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Recommended Fertilizer Practices for 1948

Fertilizer Supplies Still Short of Demand in Utah

By D. W. THORNE and H. B. PETERSON

SUPPLY OUTLOOK FOR 1948

MORE and more fertilizer is becoming available for sale in Utah. The situation does not greatly improve, however, because the demand seems to increase as fast as the supply. Provisions are being made for increased production of phosphate fertilizer and by another year our supply should be more nearly adequate. There will probably be a slight increase in the supply of nitrogen fertilizer in Utah in 1948 over that available in 1947. The two principal sources of nitrogen are ammonium sulfate, produced at the steel mills near Provo, and synthetic ammonium nitrate, shipped here from British Columbia or other areas. There will be only limited quantities of treble superphosphate which has been popular in the western states, but Simplot single superphosphate from Pocatello will be more plentiful.

An increasing proportion of plant food will probably be sold in mixed fertilizers in comparison with previous years. Unfortunately, the mixed fertilizers will consist of little of the low cost and high analysis ammonium phosphates—16-20-0 and 11-48-0—and more of the lower grade and more expensive types.

TYPES OF SIMPLE FERTILIZERS

Nitrogen Fertilizers

Ammonium sulfate

This is the most common nitrogen fertilizer used in Utah. It contains about 20 to 21 percent nitrogen (20-0-0). The average selling price is about $2.80 per hundred, with a nitrogen cost of about 14 cents per pound.

Ammonium nitrate

A good nitrogen fertilizer produced largely in synthetic nitrogen factories built for the manufacture of explosives. The pure product contains about 33 percent nitrogen (33-0-0) and sells for about $4.55 a hundred. This gives an average cost of about 14 cents per pound of nitrogen which compares favorably with the cost of ammonium sulfate. With its present excellent physical condition ammonium nitrate is a good buy in nitrogen fertilizers. Apply about 65 lbs. for each recommended 100 lbs. of 20-0-0.

Anhydrous ammonia

Some ammonia gas or anhydrous ammonia may be on the market during the coming year. It has a high analysis and is usually the cheapest source of nitrogen available. It must be handled in tanks and applied with special equipment. Anhydrous ammonia may be diluted with water to form an ammonia solution. Ammonia solutions and aqueous ammonia can be applied with applicators similar to those used for applying fumigants, or they can be applied in the irrigation water. When crops are exposed to the fumes of ammonia from either anhydrous or aqua ammonia the leaves are usually harmed, so that care must be taken in handling such materials.

Phosphate Fertilizers

Until about four years ago, most Utah farmers thought only of phosphate when considering commercial fertilizers. Studies by sugar beet companies during the past few years indicated that some land cropped frequently to sugar beets has been built up in phosphate to unusually high levels. Consequently, it is now important to watch the balance between phosphate and nitrogen rather than thinking primarily of phosphate alone.

Treble superphosphate

In the past, this has been the most commonly used phosphate fertilizer in the Intermountain States. For this reason, most of the fertilizer recommendations are based on the use of this product. It contains 43 percent available phosphoric acid (0-43-0). At an average cost of about $3.00 per hundred, each pound of available phosphoric acid is worth about 7 cents.

Single superphosphate

During the past few years, considerable single superphosphate containing 20 percent available phosphoric acid (0-20-0) has been distributed by the AAA. The Simplot Company at Pocatello is producing an 18 percent grade (0-18-0) which has sold for about $1.50 a hundred. This gives an average cost of 8.3 cents per pound of available phosphoric acid. The single superphosphate contains almost 50 percent by weight of gyspsum, but this probably has no economic value on most farm soils in Utah. Applications of about 200 to 250 lbs. of 0-18-0 should be made for each 100 lbs. of 0-43-0.

Ground rock phosphate

Each year some ground rock phosphate is sold in Utah. The use of this material is not recommended and growers are advised not to buy this product. Experiments with this material have failed to show any value from its use in states of the arid West.

(Continued on page 17)
RESEARCH ON VIRUS DISEASES OF STONE FRUITS EXPANDED

The disastrous tree and crop losses from stone fruit virus diseases and the potential threat of these diseases to the stone fruit industry of Utah and of the Northwest is rapidly being recognized. Since July 1947 money has been appropriated and personnel appointed, and plans are now taking shape for a more vigorous attack on these insidious enemies.

During the years 1940 to 1947 research has been conducted in Utah under the direction of Dr. B. L. Richards, Utah Agricultural Experiment Station, associated successively with Dr. Lee M. Hutchins and Dr. L. C. Cochran of the Bureau of Plant Industry, Soils, and Agricultural Engineering. Comparatively little budget money has been involved in this research effort during these seven years; however, the early research period closed with three major achievements to its credit, (1) with the discovery and a fair knowledge of some twenty-four virus diseases of stone fruits not previously known to Utah and some of them not previously known to science, (2) with a clear picture of the danger of these diseases to Utah agriculture and to that of the nation, (3) with an experimental plot of 15 acres of excellent agricultural land purchased with money directly appropriated by the 1943 State Legislature for the specific purpose of virus disease study of stone fruits.

The various cooperating agencies promoting the work during this early period have been the Davis County Commission, the Utah State Road Commission, the State Department of Agriculture, and the Utah State Extension Division specifically through the vigorous cooperative efforts of County Agent DeLore Nichols. In fact the work done during this early period stands as a splendid example of what can be accomplished through cooperative effort even though budgets are inadequate.

A New Era Opens in the Stone Fruit Virus Study

For the fiscal year 1947-1948, $8,000 annually was set up by the Utah Station for the stone fruit virus work. Through the Bureau of Plant Industry, Soils, and Agricultural Engineering $6,000 of Hope-Flannagan Funds was allotted for work in Utah, and from the same Hope-Flannagan funds allotted to the Bureau of Entomology and Plant Quarantine money was obtained for support of a full-time entomologist for vector studies in the stone fruit virus project. These additional funds have greatly augmented the personnel that will be involved directly in this research.

Two valuable field plots are at present available for continuation and for expansion of the research program, (1) a fifteen acre plot located just south of Kaysville, and (2) a plot at Holladay. The former plot was purchased in 1945 with funds specifically appropriated by the Utah State Legislature. This plot is at present considered a part of the Farmington Experimental Farm. Recent purchases by the Station of land adjacent to this virus plot makes possible further expansion as needs of the virus work arise.

The plot at Holladay, 6400 So. 1810 E., is made possible through the courtesy and cooperative attitude of the Utah State Road Commission. This plot is part of the nursery owned and operated by the Commission.

A large laboratory is now being equipped in the Plant Industry building at the College. This laboratory will house both federal and state workers and is immediately adjacent to other well equipped research laboratories under the supervision of the Department of Botany and Plant Pathology.

(Continued on page 15)
SOIL FUMIGATION

Only Effective Way to Control Nematodes, Wireworms and Other Soil-Inhabiting Pests

By GERALD THORNE

INSTRUCTIONS FOR SOIL FUMIGATION

1. Soil moisture should be comparable to that of a good seed bed. Dry, loose soil allows much of the gas to escape, while excessive moisture prevents proper diffusion of the gas.

2. Soil temperature should be between 40 and 85 degrees at a depth of six inches. Utah field temperatures generally will be within this range whenever the soil can be worked.

3. Plow to the usual depth. Do not depend on disking, which rarely works the soil more than four or five inches deep, leaving a solid subsoil through which the gas cannot penetrate.

4. Soil should be in good planting condition without large clods, straw, alfalfa roots, or coarse manure which will form holes and permit fumigants to escape. Fields just broken from alfalfa are not in a suitable condition for fumigation.

5. Apply fumigants as recommended here for the various pests, using a chisel or plow applicator, and make certain that the chemical is placed 6 to 8 inches deep. A competent operator is essential.

6. Work the surface down firmly immediately after application, using a harrow, leveler, drag, packer, roller, or other suitable equipment. This operation is necessary in order to confine the gas and get maximum benefits.

7. Delay planting 7 to 10 days after fumigation to avoid injury to the young plants from gas remaining in the soil. When possible, fumigate in the fall.

8. Be certain that soil fertility is high enough to produce the desired crop and insure returns for the investment in fumigation.

9. Handle fumigants only in the open air and avoid breathing fumes. Be prepared immediately to wash fumigants from the hands. Remove clothing or shoes in case they accidentally become wet with the chemicals.

CONTROL of nematodes, wireworms, and other soil-inhabiting pests by means of chemicals has been practiced for many years but, until recently, on only a relatively small scale because of the almost prohibitive costs. Production of tomatoes, cucumbers, and other specialty crops in greenhouses during the winter months frequently justified the expenditure of $150 per acre or more, but such outlays obviously were far beyond what could be afforded in field-scale farming. During the past four years the situation has been greatly improved by the discovery of new soil fumigants which can be applied at costs of from $20 to $40 per acre.

The first of these new products was D-D, which should not be confused with the well-known insecticide DDT. This product is manufactured by the Shell Chemical Company. It was soon followed by mixtures of ethylene dibromide sold under the trade names of Dowfume W10, Dowfume W40, Soilfume, and Bromofume. In 1947, the Dow Chemical Company produced Dowfume N, a product similar to D-D. All of these chemicals have given satisfactory performance when applied in the proper quantities under suitable soil conditions, but the reader must bear in mind that soil fumigation is a technical process and that instructions for handling and applying must be carefully followed if success is to be attained.

In Utah, the first fumigation experiments were conducted with D-D in 1944, for the purpose of controlling the sugar beet nematode, and results were encouraging. Field demonstration plots were fumigated in 1945 and one of these is shown in figure 1. These plots were so outstanding that the Amalgamated and Layton Sugar Companies became interested and fumigated a number of commercial fields in 1946. These field tests were generally so satisfactory that in 1947 about 700 acres were fumigated for the control of sugar beet nematodes in the intermountain area by these two companies and the Franklin Sugar Co.

(Continued on page 16)

Fig. 1. Untreated check between D-D fumigated portion of field on left and Dowfume N on right. Fumigated portions both produced 19.79 tons per acre, the untreated check 6.0 tons per acre. 2. Applicator attachment for Ford Ferguson tractor built by the Shell Chemical Company. 3. Heavy duty soil fumigation rig, McCrea Chemical Service Co., Santa Barbara, California, used in applying Dow Chemical Company products. 4. Farmall tractor equipped with fumigant applicator by the Amalgamated Sugar Company, Lewiston. 5. Plow attachment applicator built by the Layton Sugar Company, Layton

Gerald Thorne is nematologist for the U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering with headquarters in Salt Lake City. He is the outstanding man in the country in his field.

for March, 1948
FARM AND HOME SCIENCE

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GLADYS L. HARRISON, Editor

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More detailed information on the subjects discussed here can often be found in Station bulletins and circulars or may be had through correspondence.

College series no. 779

DIRECTOR R. H. WALKER

Director R. H. Walker left Logan December 26 to head a nine-man agricultural mission to Siam for the Food and Agricultural Organization of the United Nations. Other members of the mission included: Dr. H. S. Purchase, veterinarian, Kenya, Africa; Dr. K. Kohler, irrigation engineer, U. S. Soil Conservation Service; Dr. K. Ramiah, rice specialist, Rice Research Institute, Cuttack, India; Dr. W. W. Cochrane of F.A.O.; F. G. H. Lee, statistician, China; Dr. G. N. Danhol, Forest Service, Indonesia; Dr. R. L. Pendleton, Johns Hopkins University; Dr. Herbert Green, Great Britain.

