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UTAH STATE UNIVERSITY • LOGAN • AGRICULTURAL EXPERIMENT STATION
WATER MANAGEMENT
FOR POTATO PRODUCTION

Water more critical during early growth and tuber setting periods. Potatoes kept moist during the latter part of season yielded higher but tubers were of lower quality.

STERLING A. TAYLOR
AND BENGT ROGNERUD

Potatoes, like many other plants, respond differently to soil and climatic factors at different stages of growth during the season. The growth of potato plants is more intense during some periods of the plant's life, and these periods of intense growth usually coincide with increased consumptive use of water by the crop. If the soil moisture stress is allowed to increase during this period of intensive growth by withholding irrigation water, yields and quality of potato tubers may be lowered more.

DR. TAYLOR is professor of agronomy and BENGT ROGNERUD was a graduate assistant in soils. Mr. Rognerud is presently director of irrigation of Norges Landbrukshogskole, Vollebekk, Norway. The research reported here was part of a thesis submitted by Mr. Rognerud for the degree of master of science in irrigation science.
Reading the soil moisture suction in a dry plot of potatoes during the first growth period

The yield of potatoes from plots receiving different moisture treatments during the three different growth stages. W = moist, D = dry. For example, WWD means moist during the first period, dry during the second period, and moist during the final period.

![Graph showing yield versus water treatments]

Student uses a telescope to be able to read the pressure gauge from a distance so that he can regulate the application of irrigation water.

d than if water is withheld earlier or later in the growing season.

It is a common opinion that the potato is most sensitive to drought at the time when the tubers begin to form. High soil moisture stress that results from moisture deficiency during this period is supposed to reduce total yield of tubers considerably.

Test to determine effects of irrigation on tuber yields

An experiment was set up at the Greenville Experiment Farm to study how yields and quality of tubers are affected by irrigation at different stages of growth. The growing season was divided into three periods. The first period was from planting till the beginning of tuber set. The second period was from the setting and first development of tubers, and it extended until the tubers were largely set and had begun to develop. The final period was during the development and maturity of the tubers.

Different moisture treatments were applied during the three periods. During wet periods the soil moisture suction was allowed to reach six-tenths to eight-tenths bars in the root zone before irrigation water was applied, then enough water was applied to raise the moisture content of the soil in the root zone to field capacity. Dry periods were sufficiently severe to permit the soil moisture suction to reach eight bars in the root zone before water was applied.

Some plots were maintained wet during all three periods; others were maintained wet during the first and second periods and dry in the third; and still others were maintained wet in the first, dry in the second, and wet in the third; some plots were maintained dry in the first period and wet in the other two; some plots were maintained dry in the first two periods and wet in the final period; and some plots were maintained dry throughout the season. From this combination of treatment it was possible to find out how irrigation or drought affected the production and quality of tubers during these three stages of growth.

Soil moisture tensiometers, gypsum blocks, and the neutron meter were used to study the progress of the soil moisture suction and water content in the soil. These moisture measuring devices made it possible to estimate rather closely the amount of water used under each of the several treatments.

Most of the water used by Bliss Triumph potatoes that were grown...
in this experiment came from the upper two feet of the soil.

Irrigation water in the amounts needed for this experiment was available and applied by sprinkling at the time when the moisture measuring instruments indicated that it was needed.

**Amounts of water used**

There were visible differences in growth of vines as a result of moisture treatment. Plants that received the dry treatment showed smaller vines and a darker green color.

Plots that were maintained wet throughout the entire season used 11.6 inches of irrigation water and required eleven irrigations. Plots that were maintained moist during the first two periods and dry during the last period required seven irrigations using 9.8 inches of irrigation water. All other treatments used approximately the same amount of water varying between 8.7 and 11.2 acre inches per acre, except the treatment that was dry throughout the entire season which used only 7.1 inches of water with one irrigation.

Bliss Triumph potatoes were planted on April 26 and 28, the first period lasted until June 18, the second period then lasted four weeks, and the final harvest was made when the potatoes were mature, which varied from August 19, on those plots which received no irrigation during the third period, until September 10, on those plots which received irrigation during the final period.

**Yields of tubers**

The yields of tubers for all of these plots are indicated in figure 1. In the figure, W indicates the moist plots and D indicates the dry plots for the various periods.

It is apparent that the plots maintained moist during all three periods gave the highest yield. This does not tell the whole story, however, since it required four more irrigations and approximately two more inches of water to produce the yields in these plots than in the plots that were maintained dry during the last period and moist during the first two.

It was found that on all plots that were kept moist during the first two periods there were more tubers set than on those plots that were allowed to become dry during either one or both of these periods. In addition, if the plots were maintained moist during the second period the growth of the tubers was more than if they were dry during this period. There was some additional growth when the plots were kept moist during the period of maturity as indicated by the higher yield of the plots, maintained wet during all three periods as compared to those maintained wet during the first two and dry during the final. The additional growth that was obtained by keeping the plots moist during the final growth period was somewhat offset by lower starch content. In general those plots that were maintained dry during the final period had a higher starch percentage than those that were maintained wet during this final period. Moist soil during the final maturing period of potatoes tends to delay starch formation. It is generally considered that potatoes which have a high starch content have better cooking qualities than those with lower starch content, consequently it may be desirable to let the soil become dry a few weeks before harvesting.

**Irrigation in early growth periods most important for high yields**

Irrigation before and during the setting of tubers will give a higher number of tubers which may result in increased yields if sufficient water is available to allow the normal enlargement of tubers.

Readily available water to the plant seems to be important during the period of intensive growth which occurs during the early and tuber setting stages of the potatoes. Irrigation frequency may well be reduced during the latter part of the season in order to conserve moisture and increase tuber quality.
What is quality?

The term "quality" as applied to wheat has little meaning unless a particular class of wheat is specified. There are, for example, hard red wheats, soft white wheats, and others; each class has its own special uses and standards of quality. The hard red types are bread wheats and quality for them includes high protein, strong gluten, elastic dough, and good loaf volume. The soft white wheats are used for crackers and pastries, and their quality requirements are almost exactly opposite to those of the bread wheats. Durum wheats are used in the manufacture of macaroni products, and they have still another set of quality standards.

Of the total wheat produced in the United States approximately 65 percent is bread wheat. Of this figure 50 percent is hard red winter and 15 percent is hard red spring wheat. Since the bulk of Utah's wheat acreage is devoted to hard red winter wheat, we are primarily interested in quality as applied to bread wheat.

Who determines quality standards?

Even when restricted to a single class, the quality problem is still complex. Within the bread wheat class at least 4 groups have their individual ideas on quality: the miller, the baker, the farmer, and the housewife.

The miller wants a wheat which will yield a high percentage of high grade flour. The flour should sift easily without "balling up" on the screens and should flow freely through the milling system.

The baker is more concerned with the properties of the dough, its reaction to mixing, and the type of loaf into which it bakes. With the increasing use of mass produc-
Agriculture in the United Socialist Soviet Republics, like other facets of Soviet life, is in a process of change. Modern scientific methods are superseding those that have survived in a peasant culture since the Middle Ages. Because the state can tell the people what to do and because Russia is developing into an industrial state much later than western countries, Russia can borrow from and adapt to its uses advances that have developed in the United States and western Europe during the past century.

The USSR now has an extensive agricultural research program. Universities, institutes, and research stations give active attention to most agricultural problems. While the team of American agricul-
The average cash income per household is estimated to be about 3,500 roubles ($350) but part of the income is paid in farm produce and there is additional food or in-

(Continued on page 89)
The stresses of mismanagement, of other disease, and of climatic extremes are important in producing staphylococcal synovitis of turkeys. Some turkeys are inherently more susceptible to systemic staphylococcal infections. These statements are made following controlled experiments and recent studies of field cases.

Stress and its relation to disease

The concept of stress and its relation to disease has long been recognized in a general way. The pathways of stress in an animal’s body are highly complex and speculative and the underlying principles that determine its influence on the development of disease and mechanisms through which it works are poorly understood.

Stress in a broad sense is a force or influence. In the biological sense it is generally regarded as an act or influence which is contrary to the normal well-being of the animal. Stress may be further defined as any stimuli which tend to disturb the body’s normal physiological equilibrium.

Agents or influences which can be regarded as stresses may be divided into two main subdivisions; namely, (1) infectious agents such as bacteria, viruses, and protozoa, and (2) non-infectious agents. The non-infectious influences lie in the genetic makeup of the individual and in the environment.

