highlights of

Potato Marketing

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HIGHLIGHTS OF POTATO MARKETING

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INTRODUCTION

Potatoes are one of the most important staple foods in the domestic diet. They are served more often than most other foods and certainly more than any other vegetable. They are sold in a rather steady volume throughout the year, whereas the sale of many other vegetables is seasonal in nature. Also, in most stores potatoes account for the largest tonnage handled in the produce department, but, on a dollar-volume basis, they may be outranked by a few higher priced items.

Potatoes are one of the few crops grown in every State and harvested in some part of the country during every month of the year. A total of 1,650,000 farms reported production of potatoes in the 1950 census.

Production during the 10-year period 1941–50, averaged 415 million bushels and had an average farm value of $526,000,000. The small crop of 1951, totaling only 321 million bushels, had a farm value of $522,000,000. It appears at the present time that a crop of about 350 million bushels is required to meet annual domestic needs.

During the last few years potato production has gone through some revolutionary changes. Production is becoming concentrated more each year on large-scale commercial farms. Yields per acre have more than doubled since the 1930's, because the crop is more efficiently produced and harvested than during earlier years.

Potato marketing also has undergone some marked changes in recent years. The purpose of this publication is to describe those changes and to call attention, if only briefly, to marketing practices that have proved to be most efficient.

It seemed advisable to round out the discussion by touching upon factors closely related to potato marketing. For example, the declining per capita consumption of potatoes seemed worthy of mention, not only because the decline has affected the marketing of potatoes, but also because some marketing practices used in the past undoubtedly have accelerated the decline in consumption. Shifts in potato production, the effect of supply-price relationships, and the impact of Government programs also are factors that must be considered in any discussion of marketing.

[1] Acknowledgment for helpful suggestions is made to C. Donald Schoolcraft and Raymond E. Keller, Fruit and Vegetable Market News Service, and Robert H. Eaton, of the Fruit and Vegetable Branch Field Office, Portland, Oreg., all of the Production and Marketing Administration; Alfred D. Edgar, agricultural engineer, Agricultural Research Administration; and to Maurice C. Bond, Cornell University, and Charles H. Merchant, University of Maine.

This publication covers a rather broad field, perhaps too broad for the readers who are interested in detailed discussions of specific phases of potato marketing. For them, two bibliographies are recommended: Handling, Storage, Transportation, and Utilization of Potatoes, by Dean H. Rose and Harold T. Cook, United States Department of Agriculture, Bibliographical Bulletin No. 11, December 1949; and A Selected Bibliography of Potato Marketing Research (1930–50), by Perry V. Hemphill and Loyd C. Martin, North Dakota Agricultural Experiment Station Bulletin 373, June 1952.

UTILIZATION OF THE POTATO CROP

Potatoes are grown in the United States primarily as a food crop for domestic consumption, although a small volume of potatoes is exported in most years. A part of the crop is used for seed, and surplus or low-grade potatoes are salvaged for livestock feed or for the manufacture of industrial products such as starch or alcohol. There is always, in addition, a certain amount of shrinkage or other loss.

A crop of 350 million bushels, under present conditions, would be disposed of about as follows:

Use	*Million bushels*
Food (domestic use in fresh or processed form)	283
Exports[1]	5
Seed	32
Industrial products	6
Feed, shrinkage and other loss	24
Total	350

[1] Exports would be offset to some extent by imports of about 3.5 million bushels for use as food and seed.

Within rather narrow limits, the use of potatoes for food does not expand greatly even though supplies are heavy and prices low. Exports, never large, depend primarily upon supplies in Canada—our main export outlet—and in most years Canada has a surplus of potatoes. Imports come largely from Canada, only a few early potatoes being shipped in from Cuba and Mexico. In a normal season, imports and exports are about in balance. Year-to-year variations in seed use also are slight, the quantity so used being influenced largely by the acreage planted the following year. The major variations are in the side-use categories—livestock feed, seed, industrial products—and shrinkage and other loss. Most of the potato starch plants, for example, remain closed during a short-crop year, but they operate during the entire season at maximum capacity when supplies are heavy and prices are low. Shrinkage of potatoes in storage, cullage, waste, and other losses also tend to be relatively large when supplies are heavy.

FOOD USE

The per capita consumption of potatoes has shown a rather steady decline during the last 40 years, except during the World War II period, when there was a slight increase. Per capita consumption declined sharply after 1945—an indication that the slight increase during the war years was only temporary. The 1910–14 average per

capita consumption was 173 pounds, as compared with 105 pounds in the 5-year period 1948–52. Consumption in 1952 was 101 pounds per person.

The sharp decline in consumption in recent years has not been quite as drastic as it appears, however. During the 1910–14 period, for example, many farmers produced a few bushels of potatoes, most of which were stored for food purposes. Shrinkage and waste were large. Also, many urban consumers looked ahead to the winter and "laid in" a large supply of potatoes at harvesttime. Home storage is seldom ideal and the shrinkage and waste of potatoes held by urban consumers likewise were high.

There is much less shrinkage and waste today. Recent information indicates that nearly all household consumers, as well as hotels and restaurants, normally purchase small quantities to be consumed within a 4-day to 2-week period. This change in the method of purchasing virtually eliminates shrinkage losses in the hands of consumers.

Many of the so-called noncommercial producers (those who produce 0.1 to 3 acres), have largely eliminated potatoes from their crop schedule, their place in the production picture being taken over by commercial growers. The storage and handling of the crop by these commercial growers are excellent when compared with the inefficient handling and storage methods used by the noncommercial growers.

Another major factor causing the downward trend in per capita consumption is the availability, at reasonable prices, of other vegetables and of fruits during every month of the year. Although there has been a sharp downward trend in potato consumption, there has been an equally sharp upward trend in the consumption of these other products.

In discussing the food value of potatoes, the Bureau of Human Nutrition and Home Economics of the Department says:

> Potatoes pack good food values under their brown jackets. When you eat them daily, you can get as much as one-fourth of your vitamin C quota, besides some of the B vitamins, iron and other important minerals, and starch.
>
> Potatoes are a cheap energy food. Penny for penny, they have more energy-giving value than any other vegetable.
>
> Potatoes fit into any meal. You may serve them at breakfast, dinner, or supper.
>
> And potatoes need not be fattening. One medium-sized potato has about 100 calories—no more than an apple or banana, and only half the calories of a medium-sized piece of pie or a hamburger and roll. If you're watching weight, watch what you put on the potatoes. It's the gravy, butter, or other fat that "piles up" calories. And it's the total of all the foods you eat that adds the pounds.

PROCESSING

Approximately 10 percent of the potatoes sold for food purposes are processed before being sold to the consumer into such products as potato chips, frozen french fries, canned whole potatoes, and dehydrated potatoes and in mixed foods such as soups and hash. Under a recent development potatoes are partially processed, that is they are peeled for sale to institutions such as restaurants, hotels, schools, and hospitals. The processing of potatoes is mentioned here to point out that buyers of potatoes used for these purposes usually demand varieties, types, grades, or sizes suitable for their particular uses. Processors are interested in uniformly good quality as a means of increasing their volume of sales. Potato growers and country shippers are vitally interested in enlarging the business of these processors in order to expand

the consumption of potatoes. Growers and shippers should do everything possible in both growing and handling potatoes to meet the exacting specifications of the various processors.