The mission is studying control of water supplies and possibilities of irrigation projects; rice production; economic status of farmers and incentives for increased production; control of rinderpest, a livestock disease; rural public health; nutrition; coastal fisheries; conservation and improvement of forest resources; introduction of agricultural schools, experiment stations, and extension services.

The mission arrived in Siam, January 3, and recent communications from Dr. Walker indicate that the study is going forward rapidly.

Dr. Walker reports hotel accommodations and food in Bangkok, the capital city, excellent and the Siamese people very friendly and cooperative.

On his way to Bangkok by air, Dr. Walker spent several hours in Damascus with Professor Aaron Bracken who is on leave from the Station acting as agricultural adviser to the Syrian government.

Dr. Walker plans to return to Utah sometime in April.

CONSUMER DEMAND FOR PEACHES
SALT LAKE CITY, UTAH, 1947

By ELLIS W. LAMBDORN

IN THE purchase of agricultural products consumers consider cost, quality and comparative value of various products and then make their decisions as to what they will purchase. The consumer’s decision for accepting or rejecting a commodity often determines the success or failure of the farmer and the marketing agency. To ignore these decisions is economic suicide. No one can long continue to produce who does not find buyers for his products. However, a producer who gives consumers what they want in the form and at the time they want it, and at a price they are willing to pay, will find plenty of buyers.

To produce a commodity and then try to induce the consumers to accept it is like “getting the cart before the horse.” It is impossible to force a commodity through the marketing channels and force the consumer to accept it. The consumer, because he controls the purse strings, is the final judge of what he will buy. Producers and marketing agencies must determine what consumers want and then sell it to them. The best way to do this is to observe and study their actions in the market. Conclusions about consumer reactions and consumer demand may be misleading unless they are based on an actual study of individual consumers. Such information, to be of any value, should be obtained directly from consumers. The opinion of dealers and of the men who handle a particular product may or may not reflect the reaction of the final consumer.

Four hundred and forty-four consumers in Salt Lake City were interviewed by the author and his assistants in the fall of 1947 relative to their purchases of peaches during the year. The consumers, usually the housewives, were interviewed at their homes. The city was divided into high, medium, and low income areas so as to allow for an equal number of consumers with high and with low incomes.

According to the results of the study, the demand for peaches in Salt Lake City was relatively inelastic in 1947. Stated in another way, consumers in Salt Lake view their purchases of peaches as a relative necessity. When the results of this study are compared with those of similar studies, peaches appear to be more of a necessity than oranges or grapefruit. Peaches are more of a necessity than dairy products with the exception of evaporated milk and butter, and peaches are more of a necessity than lamb but are viewed by the consumer in about the same light as veal and poultry. Peaches are less of a necessity than pork or potatoes.

If a typical consumer’s income is increased his purchase of peaches will increase at a slower rate than his income. On the other hand, if his income is decreased his purchase of peaches will decrease at a lower rate than his income.

Consumption of peaches is not greatly influenced by changes in income or changes in price. A large change in price results in a small change in the quantity purchased by the consumer. A small crop of peaches will result in a larger total return than a large crop under identical conditions.

In times of depression consumption of peaches per capita will not decrease as rapidly as consumption of a more luxurious commodity such as grapefruit. On the other hand, in times of prosperity consumers can afford to have, and would rather have, a more luxurious commodity such as grapefruit than they would peaches. As a result, in times of prosperity consumers will tend to increase their consumption of commodities like grapefruit and oranges more than they will peaches. From the standpoint of the producers, this means that in times of low prices producers of peaches have a relative advantage over producers of commodities such as citrus fruits; while in periods of high prices producers of a luxury commodity such as grapefruit have a relative advantage over producers of peaches.

Ellis W. Lamborn is a new assistant professor of Agricultural Economics. He received his Ph. D. from Cornell University a year ago and was appointed to the staff last summer.

Farm and Home Science too has decided to adopt the new look, at least "a" new look. We hope you like our new masthead.

Farm and Home Science
The study of the influence of certain cultural and harvesting methods and varieties on the yield and quality of vegetables is a cooperative project of the Departments of Vegetable Crops and Home Economics of the Utah Agricultural Experiment Station and the Western Regional Research Laboratory of the U.S. Department of Agriculture. Dr. E. Milton Andersen, Dr. Ethelwyn B. Wilcox, and Dr. L. H. Pollard are the leaders. A number of the other staff members cooperated in obtaining the sweet corn data which is summarized here.

M. P. Leonard, superintendent of the Farmington Substation grew the crop and supplied harvest laborers. Alvin Hamson, a senior student in the Department of Vegetable Crops, assisted him. Mrs. Colleen Burnham and Mrs. Leora Galloway of the Department of Home Economics aided in some of the processing, did the carotene analyses, and rated the eating quality of the corn. Dr. Delbert A. Greenwood of the Chemistry Department ran all of the chemical analyses except carotene. Professor Bliss H. Crandall of the Statistical Laboratory aided in analyzing the data obtained. Dr. Lorin E. Harris of the Animal Husbandry Department obtained chopped fresh fodder samples of some of the varieties. No report of his fodder analyses is available yet.

Sweet corn variety and strain trials are planned for 1948 with cooperation of all groups who participated in 1947. It is hoped that additional information on the yield and quality of fodder may be obtained then.

For March, 1948

Yields

Yields are based on one year’s results and for this reason direct comparison of varieties on a yield basis must be made with caution.

Field yields: Yields of fresh ear corn in the husk ranged from 5.88 tons per acre for Erie down to 1.43 tons for North Star. North Star was 24 days earlier than Erie, however. Other varieties which yielded in the top eleven were Golden Cross Bantam 2439, Hybrid 71A x 104C, Oto, G.C.B. Improved, G.C.B.-T Strain, Kingscross Earpack J9, G.C.B.-VT, No. 20, G.C.B. No. 12, Kingscross 12 Row Bantam, and Ioana. Each variety was harvested at the time of estimated peak production for a single picking of fancy quality whole kernel corn. A second picking could have been made on the early varieties. A few days’ delay in the harvest of the midseason varieties to give additional “overmature” corn suitable for cream-style canning would have increased yields.

Whole kernel yield: The cut kernel (Continued on page 14)

Table 1. The unhusked and whole kernel average yields of 22 sweet corn variety trials

<table>
<thead>
<tr>
<th>Variety or strain No.*</th>
<th>Name</th>
<th>Harvest date (Aug.)</th>
<th>Un-husked tons per acre</th>
<th>Whole kernel Total</th>
<th>Husks Cobs and trim</th>
<th>Whole kernel Total</th>
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<tbody>
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<td>28.9</td>
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<td>Northern Cross</td>
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<td>0.34</td>
<td>35.0</td>
<td>36.9</td>
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<tr>
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<td>0.69</td>
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<td>32.8</td>
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<td>34.6</td>
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<td>Carmelcross Imp.</td>
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<td>0.40</td>
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<td>7</td>
<td>G.C.B.-VT</td>
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<td>0.72</td>
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* Sources of seed:
- Varieties Nos. 1, 2, 3, 4, 5, 6, 7, and 8, Northrup-King Co., Minneapolis, Minn.
- Varieties Nos. 9, 10, 11, Rogers Bros. Seed Co., 308 W. Washington St., Chicago, Ill.
- Varieties Nos. 12, 13, 14, 15, 16, 17, and 18, Associated Seed Growers, New Haven Conn.
- Varieties Nos. 19, Agercher and Musser Seed Co., Los Angeles 21, California
- Varieties Nos. 20 and 21, Joseph Harris & Co., Inc., Moreton Farm, Rochester, N.Y.
FROM the beginning of crop production in Utah the importance of the potato to the state's economy has been recognized. Immediately upon the establishment of the Utah Agricultural Experiment Station in 1888, extensive experiments with potato culture were initiated, and, after one year's observations, Director Sanborn published a bulletin in which he emphasized the importance of the potato crop to Utah agriculture. He pointed out that inasmuch as Utah-grown potatoes were superior in quality to those grown in many other areas, Utah farmers should be urged to maintain and develop this superiority so as to make a significant place on the nation's markets.

Important research work on the culture of potatoes was continued for several years by F. S. Harris, George Stewart, and their associates. In the course of their work it became increasingly apparent that disease was a limiting factor in potato production. From 1911 to 1925 work on potato seed improvement indicated that selection of high-yielding hills significantly reduced "running-out" of potato seed stocks. On the basis of these studies the hill selection method of potato seed improvement was recommended for Utah.

In all the important potato-growing areas of the United States, including Utah, these "running-out" or degenerative diseases of potatoes multiplied alarmingly in the field despite careful hill selection. This necessitated development of a more efficient procedure for eliminating these diseases as factors in the maintenance of potato seed stocks. Accordingly, in 1915 Wisconsin introduced the first potato seed certification program in the United States, patterned after a plan that had been in operation in Germany for several years. This program, involving inspection of potato seed fields and the harvested crop by competent officials and the stamp of approval by a responsible certifying agency, proved to be outstandingly effective in controlling mosaic and leafroll. Other states adopted similar programs in rapid succession. In Utah potato seed certification was inaugurated in 1923 under the joint administration of the Experiment Station, Extension Service, and the State Department of Agriculture. Since 1937 the Utah State Crop Improvement Association has been the official potato seed certifying agency. As a war emergency food production measure, the Agricultural Experiment Station undertook a greenhouse indexing and tuber-unit-increasing program in 1943, administered jointly by the Department of Botany and Plant Pathology, and Agronomy.

Shortly after potato seed certification became a standard practice in the United States, significant discoveries were made which resulted in the development of more precise techniques in potato seed production. In 1916 New York research workers demonstrated that tuber-unit-roguing of potato seed lots was much more effective than hill selection in maintaining high yielding seed stocks. About this same time European plant pathologists established the virus nature of potato degeneration diseases. This discovery placed the problem of maintaining high-yielding potato seed stocks on a sound scientific basis for the first time. On the basis of this discovery, plant pathologists at Cornell University demonstrated that virus-infected tubers could be effectively eliminated through greenhouse indexing of potato seed tubers. Shortly thereafter tuber indexing and tuber-unit-roguing became standard practices in most potato seed improvement programs. Cooperative research carried on by the Utah, Oregon, and Montana experiment stations and the United States Department of Agriculture demonstrated that seed-borne virus diseases of potatoes can be effectively controlled in the Intermountain Area by tuber indexing and tuber-unit-roguing. It was not until 1943, however, that these practices were adopted in Utah.

**Seed-Borne Virus Diseases of Potato**

Many parasitic organisms and viruses inhabit the tissues of seed tubers which seriously impair the health of the plants with a marked lowering of yield and quality. From the standpoint of re-
duced yields the virus diseases are by far the most important to the Utah potato industry. There are about 25 distinct viruses known to occur in the potato. Singly, or in combination, they are capable of producing a bewildering variety of diseases. The number of distinct virus diseases that has been described on potato now exceeds thirty. Most serious in Utah are leafroll, mild mosaic, crinkle mosaic, rugose mosaic, and spindle tuber. These are capable of reducing yields as much as 50 percent in the field. Commonly seen, but less destructive, are leaf rolling mosaic, calico, witches broom, and a virus-like disease designated as "haywire."