Infectious agents and non-infectious agents are allies in producing disease. Certain infectious agents by themselves may be sufficient to produce a disease in an animal. The influence of environment or the genetic makeup of the individual can help an infectious agent produce a disease; and under certain conditions adverse environment or lowered vitality in the individual are necessary for an infectious agent to be able to produce symptoms in an animal.

The body’s reaction to stress

Authorities have recognized three stages in the body’s reaction to stress. First, the alarm reaction in which the animal has not adapted to the influence, but is starting the reaction to control the condition. This may be recognized by such features as feeling ill, loss of appetite, loss of vigor, and aches and pains.

The second is the stage of resistance in which the animal’s body has all its defense mechanisms in action. These changes may be noted by changes in blood constituents, changes in glandular secretions, and nervous reaction. The animal either wins in this stage or goes into stage three.

The third stage is the stage of exhaustion. The body has used up all its defenses and is giving up the battle. This may result in immediate death or an irreversible chronic condition with a prolonged death time.

A compensation by the defense mechanisms of the body can not be made after they are completely exhausted. It is important to attempt to compensate for stresses and to minimize or eliminate them before the third stage is realized so that the animal can return to normal function and health.

Determining factors in staphylococcal infection

All of the factors, including the relation of the stresses to the staphylococcal organism, which determine whether a staphylococcal infection will occur in a turkey and the subsequent severity are not known; however, some factors that are considered to be influential may be enumerated.

The numbers of invading staphylococci which gain entrance into...
the turkey's body are important in determining whether synovitis will occur. Recent investigation indicates that the staphylococci capable of producing synovitis in turkeys are present in the normal habitat.

The virulence or disease-producing ability of the staphylococci vary with the innumerable strains of the bacteria. Some are potent in their ability to produce disease and others are relatively nonpathogenic.

The resistance of the turkey to staphylococci is important in determining whether synovitis will develop. The turkey's natural defense mechanisms are reduced in efficiency and effect with the continued stresses of unhealthy environmental conditions.

Stresses or conditions which appear to influence the incidence of staphylococcal synovitis in the growing turkey are those which increase the number of invading organisms and/or lower the turkeys' natural resistance.

Specific conditions which contribute to either or both of these influences may be listed:

1. Infection with Newcastle disease virus.
2. Overcrowding of birds.
3. Poor management resulting in unsanitary feeders and waterers, and contaminated litter and range areas.
4. Inadequate number and poorly arranged feeders and waterers, or lengthy periods without feed which result in competition between individuals or starvation.

5. Sudden extreme weather variations.
7. Excessive handling of birds.
8. Uncontrolled water sources such as "ditch-bank watering."

These can not be listed in order of importance, and one can not be emphasized over another.

The influence of management is often difficult to demonstrate. Management practices which eliminate or reduce the influence of these stresses can not guarantee that turkeys will be free from staphylococcal synovitis, but the grower who reduces the effect of these influences can increase his chances of growing a healthy profitable flock.

**AGRICULTURE IN USSR**

(Continued from page 87)

come from the family plot of land. Total income is claimed to average nearly twice the cash income. These values are for untrained workers and represent family income of more than one worker.

While collective farm workers cannot own land each family can own a home. The houses are usually small and are grouped in small villages. The homes visited did not have running water and lavatories were outside. Most of the farms visited had electricity but figures indicate that only about half of all farms have it. This is one of many evidences that the study groups were taken to the better farms. Fuel used in farm homes varied widely and included wood from forests and wood lots, peat, wheat straw, cotton stalks, and the usual middle eastern mixture of straw and animal manure.

Each family on a collective farm is assigned a small plot of land varying from one half to three acres in size. The family is free to produce and sell what it can from this plot. Near cities vegetables and flowers are frequently produced and marketed in the farmer's market in the city. These individual holdings account for almost half of all cattle, a third of the hogs, and a fourth of the sheep and lambs in the USSR.

Collective farms are large, ranging from 1,000 to 100,000 acres. About 55 percent of the people of the USSR live in rural areas and most are attached to farms. Labor is abundant. It is reported that 43 percent of all workers are in agriculture and forestry. About 60 percent of farm workers are women. There is approximately one Russian farm worker for every 15 acres of cropland compared with one for every 60 acres in the United States.

Workers on collective farms were reported to select their own leaders but indirect evidence indicates there is considerable government control in their selection and that occasionally the government has forced changes.

**State farms**

In addition to collective farms there are also nearly 6,000 farms operated entirely by the state. Workers are paid regular wages comparable with those paid in factories. Wages on state farms are much higher than the average for collective farms. State farms are usually larger than collective farms. They are generally more mechanized and have more agricultural scientists on their staffs.

**Farm workers**

Workers on farms are organized into brigades of 20 to 60 workers with a brigade leader or supervisor

(Continued on page 101)
Your profit or loss may depend upon shrinkage rate

**Shrinkage Allowance is a Bargaining Point**

**N. K. Roberts**

The highest price per pound for your cattle may not yield you the highest net return. You must consider shrinkage allowance as well as price.

Suppose you have a 1,000 pound animal and the average price on the day you sell is $20 a hundred pounds. The “as is” returns are $200. Now, suppose through bargaining you can get $20.50 per hundredweight, but to get it you have to agree to a 4 percent shrink. This means that you will sell 960 pounds for $20.50 per hundredweight. Total return for the animal after shrinkage is $196.80. Your bargain alternative has cost you $3.70. Now, suppose instead of one animal, you have 1,000 head averaging 1,000 pounds. Your total loss to shrinkage will be $3,700.

Shrinkage is worth bargaining over

The point is this: Shrinkage is worth bargaining over as much as sales price. If you increase the sales price or decrease the shrinkage rate, your profits cannot help but increase. Some pertinent pointers on shrinkage for you to watch in marketing cattle are suggested here.

Bargaining is important in resolving differences between buyer and seller. Shrinkage is so variable and so roughly calculated that there

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**DR. N. KEITH ROBERTS**, associate professor of agricultural economics, was a member of the regional research team investigating the economics of cattle shrinkage. Some of the results of the study were recently published by the Montana Agricultural Experiment Station in three circulars 220, 221, and 222 written by Clive R. Harston. The titles of these circulars are: Shrinkage is important; Shrinkage depends on where, when, and what you market; and Shrinkage depends on how you market. These circulars are available from the Utah Station. Dr. Roberts summarizes some of the findings in this article.
is plenty of room for difference of opinion as to its importance. The buyer or seller, who has the most information and ability to bargain will achieve an advantage. Because buyers are in the market every day, they generally but not always, have an advantage.

Look out for the average, normal, or customary shrinkage deductions. Buyers who handle large numbers of animals are naturally interested in at least “averaging out” on all deals they make. The seller, on the other hand, has no opportunity to average out since he enters the market only occasionally. His conditions may lead to less than customary or average shrinkage rates. Accepting average shrinkage adjustments will lead to unnecessary losses in some cases.

Watch for conditions that lead to double shrinkage. Point of sale is important. If you make a deal at the ranch and accept a 3 percent shrink then have to deliver your animals 6-10 miles away before establishing sale weight, you stand to suffer another 2 or 3 percent shrink. Now, if you sell in the afternoon of one day and deliver early the next morning before the cattle are allowed to take on normal feed and water, another 2 or 3 percent shrinkage is sustained even with feed and water available. Thus, a total of 7-9 percent shrinkage is deducted from the weight at the time the sale was made. Knowledge concerning loss of weight during overnight stands would help in bargaining.

How much cattle shrink

Research has shown that fat cattle off green grass, wet beet pulp, or silage shrink about 4 percent during a 12 hour stand. Fat cattle off concentrates will generally shrink 2.5 to 3 percent over night with feed and water unavailable and 2 percent with feed and water available.