Because the volume of potatoes absorbed for a particular use is small, that use should never be underrated until its market potential has been thoroughly tested and explored. Only 20 years ago potato chips were largely processed in home kitchens or in small restaurants and most of them were sold, either in bulk or in any type of package. In a relatively short period of time the chip industry has progressed from many small plants operated by individuals to a relatively few centrally located plants. Many of the chip manufacturers have large processing plants and distribute their product over a wide area.

The use of potatoes for processing into chips has been an important factor in checking the normal downward trend in potato consumption. It is estimated that the volume has increased about 10 percent in each of the recent years. In 1951 slightly more than 23 million bushels of potatoes were processed into chips. Chip manufacturers have continually expanded their sales volume by producing a quality product, packaged in the type and size of container demanded by the consumer and by effective promotional work by the industry.

These manufacturers demand potatoes having high starch content and low sugar content, and of medium to large size. The starch content of a potato will depend to some extent upon the variety, the place where grown, and the weather conditions during the growing season. Chippers encounter the most difficulties during the winter and spring months when their supplies are coming from storage stocks in the northern States. Storage of potatoes for several weeks at low temperatures changes the starch into sugar, so that the potatoes will not "chip" properly because the sugar burns and darkens or discolors the chips. Most varieties of potatoes can be reconditioned to lower the sugar content by storage at room temperature for 2 or more weeks.

The length of the reconditioning period depends upon the variety of potatoes available, the temperature at which they have been stored, and the length of storage. Manufacturers must know these factors in determining whether a lot of potatoes will produce a good light-colored potato chip after a reasonable reconditioning period. Often before purchases are made, test samples are cooked to determine whether a lot of potatoes will chip properly.

The processing of frozen, french-fried potatoes is relatively new, but the volume of the frozen product has been expanded rapidly. The probable utilization of potatoes for processing as french fries during 1951 was 1½ to 2 million bushels. The frozen french fries are distributed by a few large companies that handle a wide variety of frozen foods. As in the potato-chip industry, also, the frozen food industry has stressed high quality. The household consumer is continuously searching for good-quality foods that require relatively little preparation. Frozen french fries fit nicely into this category because prices have been kept somewhat in line with the cost of home preparation.

Dehydrated potatoes received a great deal of adverse comment from American servicemen during World War II. Since the veterans of that war are now located all over the country and in all segments of the business community, it will take a superior product, and a well-

FIGURE 1.—Potato chips as they leave the fryer. An automatic conveyor carries the potatoes to the peeler, to the slicer, and then through the fryer.

coordinated promotional campaign, to sell many dehydrated potatoes. Material improvements have been made in the quality of dehydrated potatoes and limited quantities are currently being purchased by the Armed Forces for areas where fresh potatoes cannot be handled.

Approximately 1.5 million bushels of potatoes are canned as whole potatoes. The canners of this product prefer potatoes from 1 to 2 inches in diameter. The other canning outlet for potatoes includes the various soup mixtures, canned hash, and other preparations requiring potatoes. These canning outlets consume about 1 million bushels of potatoes a year.

Another product in which potatoes are used and that has been expanded rather sharply since 1950 is a dried soup mix containing a substantial portion of potatoes. Although this soup mix absorbs a relatively small volume of potatoes at present, its use may expand materially during the next few years.

INDUSTRIAL AND LIVESTOCK FEED UTILIZATION

As mentioned earlier, the industrial utilization of potatoes and their use as a feed for livestock may be designated as salvage uses. But potatoes are bulky, heavy, and costly to handle, both at shipping point and place of use, as compared with some of the more concentrated materials, such as cereal grains and blackstrap molasses. For example, grain can be efficiently handled by gravity, suction, or con-

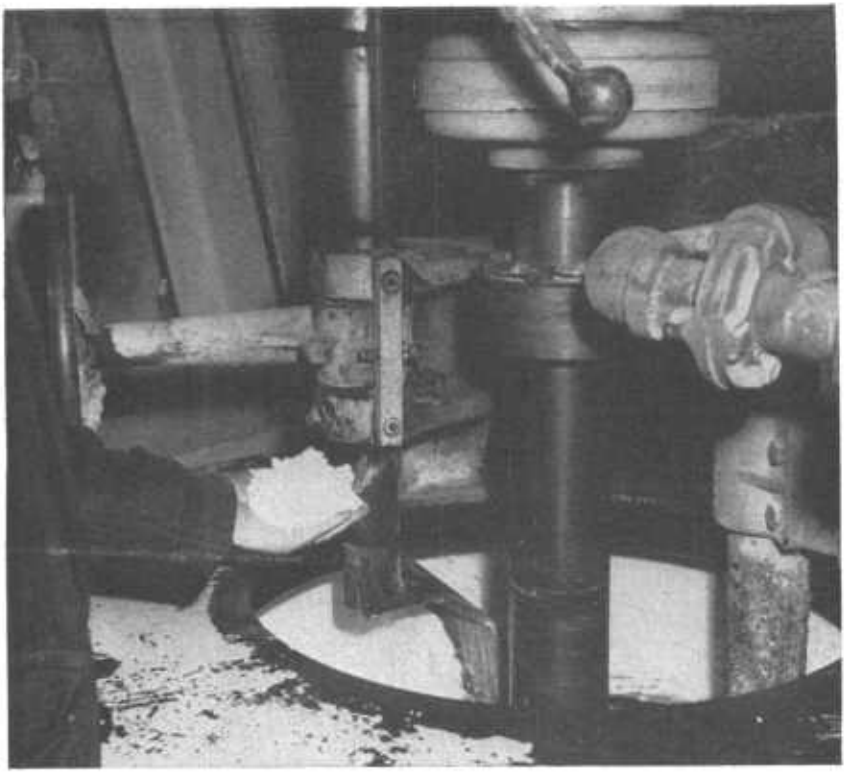

FIGURE 2.—This high-speed centrifugal separator removes most of the water from potato starch. From the separator, the starch is conveyed to a drier. The dried starch is then ground and sacked.

veyors and blackstrap molasses by pumping, whereas potatoes require a considerable amount of hand labor.

A most important industrial outlet for poor quality and surplus potatoes over a period of years has been the starch plants located in Maine and in Idaho. These plants, although relatively small, are scattered conveniently within these two large areas of concentrated production. This location factor minimizes the cost of handling and transportation. The cull and low-grade potatoes must be hauled away from the grading shed or from the storage warehouse anyway, so that it is usually no more costly to deliver the potatoes to the starch plant than to dump them. In recent years the starch plants have paid from 15 to 50 cents per hundredweight for potatoes, depending on the price of starch. Potato starch is preferred for many uses and if properly made will command a premium price over most other starches. However, this premium is not sufficient to permit the starch plant to compete with the food outlets for potatoes.