Potato viruses are disseminated from diseased to healthy plants in a variety of ways. Some viruses are readily transmitted by the cutting knife. A few are carried about on implements, clothing of field workers, or by other mechanical means. Most of them, however, are carried from plant to plant by insects, of which aphids and leafhoppers are the most common. Although this has been known since 1919, little has been learned concerning the life histories of disease-carrying insects or methods of controlling them effectively enough to prevent the spread of viruses in the field. This is one of the greatest challenges to potato disease research workers today.

Control of Potato Virus Diseases
The only effective known method of controlling virus diseases of potatoes is to eliminate disease-producing viruses from the seed stocks. In order to do this it is necessary to systematically (1) throw out all virus-infected tubers by a greenhouse indexing program (figs. 1-4), (2) propagate the tubers known to be virus-free in a tuber unit plot located in an area where virus-carrying insects do not occur, roguing out all tuber units showing disease symptoms (fig. 5) and (3) use indexed and tuber-unit-rogued stocks as foundation seed for producing certified seed potatoes. Certification means that the certifying agency has inspected the seed potatoes and found them to be free from seed-borne diseases within certain minimum tolerances.

To be successful a program of potato seed improvement must be strictly administered throughout all phases. Programs may fail (1) if the rules regulating disease tolerances are not strict enough, (2) if the certifying agency does not strictly enforce the rules, especially those governing disease tolerances, (3) if all phases of the program are not administered under a unified authority,

NEW PUBLICATIONS

This bulletin presents the results of a survey of the cost of producing sugar beets on 161 farms in Cache, Box Elder, and Utah Counties. Net returns averaged $3.46 per acre or $3.51 per ton. Man labor costs constituted 55 percent of the total cost. Yield per acre and size of enterprise were important factors in profitable production.

This bulletin reports the results of fertility studies on fruit yield and quality over a five year period in Elberta peach orchards near Willard and Spanish Fork, Utah. Five types of fertilizer treatments and three cover crops were used in the tests. Average yields of peaches were highest with combined nitrogen and phosphorus treatment. Yields were not significantly affected by cover crop practice.

Either of these publications may be obtained free by addressing a card to the Utah Agricultural Experiment Station, giving number and series of the publication desired.

(4) if technical personnel are not adequately trained in recognizing and controlling plant diseases, or (5) if growers of certified seed potatoes do not cooperate with the certifying agency in doing everything necessary to prevent contamination of seed stocks.

The improvement of potato seed stocks requires teamwork of the highest order. The Agricultural Experiment Station strives to solve perplexing problems relating to disease control, advises growers in the best methods of maintaining disease-free stocks, and supervises the critical phases of the potato seed-improvement program. The certifying agency supervises and inspects the actual production and puts its stamp of approval (blue tag) on potato seed which meets the established standards. But it is on the grower of certified seed that the final responsibility of production rests.

Dr. Alfred E. Clarke, associate cytologist in the U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering, will arrive in Logan March 15 from Beltsville, Maryland. Dr. Clarke has been conducting genetic studies on onions and plans to continue these studies in cooperation with the Utah Agricultural Experiment Station. With the increased field facilities available at the Utah Station, he will enlarge the scope of his work. In addition to genetic studies, he will do work on the development of improved hybrid types.

Fig. 6. The progeny from tuber unit plantings are used to plant fields entered for certification. Certified seed, because of relative freedom from virus diseases, produces a high yield of high quality tubers.
Peach orchards are usually cultivated in the spring and fall. Clean cultivation during the growing season depletes soil organic matter, encourages erosion and promotes a decline in the productive life of the trees.

**YIELDS OF PEACH ORCHARDS MATERIALLY INCREASED BY PROPER SOIL MANAGEMENT PRACTICES**

By D. W. THORNE

**SUGGESTIONS ON THE MANAGEMENT OF PEACH ORCHARDS**

1. Peach orchards should be located on deep, fertile soils ranging in texture from sandy loam or gravelly loam to silt loam. The subsoil should not be heavier than a light friable clay loam with no water table closer than six feet below the soil surface. Soils exceptionally high in calcium carbonate, or which contain an accumulation of lime within the upper subsoil should be avoided unless preliminary trials in the area indicate that chlorosis is not a problem.

2. The orchard should be located in an area relatively free from winter temperatures going below a — 12°F. Consideration of the rate of frost development or air temperatures indicates that spring frosts can occur.

3. In conjunction with pruning and thinning practices, fertilizer and soil management treatments should be adjusted so as to obtain satisfactory tree growth and maximum yields of peaches at least 2½ inches in diameter having acceptable commercial quality. Ten to twelve inches of new shoot growth each year is a satisfactory amount.

4. Organic matter should be added to the orchard every year by growing a cover crop such as winter vetch, Austrian winter peas, biennial sweet clover, Hubam clover, alfalfa, small grains, or by hauling manure or some other form of organic matter into the orchard each year.

5. Commercial fertilizers should be applied to obtain proper tree growth and maximum yields of desirable commercial fruit. For average conditions an application in March of one-half pound of ammonium sulfate, or equivalent nitrogen content of other fertilizer, per inch of trunk is desirable. For many orchards best results will be obtained by using a combination of nitrogen and phosphorus fertilizer every other year in place of the nitrogen fertilizer alone. The combination treatment may consist of triple superphosphate at 200 to 300 pounds per acre (or other phosphate fertilizers at comparable rates of plant food), in addition to the nitrogen fertilizer, or a mixed fertilizer such as 16-20-0, 10-10-0, or 16-8-0 to furnish the recommended amounts of plant food.

6. Where water and other conditions permit, cultivation practices should be adjusted to obtain maximum tonnage of organic matter from the cover crop before cutting it in. This will be at about full bloom. The plant residue should be cut into the surface soil only. The orchard should not be cultivated more than twice a year and never deeper than four inches. The addition of 100 pounds of ammonium sulfate per acre is desirable just before putting in the cover if it is done in the early growing season.

7. Irrigation should be according to the needs of the tree. Abundant water is required by fruit during the ripening period. At each irrigation the entire soil area between tree rows should be wet. Where chlorosis is a problem, special precaution should be taken to avoid over-irrigation. After peach harvest, water should be withheld to mature wood for winter, but the soil must be moist during winter.

8. If chlorosis is present, trees should be injected with iron salts each February to avoid yellowing of foliage. Less frequent treatment will be required in some instances.

**ADOPTION** of improved soil management practices sometimes increases peach yields as much as 150 to 200 bushels per acre. Such are the findings of experiments conducted by the Utah Agricultural Experiment Station in cooperation with fruit growers of the state. These experiments were planned in response to requests from Utah fruit growers and were continued for five years. Details of the results have been recently published in an Experiment Station bulletin. A few of the findings are summarized here.

Two orchards were selected for these studies, one in Box Elder and one in Utah County. Additional tests are now under way in two orchards in Washington County but results there are not complete enough to report. One orchard was on the Perry Dalton fruit farm near the mouth of Three-Mile Creek Canyon in Willard. The soil was a deep gravelly loam on a gentle slope from the foothills. The orchard had been well managed in the past according to standard practices. No cover crop had been used in the orchard. The principal fertilizer had been farm manure. The other orchard was on the east bench fruit farm east of Spanish Fork and near the mouth of Spanish Fork Canyon. The soil was a clay loam on the surface underlain by coarse gravel and sand at a depth of 12 inches to 3 feet. No regular cultivation or soil treatment practices had been followed. Some yellow sweet clover grew in many parts of the orchard.

The experiments included three cover crop practices: (1) a combination of cultivation in the spring and fall with weeds allowed to grow during the summer months; (2) winter vetch sown immediately after fruit harvest in the fall and disked lightly into the soil the first part of the following June, and (3) alfalfa as a permanent cover, with light disking in the fall and spring to work the current top growth into the soil. The three cover crop treatments were repeated in two locations on the Dalton orchard and in three locations on the east bench fruit farm.

Five fertilizer treatments were made on different pairs of trees within each cover crop block. The fertilizer treatments were: (1) 3 pounds of ammonium
ium sulfate per tree, (2) 3 pounds of treble superphosphate per tree, (3) ammonium sulfate and treble superphosphate combined, (4) farm manure at about 12 tons per acre, (5) no fertilizer treatment. The treatments were made in early March of each year. Ammonium sulfate was broadcast on the soil surface and the phosphate was put into the soil about five inches by dropping into holes opened with a shovel. The soils were sampled at monthly intervals during the summer and the soil samples were analyzed for soluble nitrogen. Tree growth was determined each February by measuring the circumference of the tree trunks and the past year’s growth on 20 terminal shoots located on lateral branches of each tree. The yield of peaches on each tree was determined at harvest time and the peaches were graded into culls third grade (1\(\frac{1}{4}\) to 2 inches in diameter), second grade (2 to 2\(\frac{1}{4}\) inches in diameter), and first grade (over 2\(\frac{1}{4}\) inches in diameter). Pruning, fruit thinning, irrigation, and harvesting were carried out according to standard commercial practices.

The average peach yields in relation to the fertility treatments are shown in table 1.

Somewhat greater differences in yield were obtained in the Box Elder County orchard than in the Utah County orchard. This was partly owing to management practices which were beyond the control of the experimenters. In some years the Utah County orchard was allowed to get very dry, and it was lack of moisture which limited tree growth rather than any difference in soil fertility.

In Box Elder County the average increase in yields per 100 trees was about 112 bushels for nitrogen and 146 for nitrogen plus phosphorus. The increase from farm manure gave about the same average increases in yield as the nitrogen fertilizer alone. There is no definite evidence of benefit from the use of phosphate alone in these treatments. Results from the Utah County experiments were somewhat in line with the Box Elder County tests, except that the increases from fertilizer were not quite as high.

In terms of tree growth, nitrogen was the most pronounced treatment in increasing the size of the trunk diameter and annual terminal growth of the branches. Manure acted essentially like a nitrogen fertilizer. There was no difference in the grade of fruit in relation to fertilizer treatment. Very likely the fertilizer did not affect fruit grade because the trees were heavily thinned to limit the crop to the number of peaches which would produce first grade size. Nitrogen was quite effective in delaying the date of picking. This is shown in table 2.

The untreated trees and those treated with phosphate produced about the same proportion of fruit on each of the three pickings. Similarly, the trees treated with ammonium sulfate or ammonium sulfate plus phosphate and those given manure yielded about the same proportion of fruit on the three harvests. These results and observations indicate that the date of harvest of fruit can be delayed as much as three days to a week by heavy applications of nitrogen.

(Continued on page 15)

Fruit orchards planted on steep slopes should be arranged on a contour grade between about 1 and 2 percent. Terraces like those in the picture taken at the horticultural farm at North Ogden prevent breaks in ditches and the washing of gullies down the slope.
Sugar Beet Experimental Field near Garland, Utah. Showing top growth under various fertilizer treatments. Yields per acre from these plots from left to right are: \( N_1P_2M_0 = 22.97 \) T., \( N_0P_2M_0 = 19.18 \) T., \( N_1P_2M_0 = 27.89 \) T., \( N_0P_2M_0 = 21.21 \) T., \( N_0P_2M_0 = 23.46 \) T.