Range cattle held over night in a feed lot before shipping will shrink 5 percent or more. The strangeness of the new situation contributes to the higher shrinkage rate for range feeder cattle. An experiment at the University of Wy-

(Continued on page 102)

Table 1. Prices necessary to give equal net returns from an 800-pound beef animal under alternative market conditions

<table>
<thead>
<tr>
<th>Sales channel</th>
<th>Time of sale</th>
<th>Shrink conditions*</th>
<th>Distance to market</th>
<th>Cash costs†</th>
<th>Price per cwt. to yield equal net returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central market</td>
<td>On arrival</td>
<td>percent</td>
<td>miles</td>
<td>dols.</td>
<td>dols.</td>
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<tr>
<td></td>
<td></td>
<td>10</td>
<td>1,000</td>
<td>10.87</td>
<td>23.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>800</td>
<td>9.39</td>
<td>23.25</td>
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<tr>
<td></td>
<td></td>
<td>8</td>
<td>600</td>
<td>8.75</td>
<td>22.90</td>
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<tr>
<td></td>
<td>1 day after arrival</td>
<td>6</td>
<td>1,000</td>
<td>11.52</td>
<td>22.80</td>
</tr>
<tr>
<td></td>
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<td>5.5</td>
<td>800</td>
<td>10.04</td>
<td>22.50</td>
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<td>5</td>
<td>600</td>
<td>9.40</td>
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<td></td>
<td>3 days after arrival</td>
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<td>1,000</td>
<td>13.22</td>
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<td></td>
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<td>3.5</td>
<td>800</td>
<td>11.74</td>
<td>22.25</td>
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<td></td>
<td>3</td>
<td>600</td>
<td>11.10</td>
<td>22.05</td>
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<tr>
<td>Local auction</td>
<td>On arrival</td>
<td>5</td>
<td>100</td>
<td>5.86</td>
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<td>3</td>
<td>25</td>
<td>3.79</td>
<td>21.10</td>
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<tr>
<td></td>
<td>1 day after arrival</td>
<td>3</td>
<td>100</td>
<td>6.51</td>
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<td>2.5</td>
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<td>2</td>
<td>25</td>
<td>4.44</td>
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<tr>
<td></td>
<td>3 days after arrival</td>
<td>0</td>
<td>100</td>
<td>7.81</td>
<td>21.00</td>
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<tr>
<td>Direct sale on the ranch</td>
<td>Overnight stand</td>
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<td>50</td>
<td>6.42</td>
<td>20.80</td>
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<td>25</td>
<td>5.74</td>
<td>20.70</td>
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<tr>
<td></td>
<td>2 percent pencil shrink</td>
<td></td>
<td>—</td>
<td>—</td>
<td>20.85</td>
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<tr>
<td></td>
<td>Full weight — no shrink</td>
<td></td>
<td>—</td>
<td>—</td>
<td>20.40</td>
</tr>
</tbody>
</table>

*Experiment Station research found these shrinkage conditions to be somewhat typical.
†Cash costs include: transportation, yardage, commission, and feed.
To promote and maintain orderly marketing of milk

Utah Gets Federal Milk Marketing Order

R. A. CHRISTENSEN

DAIRY farmers in many markets are turning to federal orders as a means of promoting and maintaining orderly marketing of milk. There are now about 80 markets in the United States which operate under federal milk orders. At the end of 1957 there were 70. A decade ago there were only 28. More than one-third of all milk sold by farmers to handlers is now covered by this program.

Recently a federal marketing order was put into operation to regulate the handling of market milk in the Great Basin (Utah) area. All but the pricing and payment provisions of the order became effective October 1, and all provisions were in effect November 1.

The order will affect about 75 percent of Utah market milk handlers, about 90 percent of fluid milk and cream sales by handlers in the state, and about 90 percent of the market milk producers who ship to Utah handlers.

Development of the order

The new order has been over a year in the making. Following are some of the highlights in its development.

1. May 1958. Proponents of the order petitioned Secretary of Agriculture, Ezra Taft Benson, requesting a marketing order. Their petition was accompanied by a proposed order.

2. June - August 1958. Representatives of the U. S. Department of Agriculture made a preliminary investigation of conditions in the Utah market. They studied the presence and degree of interstate commerce involved in the marketing of milk in the area, whether the problems involved come within the jurisdiction of a federal milk order, whether the petitioners and others in the market could support their proposal at a public hearing, and whether the provisions of a federal milk order could correct the problems involved.

3. September 1958. Before scheduling a hearing on the proponent's petition, the U. S. Department of Agriculture gave other interested persons an opportunity to submit proposals for consideration.

4. October 27-November 3, 1958. A public hearing was held in Salt Lake City at which evidence was presented by proponents and opponents of a federal milk order.

5. July 2, 1959. The U. S. Department of Agriculture recommended an order for the area. Exceptions to the "recommended decision" were solicited for consideration from all interested persons.


FARM AND HOME SCIENCE
a "final decision" and proposed marketing order.

7. September 17, 1959. A referendum on the proposed order was held. Out of the 1,225 producers voting, 96.7 percent voted for the order. Cooperatives voted their members as a group. Approval of two-thirds of the producers voting was necessary to make the order effective.

8. October 1, 1959. The order, except for the pricing and payment provisions, went into effect.

9. November 1, 1959. The pricing and payment provisions of the order became effective.

Reasons for the order

After studying the testimony presented at the hearing the U. S. Department of Agriculture decided a federal order was needed in the Great Basin marketing area in order to provide:

1. A regular and dependable method for determining prices to producers

2. The establishment of uniform prices to handlers for milk received from producers according to a classified price plan based upon the use of the milk

3. An impartial audit of handlers' records of receipts and use to insure uniform prices for milk purchased

4. A means to insure accurate weights and tests of milk

5. Uniform returns to producers supplying the market, and an equitable sharing by all producers of the lower returns for sale of surplus milk

6. Market-wide information on receipts, sales, and other data relating to milk marketing in the area.

Market administrator

A market administrator, Dr. H. Alan Luke, has been appointed to carry out the terms and provisions of the order. Dr. Luke has been in milk marketing work for about 15 years. He is a native of Junction, Utah, and holds a B.S. degree from Utah State University and M.S. and Ph.D. degrees from Cornell University. The market administrator's office is in Suite 339 of the Surety Life Building, 1935 South Main Street in Salt Lake City.

Marketing area

The Great Basin marketing area includes the 19 Utah counties of Box Elder, Carbon, Daggett, Davis, Duchesne, Emery, Grand, Juab, Millard, Morgan, Salt Lake, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, Wasatch, and Weber. About 90 percent of Utah's population lives within this area. Other counties of the state were not proposed to be in the market area and are not included.

Who is regulated

The Utah order, similar to all federal milk orders, imposes no regulations on farmers. Instead, it regulates handlers. Those to be regulated include handlers from whose plants 50 percent or more of the market milk received is disposed of on routes in the market area, and who dispose of 10 percent or more of their fluid milk products within the market area. Cooperatives which have authorization to divert member milk are considered handlers even though they do not operate a plant.

Producer-handlers are not regulated unless they purchase milk other than their own. Handlers who dispose of less than 500 pounds of fluid milk and cream per day within the market area are exempt from price-fixing regulation. Also not regulated are non-profit organizations which produce milk for their own use only.

How are handlers regulated

The order requires handlers to classify and pay farmers for milk according to the use they make of it. It sets minimum prices handlers must pay producers for each class of milk. To insure that they do this, handlers must submit monthly reports to the market administrator. These reports show the amount of milk they receive from producers and from other sources and the use of this milk in the different classes, as well as other pertinent data. Handler records are audited each month by personnel from the market administrator's office.

How many classes of milk

There are two classes of milk — I and II. Class I includes the skim milk and butterfat disposed of in all fluid milk and cream products. Class II includes all skim milk and butterfat used to produce manufactured products.

What will the class prices be

The minimum class I price will be $5.25 per hundredweight for the first 18 months for milk testing 3.5 percent butterfat. On a 3.6 percent butterfat basis, which has been the customary way of quoting prices in the market, this would be about $5.33 per hundredweight. The price will be reviewed at a public hearing after the order has been in operation long enough to provide sufficient market data to make an analysis of how satisfactory this price level is.

The class I price contained in the order is lower than the price requested by the proponents. The price asked for by the proponents was the general price prevailing on the market before the order began, which was $5.56 per hundredweight for 3.5 test milk. The U. S. Department of Agriculture recommended the lower price because it was more in line with prices in surrounding states. Their decision was also influenced by (1) the considerable surplus of milk on the market, (2) a supply of market milk is readily available from northern Utah and southern Idaho, (3) additional quantities can be obtained from producers in the area who could switch from production of manufacturing to market grade milk.

The minimum class II price will be derived by use of a formula.
based on midwest prices of butter and nonfat dry milk. This price level will be similar to that in other federal marketing orders.