On the average it is possible to recover 10 to 12 pounds of starch from 100 pounds of potatoes. The starch content varies with the season, the variety, and the length of time the potatoes have been in storage. If all the starch plants were operated at maximum capacity for the normal marketing season in Maine and Idaho, approximately

20 million bushels of potatoes could be ground to make about 60,000 tons of starch. Most of the potato starch is used in sizing textiles during the weaving process, for making various kinds of adhesives, and for finishing paper.

The largest potential outlet for low-grade and surplus potatoes is for livestock feed. Although central and northern Europeans have for generations fed potatoes to livestock, the value of potatoes as stock feed has not been appreciated in this country until recently. It has been difficult for potatoes to compete successfully with corn and other feed grains which can be grown easily and economically throughout most of the United States. Potatoes have a feeding value about equal to corn ensilage, or somewhere between a fourth and a fifth of the value of good-quality corn. The feed value and the most economical feeding rates have not been determined for potatoes as accurately as they have for many of the other feed products, but it is known that large quantities of potatoes have been fed to livestock within the last 10 years with very good results.

In nearly all instances dairymen have reported an increase in milk production when potatoes are fed. Some farmers have fed feeder steers nothing but potatoes for 90 to 100 days with fair success but this practice is not recommended. Potatoes should be fed in a well-balanced ration. They make an excellent feed for beef cattle that are being fed dry rations such as grain and hay.

Because of their bulk and weight, the feeding of potatoes presents special problems. One of the biggest problems has been the assurance of a fairly uniform volume over a period of 90 days or more. Potatoes are highly perishable and must be protected from frost during the winter months. This means that the livestock feeder in the late-production areas either must haul directly from a packing shed on a day-to-day basis or obtain his potatoes from a nearby storage house. The feeder cannot change rations at frequent intervals and maintain profitable gains. Since it requires 400 to 500 pounds of potatoes to equal the feeding value of 100 pounds of corn, it is obvious that the livestock feeder cannot afford to move these potatoes many times before they are fed to the livestock. Therefore, a little ingenuity and cooperation between the potato growers or local dealers are required to keep the livestock feeder supplied with a fairly uniform volume of potatoes over a period of time.

It was discovered by accident that potatoes have some fertilizer value. To get rid of their surplus potatoes, a number of growers in New Jersey scattered them over their fields. To their surprise, the next year's wheat crop on these fields made a stronger, healthier growth, and produced higher yields than formerly. The following year these growers refused to sell any off-grade or surplus potatoes at prices lower than 30 cents per hundredweight because according to local estimate, the potatoes were worth that amount for fertilizer. A more vigorous growth of grass was reported, also, where potatoes were dumped on pastures in the Red River Valley.

PRODUCTION

AREAS OF PRODUCTION

Potatoes are produced in every State but production is concentrated in a few relatively small areas. Only 11 States in 1951 produced more

FIGURE 3.—A potato field in blossom, Aroostook County, Maine.

than 10 million bushels and 4 States (Maine, Idaho, California, and New York) accounted for 45 percent of the crop. Even in these States production is concentrated—in Aroostook County, Maine; along the Snake River in Idaho; in about 10 counties in New York; and in Kern County, Calif., which produces more than half the State's crop. The 1951 yields per acre in these 4 States were as follows: Maine, 445 bushels; California, 439; Idaho, 280; and New York, 274 bushels. All the important commercial areas produce high yields of good-quality potatoes.

In the other States the commercial production of potatoes is confined largely to a small part of the State and may be confined to several isolated areas within the State. In Colorado, for example, there is an important area centering around Greeley and another area in the San Luis Valley. These areas are approximately 300 miles apart and virtually no potatoes are grown between the two areas.

There are 409 million acres of cropland in the United States; yet in 1951 only 1.4 million acres were planted to potatoes. Figure 4 shows the overall scatter of production, and the widely separated commercial producing areas.

Approximately a fourth of the potato crop is grown in areas requiring irrigation and most of the remainder in areas of above average rainfall. Even in these latter areas there is a continual increase in the use of supplemental irrigation. On Long Island, for example, a sub-

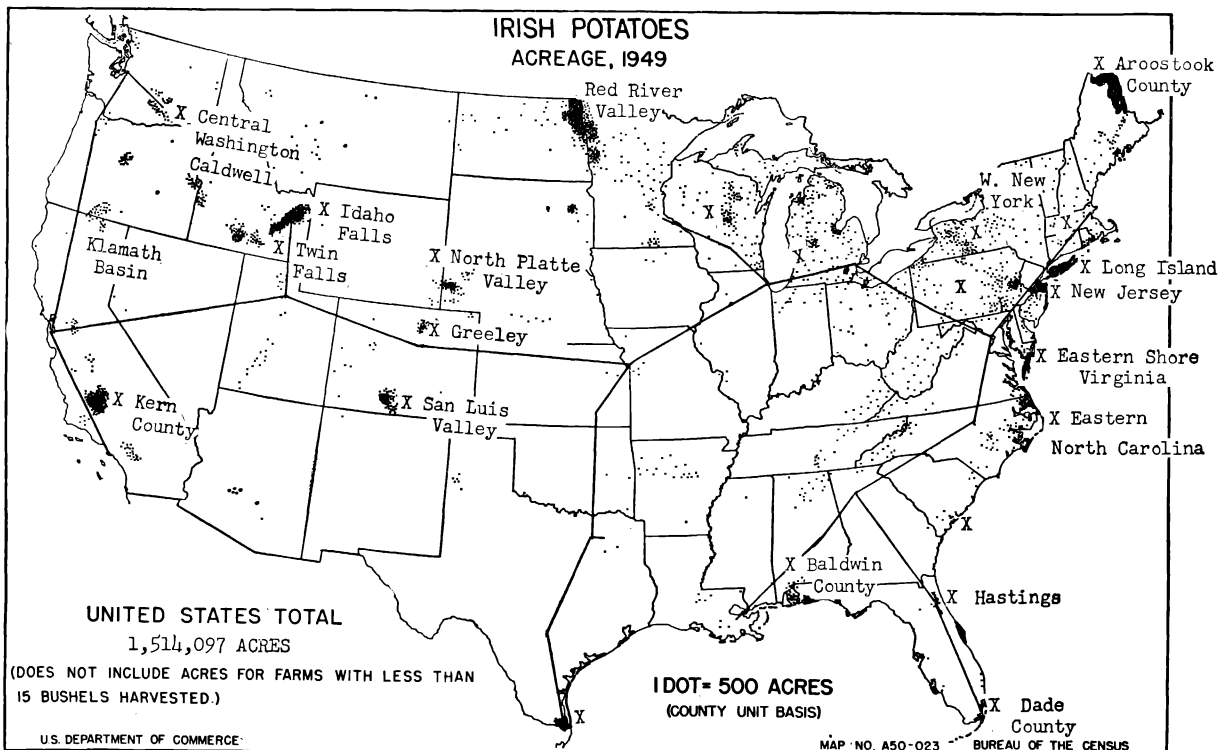

FIGURE 4.—A dot map showing the areas of potato production.
(The solid lines show the fruit and vegetable Market News Service leased wire system for transmitting market information. The X's show the production areas where f. o. b. markets are reported. Also, several areas of concentrated production are identified.)

stantial part of the acreage has been put under supplemental irrigation in recent years. Also, many other areas in the East and Midwest are increasing the use of irrigation where either surface or underground water is available. In some years these areas have little need for irrigation, whereas in other years yields may be increased 100 percent or more over the nonirrigated acreage with a corresponding increase in the size and quality of the potatoes.