\( N_1 \) equals 80 pounds per acre of nitrogen, \( N_2 \) equals 160 pounds of nitrogen per acre; \( P_1 \) equals 100 pounds of phosphoric acid per acre, \( P_2 \) equals 250 pounds phosphoric acid per acre; \( M_1 \) equals 15 tons manure per acre.

Some Factors Affecting the Production of Sugar Beets

Seedbed Preparation, Use of Fertilizer, and Irrigation Important Factors in Obtaining High Yields

By JAY L. HADDOCK

The first sugar beets grown under irrigation in the arid West were produced in the fall of 1853. This was six years after the first attempts of irrigation in this area. This crop reached its maximum acreage in Utah in 1920 when 113,000 acres were grown. By 1934 the acreage had declined to 32,000 acres. At times the entire industry has been in precarious financial condition. Although farmers and industry alike have learned many helpful things about sugar beet growing and sugar processing much additional information is needed in order to make the enterprise a stable part of irrigation agriculture.

The average yield of sugar beets in the irrigated area of the West is far too low. Possibly under complete mechanization sugar beets can compete successfully with sugar cane, even under conditions of mild agricultural depressions. It would be a much more stable crop in farm rotations if the average yield could be increased from the present 12 tons to 20 tons per acre.

A recent economic study indicated that net returns from sugar beets were about two dollars per ton when yields were ten tons of beets per acre and five dollars per ton when yields were twenty tons of beets per acre. It is of great importance to a farmer whether he obtains a net return of twenty dollars or one hundred dollars per acre.

It can be said with considerable justification that sugar beets cannot be produced economically when yields are low no matter what the price or what labor saving devices are used. Conversely, if yields are high the sugar beet crop is profitable even though production costs are high and prices relatively low.

**Seedbed Preparation**

Early seedbed preparation is recognized as a must for successful sugar beet growing. This generally, necessitates fall plowing for two good reasons. First, fall plowed land permits early planting. Under most situations this is a distinct advantage because there is less risk in getting a stand. Also, early planting provides for a longer growing season. Yields are closely related to both of these important factors. Second, soil moisture relationships are favorable for seed germination and seedling growth early in the season, which makes it possible to get a good stand without the necessity of preemergency irrigation. This practice also gives the beet seedlings a better chance to compete with weeds.

In recent years great efforts have been made to mechanize all phases of sugar beet production. The most widely accepted developments in mechanization have been those related to obtaining satisfactory field stands of beet plants. In order to obtain good field stands with machine choppers or thinners it was found necessary to have an adequate population of uniformly spaced, single, beet plants. This has necessitated the development of the precision planter and segmented seed. Early seeding on a well-prepared seed-
bed gives segmented seed and precision planting a real chance of succeeding. All of these operations should be successful if spring mechanization is to make rapid progress. Without good stands of precision planted, segmented seed, mechanical thinning will operate under a great handicap.

On all farms many jobs demand attention in the spring. The later in the season these jobs are left the more urgent the demand. Since the sugar beet is generally known as a complementary or supplementary crop in a rotation it should be seeded when all physical conditions are most favorable to the crop and when competition of other crops for attention is least keen. In Utah this means sometime in April. It is often difficult to do this and meet all the conditions above referred to unless sugar beet land is fall plowed.

**Use of Fertilizer**

Fertilization of the sugar beet crop in Utah has become a necessity. The precise pattern of crop rotation and fertilization for sugar beet production has not been worked out. It has been definitely established that some system of organic matter maintenance and commercial nitrogen and phosphoric additions are necessary. Experimental studies have shown that barnyard manure of all kinds is beneficial, particularly when good irrigation practices are followed.

Applications of superphosphate to sugar beets has generally been found profitable. One hundred fifty to two hundred pounds of 0-43-0 fertilizer per acre or its equivalent is considered adequate. Possibly this fertilizer should be applied when seeding alfalfa, in amounts of three hundred pounds of 0-43-0 or equivalent per acre, and none applied to the sugar beet crop following alfalfa. After several applications have been made to one or more crops in a rotation it is entirely likely that additions of this fertilizer will no longer increase sugar beet yields. The amounts applied in order to obtain satisfactory stands and yields of alfalfa may be more than adequate for the sugar beet crop. As the use of superphosphate, or any other fertilizer for that matter, is continued, the need for satisfactory soil tests will become more and more urgent. The time is approaching rapidly when soil tests will be a necessary yearly chore on all intensive, modern, farming operations. This work will probably be done by the county agent's office, or some centrally located branch of the Extension Service.

Soils in the irrigated areas of the West are generally low in total organic matter. Since soil organic matter is the principal source of plant nitrogen it is not surprising that most sugar beet fields in this area show nitrogen deficiency by mid-August. They should not show this deficiency until the last of September. Sugar beets will not produce large yields when nitrogen is deficient. On the other hand too much nitrogen may greatly depress the sugar content of beets. A farmer, then, is in the precarious position of either providing too much or too little nitrogen.

(Continued on page 16)

<table>
<thead>
<tr>
<th>Plot no.</th>
<th>2-1</th>
<th>2-3</th>
<th>2-5</th>
<th>2-2</th>
<th>2-9</th>
<th>2-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>N₀P₀M₀</td>
<td>N₀P₀M₀</td>
<td>N₀P₀M₀</td>
<td>N₀P₀M₀</td>
<td>N₀P₀M₀</td>
<td>N₀P₀M₀</td>
</tr>
<tr>
<td>Yield tons/acre</td>
<td>20.73</td>
<td>24.10</td>
<td>26.38</td>
<td>26.45</td>
<td>27.56</td>
<td>28.46</td>
</tr>
</tbody>
</table>

*80 lbs. N, applied June 5, 80 lbs. applied July 21, N₀—no nitrogen, N₁—80 lbs. nitrogen, N₂—160 lbs. nitrogen; P₀—no phosphoric acid, P₁—100 lbs. phosphoric acid, P₂—250 lbs. phosphoric acid; M₀—no manure, M₁—15 tons manure per acre*
An experiment was conducted on the spring mechanization of sugar beets on the Greenville Farm of the Utah Agricultural Experiment Station at North Logan in 1947. The objectives of the studies were to obtain uniform but thin stands of beets so that machine blocking would be satisfactory in place of thinning; and to investigate ridge cover plantings as a possible solution to the problem of early weeds.

The soil used is a medium loam of good texture and fertility, but it crusts badly after rains. This had an important bearing on this experiment. The field was partly in grain and partly in tomatoes the year before and was fairly badly infected with weeds such as redroot, lambsquarters, purslane, prickly lettuce, and pigeon grass. The land was manured and plowed in the fall. Phosphate and nitrogen fertilizers were broadcast in the spring before working the land up into a seedbed.

For the first experiment most of the field was drilled on April 16 with a Lindeman-Cobbley precision drill set to deliver 134 pounds of sheared seed (7.9/64 inches diameter) per acre in 20-inch rows. For comparison, three plots were planted with whole seed (April 19) at an estimated rate of 15 pounds per acre. The seeds were planted about an inch deep (in good moisture) and on half of the precision-drilled plots ridges of loose soil about 3 inches high were thrown up over the beet rows. The theory of this "ridge-cover" planting is that the ridges will keep the soil moist around the beet seed but smother out the early weeds that will not germinate well except near the surface. The ridges must be removed by harrowing or other means as soon as the beet seeds have germinated, thus giving the beets the advantage of both shallow and of deep planting.

There was an unusually heavy rain (1.56 inches) on April 21-22 (4 days after planting) which thoroughly packed the soil and made the field so muddy it was not possible to get into it with implements until April 26. The soil was left with a tough crust over an inch deep. Only the thickly planted whole seed beets were able to survive (table 1). They had a reasonable stand and were quite weedy. Although the ridges were removed from the ridged beets as soon as possible, some by harrow and some by cultivator, not a single beet survived this treatment. There was less than half a stand of the unridged thin planted beets. It is interesting to note that the field just south of this was planted to beets on the same day at the rate of 5 pounds decorticated seed per acre and got a reasonably good stand.

Since the purpose of this experiment was to try out mechanical blocking which requires a good stand, one plot of the whole seed and one of the thin-planted, unridged were saved and the balance of the field was disked up for replanting (May 8-9). After careful hand-thinning, because of many weeds, these original, early planted plots out-yielded all the replanted beets so that from the point of view of yield, re-planting did not prove successful.

The disking up of these beets was interrupted by another unusually heavy rain of 1.73 inches, so that it was impossible to get the field in shape for planting again until May 19, at which time it was prepared and resowed with decorticated seed at the rate of 5 pounds per acre. The low yields are doubtless the result of this late planting.

This second seeding gave a fine but rather dense stand (table 2) averaging about 375 beets per 100 feet of row and

Table 1. Yield and stand of sugar beets with various methods of planting and thinning. First plantings of April 16 (numbers per 100 feet of row)

<table>
<thead>
<tr>
<th>Planting method</th>
<th>Beets and clumps</th>
<th>Total beets</th>
<th>Clumps</th>
<th>Singles</th>
<th>Vacant</th>
<th>Stand</th>
<th>Yield per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>no.</td>
<td>no. percent</td>
<td>no. percent</td>
<td>no. percent</td>
<td>no. percent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole seed-thick</td>
<td>93</td>
<td>265</td>
<td>74</td>
<td>80</td>
<td>19</td>
<td>20</td>
<td>36</td>
</tr>
<tr>
<td>Precision-flat</td>
<td>59</td>
<td>70</td>
<td>28</td>
<td>47</td>
<td>31</td>
<td>53</td>
<td>52</td>
</tr>
<tr>
<td>Precision-ridged</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>over rows</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Professor D. W. Pittman is professor of agronomy and in charge of the Greenville farm.
with few weeds. Eleven plots were hand thinned by experienced workers leaving an average spacing of 15 inches (12 inches attempted) with 10 skips of over 20 inches per 100 feet of row. These plots yielded an average of 12.73 tons per acre which may be considered standard for this late planting. One plot was thinned by hand with great care, without regard to time or expense, leaving the beets at an average interval of 10 inches (because of the late planting) with only two intervals of over 20 inches per 100 feet of row, and leaving wherever possible the largest beets. This plot yielded 13.75 tons per acre or 8 percent more than the standard.

A gauge wheel was constructed with adjustable markers near the rim. As this was rolled beside the row with the markers set at different positions, a man with a note book walking beside it could record the number of beets (single or multiple) and the number of long spaces which would be left by any suggested combination of removals by a mechanical blocker or chopper. Construction of this gauge wheel is described below and shown in the illustration.

Using this gauge wheel it was ascertained that even with a cross blocker set to remove 7 inch strips and leave 3 inch blocks, which is probably about as little removal as would ordinarily be feasible, there would remain only 68 total beets per 100 feet of row with 53 percent doubles. From this it was decided that cross blocking these beets was not feasible.