Use of this formula will result in a class II price higher than that which has prevailed on the market. If the formula had been used in 1958, producers shipping to regulated handlers would have received an average price of $2.99 per hundredweight of class II milk containing 3.5 percent butterfat instead of about $2.69. In September 1959, the price would have been $2.93 instead of $2.69, which was the generally prevailing price.

Producers receive uniform price

The Great Basin order provides for a “market-wide” pool. Under this arrangement all producers delivering milk to regulated handlers are paid a uniform price per hundredweight (except for butterfat and location differentials) regardless to which handler they ship.

The uniform price is the “blended” or average price paid for milk by all regulated handlers, with handlers paying the class I price for milk disposed of as fluid products and the class II price for milk used in making manufactured dairy products.

In the case of producers who are members of a cooperative association which does not process and distribute their milk, the handler which receives the milk may be directed to pay the uniform price to the cooperative, if the producers and cooperative so desire. Under this arrangement, the cooperative can then reblend the sales proceeds from milk sold to various outlets before paying producer-members. It also makes it possible for cooperatives to use such systems as the base-surplus pricing plan in allocating these funds to individual producers.

Average price about same under order

Although some producers may be paid more and some less, the average price paid all producers shipping to regulated handlers will be about the same under the order as it would be without it. In 1958, the average price paid producers who will be affected by the order for milk testing 3.5 percent butterfat was about $4.44 per hundredweight. If the order had been in effect, the average price would have been about $4.41.

If the order had been in effect in 1958, the average class I price would have been down 39 cents per hundredweight, but the class II price would have been up 30 cents. In addition, if the system of accounting and classification contained in the order had applied in 1958, class I use would have been about 63 percent instead of 59 percent. It is estimated by the U. S. Department of Agriculture that the method used by the order will increase class I use about 4 percent.

Producer-settlement fund

Handlers owe for milk on a use basis, but pay producers or cooperatives a uniform price. Since the amount which a particular handler owes for his milk may be more or less than the amount which he is required to pay directly to producers, a producer-settlement fund is used to balance these amounts. All handlers who are required to pay more for their milk on the basis of their use than they are required to pay for producer milk at the uniform price, pay the difference into the producer-settlement fund; and all handlers who are required to pay more for producer milk at the uniform price than they are required to pay for their milk on the basis of use receive the difference from the fund.

This system of accounting results in all producers receiving the same basic price for milk, and all handlers paying the same price according to the way they use it. To accomplish this was one of the main reasons why proponents petitioned for the order.

Compensatory payments

Compensatory payments will be required by the order on all milk in excess of 500 pounds per day distributed on routes in the marketing area by handlers not regulated by this order. Compensatory payments will also be required from handlers on all milk received from unregulated sources allocated to class I sales. The payment per hundredweight of milk is the difference between the class I and class II prices.

Who pays for the order

The cost of administering the order is borne by handlers. The market administrator may assess handlers up to 4 cents per month per hundredweight of milk received from producers and non-pool plants. This will provide an annual budget of up to $150,000. The assessment will begin at 4 cents per hundredweight and will later be reduced after office equipment is paid for and certain reserves are accumulated.

Some things the order does not do

The federal order does not guarantee a given level of price to producers. It does not guarantee farmers a market with any buyer. The order does not control production, nor restrict the marketing of milk by farmers. It does not establish sanitary or quality standards.

The order sets minimum prices handlers must pay producers, but does not regulate retail prices. Neither does the order prevent producers from bargaining for prices higher than the minimum established prices, nor handlers from paying premiums for various reasons such as for extra high quality milk.
APRICOTS FOR UTAH

New varieties show promise

ROBERT A. NORTON AND ROBERT K. GERBER

The apricot, in common with many other fruits, is a world traveler. Originating in central China (according to most authorities) it has since been carried to eastern Europe, central Europe, Mexico, and the United States. This appealing and wholesome fruit contains nine times as much vitamin A as the average of eighteen other common fruits and twice as much as its nearest competitor—the nectarine. It exceeds the average of these eighteen fruits in protein, carbohydrates, phosphorus, and niacin. However, it is slightly lower in fats, calcium, ascorbic acid, and thiamin.

Fruit growers in Utah have produced an average of 5,500 tons of apricots each year during the past 20 years. At $90 per ton this is a gross return of a half million dollars per year. The high yield was 10,000 tons in 1945, while the low yield came in 1950 with 400 tons. This extreme fluctuation is mostly the result of winter cold and spring frost. In only five different years since 1929 (1943, 1948, 1949, 1952, and 1957) has a portion of the crop been wasted as a result of overproduction. Average prices received by growers show extreme variation through the years, and combined with variability of production, have resulted in sharp fluctuations in annual crop values. These conditions have discouraged many growers.

At the present time California produces 83 percent of all the apricots grown in the United States, Washington 13 percent, and Utah 4 percent. California grows approximately 170,000 tons annually. Of this amount, nearly 54 percent is canned and 35 percent dried. The remainder is sold fresh; some is shipped as far east as New York. A few of the reasons for California’s overwhelming superiority in apricot production is the state’s relative freedom from spring frost, the warm, dry climate which reduces disease problems and the deep, fertile coastal soils that enable high yields of uniform quality fruit.

Utah shares California’s warm, dry summers, but is not as fortunate in being free of spring frosts. In order to obtain some frost protection, apricot orchards in Utah are usually located on benchlands with good air drainage. However, these soils are often shallow and gravelly. There is great need for research in production and marketing to overcome some of these problems.

New varieties needed

A major part of Utah’s apricot marketing problem is the fact that production is limited to one variety, the Chinese (also known as Jones
or Large Early Montgamet). In frost-free years it tends to overbear thus reducing fruit size. This depresses the price, even of larger-sized fruit produced in well-cared for, thinned orchards. There is a great need for new varieties which will produce uniform crops of large fruit over a longer season. These varieties must be suitable for commercial canning, yet be firm enough to ship fresh to distant markets. If processing and shipping markets can be developed through better varieties and more consistent production, Utah growers may expect to have a profitable, stable industry.

Variety studies conducted at USU

Apricot varieties have been studied by USU horticulturists since 1890. F. M. Coe, in 1934, described many varieties, several of which are still grown commercially. He did some breeding and some of his material is still being evaluated by the Experiment Station. Since Coe’s report, many promising new varieties from other areas have been introduced into the state. These varieties and selections, numbering over forty, are being carefully evaluated each year at the Howell Field Station. Many promising new varieties and selections, numbering over forty, are being carefully evaluated by averating at the Howell Field Station. Since Coe’s report, many promising new varieties from other areas have been introduced into the state. These varieties and selections, numbering over forty, are being carefully evaluated each year at the Howell Field Station. These varieties are rated for fresh and canned quality. Fruits from some of the better selections are sun dried. Each year, an attempt is made to discard inferior types. Listed below are some of the more promising varieties and selections.

Promising varieties

Earli Orange. (Plant Patent No. 674.) This variety originated in Grand View, Washington, and was introduced by Stark Brothers Nursery. It is the earliest high quality variety at the Station. It is attractive with a bright orange ground color overlaid with a bright red blush. Considering its earliness, it sizes well with fruits averaging 1½ to 2½ inches in diameter. Its quality for fresh use and canning is fair to good. It is definitely a promising early variety.

Wilsont Delicious. This apricot is one of Stark Brothers’ introductions. The fruits are large and attractive when grown on well managed trees. They have a dark orange color and ripen slightly before Chinese. The flesh is juicy and of fair to good quality, although somewhat bland.

Hungarian. This apricot shows some promise in the Station orchard. The fruits are orange with little blush and medium to large in size when well grown. The flesh is orange, slightly stringy, moderately firm, and fair to good in quality.

Moorpark. This old variety has been discriminated against by local canners in recent years. If allowed to color on the tree, the fruits are usually quite soft. In addition, they ripen unevenly—green on one side and ripe and soft on the other side and in the center. If picked green and allowed to color in shipment or storage, the fruits are lighter in color and usually less juicy. Where well grown, the fruits are large and somewhat flat. The quality is fair to good. The ripening date coincides with Chinese. The tree produces heavy crops annually. Moorpark is not recommended in new plantings because of its limited usefulness in Utah.