Potatoes are successfully grown on a wide variety of soils such as the marl in Dade County, Fla., the muck areas of Indiana, the heavy loam of the Missouri and Red River Valleys, the volcanic ash soils in the Pacific Northwest, and the rocky Caribou loam of Aroostook County, Maine. They also are grown under various climatic conditions, in the deserts of Arizona as well as the short-summer areas along the Canadian border. It is not the soil, the climate, or the availability of land that limits the production of potatoes, but rather the availability of market outlets at profitable prices. This does not mean that potatoes can be grown anywhere on a commercial scale; but with the proper knowledge of local conditions there are many additional areas where potatoes can be successfully grown if markets and prices warrant doing so.

One of the difficulties in marketing potatoes and particularly in forecasting prices is the continual overlapping of harvesting and marketing seasons between the different areas.

The crop year for potatoes begins in December in south Texas and south Florida and extends through the following calendar year and to the end of June in the second year or over a period of 19 months. The Crop Reporting Board in estimating production classifies the segments of the crop as early, intermediate, and late. But there is no clear-cut dividing line between early, intermediate, and late potatoes, and it is virtually impossible to make such a division in all areas. For handling and marketing purposes the intermediate potatoes are treated in the same manner as early potatoes and the late potatoes constitute the storage crop.

Potatoes are harvested in some area every month in the year and in one State (California) they are harvested every month. In some areas, potatoes can be harvested either as early or late potatoes, depending on growers' evaluation of the market. In some States where soil and climatic conditions permit, a few potatoes mature in the fall, but are not harvested until the late winter months.

From data available it appears that commercial growers are steadily winning the production battle with the so-called noncommercial growers. A commercial potato farm is generally considered as one with 3 or more acres of potatoes. As a rule, the yield per acre on larger acreage is much higher than that on the small acreage grown largely for home use. In the 1950 census, 1,649,906 farms reported potato production. The small noncommercial farms produced 93 bushels an acre, whereas farms harvesting 3 acres or more had a yield of 268 bushels an acre or almost 3 times the yield of the small acreage. There were 62,404 commercial farms (3 acres and over) which harvested 77 percent of the acreage and produced 91 percent of the crop. Sixty-three percent of the potatoes were produced on only eight-tenths of 1 percent of the farms reporting potato production. These farms harvested 25 or more acres per farm. Table 1 shows potato acreage and production, by size of farms.

TABLE 1.—*Potato acreage, production, and yield, United States, by size of farm, 1949 crop*

Size of farm (acres)	Farms reporting	Percentage of total	Acres harvested	Percentage of total	Quantity harvested	Percentage of total	Yield per acre
	Number	*Percent*	*Acres*	*Percent*	*1,000 bushels*	*Percent*	*Bushels*
(1)	988, 320	59. 9	[2] 93, 653	5. 8	7, 693	2. 1	[3] 82
0. 1–0. 9	497, 895	30. 2	148, 303	9. 2	15, 133	4. 1	102
1. 0–1. 9	80, 697	4. 9	84, 938	5. 3	6, 956	1. 9	82
2. 0–2. 9	20, 590	1. 2	42, 840	2. 7	4, 718	1. 3	110
3. 0–9. 9	31, 615	1. 9	158, 823	9. 9	29, 772	8. 1	187
10. 0–24. 9	17, 710	1. 1	271, 449	16. 9	70, 181	19. 1	259
25. 0–49. 9	8, 001	. 5	271, 446	16. 9	77, 273	21. 1	285
50. 0 and over	5, 078	. 3	536, 296	33. 3	154, 803	42. 3	289
Total	1, 649, 906	100. 0	1, 607, 747	100. 0	366, 528	100. 0	228

[1] Farmers reported production but did not specify acreage involved.
[2] Derived acreage for this group based on assumed yields.
[3] Assumed yield by Bureau of Agricultural Economics, USDA, for this group is based on yields for the other small size group.

Source: Compiled from 1950 Census of Agriculture, Bureau of the Census.

There is little advantage in garden-fresh potatoes. In fact, garden potatoes are likely to be poorer in quality than those grown commercially, so the person growing his own potatoes gains little except the pleasure of having a garden. A family of 4 that consumes the average quantity of potatoes, would eat only 420 pounds a year. A home-grown supply cannot be stored for much more than 6 months; thus the quantity of home-grown potatoes that could be consumed would be reduced to only 210 pounds for a family of 4. Considering the cost of seed, fertilizer, and spray materials purchased in small lots, there can be little or no cash reward for the hours of labor expended. Most farms are tending toward fewer, specialized crops in order to afford and utilize properly the necessary high-priced equipment. Hand labor, even at a nominal cost, cannot compete with modern machinery.

SHIFTS IN AREAS OF PRODUCTION

The bulk of commercial potato production for a long period of time has been concentrated in a number of widely scattered areas. However, there have been a few significant changes in recent years. Kern County, Calif., is a notable example. During the 1920's the acreage and production in this county were rather insignificant and yields per acre were low. When the extensive use of pump irrigation was started in the early 1930's, however, several growers discovered that with the use of good certified seed, proper fertilization, and irrigation, they could produce high yields of good-quality potatoes of the White Rose variety. Yields of from 500 to 600 bushels per acre are not uncommon. The average for all early potatoes in California was 445 bushels per acre in 1951.

In Steuben County, N. Y., potato production had virtually died out, but in the 1930's some growers found that, with good cultural practices, they could produce from 250 to 400 bushels per acre. The primary limiting factor in the increase in production in these areas,

as well as many others, is the inadequate market outlet at a profitable price.

There has been a sharp downward trend in acreage in all States where yields per acre are low. The 10-year (1940–49) average yield per acre in Texas, Oklahoma, Louisiana, Arkansas, Mississippi, Tennessee, Georgia, Kansas, Kentucky, and Illinois was below 100 bushels per acre, and there has been no significant increase in yields during recent years. The 1951 acreage in these 10 States was only 42 percent of the 10-year (1940–49) average, whereas in the 4 highest producing States—Maine, Idaho, California, and New York—the 1951 potato acreage was 68 percent of their 10-year average.

CERTIFIED SEED

All potatoes are potentially seed potatoes. However, only officially certified seed are generally recognized as seed potatoes, because tests and inspections have been made on these potatoes to assure the purchaser that they are relatively free from diseases that are transmitted through the seed piece.

The rules and regulations for the certification of seed potatoes are under the jurisdiction of an agency designated by each State. The certification rules vary slightly from State to State but basically they are similar. All States require field inspection of the growing plants as well as bin inspection of the tubers. Seed potatoes are sold on the reputation of the grower and of the State seed certification agency. Therefore, it is to the advantage of growers to strive to maintain strains of seed potatoes that are as nearly free from disease as possible.