The gauge wheel showed that with a Dixie chopper set to remove 3 inch spaces between 2 inch blocks there should remain 114 total beets per 100 feet row with 47 percent doubles. Ten plots were blocked with the Dixie at this setting and of these six were sub sequentially trimmed by hand hoes while four received no further hand work. Those plots thinned by the Dixie alone gave an average yield of 10.07 tons per acre (79 percent of standard hand thinned) and those blocked by the Dixie with subsequent hand thinning, although there were fewer beets, yielded 11.86 tons per acre or 93 percent of the standard.

These results are somewhat more unfavorable for the use of the Dixie thinner alone than past results on the Greenville Farm. These results are: 1944, 83 percent of standard hand thin; 1945, 85 percent; 1946, 90 percent; and 1947, 79 percent. The differences probably result from differences in original stand. Pelleted beet seed was tried out on the Greenville Farm during the summer of 1947. The pellets were said to be made of ash plus feldspar with 10 percent arasan and 10 percent phosphate fertilizer added and to contain decorticated beet seed. On blotting paper in a germinator these pellets showed 49 percent germination, including 13 percent doubles. The pellets were drilled with a special plate in a John Deere drill so geared theoretically to place the seed 3.17 inches apart. The pre-thinning stand was about 163 beets per 100 feet of row, including 34 doubles and 32 spaces of 2 inch or less. What cannot be shown in a brief table is that the beets were so uniformly spaced that it was easy with a long-handled hoe to leave an almost perfect stand with about one-fourth doubles. This was done by going through the beets twice, rapidly with long handled hoes, first when the seedlings were very small (2 small cotyledonous leaves only) and again 5 days later, to eliminate later germinating beets not wanted and weeds. This is probably the best stand of beets yet obtained on the Greenville Farm without stooping. Because of the very late planting (July 26), no attempt was made to get yield data on these plots.

The gauging wheel is used to determine in advance the probable stand of beets remaining after cross blocking or chopping at various suggested intervals. The wheel was made from plywood and was 60 inches in circumference (19.1 inches diameter) so that it could be subdivided into multiples of either 10 or 12 inches (one on one side, and one on the other). The markers were made from black insulated wire, the ends of which were bared and bent through small holes drilled through the wheel on radii from inch marks on the circumference. These could be readily removed and replaced in any combination of settings desired. A sledge handle and a ½-inch machine bolt with two nuts, washers, and the threads extended somewhat toward the head completed the apparatus. In use, one man rolls the wheel near the beets and calls the numbers appearing within each hypothetical block, while another man records the figures in a note book. It requires only a short time to determine whether or not a reasonable stand would be left.

**Conclusions**

The general conclusions that may be drawn from these experiments are:

1. With a clean thin but uniform stand of sugar beets mechanical blocking may produce a yield 80 to 90 percent as good as hand thinning.

2. Processed seed - segmented or decorticated — a precision drill, a good

**Table 2. Yield and stand of beets with various methods of planting and thinning. Survivors and replants of May 17 and pellets of July 26**

<table>
<thead>
<tr>
<th>Planting and thinning method</th>
<th>Beets before thin</th>
<th>Beets after thin</th>
<th>Skips over 20&quot;</th>
<th>Average spacing</th>
<th>Yield per acre</th>
<th>Doubles percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole—early</td>
<td>80</td>
<td>76</td>
<td>17</td>
<td>16/2</td>
<td>19.05</td>
<td>14.86</td>
</tr>
<tr>
<td>Precision—early</td>
<td>67</td>
<td>65</td>
<td>21</td>
<td>10</td>
<td>13.75</td>
<td></td>
</tr>
<tr>
<td>Hand thin—care</td>
<td>377</td>
<td>120</td>
<td>2</td>
<td>10</td>
<td>12.73</td>
<td></td>
</tr>
<tr>
<td>Hand thin—by acre</td>
<td>333</td>
<td>80</td>
<td>10</td>
<td>15</td>
<td>11.86</td>
<td></td>
</tr>
<tr>
<td>Dixie and trim</td>
<td>395</td>
<td>70</td>
<td>17</td>
<td>17</td>
<td>10.07</td>
<td></td>
</tr>
<tr>
<td>Dixie only</td>
<td>429</td>
<td>94</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pellets—long hoe</td>
<td>156</td>
<td>102</td>
<td>9</td>
<td>12</td>
<td>35</td>
<td>23</td>
</tr>
<tr>
<td>Pellets—not thin</td>
<td>170</td>
<td>170</td>
<td>7</td>
<td>7</td>
<td>34</td>
<td>20</td>
</tr>
</tbody>
</table>

**Table 3. Possible stand of sugar beets with cross blocking or chopper as shown by gauge wheel**

<table>
<thead>
<tr>
<th>Planting or thinning (later) of plots</th>
<th>7&quot; out No. per 100’ row</th>
<th>3&quot; block Doubles</th>
<th>3&quot; out No. per 100’ row</th>
<th>2&quot; block Doubles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand thin by acre</td>
<td>71</td>
<td>40</td>
<td>56</td>
<td>120</td>
</tr>
<tr>
<td>Dixie and trim</td>
<td>65</td>
<td>32</td>
<td>49</td>
<td>108</td>
</tr>
<tr>
<td>Pellets—long hoe</td>
<td>75</td>
<td></td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Pellets—not thin</td>
<td>88</td>
<td></td>
<td>28</td>
<td></td>
</tr>
</tbody>
</table>

For March, 1948
seedbed, and land reasonably free from weeds are needed if mechanical blocking is to replace hand thinning.
3. Too thin a stand or "ridge-cover" planting is disastrous if heavy rains occur between drilling and emergence on soil that crusts badly.
4. By the use of a gauge wheel or marker of some kind it is possible to tell in advance whether or not a stand of beets is sufficiently good for mechanical blocking to replace hand thinning.
5. With a uniform thin stand of beets with few doubles it is possible to leave a good stand with a long-handled hoe and no stooping.

**SWEET CORN VARIETIES**

(Continued from page 5)
yields are the canner's first consideration and that of the grower, too, since this is what the consumer buys. The highest quality canned or frozen corn is fancy tender whole kernel corn. This corn was called "mature" in this study. Yields of immature and overmature kernels were also obtained. Total yield included the washed kernel yield of all three maturity classes.

*Mature whole kernel yields* did not exactly follow yields of corn in the husk.
The reason for this is that some varieties produced a higher percentage of husks or of cobs than did other varieties.

*Total whole kernel yields* in general followed mature whole kernel yields. G.C.B. No. 12 replaced Golden Glory in the ranks of the top eleven varieties.

**Quality Rating**

'A preliminary scoring of one replication for quality of the frozen corn after it had been uniformly cooked for eating is given in table 2. This is based on the average ratings given the varieties by four persons who tested the corn and scored relative tenderness, flavor, freedom from defects, and appearance.

North Star was scored very low partly because of the presence of extraneous material such as portions of cob. Kernel cutting and washing equipment was not perfectly adjusted when this earliest variety was harvested. No other variety had any markedly objectionable characteristic.

Many varieties were of excellent quality, being scored down only on technical points. Ioana received the highest average score, 89 points. G.C.B. No. 12, G.C.B. No. 10, G.C.B. 2439, and G.C.B. Improved each scored 86 points. Golden Glory, Kingscrot Earpack J9, Kingscrot 12 Row Bantam, and G.C.B.-T Strain each scored 84 points.

**Average Percentage Composition of Whole Kernel Corn**

The ultimate value of sweet corn is made up of (1) the nutrient value of the canned or frozen corn for human consumption, plus (2) the animal feeding value of the waste products including stalks. A detailed study of the first item was made in 1947. Representative stalks were put through a portable silage cutter in 1947 and samples taken for preliminary analyses as a beginning of a study of the second item.

<table>
<thead>
<tr>
<th>No.</th>
<th>Variety or strain</th>
<th>Quality Rating</th>
<th>Perfect</th>
<th>Total sugars</th>
<th>Reducing sugars</th>
<th>Total starch</th>
<th>Total protein</th>
<th>Carotene</th>
<th>Percent moisture</th>
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<tbody>
<tr>
<td>2</td>
<td>Carmelcross</td>
<td>78</td>
<td>4.05</td>
<td>1.33</td>
<td>3.08</td>
<td>2.60</td>
<td>.043</td>
<td>77.7</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Carmelcross</td>
<td>79</td>
<td>3.71</td>
<td>1.13</td>
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<td>.034</td>
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<tr>
<td>7</td>
<td>G.C.B. VT 20</td>
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<td>1.00</td>
<td>3.76</td>
<td>3.03</td>
<td>.042</td>
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<tr>
<td>20</td>
<td>N. Cross</td>
<td>80</td>
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<td>1.00</td>
<td>4.06</td>
<td>3.41</td>
<td>.042</td>
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<td>1.02</td>
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<td>2.77</td>
<td>.036</td>
<td>78.5</td>
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<td>12</td>
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<td>0.80</td>
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<td>10</td>
<td>G.C.B. No. 71A</td>
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<td>0.81</td>
<td>3.66</td>
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<td>11</td>
<td>No. 71A x 104C</td>
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<td>2.93</td>
<td>.046</td>
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<td>16</td>
<td>Ioana</td>
<td>89</td>
<td>2.90</td>
<td>0.75</td>
<td>4.13</td>
<td>3.14</td>
<td>.054</td>
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<td>2.76</td>
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<td>3.60</td>
<td>3.18</td>
<td>.039</td>
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<tr>
<td>19</td>
<td>G.C.B. T</td>
<td>84</td>
<td>2.31</td>
<td>0.58</td>
<td>4.07</td>
<td>3.64</td>
<td>.052</td>
<td>75.5</td>
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<tr>
<td>14</td>
<td>Erie</td>
<td>78</td>
<td>2.03</td>
<td>0.55</td>
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<td>17</td>
<td>Otto</td>
<td>79</td>
<td>1.89</td>
<td>0.42</td>
<td>5.06</td>
<td>3.72</td>
<td>.039</td>
<td>73.7</td>
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<tr>
<td>Average</td>
<td></td>
<td>2.79</td>
<td>0.78</td>
<td>3.96</td>
<td>3.05</td>
<td>0.059</td>
<td>76.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Minimum difference necessary to be significant difference between varieties: Odds 19:1 0.80 0.19 0.81 0.53 0.018
Odds 99:1 1.07 0.26 1.08 0.70 0.025

Statistical analyses of the chemical data show that significant differences in each chemical constituent exist with odds of 99:1, between varieties. No variety rates highest in all chemical constituents, however.

The chemical determinations were made on samples of whole kernel corn which were at best canning maturity. The samples used, which were tray-frozen and vacuum-sealed in no. 2 tin cans at the Farmington Laboratory, were kept frozen until analyzed. Separate samples from each of the four field replications were analyzed, except in the case of carotene values. The samples from two replications were combined, giving two composite carotene determinations of each variety.

Farm and Home Science
total starch. It is true that the three varieties highest in starch were among the four varieties lowest in total sugars, but the varieties ranking 4th, 6th, 8th, 11th, and 19th, in total starch ranked 2nd, 6th, 12th, 7th, and 4th, respectively, in total sugars. Thus, some varieties were high in one and low in the other, while others were high in both sugars and starches. Since high starch content would add considerable nutrient value to a high-sugar sweet corn variety, this might be a desirable characteristic.