Chinese (Jones). This variety

<table>
<thead>
<tr>
<th>Variety</th>
<th>Ripening date (Ogden)</th>
<th>Color</th>
<th>Firmness</th>
<th>Flavor</th>
<th>Canning quality</th>
<th>Color</th>
<th>Texture</th>
<th>Flavor</th>
<th>Quality rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earli Orange</td>
<td>9</td>
<td>Orange-red blush</td>
<td>Moderate</td>
<td>Fair - good</td>
<td>6.1</td>
<td>5.8</td>
<td>5.6</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td>Valnur</td>
<td>5</td>
<td>Orange-red blush</td>
<td>Moderate</td>
<td>Fair - good</td>
<td>6.0</td>
<td>6.7</td>
<td>4.4</td>
<td>5.7</td>
<td></td>
</tr>
<tr>
<td>Wilson Delicious</td>
<td>4</td>
<td>Orange-red blush</td>
<td>Moderate</td>
<td>Good</td>
<td>6.1</td>
<td>6.4</td>
<td>5.8</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>Perfection</td>
<td>2</td>
<td>Orange</td>
<td>Moderate</td>
<td>Fair - good</td>
<td>6.5</td>
<td>5.1</td>
<td>5.6</td>
<td>5.7</td>
<td></td>
</tr>
<tr>
<td>Hungarian</td>
<td>2</td>
<td>Orange</td>
<td>Moderate</td>
<td>Good</td>
<td>7.4</td>
<td>6.9</td>
<td>7.1</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Chinese</td>
<td>0</td>
<td>Orange</td>
<td>Moderate</td>
<td>Good</td>
<td>6.2</td>
<td>6.0</td>
<td>5.9</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>Utah 27</td>
<td>0</td>
<td>Orange-red blush</td>
<td>Moderate</td>
<td>Good</td>
<td>7.4</td>
<td>6.9</td>
<td>7.1</td>
<td>7.3</td>
<td></td>
</tr>
<tr>
<td>Tilton</td>
<td>4</td>
<td>Yellow</td>
<td>Firm</td>
<td>Bland</td>
<td>8.2</td>
<td>7.7</td>
<td>8.2</td>
<td>8.0</td>
<td></td>
</tr>
<tr>
<td>Sun Glo</td>
<td>5</td>
<td>Orange</td>
<td>Firm</td>
<td>Fair - good</td>
<td>8.2</td>
<td>7.7</td>
<td>8.2</td>
<td>8.0</td>
<td></td>
</tr>
<tr>
<td>Utah 18</td>
<td>7</td>
<td>Orange</td>
<td>Moderate</td>
<td>Fair - good</td>
<td>8.2</td>
<td>7.7</td>
<td>8.2</td>
<td>8.0</td>
<td></td>
</tr>
<tr>
<td>Utah 32</td>
<td>8</td>
<td>Orange</td>
<td>Moderate</td>
<td>Good</td>
<td>8.2</td>
<td>7.7</td>
<td>8.2</td>
<td>8.0</td>
<td></td>
</tr>
</tbody>
</table>

*1932-59 average. Days before (−) or days after (+) Chinese
†Color, texture, and flavor are rated 1 = poor, 10 = excellent
‡Quality rating obtained by averaging individual quality scores. Highest score indicates highest quality.
Sodium hexametaphosphate, commercially manufactured as Calgon, is available in grocery stores.

**Use of a water softener**

**improved quality**

**of overmature processed peas and aided in removing skins of peaches**

**BLANCHING WITH SOFT WATER**

D. K. SALUNKHE AND A. R. HAMSON

**W**ater in Utah contains high amounts of calcium and magnesium salts. Because of these high salt concentrations the water is considered hard. When such water is used for washing and blanching fruits and vegetables, the tissues become tough because the pectinaceous material in the fruit or vegetable combines with calcium and magnesium to form complex compounds which toughen the processed, especially frozen, products.

Sodium hexametaphosphate, commercially manufactured as Calgon, is a straight chain polyphosphate with water softening properties. It has been used extensively as a water softener for laundry, dish washing, and bath. According to personal communication with Dr. John Mahon, Chemical Research and Development, Hagan Chemicals and Control, Inc., Pittsburgh, Pennsylvania, "... At the present time sodium hexametaphosphate is permitted in a variety of food products. In certain cured meats, such as ham, for example, up to 5,000 ppm of sodium hexametaphosphate is permitted by the meat inspection branch in Washington, D. C. Sodium hexametaphosphate is also permitted in certain processed cheeses in amounts up to 30,000 ppm by weight of the finished product. In the proposed standard of identity for artificially sweetened fruit jellies, the use of sodium hexametaphosphate is permitted up to 1,250 ppm in the finished product. Although the safety of sodium hexametaphosphate in the diet has not been questioned, as illustrated by the foregoing approval for uses in food, a two-year feeding experiment at the University of Rochester is being conducted to establish further safety of sodium hexametaphosphate in food. To date these tests do not indicate any toxic characteristics of sodium hexametaphosphate... ."

This article presents observations on the effects of sodium hexametaphosphate used as a water softener for washing and blanching peas and peaches for processing by canning and freezing.

**Peas**

The variety Early Perfection peas was grown on the Greenville Farm of the Utah Agricultural Experiment Station in North Logan, Utah. The crop was harvested for this experiment when it was slightly beyond the optimal harvest time for processing. The tenderometer values were in the range of 120 to 125. Shelled peas were used to determine tenderometer values when raw, after blanching in boiling water alone for 2 minutes, and also after blanching in boiling water containing 2000 and 4000 ppm sodium hexametaphosphate follow-

(Continued on page 104)
Farmers are searching for more economical rations for the swine breeding herd. Survey results indicate that maintaining the breeding herd represents 30 percent of the total cost of producing pork, and that the feed makes up over three-fourths of the breeding herd costs. Frequently farmers, in an effort to economize, have used rations that lack essential nutrients, with disastrous results. Litter size has been reduced, pigs have lacked vigor at birth, and sows frequently have not come into milk production when poor rations have been used. Only small litters have been weaned as a result and the chance for profit has been reduced or lost completely.

Roughages are usually a cheaper source of many of the nutrients than are concentrates and hog producers have been interested in learning how to use roughage to the fullest extent. High quality alfalfa is valuable in swine rations largely because of its mineral and vitamin content. Frequently, however, the costs of grinding the hay in preparation for incorporating it into a complete mixed ration have been so high as to restrict its use.

The Utah Station has started studies to determine how roughages might be advantageously used to produce economical yet adequate rations for pregnant swine. The two roughages studied to date are high quality third crop alfalfa hay and corn silage.

Two levels of concentrate fed with alfalfa

In the alfalfa feeding tests, alfalfa was fed free choice as long hay in a feeder and a concentrate mixture was hand fed to the gilts. Two levels of concentrates were fed: 4.5 pounds per gilt per day and 3.5 pounds per day. As shown in table 1, alfalfa was consumed in rather large amounts. The gilts on the lower level of concentrates ate nearly two-thirds of a pound of alfalfa per day more than those on the higher level. This was not sufficient, however, to make up the difference in nutrients and these gilts gained only 0.77 pounds per day as compared to 1.14 pounds for those on 4.5 pounds of concentrates. The lower level of feed intake had a markedly adverse effect on reproduction; only 6.8 live pigs were born per litter, on the average, as compared to 10.8 pigs for gilts fed at the higher level. The difference in total number of pigs born was small, only 0.7, but the difference in live pigs born was marked.

It is estimated that feeding only 4.5 pounds of concentrates and forcing the gilts to eat more than 2 pounds of long alfalfa hay per day saved approximately 1.75 pounds of concentrates per day. At the prevailing prices for hay and concentrates, this effected a saving of some 2¢ per gilt per day or $2.00 for each gilt for a 100 day pregnancy feeding period.
Corn silage compared with alfalfa

A second experiment compared corn silage with alfalfa as a roughage source for swine. The same concentrate mixture was fed at the level of 4.5 pounds per gilt per day along with either corn silage or alfalfa hay, free choice. The corn silage was from corn cut at the early dent stage and had a total digested nutrient content of approximately 20 percent.

Performance on both rations was highly satisfactory. Those gilts receiving corn silage gained a little more than those getting the alfalfa (1.4 pounds daily as compared to 1.2 pounds daily). Little difference was apparent in reproductive performance, however. The average number of live pigs born in the alfalfa group was 8.3 while the number in the corn silage group was 9.5. This difference was not significant. The daily consumption of alfalfa was again 2.1 pounds per gilt and of corn silage 5.2 pounds.