The introduction of more effective insecticides and fungicides in recent years has materially improved the quality of certified seed potatoes. Furthermore, potato fields can be dusted with pesticides by airplanes or helicopters, when weather conditions will not permit the use of tractor-mounted dusters and sprayers. Since insects spread many potato diseases, their control results in better seed and a more plentiful supply.

Another development has been the field tests of seed potatoes in Florida, Alabama, Arizona, and southern California, and greenhouse tests within the production area. Samples of a grower's certified seed are planted in these test areas during the winter months, and a qualified technician makes disease readings of the growing plants. When these tests indicate that the seed from a particular lot is relatively free from disease, the seed will command a premium price on the market. Many growers will not purchase certified seed potatoes unless samples of them have been field-tested.

Any grower planting poor-quality seed potatoes is headed for production trouble regardless of the cultural practices he follows during the growing season. One of the poorest ways for a grower, either commercial or home gardener, to economize is to plant seed potatoes of questionable quality. Growers in the early and intermediate potato States generally purchase northern-grown certified seed, whereas in the Northern States where considerable trading among growers takes place they may plant officially certified seed, or potatoes from a field that they have observed growing during the season, or the small unsalable table stock potatoes, provided the

crop from which they were selected was relatively free from disease. A number of growers in the late States normally plant a small seed plot with certified seed, then use the potatoes produced on this plot to plant their crop the following year.

Certified seed production has materially increased during the last 10 years. The 1950–52 average production of certified seed was 43 million bushels. During the last 10 years, 29 States have recorded such seed production but 4 States—Maine, North Dakota, Minnesota, and California—have rather consistently produced three-fourths of the total certified seed crop. Practically all the imported certified seed potatoes come from the Maritime Provinces of Canada. Approximately 32 million bushels of potatoes are needed to plant the crop, but not all growers plant certified seed. Therefore, many of the certified seed potatoes have been sold in recent years as table stock.

VARIETIES

The production of the commercial potato crop by variety has not been estimated. The production of certified seed, however, is reported for each variety. The leading varieties in order of certified seed production, averaged for the 3-year (1950–52) period with respect to their percentage of total seed production, were as follows: Katahdin, 31 percent; Irish Cobbler, 12; Russet Burbank, 11; Triumph, 10; White Rose, 7; Red Pontiac, 6; Green Mountain, Kennebec, and Chippewa, 4 percent, each; Pontiac, 2; and other varieties combined, 9 percent.

In 1952 more than 500,000 bushels of certified seed were produced for each of the above varieties. These 10 varieties in 1952 accounted for 91 percent of the total certified seed production and the first 4 varieties accounted for 62 percent of total production. Certified seed production can be used only as a rough guide to production by varieties. Some growers sell the large size seed potatoes for food purposes and all surplus certified seed of any variety is sold for other than seed uses.

During the period 1946–52 a number of new varieties of certified seed were reported, but by the end of the period 22 of these varieties had disappeared.

A few of the varieties are widely grown; others are confined to a relatively small area. A few Irish Cobblers are grown in most States, whereas Red McClures are grown almost exclusively in the San Luis Valley of Colorado. Russet Burbanks are produced largely in five Northwestern States. The White Rose is grown as an early potato in the Western States.

It requires approximately 10 years to develop a new variety of potato to commercial importance. Even after new varieties are introduced, their rate of disappearance is high. Certified seed for one new variety—Kennebec—jumped from only 200 bushels in 1948 to 2.6 million bushels in 1952. Plant breeders are continually striving to develop a new variety for a particular purpose or one that is better adapted to certain climatic or soil conditions of a particular locality. For example, Bliss Triumph, when grown in Nebraska and Wyoming, usually shows some scab, air cracks, and shatter bruises. A number of new varieties are being tried in this area and some of them appear to have good possibilities. The Irish Cobbler is one of the oldest varieties and it can stand more adverse weather and abuse

than most of the other varieties grown. Hence, it is popular with home gardeners, small growers, and commercial growers in the Middle Atlantic States.

HARVESTING, STORAGE, AND GRADING

HARVESTING

Just where production stops and marketing begins, during the cycle of growing and moving potatoes to the ultimate consumer, is a debatable point. It can be argued that production stops as the digger lifts the potatoes out of the ground or that production is finished when the potatoes are delivered to the grading shed or storage house. For the purpose of this discussion the marketing operation begins as the digger lifts the potatoes out of the ground.

Obviously many cultural practices affect the quality and condition of potatoes. The quality of potatoes depends on their size, maturity, color, shape, texture, cleanness, and freedom from defects and other more permanent physical properties that affect market value. The condition of potatoes is based on firmness and their freedom from decay, freezing injury, shriveling, sprouting, or any other type of deterioration. A potato with a cut or bruise may remain in good

FIGURE 5.—A two-row, level-bed digger in Kern County, Calif. The man on the digger adjusts the depth of the digger blade and removes vines that clog the digger chain. In this area field sacks are used in hauling the potatoes to the packing shed.

condition throughout its normal storage life, but one that has been even slightly frozen will usually become wet and spongy in a short time.

Most potatoes are now harvested with 1-row or 2-row power-drawn diggers. In general, the larger the equipment, the lower the cost per unit in harvesting potatoes, provided the acreage to be harvested is large enough to justify the larger equipment. In a 3-year study in Aroostook County, Maine, it was found that the average cost per barrel (165 pounds) for digging potatoes (digging includes lifting potatoes from the ground and placing them in barrels in the field) with a single-row digger was 32 cents and with a double-row digger 28 cents. There was a variation in costs of from 27 to 35 cents a barrel, depending on such factors as yield per acre, condition of the soil, efficiency of the operator, and speed of the digger.

The time lost for stops, turning, breakdowns, and the like materially affects the efficiency of harvesting. If the speed of the digger is increased beyond a certain point the damage to the potatoes is materially increased and more than offsets any lowered cost. Tuber bruising from digging averaged 11.4 percent—2 percent serious grade defects and 9.4 percent minor defects—in the Maine experiments. When the digger chain was run at fast speed, the serious bruising damage was four times the rate at low speed and the minor bruising 18 percent greater. On the average, young drivers (those under 30) bruised more potatoes than drivers over 30. Closer supervision, especially of younger drivers, should help to reduce bruises which later show up as defects that reduce quality and, thereby, cost the grower money. In Maine both serious and minor bruises at the time of the study averaged only about 50 percent of the number prevailing 15 years earlier.

In order to reduce the amount of bruising in digging, research workers at the Idaho Experiment Station recommend as follows:

1. Reduce the field speed of the digger to 1½ miles per hour or less.
2. Reduce the digger chain speed to 150 feet per minute or less.
3. Operate the digger chain with the raised portion of the link ends on the underside or shield them with belting.
4. Replace kickers with idler wheels, if soil conditions permit.
5. Place rubber tubing on digger chain links.
6. Eliminate drops of more than 6 inches.