The large amount of protein which sweet corn kernels contain may be surprising to many. The varieties tested here ranged from a high of 3.72 percent for Otlo to a low of 2.60 percent for Carmelcross. Sweet corn is not eaten for its high protein content, but if this characteristic was associated with high total sugar content it would be a desirable feature in any variety.

Carotene analyses indicate relative vitamin A content of these yellow sweet corns. White sweet corn contains negligible amounts of carotene. It is noteworthy that Hybrid 71 A x 104C, the variety of highest carotene content in these trials, contained 0.111 milligrams per 100 grams, more than 3 times as much as Marcross, which contained only 0.034 mgms. per 100 grams. Hybrid 3041, Kingscrot Earpack J9, and Carmelcross Improved, in addition to 71A x 104C, were significantly higher in carotene than all other varieties tested.

VIRUS DISEASES OF STONE FRUITS
(Continued from page 2)

The greenhouse space now available for virus research work is wholly inadequate and much of the basic research underlying control must await additional greenhouse construction.

Immediate Problems Ahead

The new and enlarged organization will be concerned immediately with the following:

(1) A definite expansion and intensification of the basic research program. This will involve a more accurate knowledge of the virus diseases present in Utah orchards, their host range, distribution, insect vectors, rate of spread, and general economic importance. The possibilities of virus strains, immunization, and control through chemotherapy must be considered a basic part of the program.

(2) A cleanup or removal program to eliminate virus spread in certain infested areas.

(3) The establishment of sources of reliable virus-free budwood for growers and nurserymen.

(4) In cooperation with the State Department of Agriculture to work out and establish an effective inspection and certification procedure for all nursery stock and budwood sources.

(5) A further perfection and extension of interstate and state machinery to prevent introduction of dangerous virus diseases into Utah orchards. The threat of such destructive diseases as albino of the cherry in Oregon, little cherry in British Columbia, and yellow bud of the peach in California, emphasize the dangers of delay in this program.

PEACH YIELDS
(Continued from page 9)

Table 2. The date of harvest of Elberta peaches in relation to soil management practices (Dalton fruit farm, average for five years)

<table>
<thead>
<tr>
<th>Percent of total harvest made at each picking</th>
<th>1st pickinga</th>
<th>2nd picking</th>
<th>3rd picking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>1st pickinga</td>
<td>2nd picking</td>
<td>3rd picking</td>
</tr>
<tr>
<td>No treatment</td>
<td>65.0</td>
<td>26.0</td>
<td>8.5</td>
</tr>
<tr>
<td>Farm manure</td>
<td>40.5</td>
<td>40.0</td>
<td>19.5</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>35.7</td>
<td>38.4</td>
<td>25.9</td>
</tr>
<tr>
<td>Phosphate</td>
<td>55.9</td>
<td>34.7</td>
<td>9.4</td>
</tr>
<tr>
<td>Nitrogen plus phosphate</td>
<td>33.1</td>
<td>35.6</td>
<td>31.3</td>
</tr>
</tbody>
</table>

a Days between first and second pickings varied from three to five.

Days between second and third pickings varied from three to four.

gener fertilizers. The fruit on the nitrogen-fertilized trees was generally more poorly colored than that on the unfertilized or phosphate-treated trees. The poorer color was probably owing to the greater shade provided by increased growth of branches and leaves on trees treated with manure or nitrogen fertilizers. Direct sunshine makes good fruit color.

Soil analysis provided some additional information helpful in determining the best fertilizer treatments for orchard use, as shown in table 3.

The amount of available nitrogen in the soil was greater where nitrogen fertilizer or farm manure was applied. Data not shown in this table indicate that farm manure probably would not supply enough nitrogen for best tree growth during the early spring. A fairly large part of the summer was needed for manure to be decomposed by soil bacteria and to make the nitrogen available for the trees. These results indicate that where manure is used as the principal fertilizer in orchards, some nitrogen fertilizer should also be added in the early spring to provide additional available plant food during the period while the manure is being decomposed.

The cover crop treatments did not give distinctly different yields in grade

Table 3. Average content of nitrate nitrogen in orchard soil as related to fertilizer treatment (Dalton fruit farm, parts of nitrate nitrogen per million parts of soil, average for five years)

<table>
<thead>
<tr>
<th>Fertilizer treatment</th>
<th>Soil depth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-12&quot;</td>
</tr>
<tr>
<td>None</td>
<td>5.9</td>
</tr>
<tr>
<td>Farm manure</td>
<td>12.4</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>18.6</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>5.9</td>
</tr>
<tr>
<td>Nitrogen plus phosphorus</td>
<td>15.9</td>
</tr>
</tbody>
</table>

For March, 1948
of fruit, nor did they significantly influence the growth of the trees. The lack of influence of the cover crop under these experiments may result in part from the short duration of the tests. The five-year period is short for cover crop treatments to bring about distinctly different yields or tree growth. The fruit grower, however, is interested in orchard performances over much longer periods of time than a five year period. He is interested in the entire life of the orchard and in the production of succeeding orchards on the same soil. Cover crops increase the organic material content of the soil. They also help to control soil erosion. In many Utah orchards the top soil is being rapidly washed away and production is being cut down seriously. No doubt the production of future orchards after the present ones are pulled out will be even more seriously limited by lack of good cover crop practices. Even though these experiments fail to show the benefits anticipated, results over a long period of time would no doubt justify their use. This has been the experience in fruit producing areas in other states.

SOIL FUMIGATION (Continued from page 3)

D-D and prevented aeration of the soil, at the rate of crop treatments to bring about these experiments may result in part of fruit, nor did they significantly influence the growth of the trees. The lack of influence of the cover crop under these experiments may result in part from the short duration of the tests. The five-year period is short for cover crop treatments to bring about distinctly different yields or tree growth. The fruit grower, however, is interested in orchard performances over much longer periods of time than a five year period. He is interested in the entire life of the orchard and in the production of succeeding orchards on the same soil. Cover crops increase the organic material content of the soil. They also help to control soil erosion. In many Utah orchards the top soil is being rapidly washed away and production is being cut down seriously. No doubt the production of future orchards after the present ones are pulled out will be even more seriously limited by lack of good cover crop practices. Even though these experiments fail to show the benefits anticipated, results over a long period of time would no doubt justify their use. This has been the experience in fruit producing areas in other states.

SOIL FUMIGATION (Continued from page 3)

pany. Yields of sugar beets generally justified the expenditures for fumigation except for about 45 acres in the Lewiston district where heavy rains fell immediately after the applications of D-D and prevented aeration of the soil and proper diffusion of the gas. Experiments designed to correct such conditions will be conducted in 1948.

All of the above mentioned fumigants are liquids which are applied at depths of 6 to 8 inches where they volatilize into gases which penetrate from 15 to 20 inches deep and kill a large portion of the soil-inhabiting pests, but never completely eradicate them. Mechanical applicators of several types have been built, the larger outfits consisting of tractor-drawn units which inject the chemicals under pressure through tubes leading down behind cultivator chisels (figs. 2, 3). Similar types have been built on the cultivator bars of tractors and are especially suitable for the smaller land units in Utah (fig. 4). An inexpensive and popular unit is one designed to apply the chemicals in the bottom of the furrow at plowing time (fig. 5). The various sugar companies operating in Utah and Idaho have been chiefly responsible for building these applicators and encouraging the use of fumigants by their growers. For use in the home garden, hand injectors are available.

Certain pests can be controlled satisfactorily by the following recommended applications of the various fumigants:

Sugar beet nematode: Apply 25 gallons per acre of D-D or Dowfume N. This will give one year control and produce a normal crop of sugar beets. Experiments have demonstrated that even 50 gallons per acre will give only one year of control so there is nothing to be gained by adding to the 25 gallons recommended.

Root knot nematode: Use 20 to 25 gallons of D-D, Dowfume N, Dowfume W10, Soilfume, Bromofume, or 10 gallons of Dowfume W40. The lower applications apply if tomatoes, peppers, or similar crops are to be grown, but the heavier applications are necessary for potatoes, carrots, or other root crops.

For control of root knot nematode in cantaloupes, watermelons, squash, and similar crops, first mark off the field, locating the points where the hills are to be planted and then apply about 3 cc of the desired chemical per hill at a depth of 6 to 8 inches, using a hand applicator. This method costs only a small fraction of that for complete field coverage.

Wireworms: Apply 20 gallons per acre of Dowfume W10, Soilfume, Bromofume, or 10 gallons of Dowfume W40. D-D and Dowfume N usually give fair control of wireworms but generally are not considered to be as effective as the ethylene dibromide mixtures. Benefits for wireworm control have been reported in some instances for two, and even three years after fumigation. However, it must be remembered that wireworms are the larvae of click beetles which may fly into the fumigated area from surrounding fields and reinfect it within a year or two.

White centipedes: Variable reports are given for fumigating against this pest and much appears to depend on just where the centipedes are located in the soil at the time of fumigation. In Utah, early in the spring they are found largely in the first foot of soil, while in late June and the hot summer months they go deep down where they cannot be reached by fumigants. Only one attempt to control them has been made thus far in Utah and in this instance D-D, at the rate of 30 gallons per acre, was applied early in April 1946. Excellent control was obtained not only in that year but also through 1947.

SUGAR BEET PRODUCTION (Continued from page 11)

for his sugar beet crop. The only solution to the dilemma is the development of satisfactory soil tests, which will serve to guide the farmer in his use of commercial nitrogen.

Since nearly all our soils are inadequately supplied with organic matter and since organic matter is the principal source of plant nitrogen and, furthermore, since the process of building-up soil organic matter is extremely slow, it is entirely likely that nitrogen fertilizer will need to be added regularly and indefinitely to the sugar beet crop. The big question will always be—how much should be added? Too little will result in poor yields; too much will be uneconomic and may actually decrease the yield of sugar.

Profitable increases in sugar beet yields have been obtained generally for 200 to 250 pounds of 33-0-0 fertilizer or its equivalent per acre. This amount of nitrogen fertilizer should be side-dressed just before thinning. It is sufficient nitrogen, for most soils growing sugar beets, to give marked increases in yield without depressing the sugar percentage greatly.

Irrigation

The time and method of irrigating sugar beets are now receiving considerable attention. It is known that sugar beets grow best when supplied with adequate but not excessive moisture. The popular opinion that withholding water from beets early in the season encourages deep rooting is not well founded. It is true, however, that a high water table tends to discourage deep root penetration. Present evidence strongly suggests that sugar beets should be kept moist and growing rapidly during the early part of the season. If only one or two irrigations are to be given these should be before the plants begin to suffer for want of water. There is considerable evidence to show that once sugar beets are well established their growth appears to be affected much more by fertility conditions than by small variations in moisture. On the other hand, when sugar beet soils become very dry, fertilizers have little in-
LAWD INVENTORY AND AGRICULTURAL PRODUCTIVITY IN UTAH WILL BE STUDIED

Lawrence A. Reuss, economist with the Land Economics Division of the Bureau of Agricultural Economics, has arrived in Logan with his family from Washington, D.C. Mr. Reuss will cooperate with the Department of Agricultural Economics of Utah Agricultural Experiment Station on land inventory and agricultural productivity of Utah lands. Professor George T. Blanch of the Department of Agricultural Economics will be associated with Mr. Reuss on this study.