These results suggest that both good quality alfalfa hay and corn silage are highly useful feeds for pregnant sows. Concentrate level can be reduced when these feeds are given in liberal amounts. Restricting concentrate level to as little as 3.5 pounds daily per gilt does not appear to be desirable as daily gains are below recommended levels and reproductive performance is lowered. Feeding 4.5 pounds of concentrates daily along with either of these roughages gave good results. It is possible that 4.0 pounds daily may be adequate but this has not been tested sufficiently.

It is highly important that the concentrate mixture fed with these roughages be one that is adequate in all needed nutrients yet not excessively high in cost. The mixture used in these trials is given in table 2. Many other suitable combinations could be devised. This one, however, is economical under most Utah conditions and judging from results would seem to be quite adequate. Its use along with liberal feeding of corn silage or high quality alfalfa hay offers possibilities for reducing the feed costs during the pregnancy period.

### Table 1. Gains and reproductive performance of gilts fed two levels of concentrates with alfalfa hay

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fed 3.5 lbs. conc. daily</td>
<td>Fed 4.5 lbs. conc. daily</td>
</tr>
<tr>
<td>Average daily consumption of hay (pounds)</td>
<td>2.64</td>
</tr>
<tr>
<td>Average daily gain (pounds)</td>
<td>0.77</td>
</tr>
<tr>
<td>Average number of pigs born alive</td>
<td>6.8</td>
</tr>
<tr>
<td>Average number of pigs born (total)</td>
<td>10.5</td>
</tr>
</tbody>
</table>

### Table 2. Concentrate mixture fed to pregnant sows

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground barley</td>
<td>87.5</td>
</tr>
<tr>
<td>Meat scraps (50% protein)</td>
<td>4.0</td>
</tr>
<tr>
<td>Soybean meal (50% protein)</td>
<td>7.07</td>
</tr>
<tr>
<td>Common salt, iodized</td>
<td>.75</td>
</tr>
<tr>
<td>Bonemeal</td>
<td>.25</td>
</tr>
<tr>
<td>Monosodium phosphate</td>
<td>.20</td>
</tr>
<tr>
<td>Zinc sulfate</td>
<td>.08</td>
</tr>
<tr>
<td>B12 supplement (6 mg. vitamin B12 per pound)</td>
<td>.15</td>
</tr>
</tbody>
</table>

Total 100.00

(Continued from page 85)

QUALITY IN WHEAT

(FOR DECEMBER 1959)
these several concepts of quality into one variety. To add to his problem the concept of what constitutes quality undergoes periodic change. Varieties once considered satisfactory need replacement as quality standards change. Varieties vary widely in the degree to which they exhibit various quality characteristics. Evidence of genetic variation in quality, even among closely related breeding lines, can be seen in figure 1. The 3 lines shown are selections from the same cross. One of these lines possesses definitely inferior loaf volume and texture while its two sister selections bake into acceptable loaves. It is this genetic variation which forms the basis of quality improvement through breeding.

Breeding for quality has lagged behind breeding for characteristics such as yield and disease resistance for a number of reasons. One of these has been the failure of those concerned with the processing and consumption of bread wheats to arrive at a definite set of quality standards. A second factor has been the lack of reliable methods and procedures for measuring the various quality components. Yield can be measured and resistance to disease can be readily observed. By contrast, few of the important quality characteristics can be seen by the breeder. Within a particular class the kernels of one variety are pretty much like the kernels of another – on the outside.

It has remained for the chemist and the milling and baking technicians to develop tests by which they can point out to the breeder the quality differences among his selections which he cannot see. Many of the tests are as yet only partially satisfactory, but a great deal of progress has been made in recent years and methods are constantly improving.

Quality tests

One of the most used criteria of quality in bread wheats has been protein content. In the past if a wheat was hard, red, and high in protein (13-16 percent) it was considered to be good bread wheat. Although the quantity of protein in wheat is still considered important, it is now recognized that the quality or type of protein is also a major factor in bread-making quality. Varieties possessing similar percentages of protein may differ markedly in quality. It can be seen from figure 2 that high protein alone does not insure good loaf volume and texture.

The determination of the ash or mineral content of flour is an important test for milling quality. It gives an indication of how completely the germ and bran are separating from the endosperm (the mineral content of bran is about 20 times that of endosperm). Varieties differ considerably in the percentage of high grade, low ash flour they yield.

A number of tests have been developed to measure the reactions of flour as it is mixed into dough. The baker desires a "strong" flour which exhibits good stability during the mixing process. "Weak" flours result in dough which breaks down and becomes difficult to manage when over-mixed. An instrument which is finding extensive use in measuring the response of dough to mixing is the farinograph. This instrument records graphically the amount of mixing required to develop the dough properly and the stability of the dough to mixing. Sample farinograms are shown in figure 3. The curves for strong wheats such as Cheyenne and some of the newer varieties and breeding lines remain relatively level after reaching their peak. Curves for the varieties which are less stable to mixing begin to fall off after a few minutes. This variation in mixing tolerance, as recorded by the farinograph, is shown for several varieties and selections in table 1.

The ultimate test of bread-making quality is the type of loaf into which a variety of wheat bakes. As can be seen from table 1, excellence in some of the other quality characteristics, such as mixing tolerance, does not necessarily mean that a variety will bake into a good loaf. Baking tests have been devised using samples of flour as small as 8 grams. However, results are more meaningful where sufficient flour is available to bake the commercial one pound loaf. The over-all rating given a baked loaf is a composite of its volume, the character of its crust, its crumb and crust color, and its texture.

Cooperative effort

Most of the tests described above involve elaborate equipment and facilities and highly trained personnel. These facilities and the technical assistance have been made available to the wheat breeding program in Utah through a cooperative arrangement between Utah Agricultural Experiment Station and several of the large commercial mills in the state. Breeding lines developed at the Experiment Station are tested for quality in the well-equipped laboratories of the commercial mills. Those selections shown to possess inferior quality characteristics are eliminated from the breeding program.

This cooperative approach has

Table 1. Quality characteristics of 7 winter wheat varieties and selections. 1957-58.
(data supplied by Sperry Operations, General Mills, Inc.)

<table>
<thead>
<tr>
<th>Variety</th>
<th>Mixing tolerance (in minutes)</th>
<th>Loaf volume (in cubic cms.)</th>
<th>Over-all rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Itana</td>
<td>7.5</td>
<td>10.0</td>
<td>2600</td>
</tr>
<tr>
<td>Columbia</td>
<td>6.5</td>
<td>18.0</td>
<td>2775</td>
</tr>
<tr>
<td>Cache</td>
<td>2.5</td>
<td>5.5</td>
<td>2750</td>
</tr>
<tr>
<td>Wasatch</td>
<td>2.0</td>
<td>4.0</td>
<td>2450</td>
</tr>
<tr>
<td>Utah Kanred</td>
<td>2.0</td>
<td>5.0</td>
<td>3025</td>
</tr>
<tr>
<td>Utah selection #208-63-2-1</td>
<td>14.0</td>
<td>24.0</td>
<td>2875</td>
</tr>
<tr>
<td>Utah selection #234-6</td>
<td>13.5</td>
<td>13.5</td>
<td>2300</td>
</tr>
</tbody>
</table>
made possible the isolation of several selections which excel our present standard varieties in bread-making quality (fig. 4). Such quality improvement should eventually benefit all those in the state who are concerned with the production, processing, and consumption of bread wheats.

AGRICULTURE IN USSR
(Continued from page 89)

over each brigade. On the larger farms the brigades are organized in sections of 150 to 200 workers. Workers are paid according to day work units. One working with his hands at ordinary labor has a certain quota of work that must be completed to make a day work unit. A tractor driver may be paid about two-day work units for each day worked. A farm manager is paid four to five times the rate of a hand laborer and a scientific adviser such as an agronomist, a veterinarian, or an engineer attached to the farm is paid about 85 percent that of the farm manager.

Expansion of irrigated land

Russia is rapidly expanding the area of irrigated lands. A new project on the Hungry Steppe in Uzbek is adding about a million acres and may ultimately add nearly two million acres. The total irrigated land is between 27 and 50 million acres which is only slightly less than that in the United States. Cotton, alfalfa, fruit, vegetables, and feed crops are the important irrigated crops. In the Fergana Valley near Afghanistan many mulberry trees are grown between the cotton fields. These are used as feed for an active silk worm industry.