More good-quality potatoes are ruined in harvesting and grading than in any other phase of the growing and marketing processes. Very few growers use all the approved methods for reducing this mechanical slaughter of potatoes. It would appear that all growers would exercise every precaution known, and especially those that involve little or no cash outlay to adopt. Perhaps the most important reason for lack of proper handling is that once harvest starts, everything must be done hurriedly. During the late spring and summer the potatoes should be under cover and out of the sun and wind within 30 minutes after the digger lifts them out of the ground. During the late harvest, fear of freezing temperatures causes hurried and careless handling of potatoes by the farmer who so carefully grew them. The grower of late potatoes may have 3 or 4 weeks to harvest his crop but there is always a possibility that rain or snow can cut the actual harvest time to a few days. Unless the grower does some planning in advance and makes necessary adjustments in the equipment prior to harvest,

such adjustments will not be made. When a harvesting crew and equipment costs the grower from $20 to $40 an hour, every minute counts.

A typical crew in Maine for a 2-row digger consists of 1 driver, 1 digger tender, and 10 to 19 pickers. In Maine the potatoes are picked into baskets. These baskets of potatoes are then dumped into barrels. According to a recent study, the emptying from the baskets into the barrels caused an additional 0.8 percent serious bruising and 3.5 percent minor bruising. In many areas the potatoes in the baskets are dumped into field sacks; in other areas the picker drags the picking sack, which is attached to his belt, until it is half filled. This method causes considerable skinning and bruising because many of these field sacks are secondhand potato sacks made of lightweight (7½-ounce) burlap. In hot dry weather these lightweight sacks give little or no protection from either the heat or drying effect of the wind.

In Nebraska and California it has been demonstrated that heavy-duty canvas bags give much better protection to the tubers and are more durable than the lightweight sacks. In California when early potatoes were allowed to remain in the field for 1½ hours, there was 80 percent less browning from exposure to heat and dry wind in the heavyweight fertilizer sacks than in either potato or grain sacks. Fertilizer sacks should be thoroughly cleaned before they are used because fertilizer burns the potatoes.

Tests at the Idaho Agricultural Experiment Station show that when potatoes are hauled from the field to the packing shed or storage house, the bed of the truck should be padded, preferably with ½ to ¾ of an inch of sponge rubber, or covered with canvas or with sacks over straw, or just sacks—which are better than nothing.

FIGURE 6.—Potato harvesting in Maine. Potatoes are dumped from the picking baskets into the barrels.

FIGURE 7.—A mechanical harvester in operation in the Red River Valley. The workers riding on the harvester are removing vines and trash as the potatoes are elevated into the truck.

During the last few decades the harvesting of many farm crops has been radically changed, simplified, and speeded up, with consequent savings in cost, by applying power and mechanical methods to the jobs. The old hand methods of harvesting and hauling potatoes on commercial farms appear to be giving way to mechanical operations, requiring fewer hands to get the job done. Many combine harvesters, either homemade or manufactured by machinery companies, are in the process of development. Most of the combine harvesters have attachments for elevating the potatoes, from the digger chain, over a short picking belt for the removal of trash, vines, and stones. The elevator then deposits the potatoes into a dump truck or into a truck with a V-shaped bed and an unloading conveyor at the bottom of the V. An Iowa grower has gone one step further, placing the potatoes from the mechanical pickup into 4- by 4- by 4-foot boxes which hold approximately 40 bushels of potatoes. These boxes—6 on a dual-wheeled truck are hauled to the storage or grading shed and handled by fork-lift trucks. In this operation the potatoes are stored in the boxes. This eliminates many of the pressure bruises and much of the mechanical damage caused by unloading into and out of bins.

Everything points to the fact that there is less mechanical injury to potatoes in combine harvesting and hauling in bulk or large boxes than in the conventional methods of hand picking and hauling in sacks and barrels. Research information also indicates that some potatoes are mechanically injured each time they are handled, regardless of how carefully they are moved. It would appear that proper handling of potatoes in palletized 40-bushel boxes would afford the most efficient method of handling and storing them, even though the initial invest-

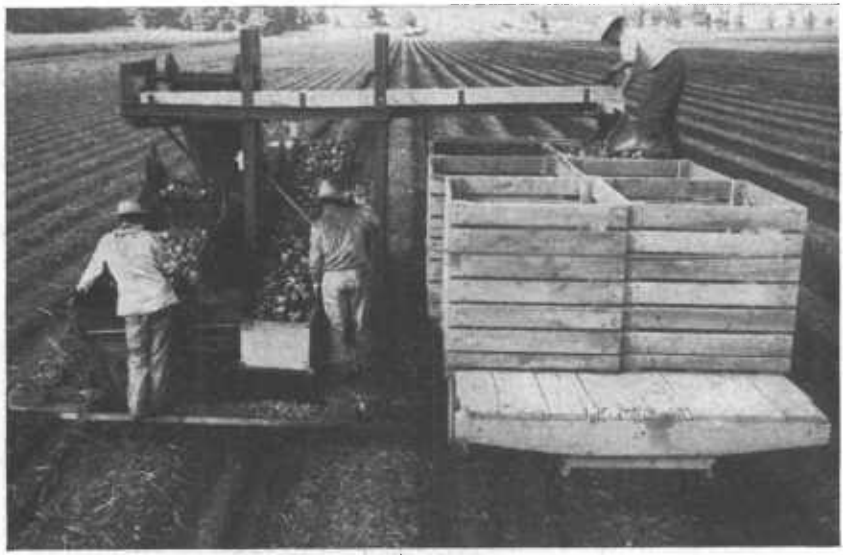

FIGURE 8.—A mechanical harvester elevating potatoes into 40-bushel pallet boxes. These boxes are unloaded from the truck and placed in storage with a fork-lift truck. The potatoes remain in these boxes until they are graded for market.

ment be higher. Information on the 1952 harvest indicates that the cost of large boxes and lift trucks at storage warehouses can be offset by reduced harvesting and unloading costs of producers of more than 20,000 bushels of potatoes.

Potatoes should not be exposed to the sun and drying wind any longer than is necessary. If they are hauled in lightweight sacks they should be covered with a tarpaulin to protect them from the sun and the drying effect of wind. During the summer, potatoes that are allowed to remain for a few hours on a truck at the grading shed or storage house, can be ruined. Often the temperature of the outside layer of potatoes exposed to direct sunlight will be 100° to 135° F. These potatoes usually break down and develop bacterial soft rot either in transit or before they can be moved through the distribution channels. These exposed potatoes are thoroughly mixed with other potatoes as they go through the grading process. It takes only a slight sign of bacterial soft rot to make terminal buyers wary of a shipment. One decayed potato can often wet many potatoes in a sack and sometimes adjoining sacks also.

STORAGE

Early potatoes (those harvested from late spring to early fall) are seldom stored because of immaturity and because high temperatures at the time the potatoes are dug would necessitate mechanical refrigeration. Also, more potatoes are being harvested each month so that prices seldom advance enough to pay the added costs of handling and storing.

