

Floriculture. As population grows and incomes rise, interest in the growing of lawns, flowers, shrubs, and trees on home grounds increases. In addition, there is a sizeable industry devoted to commercial flower growing and the production of nursery stock. While it is difficult to estimate the relative value of floriculture in Utah, it will no doubt continue to increase in importance as the urban population continues to grow.

NEW PUBLICATIONS


The objective of this bulletin is to provide basic information which a rancher can use in estimating the probable costs of seeding, the expected returns, and the likelihood of success.


This publication reviews the research carried out in Utah to develop a tomato resistant to curly top. It will be of interest mainly to plant breeders.

Index to Farm and Home Science, volumes 11 through 20, 1950 through 1959. 16 p.

This author and subject index to Farm and Home Science completes the index to the first twenty volumes.

Single copies of these bulletins will be sent free to those requesting them from the Agricultural Experiment Station, Utah State University, Logan.
INCREASES ASKED ABOVE THE 1959-61 APPROPRIATION ARE

For salaries $239,740

Most professional staff members of the Experiment Station are employed one-fourth to one-half time in teaching at Utah State University. Average Station salaries are determined, therefore, by University policy. Careful evaluation systems are being used to give salary increases strictly on a merit basis.

A large portion of the funds requested for salaries is to provide the same pay rates for the summer months as is paid during the traditional nine months of the regular University year. All research personnel are needed on a full year basis. Indeed, for many researchers in agriculture, this is the most critical period. Out of present available funds it is possible to pay Station workers during the summer months at only 64 percent of the rate they are paid under the regular University salary schedule. The request is for funds to provide equal pay for equal work for research workers compared with other faculty members.

For operating budgets $124,600

Research operating budgets provide for assistants paid by the hour or month, for supplies, equipment, travel, land rent, and maintenance and repair of buildings (other than those on the central campus).

Pay rates for hourly and monthly workers have had to be increased along with regular salaries. This rising cost of labor reduces the amount of research that can be accomplished under fixed budgets.

Supplies and equipment used in research are increasing in cost faster than the average for general industrial products. The U.S. Department of Agriculture collected information on costs of a large number of research supply and equipment items in 1950 and 1960. This shows that costs of these supplies and equipment increased an average of 5 percent.

Modern research requires increasingly complex equipment. Most discoveries that are possible with traditional equipment of the past have been made. This new equipment is expensive.

Funds for increases in operating budgets are given high priority in the Station's request. Many staff members are working at relatively low efficiency because of inadequate assistants or facilities. It is our conviction that improved operating budgets should take precedence over any expansion in staff or new areas of research.

For new or strengthened research $79,500

1. Climatology-meteorology

Kennecott Copper Corporation has provided over the past 12 years three four-year grants to assist in initiating research on important new problems. For the next four years an investigation in climatology and meteorology has been suggested. This will require the employment of a meteorologist.

The proposed program in climatology and meteorology will be in close cooperation with present research on water supplies and conservation, soil, and the agricultural and industrial development of the state. The Kennecott grant will lack about $5,000 per year in paying the costs of obtaining a professional meteor-
ologist and providing him with a minimum operating budget.

2. Air pollution and agricultural chemicals

Industrial areas of Utah are surrounded by mountains which hold air pollutants from homes, automobiles, and industries in restricted areas. With projected increases in population and industry, air pollution is one of the most difficult and limiting factors the state will face. Continued research is urgently needed to help keep abreast of these problems.

During the past 10 years industry and federal agencies have provided about $1,250,000 for research on these problems in the state. Most of this has come from grants from private sources. These grants are terminating July 1961. The Station has paid the salaries of the principal workers on this program. Practical solutions have been found to the problems of fluorine damage. There are, however, increasing problems with other air pollutants and with the problem of protecting human health from insecticides and other agricultural chemicals. Funds are needed to provide operating budgets to continue at least a limited program in this important area.

3. Turkey production

Turkey production is a major Utah industry. To stabilize the industry we need associated food processing industries. This will require a year-round supply of birds. To do this, turkeys will have to be produced in confined pens rather than on the open range. The transition involves more intensive problems of management, nutrition, and disease control. A separate request is made for turkey housing facilities at Ephraim. This request is for an operating budget to carry out the proposed studies. The turkey industry is paying part of the costs of these and other investigations.

4. Starlings

Starlings, a medium sized bird with filthy habits and a voracious appetite, have migrated into Utah in large numbers during the past five years. They now are becoming a serious pest in urban areas and are causing large losses of feed among livestock producers. If numbers increase, they will probably cause severe losses in fruit and vegetable producing areas. Reports, such as a recent article in Reader's Digest, indicate the national importance of the problem and the difficulty of a practical solution.

The proposal is to initiate basic studies on the life history of these birds. If mating, nesting, migrating, and other traits are fully known, a basis may be found for control measures.