The central USSR government and the governments of the various republics share in farm development costs. The government provides all costs of storing, diverting, and conveying irrigation water so that water is delivered to farms without cost. The government pays all costs of new project development, but apparently new project lands are converted principally to state farms. The government pays half the cost of draining land on collective farms. Half of land leveling costs is also paid if accompanied by major stone removal operations. The government pays all costs of developing state farms. They are, in fact, operated just like a factory and the workers have no share in income beyond their regular wages.

Farm mechanization in rapid transition

Mechanization on Russian farms is behind that of the United States but it is in rapid transition. Large tractors, combine harvesters, plowing and cultivation equipment seem adequate. There is limited equipment for harvesting hay and for other miscellaneous tasks. Much of the transportation on farms is by ox cart.

Until 1958 all power machinery was assigned to machine tractor stations (MTS). Individual farms arranged with the local MTS for tractor and other machinery work. In 1958 the farmers were permitted to buy their own equipment and all but the poorest collective farms are purchasing major equipment items to do all except a few specialized operations.

Livestock of poor quality

The USSR had large losses of livestock during World Wars I and II, during the Russian Revolution, and during collectivization of small farms in the 1930's. As a result meat, butter, eggs, and milk have been limited in the diet and emphasis has been directed more toward increasing the quantity of livestock than toward quality. Numbers are becoming adequate and current emphasis is shifting toward quality improvement.

Russia has few beef cattle. Emphasis is placed on dual purpose milk cows. These are generally of large body and of lower average production than cows in the United States. A 25 percent increase in production has been recently attributed to improved care of animals. In 1957 production averaged 4,000 pounds of milk on collective farms and 5,750 pounds on state farms. (U.S. average 6,162 pounds.)

Direct care of animals is principally by women workers and the personal attention given cows far exceeds that on American dairy farms. One worker is usually assigned the care of 7 to 15 cows. This is direct care of the animals and does not include general farm work in feed production. Most cows on farms are milked three times a day and freshening heifers are milked four times. During the growing season pasture, alfalfa, and other forages are cut daily and fed green chop on many of the farms. Not many cows in farm herds graze directly in the fields. Hay, silage, grains, beets, and squash are fed during the long winter seasons. Most farms have large, well-constructed stanchion barns for winter. Some have open air milking and feeding parlors for summer.

Russian scientists pioneered in artificial insemination of livestock and today 85 percent of the dairy cows are bred by this procedure. An attempt is being made to increase the butterfat of milk by importing Jersey bulls, but importations of Holstein-Friesian and bulls of other breeds from high-producing herds in Europe is being practiced to upgrade dairy production. Artificial insemination is also practiced on about 85 percent of the sheep and extensively with swine.

Russia has a total of 120 million sheep compared with 31 million in the United States. The fat-tailed coarse-wooled sheep are used extensively in desert areas but are being replaced by finer-wooled types. Hogs are principally of large white and spotted fat-producing types. There is a shortage of fat in the Russian diet and little interest was expressed in meat-type hogs.

Ducks and geese are more common throughout the USSR than in the United States. It is a common sight to see children herding small flocks. Chickens are common but production is relatively low. Figures of 80 to 160 eggs per year per laying hen were commonly quoted.

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Laying hens seem to roam freely about the household plots.

Farms are serviced with veterinarian help and there is relatively good control of most diseases. In addition to their own research on livestock diseases Russian veterinarians follow closely recent findings in the United States and Europe.

A visit to a collective farm

The Orzdonikidze Collective Farm of 17,500 acres is located about 100 kilometers southwest of Dnepropetrovsk in the Ukraine, an area somewhat similar to central Nebraska. About 6,000 acres are used for wheat and nearly 7,000 acres are planted to a 12-year rotation that includes winter wheat, corn, sunflowers, spring grains, Sudan grass, and fallow. An orchard area of 300 acres is irrigated and produces principally apples. A soil survey and general farm plan were made this year by the Soils Institute of Dnepropetrovsk.

The farm has 560 families located in four villages. There are 640 regular workers. Two agronomists, one for field crops and one for fruits, plan the soil management and crop production practices. There is one machinery engineer and one animal husbandry officer. The farm manager is credited with four labor day units for each day worked, an agronomist receives 85 percent as much as the farm manager. A tractor driver is paid according to work done, getting one labor day unit credit, for example, for each five acres of land plowed with a five-bottom plow. A farm laborer was paid for each labor-day unit last year: 12 roubles, 2 kilograms of grain, 5 kilograms of vegetables, and 1½ kilograms of fruit.

There were five tractor stations on the farm, comprising 28 tractors, 29 trucks, and 24 combine harvesters. There were 700 milk cows, 2,000 hogs, and 13,000 poultry. The farm had a total income last year of 12 million roubles, 5 million of this coming from fruit.

A state farm is visited

The Saval State Farm near Andizhan in the Fergana Valley of middle Asia has an area of about 20,000 acres with about 16,000 acres irrigated. The farm produces about 11,000 acres of cotton plus alfalfa, corn, and small amounts of fruits and vegetables. It has about 670 cattle, 230 milk cows, 1,200 hogs, and 3,800 sheep. There are 2,700 families (8,000 people) on the farm and 4,500 workers; 50 percent of these are women. The farm workers are divided into 10 sections with a mechanic graduated from a secondary technical school in charge of each section. One section deals only with livestock, the others have mixed crops and some livestock.

Section 1 grew 1,075 acres of cotton, 125 acres of corn, and 180 acres of alfalfa in 1958. The workers of Section 1 are organized into 6 cotton growing brigades of 15 to 20 workers each. In addition, there are 2 mechanical brigades of 8 to 10 workers. Every cotton growing brigade has 2 tractors for routine operations. Three or four members of a brigade are constantly responsible for irrigation. Every worker is given a quota of work and is paid a bonus of 50 percent for work in excess of the quota.

They have on the farm 15 agronomists, 3 irrigation engineers, 4 veterinarians, and 5 mechanical engineers. Every section on the farm has an agronomist that plans the farm practices. The section chief and the brigade leaders see that the plans are carried out. The chief agronomist reviews the irrigation and other practices for the entire farm and approves or modifies them.

The chief engineer has charge of all water distribution on the farm. He has one assistant responsible for distributing water between sections and another assistant responsible for the maintenance of installations.

Wheat fields appeared particularly productive with yields comparable to those in the United States. Corn was generally inferior. Frequently corn was planted broadcast and used as a nurse crop for alfalfa or was cut for hay. In some places corn and sunflowers were cut for silage with field choppers similar to those used here. In these cases the ears were immature and had not reached maximum feed value.

Potato fields were generally productive in appearance even in the steppe regions of northern Kazakhstan and Siberia where precipitation averaged about 12 inches. We estimated crop yields in 1958 would average about two-thirds of those under comparable soil and climatic conditions in the United States.

SHRINKAGE

(Continued from page 91)

<table>
<thead>
<tr>
<th>Hours</th>
<th>Percent shrink</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>3.3</td>
</tr>
<tr>
<td>16</td>
<td>6.2</td>
</tr>
<tr>
<td>24</td>
<td>6.6</td>
</tr>
</tbody>
</table>

Time in transit is related to rate of shrink. However, after the first 2 or 3 hours the increase in shrinkage becomes smaller. On the average, shrinkage will increase up to 9 or 10 percent until the first rest stop is taken. Some weight is recovered, but by the time the second rest stop is reached, shrinkage will reach 10 to 11 percent. Feed and water stops certainly pay off if sales point has not been reached. This is true for shorter hauls also, since a large part of the shrinkage occurs during the first few hours in transit. The Wyoming study found that feeder steers shrank according to the following pattern:

<table>
<thead>
<tr>
<th>Hours during trucking</th>
<th>Percent shrink</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>3.9</td>
</tr>
<tr>
<td>16</td>
<td>6.1</td>
</tr>
<tr>
<td>24</td>
<td>6.6</td>
</tr>
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</table>

Some physical characteristics affect the rate of shrink. Others apparently do not. Results from experiments on shrinkage differences between steers and heifers are not conclusive. Heifers may shrink more than steers during hot
weather, but results are not highly predictable. Bulls generally shrink more than steers or heifers because of the disturbing influence of strange animals nearby. Calves also shrink more than steers because of influences associated with weaning.