About 75 percent of the Nation's potato crop is harvested in the fall and the great bulk of these potatoes is stored. They are usually

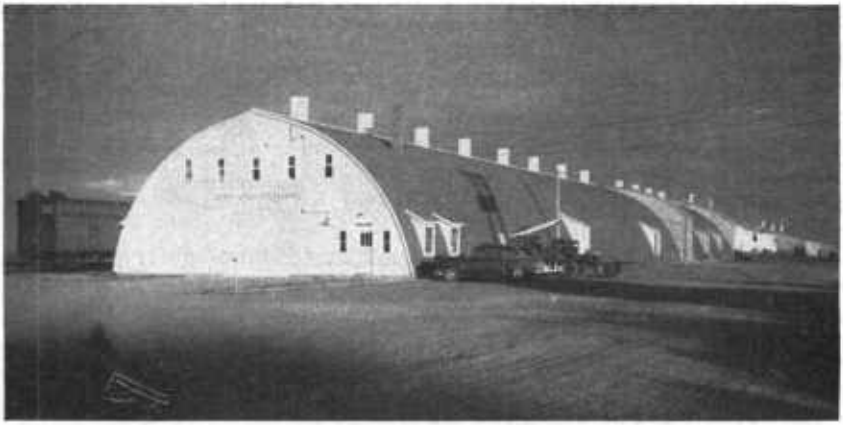

FIGURE 9.—The exterior view of a large modern storage warehouse in the Red River Valley.

mature. Maturity may be hastened by killing of the vines by frost or by the use of vine killers (chemical sprays or mechanical beaters). The weather is cool at harvesttime and the late potatoes can be placed in a storage house which depends on the circulation of cool night air through it to lower the temperature to the desired level.

Potatoes are perishable, hence the storage conditions are exacting and each time potatoes are moved, whether in bulk or in packages, a few are damaged. Because of this, potatoes usually remain at the original point of storage until they start through distribution channels. Nearly all are stored in bulk in bins of "common" storage

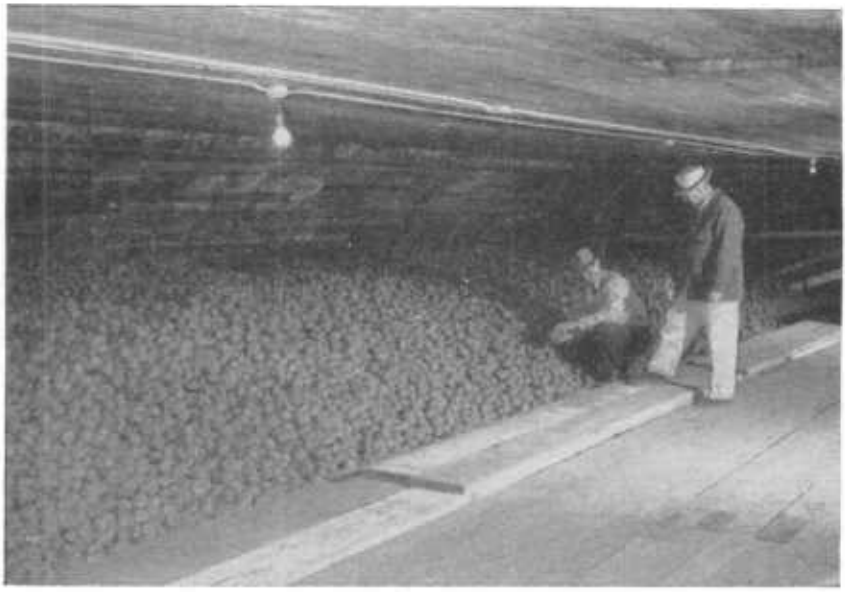

FIGURE 10.—The interior view of the storage warehouse shown in figure 9.

houses. In these houses there is no mechanical refrigeration, so temperature control is dependent on the circulation of outside air through the storage.

Farm storage structures are located on or adjacent to the farm where the potatoes are grown and are operated by the grower. Trackside storage houses are located on a railroad siding and are operated by warehousemen or more generally by country shippers. Terminal storages are usually large commercial refrigerated warehouses handling a variety of commodities.

Several decades ago terminal storage loomed importantly in winter potato marketing, but large scale use of refrigerator cars and insulated trucks beginning with World War I brought a change in the timing and methods of distribution by shifting storage from terminals to country points where farm and trackside common storages are used.

Late potatoes may be stored from a few weeks to 8 or 9 months, the length of time depending on the area, the weather, type of storage, and the grower's evaluation of the market. Potatoes can be successfully stored in temporary, frostproof storage structures for 2 to 3 months during the fall, with little loss or damage. Few growers plan to sell all their potatoes by December 1. They often store them in a barn or shed that was designed for other purposes; or they may store them in the alleyways between the bins or in the drive-in space above the storage bins.

Potatoes that are to be marketed within 3 to 4 months after they mature do not need to be stored at temperatures below 50° F.; those to be held longer should be stored at 40° and at a relative humidity of 90 percent. When potatoes are first placed in storage they should be held at a temperature of 60° (taken at the top of the bin) and a humidity of 85 to 95 percent for about 10 days so that wounds will heal. Restricted ventilation will hold the humidity at this level. After the wound-healing period, the storage area should be ventilated just enough to reduce the temperature at the top of bin from 60° to 50° in 45 days, and for continued storage the top of bin temperature should be reduced from 50° to 40° during the next 45 days. More rapid cooling usually results in excessive shrinkage because of a lower storage humidity.

In most of the late-potato producing areas these conditions can be maintained with the use of forced air circulation in a common storage that is properly insulated. In the drier climates the humidity can be increased by wetting down the alleyways or by passing forced air through a fog spray or wet burlap. Any person planning to construct a new storage house or to modify an old one should consult specialists at the State colleges, agricultural experiment stations, and the Bureau of Plant Industry, Soils, and Agricultural Engineering, USDA, as improvements in construction and arrangements for more efficiently handling potatoes in and out of storage are continually being made.

Should the grower store on the farm or at trackside? There are advantages and disadvantages to both systems. Probably more trucks will be needed to haul from the field to trackside, and if the storage house at shipping point is large, there may be congestion and delays in unloading. During the winter months, on the other hand, there are days when low temperatures or snow-blocked roads would pre-

vent hauling from farm to shipping point. The large stationary washing and grading plants make it more economical to flume the potatoes from the storage bin to the grader.

Where winter temperatures are mild it is difficult to store potatoes for more than 3 to 4 months unless the storage is refrigerated. The insulation of a storage house should be such that any moisture condensation will be along the side walls and can be drained off. There should be a vapor seal along the walls to prevent moisture penetration of the insulating material. If water drips from the ceiling onto the potatoes, excessive decay is likely to follow. Loose dirt and trash should be removed because such foreign material hinders air circulation and, in addition, if it holds excess moisture, will foster and increase decay. Potatoes containing late blight or field frost should be stored near the doorway so that they can be moved first, because such potatoes cannot be stored satisfactorily very long regardless of storage conditions.