5. Horticulture

For years the Station has tried to carry out a research program on fruit crops with one well-trained pomologist and an assistant. Because of the demands and breadth of the program, the result has been a rapid turnover in staff and unsatisfactory progress on our fruit problems. The requested funds would be for the employment of a pomologist and some operating funds.

Some research needs include: bringing to Utah and testing fruit and berry varieties; studies on the decline in yields of sour cherries in older orchards; mechanical harvesting procedures for fruit crops; controlling diseases and insects presently so detrimental to raspberries; developing new uses for horticultural crops.
At the request of the state the Experiment Station submitted a ten-year building program two years ago. This included a request for $190,000 for off-campus buildings for the 1959-61 biennium. The Governor recommended $110,000. This was entirely deleted at the last day of legislative action. The requests for the coming biennium, as approved by the Utah State University Board of Trustees, are as follows:

1. **Animal Husbandry Farm**

   The University is taking over the present animal husbandry farm for student housing. If research in the animal sciences is to be continued, the Station must have a new farm.

   The need is for a farm of 200 to 250 acres. Later legislative requests will be made to provide buildings on the farm.

2. **Land purchase**

   Lands adjacent to Station farms, now rented with options to buy, may be placed on sale in the next two years. Station operating funds are not sufficient for their purchase.

   The summer range near Cedar City is inadequate to provide feed for sheep required there in the research and teaching programs. The acquisition of needed range has been postponed for years until the present range is in a badly depleted condition, reflecting seriously on the public institutions associated in the use of these lands.

3. **Animal disease barns**

   Some inadequate sheds in the center of the present animal husbandry farm are now used for disease studies. Land has been obtained for an animal disease research center. Funds are required to construct buildings at this center. This need is accentuated by the taking of the present farm for student housing.

4. **Turkey research buildings, Ephraim**

   Sanpete County is the center of the Utah turkey industry. Facilities are needed at Ephraim to study production problems in confined housing on a year round basis. The Utah Turkey Marketing Board helps support the research.

5. **Meat and wool laboratory**

   No facilities are available to make detailed studies of livestock and poultry carcasses and meat samples; laboratories for wool investigations are inadequate.

6. **Remodel home on dairy farm**

   This home has been abandoned because of deterioration. A living place is required so the farm manager can be available at all times. The house needs new floors, heating system, windows and door fittings, and other repairs to make it habitable.

7. **Alterations and repairs on state farms**

   The responsibility for the repair and maintenance of farms and field stations falls to the Experiment Station. No funds have been provided for this purpose.

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**CAPITAL FACILITIES REQUEST**

<table>
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<tr>
<th>Item</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Animal husbandry farm</td>
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<tr>
<td>Land purchase</td>
<td>$75,000</td>
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<tr>
<td>Dairy cattle sheds</td>
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<tr>
<td>Animal disease barns</td>
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<tr>
<td>Turkey research buildings</td>
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<tr>
<td>Meat and wool laboratory</td>
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<tr>
<td>Home on dairy farm</td>
<td>$15,000</td>
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<tr>
<td>Farm alterations, repairs, and improvements</td>
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<tr>
<td><strong>Total request</strong></td>
<td><strong>$540,000</strong></td>
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*The State Board of Examiners approved a deficit appropriation of $30,000 to build the dairy cattle sheds. The Station added $10,000 from its funds and the sheds are already in the planning stage.

Utah Turkey Federation in its annual meeting voted to increase the request to $35,000.*
# Utah Agricultural Experiment Station

Financial summary for the two-year period July 1, 1958 to June 30, 1960

**Where the funds came from**

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Source</th>
<th>Amount</th>
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<tbody>
<tr>
<td>25%</td>
<td>From grants from foundations, federal agencies, and private companies</td>
<td>$706,321.78</td>
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<tr>
<td>38%</td>
<td>From funds appropriated by the Utah State Legislature for agricultural research</td>
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<td>29%</td>
<td>From federal appropriations including funds granted under the Hatch and Regional Research and Marketing Acts plus sales from projects supported by these funds</td>
<td>$816,871.19</td>
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<td>8%</td>
<td>From miscellaneous sources including income derived from sales from projects supported by state funds</td>
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**TOTAL FUNDS**

$2,848,758.60

**How the money was used**

<table>
<thead>
<tr>
<th>Percentage</th>
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<tbody>
<tr>
<td>34%</td>
<td>For research in animal science</td>
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<tr>
<td>22%</td>
<td>For research in plant science</td>
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<td>14%</td>
<td>For research on soil and water problems</td>
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<td>10%</td>
<td>For research on air pollution and agricultural chemicals</td>
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<td>7%</td>
<td>For research on forest, range, and wildlife management</td>
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<td>5%</td>
<td>For research on marketing and new uses for agricultural products</td>
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<tr>
<td>5%</td>
<td>For research on agricultural and rural adjustments</td>
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<tr>
<td>3%</td>
<td>For research in human nutrition</td>
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**TOTAL FUNDS**