The purpose of this investigation is to obtain information on present land ownership and land use and to determine the productivity of various kinds of land and types of farming practices. The various factors affecting the uses and shifts in uses of land will be studied. Such information will be especially valuable in developing policies relative to the use of private and public lands of this state.

FERTILIZER RECOMMENDATIONS

(Continued from page 1)

Ground rock phosphate and sulfur

Some ground rock phosphate, to which sulfur has been added, is being offered for sale. The contention for the mixture is that the sulfur makes the phosphate available. In an experiment conducted by the Utah Agricultural Experiment Station over a period of 14 years, it was found that rock phosphate and sulfur had no appreciable effect on the yield of any crops in the rotation. It is likely that few if any soils in the state would be benefited by the application of rock phosphate and sulfur.

Colloidal phosphate

This is a special preparation of ground rock phosphate. The statements on rock phosphate apply also to this product. It is not recommended for use in this state.

MIXED FERTILIZERS

There will probably be a large variety of mixed fertilizers available this year. Some are priced too high, others are reasonable. In general, however, the price per pound of plant food is more in mixed fertilizers than in single carriers because of additional costs for mixing and handling. In buying mixed fertilizers, select a combination of plant nutrients to meet the needs of your soils and crops and then estimate the relative cost per pound of plant food of each product available that meets your need.

Mixed fertilizers should be judged on the basis of the guaranteed analysis on the bag plus the physical condition in relation to drilling characteristics. The guaranteed analysis on the bag is made up of three figures such as 5-15-10. The meaning of these symbols is as follows:

The first figure, 5 means 5 percent nitrogen
The second figure, 15 means 15 percent available phosphoric acid (P₂O₅)
The third figure, 10 means 10 percent water soluble potash (K₂O)

In most cases, mixed fertilizers needed in Utah are those containing nitrogen and phosphorus, but seldom potash.

There are two general types:

A. Those having a relatively high nitrogen to phosphate ratio. These include those with simple proportions of nitrogen to phosphorus between 1 to 1 and 1 to 2.

B. Those having a relatively low nitrogen to phosphate ratio. These include those with simple proportions of nitrogen to phosphorus between 1 to 3 and 1 to 5. Some common mixtures on sale or that may be prepared by home mixing are:

High nitrogen to phosphate ratios

16-20-0. Very little on sale as ammonium phosphate. It can be prepared by mixing 1 bag of ammonium nitrate with 1 bag of treble superphosphate.

13-15-0. Prepared by mixing 2 bags of ammonium sulfate and 1 bag of treble superphosphate. Use at rates recommended for 16-20-0.

10-20-0. On sale, or prepared by mixing 1 bag of ammonium sulfate and 1 bag of treble superphosphate. Use at equal or slightly higher rates than 16-20-0.

8-12-0. On sale. Use at twice the rate recommended for 16-20-0.

10-10-0. Prepared by mixing 1 bag of ammonium sulfate and 1 bag of single superphosphate. Use at about twice the rates recommended for 16-20-0.

16-8-0. On sale or prepared by mixing one bag of ammonium nitrate with one bag of Simplot single superphosphate.

Low nitrogen to phosphate ratios

11-48-0. Very little if any on sale as ammonium phosphate.

4-16-0. On sale. Prepared by mixing 1 bag of ammonium sulfate and 4 bags of single superphosphate. Use at three times the rate recommended for 11-48-0.

6-30-0. On sale. Prepared by mixing 30 lbs. of ammonium sulfate with 70 lbs. of treble superphosphate. Use at nearly two times the rate recommended for 11-48-0.

Mixed fertilizers containing potash

Several mixed fertilizers will be on sale containing potash. No experimental test under direction or observation of Agricultural Experiment Station staff...
members has shown a need for potash on Utah soils. It is recognized, how-
however, that there may be some response to potash in a few instances. Accor-
ing to general experience, potash need will first appear on very sandy soils.
The general recommendation is not to pay the added cost for potash-contain-
ing fertilizers unless a definite need has been established. Fertilizers on sale in
this group include: 10-18-4, 10-10-5, 4-2-4-4, 4-16-4, 4-12-4, 16-8-4, 4-8-4,
5-10-5, and 6-10-4.
Use at rates equivalent to those recommended for fertilizers containing similar contents of nitrogen and phos-
phate.

Liquid fertilizers

During the past two years there has been an increased sale of liquid fertili-
zer materials for distribution in irrigation water. Many questions remain un-
answered on the desirability of these materials and the best procedures for their
application. In general, the cost of plant food in these preparations is too high to justify their use. Unless
convinced by past experience of the economy of these materials, their use is
only suggested on a limited experimental basis. Most of these materials are harmful to equipment when used in
overhead sprinkling systems.

MATERIALS OF QUESTIONABLE VALUE SOLD AS FERTILIZERS

Gypsum

Gypsum contains calcium and sulfur. Value has been found from gypsum
only on soils containing black alkali. If black alkali is suspected on your farm,
send a soil sample to the college through the county agent or Soil Conservation
Service representative for analysis and recommendation before purchasing gyp-
sum.

Sulfur and sulfur materials

Like gypsum, sulfur materials have no general value on Utah soils. They
are useful only on soils containing black alkali. Obtain a soil analysis before
making a purchase.

Sulfur dioxide

Seemingly exaggerated reports on re-

sults from use of this material on alkali
soils have come from commercial agen-
cies in California. It is not recommen-
ded for soil treatment here.

Boron preparations

There is no evidence of boron de-
ciency in soils of the Great Basin
area. Toxic amounts are found in many
soils of the Uinta Basin and in areas
irrigated by water from the lower
Sevier. Do not buy boron materials as fertilizers for Utah except on an ex-
perimental basis — harm rather than benefit might result.

Minor elements

Various elements needed in small quantities for plants are occasionally
sold as fertilizers in the state. More
often fertilizers containing nitrogen and phosphorus are advertised as being
especially desirable because of a content of such elements as copper, zinc, man-
ganese, iron, or even other elements.
Although many tests have been made, no response has been obtained in Utah
on common field or vegetable crops from fertilizer treatments with these
elements. Some cases of deficiency of iron, zinc, and manganese have been
observed with fruit trees, but affected
trees have not been helped in most cases
by soil treatments. If deficiencies of these elements are suspected, consult
your county agent and have him get
advice on the problem.

Soil fumigants

Some stimulation in plant growth
has been observed on land planted fol-
lowing soil fumigation. This increased
growth does not justify the use of
fumigants unless the presence of such
parasites as nematode endangers crops.

Feathers

Feathers have practically no value in
themselves as a fertilizer. Frequently,
in poultry processing plants consider-
able blood becomes mixed with feathers.
Blood is an excellent fertilizer material
and is responsible for most benefits
claimed for feathers.

Organic wastes

Waste products from factories, fish
hatcheries, and sewage plants, are often
offered locally for fertilizers. Their
value depends on composition. If they
are available at low cost, they will
probably be worthwhile to use. Some
benefit will usually result from applica-
tion to land. If large quantities are for
sale and the price is questionable, ob-
tain a chemical analysis before pur-
chasing.

Miscellaneous materials

Numerous materials in addition to
those mentioned are offered for sale for
soil treatment. Among those sold in the
past have been vitamins, lime, clay,
and coal. Such materials are usually of
little value. Lime is important on the
acid soils of the humid east but there are
few, if any, acid farm soils in Utah.
If in doubt about such materials in-
quire from your county agent or write
to the Utah State Agricultural College.

METHODS OF FERTILIZER APPLICATION

In the past, most fertilizers in Utah
have been applied broadcast and har-
rowed into the soil surface. Deeper
placement will be obtained if the fer-
tilizer is broadcast on a plowed soil
surface before it is harrowed. It is
more efficient and economical to place
phosphate fertilizers in bands near the
plant row with some type of drill.
Fertilizer placement with a drill has the
following advantages over broadcast
applications:

(1) The fertilizer is placed in the
proper position for plant roots to feed
on it easily; (2) One hundred pounds
of fertilizer drilled at the side of rows
often increases yields as much as 200
pounds applied broadcast; (3) Fertilizer
placed in bands does not come in as
intimate contact with the soil and hence
remains in soluble forms longer than
broadcast fertilizer.

The coming year will probably find
a large number of fertilizer drills on the
market. For the average farmer a cul-
tivator type of fertilizer distributing
attachment is probably the most prac-
ticable. Such an attachment can usu-
ally be shifted easily from one piece of
equipment to another and can be used
on a number of crops. Be sure
that the quantity of fertilizer applied
by equipment purchased can be varied
to low enough amounts for the con-
centrated fertilizers used in this area.
The fertilizer distributors which drop
the fertilizer in the same opening as the
seed should be avoided because the
fertilizer damages the seed.

RECOMMENDED FIELD APPLICATION

PRACTICES

No single set of recommendations can
be made that will apply to all soil and
cropping conditions in Utah. The fol-
lowing recommendations are based on
average soil conditions where farm man-
ure is not applied. A footnote indicates
the advisability for decreasing applica-
tions of nitrogen fertilizers in propor-
tion to manure applications. Many
soils contain adequate amounts of avail-
able phosphate for present crop needs.
Under such conditions, phosphate can
be omitted from fertilizers applied.