Breed seems to have no real effect on shrinkage rates. The Arizona Experiment Station found little difference between Brahmas and Herefords. Neither has breeding lines shown any consistency in their effect on shrinkage.

Fat cattle shrink more than feeder cattle during the first few hours in transit. However, after the first few hours feeders shrink more. Experiments show average situations:

<table>
<thead>
<tr>
<th>Hours in transit</th>
<th>Rate of shrink Fats Feeders</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>5.4  3.8</td>
</tr>
<tr>
<td>15</td>
<td>6.2  8.2</td>
</tr>
<tr>
<td>60</td>
<td>8.2  9.5</td>
</tr>
<tr>
<td>80</td>
<td>10.8 12.4</td>
</tr>
</tbody>
</table>

**Variations in shrinkage**

Studies have indicated considerable variation in cattle shrinkage. Time in transit is related to shrinkage, but the level at which an animal shrinks enroute depends on many factors. Over filling animals will cause shrinkage to start and continue at a higher level through the marketing process than for animals fed normal quantities of feed and water. Preconditioning cattle before shipment with less laxative feeds and adjustment to new environment can reduce the level of shrinkage. Quiet, patient loading and unloading can pay off in reduced shrinkage. Travel protection from excessive heat and cold is worth the added expense for water stops or covers.

**Weighing market possibilities**

Often your most valuable hours will be those you spend weighing alternative market possibilities with your information on price and shrinkage. An example of the process of weighing alternatives is in table 1.

Shrinkage considerations may increase your profits. Wise bargaining can equalize the advantage between buyer and seller. Average conditions may not apply to your specific situation. Know your own position. Watch the physical conditions incident to marketing. Calculate the differences among your market alternatives. Maintain flexibility in order to take advantage of your opportunities.

**APRICOTS**

(Continued from page 96)

was shown by Coe to be the Large Early Montgamet from the eastern or central United States. It is the standard apricot of Utah. The fruit is medium to large when well grown, round, light orange, and sometimes blushed with red. It is moderately firm, good in quality, and somewhat sprightly in flavor. The tree sets light crops in some years because of bud-kill in winter and early spring.

**Tilton.** This important Pacific Coast variety hasn't done too well at the Station. The fruits are light in color, small, and late when compared with Chinese. Under our conditions the flesh is light in color, juicy, somewhat tart, and stringy. The quality is fair.

**Sun Glo. (Plant Patent No. 751.)** This variety was introduced in Washington by the Columbia and Okanogan Nursery in 1946. It shows promise for extending the canning season of the Large Early Montgamet. Its deep rich orange color makes it stand out in the orchard. It should be thinned as it tends to overset. The firmness of the fruit even when highly colored makes it ideal for roadside market or shipping. The quality is fair to excellent for canning.

**New Utah varieties for trial**

The development of a new fruit variety requires many years of testing and evaluation. Professor Coe's apricot breeding program was started more than twenty years ago. Hundreds of seedlings were planted at the Farmington Field Station near Kaysville. Many were eliminated before coming into bearing because of poor growth characteristics. By 1958 only 20 selections remained. In 1959, considered to be a typical production year, a critical evaluation was made and 11 of these were discarded as no better than varieties already in existence. Of the remaining 9, three appeared promising enough to release to nurserymen during the 1959 season. Naming of one or two of these will follow if grower tests are satisfactory. An unfortunate aspect of this breeding work is that the parentage of all of these new selections is unknown, the result of time and Professor Coe's leaving the University.

**Utah 27.** Most attractive of the new selections, this variety, ripening with Chinese, is blushed with a bright red color over half of its surface. In shape, it is distinctly flattened, oval with little suture and is extremely uniform throughout the tree. The flesh is bright orange, juicy, moderately firm, and of good quality. Canning tests on a limited sample have shown it to be somewhat more bland in flavor than Chinese, probably because the flesh is lower in acidity. When sun dried, it has a more attractive color than Chinese and is comparable in flavor. It is the only one of the selections that has a sweet kernel, like the Chinese. The tree is upright spreading with large, dark green foliage. Utah 27 has been released to two Utah nurseries and will be available in the fall of 1960 or spring of 1961.

**Utah 18.** Large size, late maturity, and quality similar to Chinese make this selection promising for extending the apricot canning season in Utah. This seedling ripens about a week after Chinese and is the largest apricot in the Station orchard. The fruits are similar to Chinese—round to slightly flattened, bright orange with little or no red blush. The flesh is mild in flavor and the quality fair to good. The pit is bitter. No canning tests were made during the 1959 season. This selection, like Utah 27, has
been released to nurserymen for propagation and sale on a trial basis.

*Utah 32.* This is the latest of the promising new selections at the Utah Station, maturing eight days or more after Chinese. It has the highest quality of any variety in the canning tests and thus may become a valuable variety to extend the apricot processing season. The fruits are medium to large, round to somewhat flattened, moderately attractive with no blush. The flesh is bright orange, juicy, and of good quality. The pit is bitter. This selection will be released upon request to licensed nurserymen in 1960.

**BLANCHING WITH SOFT WATER**

(Continued from page 97)

Peas blanched with water containing 4000 ppm of sodium hexametaphosphate were more tender than peas blanched in water without this softener. We may conclude that it is possible to soften blanching water as well as plant tissues by using sodium hexametaphosphate.

Canners and freezers will likely limit the use of sodium hexametaphosphate for washing and blanching peas and beans depending upon the grade of the product and also upon the hardness of the water. For example, for washing and blanching peas of sieve sizes 1 to 4, only small amounts of sodium hexametaphosphate may be needed, because these peas are young and tender. Sodium hexametaphosphate treatment would not be required unless the water is hard. It is, therefore, suggested that canners and freezers analyze the blanching water for its hardness before calculating the amount of sodium hexametaphosphate needed. Peas of sieve sizes 5 and 6 are tough skinned and starchy and should be washed and blanched in water containing sodium hexametaphosphate. This treatment will not affect the sweetness of the peas but the texture will be softer so the peas will seem to be more tender to the consumer.

Sometimes high temperature, low relative humidity, and/or low moisture content in the soil cause toughness in the seedcoat even though the cotyledons are sugary. These conditions favor the use of sodium hexametaphosphate to improve the quality of the peas.

**Peaches**

The peach variety Elberta was obtained from the Howell Field Station of the Utah Agricultural Experiment Station at Ogden, Utah. Fruits of firm-ripe maturity were selected for the experiment. Fruits were washed and blanched for 2 minutes in boiling water as well as in boiling water containing 8000 ppm sodium hexametaphosphate followed by a 2 minute dip in cold water and in water containing 8000 ppm sodium hexametaphosphate. Sodium hexametaphosphate helped to remove the skin more easily and with less tearing of the peach flesh. No adverse effect on the quality of canned peaches was observed.

The information presented in this paper could be useful to commercial processors as well as home canners where water hardness is a problem.

Fruits and vegetables can be washed, blanched, and processed in water containing approximately 1 to 2 heaping tablespoons of sodium hexametaphosphate or Calgon per gallon of water. However, the concentration of sodium hexametaphosphate needed will depend upon the hardness of water, type and maturity of fruit and vegetable, and the time required for washing, blanching, and processing.

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**CONTRIBUTIONS TO RESEARCH**

**August 15 to November 1, 1959**

<table>
<thead>
<tr>
<th>Organization</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kennecott Copper Corporation</td>
<td>$12,500 for (1) study of the control of dodder, (2) performance testing of sheep and cattle, and (3) nutrition of poultry</td>
</tr>
<tr>
<td>Moroni Feed Company</td>
<td>$1200 for studies in turkey nutrition</td>
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<tr>
<td>National Association of Artificial Breeders</td>
<td>$1200 for studies of causes of early embryonic death in cattle</td>
</tr>
<tr>
<td>American Cyanamid Company</td>
<td>$1000 each for study of staphylococcus in turkeys</td>
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<tr>
<td>Eli Lily Company</td>
<td>$500 for research on tomatoes</td>
</tr>
<tr>
<td>American Can Company</td>
<td>$500 to study the effects of zinc bacitracin in fattening lambs</td>
</tr>
<tr>
<td>Commercial Solvents Corporation</td>
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</tbody>
</table>

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**FARM AND HOME SCIENCE**