$2,848,758.00

FOR DECEMBER 1960
CONTRIBUTIONS TO RESEARCH

(Funds received in addition to indirect costs)
For the two-year period July 1, 1958 to June 30, 1960

Abbott Laboratories, for studies on synovitis of turkeys $3,402.60
American Cyanamide Company, for study of staphylococcosis of turkeys 500.00
American Dairy Association, for study of staphylococcosis of turkeys 1,000.00
American Holstein Breeders Association, for study of staphylococcosis of turkeys 300.00
Cache Valley Breeding Association, for research on embryonic death in calves 4,500.00
California Spray Chemical Company, for insect studies and for study of the influence of nutrient solutions on the yield, quality, and chemical composition of sugar beets 3,500.00
Campbell Soup Company, for cultural studies with tomatoes 720.00
Commercial Solvents, for developing techniques for metabolism trials and studying the relation between live animal measurements and carcass characteristics in sheep 500.00
Dow's Laboratories, for poultry nutrition studies 1,500.00
Difco Company, for preparing film on media preparation 200.00
Enjay Chemical Company, for study of form conveyance and water application 256.40
Herman Frasch Foundation, for studies on the relation of nitrogen and water in soils 17,598.70
Hess and Clark, for studies of trichomoniasis, coccidiosis, and other parasitic diseases of livestock 9,270.00
Indian Jute Mills, for study of lining of irrigation canals and reservoirs 5,417.30
Kennebunk Copper Corporation, studies on the improved use of wet and salted soils for forage production, control of dodder in alfalfa seed production, and performance testing of bulls and rams 22,500.00
El Lilly Company, for study of staphylococcosis in turkeys 1,000.00
Moroni Feed Company, for study of staphylococcosis in turkeys, turkey feeding trials 8,100.00
National Association of Artificial Breeders, for studies of the causes of early embryonic death in calves 1,200.00
National Plant Food Institute, for research on soil fertility 2,000.00
National Turkey Federation, for studies of staphylococcosis of turkeys 5,625.00
Ogden Grain Exchange, improvement of wheat and barley through breeding 2,400.00
Pfizer Company, for study of antibiotic-containing lamb rations 1,000.00
Poultry Hatchers and Breeders, for Interstate market sample egg-laying contests 2,800.00
Rural electrification (electric power companies) 18,423.00
Seed companies, for hybrid corn testing 1,540.00
Shell Chemical Corporation, for experimental tests with insecticides 2,500.00
State Holstein Breeders Association, for study of embryonic death in calves 100.00
Stouffer Chemical Company, for insect investigations 1,000.00
Sugar Research Foundation, for studies on ammoniated beef pulp, urea-molasses, phosphoric acid supplements as a source of nitrogen for sheep 2,302.50
Union Carbide (Bakelite Company), for canal lining studies 5,000.00
U.S. Steel Corporation, for studies on the effects of fluorides on plants and animals 170,816.66
U.S. Steel Corporation, for fertilizer research 5,882.60
Upjohn Company, for studies of staphylococcosis of turkeys and parasitic diseases of animals 7,084.00
Utah Cannery Company, for study on the culture of tomatoes 2,000.00
Utah Canning Crops Association, for studies on the culture of tomatoes 1,000.00
Utah Crop Improvement, for crop improvement studies 300.00
Utah Heart Association, for study of brisket disease in cattle 500.00
Utah Turkey Federation, for study of staphylococcosis of turkeys and the use of turkey in the school lunch program 13,517.26
Utah Turkey Marketing Board, for study of staphylococcosis of turkeys and the use of turkeys in the school lunch program 11,006.00
Velsicor Corporation, for experimental tests of insecticides 1,002.40
Western Condensing Company, for study of the use of whey in making ice cream 500.00
U.S. Atomic Energy Commission, for (1) a study of the nature and fundamental structures of viruses, (2) for study of time-induced chlorosis 36,062.40
U.S. Agricultural Research Service, for studies in agricultural engineering, agronomy, animal husbandry, botany, horticulture, poultry, veterinary science, and zoology 55,121.69
Foreign visitors program 18,985.56
Intermountain Forest and Range Experiment Station, for watershed studies 6,000.00
National Institutes of Health, for (1) study of effects of residues of the newer insecticides on health, (2) aid in construction of an animal metabolism research center, (3) study of inflammatory factors in natural products, (4) study of the effects of atmospheric fluorides on man, (5) study of the factors affecting the phytolankton and zooplankton in Logan River, and (6) study of the ascorbic acid nutrition and gingivitis in Indian children 181,542.50
National Science Foundation, for study of the inhibition of the cytochrome system in higher plants by bicarbonate and possible relations to lime-induced chlorosis 21,304.35
U.S. Army, for a study of the effects of radiation on the keeping qualities of fruits and vegetables 14,951.03
U.S. Army Signal Corps, for study of the thermodynamics of water movement in soil 16,407.50
U.S. Public Health Service, for study of the ascorbic acid nutrition and gingivitis in Indian children 1,011.92

Total $961,151.37