Farm and Home Science
### RECOMMENDED FIELD APPLICATION PRACTICES — 1948

<table>
<thead>
<tr>
<th>Crop</th>
<th>Fertilizer</th>
<th>Lbs./acre</th>
<th>Suggested alternative practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar beets</td>
<td>16-20-0*</td>
<td>300 or</td>
<td>(1) Apply fertilizer broadcast on plowed land and harrow into seedbed.</td>
</tr>
<tr>
<td></td>
<td>8-12-0</td>
<td>500 - 600 or</td>
<td>(2) Use fertilizer drill attachment if available. If fertilizer is dropped with seed, use not more than 75 lbs. of 0-43-0 per acre and no mixed fertilizer or nitrogen. (3) Side dress nitrogen or mixed fertilizers with fertilizer cultivator attachment at about time of first irrigation after thinning or earlier if the soil is moist. Crops receiving only phosphate at or before planting may be side-dressed with a nitrogen fertilizer later if tops are small or light in color.</td>
</tr>
<tr>
<td></td>
<td>10-20-0*</td>
<td>300 - 400 or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0-43-0</td>
<td>150 or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0-18-0</td>
<td>300 and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20-0-0*</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Alfalfa and clovers</td>
<td>0-43-0</td>
<td>200 to 300 or</td>
<td>New plantings. (1) Apply phosphate with plow attachment. (2) Apply broadcast on soil surface and plow under. (3) Apply broadcast on plowed land and harrow in. (4) Drill into seedbed as deep as possible with fertilizer attachment on grain drill.</td>
</tr>
<tr>
<td></td>
<td>0-18-0</td>
<td>400 to 600</td>
<td>Old stands. (1) Apply fertilizer broadcast on soil in late fall or early spring and harrow into soil. (2) Drill into soil in early spring with grain drill having a fertilizer attachment. Applications only needed every third or fourth year.</td>
</tr>
<tr>
<td>Irrigated pastures</td>
<td>16-20-0*</td>
<td>300 or</td>
<td>New plantings. Apply as for new plantings of alfalfa.</td>
</tr>
<tr>
<td></td>
<td>10-20-0*</td>
<td>200 - 300 or</td>
<td>Established pastures. Apply fertilizer broadcast in early spring. Apply phosphate every second or third year. Nitrogen fertilizers stimulate grass growth. Phosphate fertilizers stimulate the clovers in mixed pastures. Effects of nitrogen fertilizers usually do not last longer than two months. Full phosphate treatments should last three years.</td>
</tr>
<tr>
<td></td>
<td>20-0-0*</td>
<td>200 - 300</td>
<td></td>
</tr>
<tr>
<td>Potatoes</td>
<td>16-20-0*</td>
<td>200 - 300 or</td>
<td>(1) Apply broadcast on plowed surface in spring and harrow in.</td>
</tr>
<tr>
<td></td>
<td>10-20-0*</td>
<td>200 - 300 or</td>
<td>(2) Side dress to each side of rows at planting time with planter attachment.</td>
</tr>
<tr>
<td></td>
<td>20-0-0*</td>
<td>200 - 300</td>
<td>(3) Side dress at time of first irrigation with cultivator attachment.</td>
</tr>
<tr>
<td>Beans, dry</td>
<td>11-48-0*</td>
<td>200 - 300 or</td>
<td>(1) Apply broadcast on plowed soil in spring and harrow in.</td>
</tr>
<tr>
<td>Beans, Lima</td>
<td>4-12-0*</td>
<td>500 - 700 or</td>
<td>(2) Side dress at sides of rows with a fertilizer attachment at planting time.</td>
</tr>
<tr>
<td>Onions</td>
<td>16-20-0*</td>
<td>200 - 400 or</td>
<td>(3) Side dress row crops with a cultivator fertilizer attachment at time of first irrigation.</td>
</tr>
<tr>
<td>Peas</td>
<td>10-20-0*</td>
<td>300 - 400</td>
<td>Tomatoes: Starter solutions for use in tomato transplanting usually stimulate a quicker growth. A fertilizer such as 4-12-4 at 10 lbs. per 100 gallons of water makes a satisfactory solution.</td>
</tr>
<tr>
<td>Tomatoes</td>
<td></td>
<td></td>
<td>Apply 16-20-0, 10-20-0, or their equivalent to unmanured plowed land in early spring. Land heavily manured can be fertilized with 200 lbs. of treble superphosphate or 400 lbs. of 18% phosphate. Side dress with 100 to 150 lbs. of 20-0-0 or 10 lbs. 33-0-0 per acre at two-week intervals for three dressings beginning about August 1 in northern Utah. A hand-pushed drill such as a Planet Junior can be used if larger equipment is not available.</td>
</tr>
<tr>
<td>Cabbage</td>
<td>10-20-0*</td>
<td>300 or</td>
<td></td>
</tr>
<tr>
<td>Carrots</td>
<td>16-20-0*</td>
<td>300 or</td>
<td></td>
</tr>
<tr>
<td>Corn, silage</td>
<td>10-20-0*</td>
<td>300 - 400</td>
<td></td>
</tr>
<tr>
<td>Corn, sweet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wide spaced celery</td>
<td>10-20-0*</td>
<td>300 or</td>
<td>Apply 16-20-0, 10-20-0, or their equivalent to unmanured plowed land in early spring. Land heavily manured can be fertilized with 200 lbs. of treble superphosphate or 400 lbs. of 18% phosphate. Side dress with 100 to 150 lbs. of 20-0-0 or 10 lbs. 33-0-0 per acre at two-week intervals for three dressings beginning about August 1 in northern Utah. A hand-pushed drill such as a Planet Junior can be used if larger equipment is not available.</td>
</tr>
<tr>
<td>Close spaced celery</td>
<td>16-20-0*</td>
<td>300 or</td>
<td>Apply 150 to 200 lbs. 0-43-0 or equivalent, or 250 lbs. 16-20-0 or equivalent, on plowed land before preparing seedbed.</td>
</tr>
<tr>
<td></td>
<td>10-20-0*</td>
<td>300 and</td>
<td>If 0-43-0 is used, apply 100 lbs. 20-0-0 as side dressing in fall.</td>
</tr>
<tr>
<td></td>
<td>20-0-0</td>
<td>400 or</td>
<td>Apply 100 to 300 lbs. 20-0-0 or 200 to 400 lbs. 16-20-0 or equivalent as side dressing in spring.</td>
</tr>
<tr>
<td></td>
<td>33-0-0</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>Sugar beet seed</td>
<td>20-0-0*</td>
<td>400 and</td>
<td>(1) Apply broadcast on plowed land, and harrow in.</td>
</tr>
<tr>
<td>Washington County</td>
<td>16-20-0*</td>
<td>300 or</td>
<td>(2) Drill to side of row at planting time.</td>
</tr>
<tr>
<td></td>
<td>10-20-0*</td>
<td>600 or</td>
<td>(3) Side dress with cultivator attachment at time of irrigation.</td>
</tr>
<tr>
<td></td>
<td>0-43-0</td>
<td>700</td>
<td></td>
</tr>
<tr>
<td>Northern Valleys</td>
<td>20-0-0*</td>
<td>200 and</td>
<td>Apply all phosphate or half of mixed fertilizer in fall before seeding.</td>
</tr>
<tr>
<td></td>
<td>0-43-0</td>
<td>250 or</td>
<td>Side dress with 20-0-0 or other half of mixed fertilizer in early spring.</td>
</tr>
<tr>
<td></td>
<td>16-20-0*</td>
<td>400 or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-20-0*</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Vegetable seeds Annual</td>
<td>16-20-0*</td>
<td>300 or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-20-0*</td>
<td>300 or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8-12-0*</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Vegetable seeds Biennial</td>
<td>16-20-0*</td>
<td>400 or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-20-0*</td>
<td>400 or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0-43-0</td>
<td>200 and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20-0-0</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Berries</td>
<td>20-0-0*</td>
<td>300 or</td>
<td>Apply to sides of rows in early spring on established stands of berries.</td>
</tr>
<tr>
<td></td>
<td>33-0-0</td>
<td>300 or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16-20-0*</td>
<td>300 - 400 or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-10-0*</td>
<td>400 - 600</td>
<td></td>
</tr>
<tr>
<td>Fruit trees, all</td>
<td>20-0-0*</td>
<td>1/2 or</td>
<td>Apply fertilizer two weeks before blossom stage.</td>
</tr>
<tr>
<td></td>
<td>33-0-0</td>
<td>1/2 or</td>
<td>(1) Apply broadcast and disk into ground.</td>
</tr>
<tr>
<td></td>
<td>16-20-0*</td>
<td>1/2 or</td>
<td>(2) Drill in between tree rows with fertilizer drill. Phosphate fertilizers should be drilled or dug into ground to be effective. A phosphate-containing fertilizer need not be applied often or than every second year. Nitrogen fertilizers are needed annually unless ample manure is available.</td>
</tr>
<tr>
<td></td>
<td>16-8-0*</td>
<td>1/2 or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-10-0*</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

*If ordinary farm manure is applied, reduce fertilizers by 4 lbs. of nitrogen per acre (20 lbs. of ammonium sulfate) for each ton of manure applied. One ton of sheep or poultry manure can be considered equivalent to 2 tons of horse, cow, or hog manure. Where heavy applications of manure are made, no nitrogen may be needed in commercial fertilizers for most crops.

for March, 1948
This fund was given to purchase a foundation cattle for use in the beef cattle improvement program at the college, which is being carried on as a cooperative project with eleven western states and the U. S. Department of Agriculture. All purchases have been made through a committee in the Animal Husbandry Department consisting of George R. Henderson, James A. Bennett, and Louis L. Madsen. Eleven Herefords and four Shorthorns have been purchased.

The four Shorthorns were purchased at the Sni-A-Bar Dispersion sale held at Kansas City on May 30 and 31. At this sale two breeding cows, a yearling heifer, and a bull calf were obtained. The heifer has proved itself in competition at several shows in the state and won first in class and was Reserve Champion Female at the Centennial Beef Cattle Exposition held at Salt Lake City. The bull calf, named U. S. A. Control, is a son of the 1946 International Grand Champion bull, Sni-A-Bar Control, that sold for $10,000 in the same sale.

In June, five of the top Hereford heifers offered in the Bear Claw sale at Dayton, Wyoming, were purchased. These heifers were obtained specifically to strengthen the female line established by the bull Advance Domino 3rd at the college. Three of these heifers are by Advance A Domino, one of the great proved sires of the breed, and the other two are by BCR Advance Domino 23rd, a son of Advance Domino 140th, the sire of Advance Domino 3rd. One of these heifers is in calf to Advance A Domino, another to BCR Advance Domino 140th and three to W.H.R. Royal Domino 96th. Subsequent to the purchase of these outstanding heifers the Bear Claw Ranch donated the college a two-year old herd bull prospect by Advance A Domino and out of their 1943 Denver Grand Champion female, a half-sister to the college senior herd bull, Advance Domino 3rd. Two half-brothers, out of the same cow as the bull donated to the college, sold in the 1946 Bear Claw sale for $2,100 and $5,000, respectively.

B C R Advance A 16th, 4623943, donated to the college by Mrs. J. C. Morrill, owner, and E. E. Leone, manager, of the Bear Claw Ranch, Dayton, Wyoming. This bull is sired by Advance A Domino and is out of B C R Miss Advance A, the 1943 National Livestock Show champion and half-sister of Advance Domino 3rd, senior herd sire at the college.

**Beef Cattle Purchased by Sears Roebuck Foundation For the College**

By LOUIS L. MADSEN

In July five heifers were purchased from Fay F. DeBerard of Kremmling, Colorado. Mr. DeBerard was the breeder of Advance Domino 3rd, the 1940 Denver champion and now senior herd sire at the college. Two of the heifers are sired by the 1946 International Grand Champion, Royal D. H. Domino 43rd, shown by Fred C. DeBerard, and one heifer is a half-sister of this champion bull. The other two heifers are by O J R Royal Seth and Advance Domino 17th.

The final Hereford purchase was made at the Ogden Livestock Show on Nov. 18, 1947, at which time Blue Bonnet Domino 108th was obtained from W. J. Largent of Merket, Texas. This outstanding young heifer was the champion female of the Intermountain Hereford sale cattle, and she is sired by the youngest register of merit sire, C-W Prince Domino 21st. Competition was keen for this heifer and she has recently been described as one of the finest heifers ever sold at auction in Utah. Her sire is rapidly gaining national recognition since out of his last three calf crops, Mr. Largent has won 41 firsts, 12 seconds, 11 thirds, and 9 championships at nine major Hereford shows.

The purchase of these cattle has greatly improved the cattle owned by the college and through the beef cattle improvement program, offspring of these cattle will be tested and made available to the cattlemen of Utah.

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Dr. L. L. Madsen is head of the Animal Husbandry Department and in charge of the beef cattle breeding and nutrition studies.

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