Although air circulation through bins of potatoes results in more effective cooling, it causes greater shrinkage. In late crop areas shell cooling is adequate and reduces shrinkage and preserves better table quality. This process consists of circulating air under and around the bins having tight floors and sides rather than through the mass of potatoes. By the proper circulation of air in these houses, the condensation of moisture is eliminated and the building is less subject to damage by moisture. The shrinkage losses are from 1 to 10 percent less than in other types of houses and a more uniform temperature of the potatoes can be maintained. In a house where air circulation is poor the top layer of potatoes becomes warm and may develop sprouts, which lower the grade or cause a total loss, whereas potatoes in the lower part of the bins may be in good condition. Heat is unnecessary in most well-insulated storages if there is good circulation of air around the bins. However, in cold weather, heat or ventilation may be necessary to prevent ceiling condensation and dripping even though the drier air causes an increase in shrinkage.

One of the biggest problems is that of handling potatoes in and out of storage. This involves both the cost in labor and the loss due to mechanical damage to the potatoes. Experiments in Idaho show that bruising in unloading potatoes into storage bins can be materially reduced by taking the following measures:

1. Slow piler chain to 60 feet per minute.
2. Put rubber tubing over each link.
3. Pad the hopper with sheet or sponge rubber.
4. Feed potatoes into the hopper steadily.
5. Handle sacked potatoes with care.
6. Keep the delivery end of the piler a short distance above the pile. Do not allow potatoes to pile up and be dragged back down with the piler chain.

Often potatoes are dropped several feet as they are dumped into the bin and some may roll an additional 20 feet before coming to rest in a somewhat battered condition. Most of this mechanical injury can be eliminated by exercising known precautions.

In most instances where the labor is handled on a contract or piecework basis, workers are interested in volume and not in the careful handling needed to reduce bruising. One way to reduce these losses

is to design packages and handling machinery to minimize the bruising. The 40-bushel box and pallet handling may be the answer.

A system has been developed whereby these boxes can be tilted into the grader hopper with a device that forms a partial lid over the box so that the potatoes can be gradually poured into the hopper. If potatoes are properly handled, this system should reduce the mechanical injury in handling to the grader by 50 percent or more. These boxes may work equally well with early potatoes as this method of handling should reduce the wind and sun damage, provided a heavy tarpaulin is used to cover the boxes. Boxes are generally used with combine harvesters so any operator using them is able to save on wire picking baskets and field sacks or barrels, which normally are rather

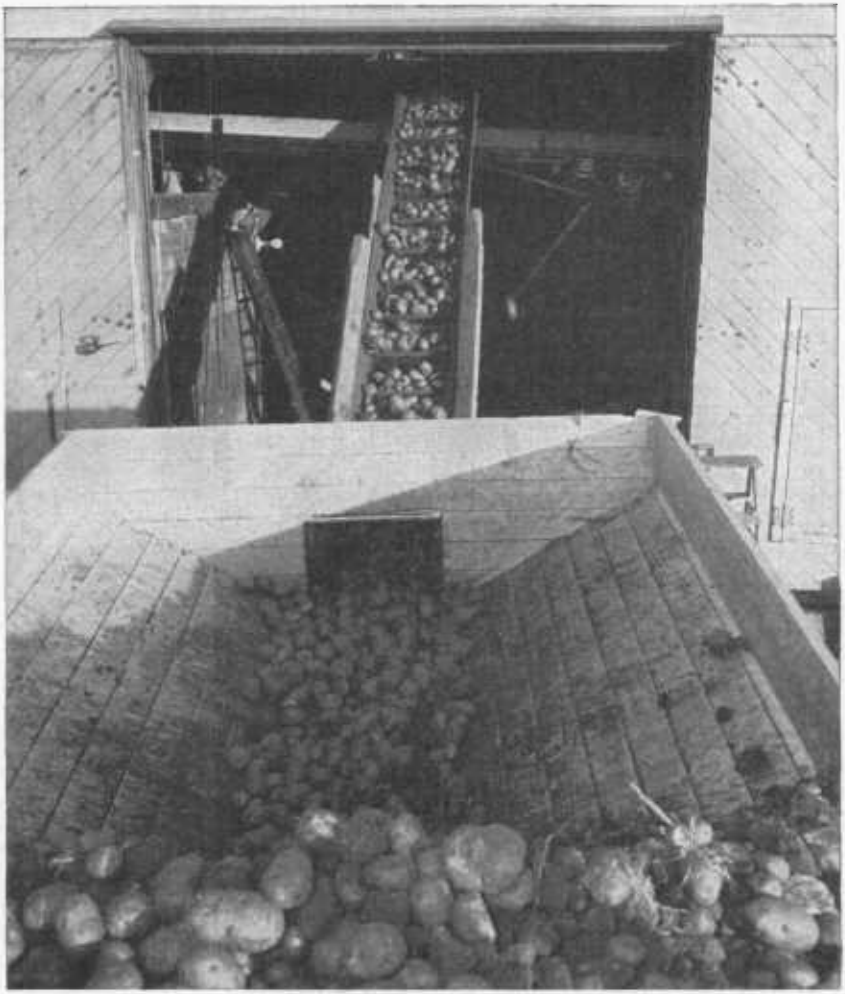

FIGURE 11.—A self-unloading truck box. A portable electric motor is attached to a shaft at the rear of the truck and it runs the belt which extends along the bottom of the truck box. Another belt picks up the potatoes at the end of the truck box (at the small door) and elevates them into the storage house.

FIGURE 12.—Unloading potatoes in a bin. Note the chains and pulleys for raising, lowering, and moving the piler from side to side and the baffles to prevent the potatoes from rolling too fast.

costly items. The boxes should last longer because they are of sturdy construction and not as likely to be damaged by rough handling as are barrels and crates.

Potatoes are less subject to bruising if they are warmed up to 50° F. for a few days before they are graded. This warming-up process is difficult in a large storage house unless the entire house is heated. However, if the potatoes are in boxes, they could be moved quickly with a forklift truck into a conditioning room, then to the grader. This system would be ideal for handling potatoes for chips and other specialized processing.

GRADING

Grading of potatoes and vegetables is a relatively recent development. About 40 years ago there was virtually no grading or sizing of potatoes. At first most of the sorting was done in the field as the potatoes were picked up, but that practice proved rather inefficient because most picking crews are not trained to grade and size potatoes—and even if they were, it would be necessary to pick over the field two or three times. The grading process developed from the method of pouring the potatoes over a slatted table to a hand-cranked chain grader. Then electric motors replaced the man at the crank. Now these small portable graders are rapidly being replaced by the complex washer-grader and sometimes washer-grader-drier combinations.

Many of these machines will handle a carload or more of potatoes in an hour. Some operators have added wax in the washing operation to improve color and appearance.

Sizing is almost as important as grading for quality defects. Most homemakers prefer a medium-sized potato, which is usually considered to be 2¼ to 3 inches in diameter for round types or 6 to 12 ounces for the long type. Some areas pack large sizes for baking and institutional use. It is now possible to buy almost any quality or size of potato, if the buyer is willing to pay enough to cover the costs incurred in grading and sizing. It is not economical to segregate a poor-quality lot of potatoes into several grades or sizes because the top quality of such a lot is unlikely to command a premium sufficient to pay the added cost.

There is always a need for more and better trained crews for handling potatoes in the packing sheds. It would probably be helpful

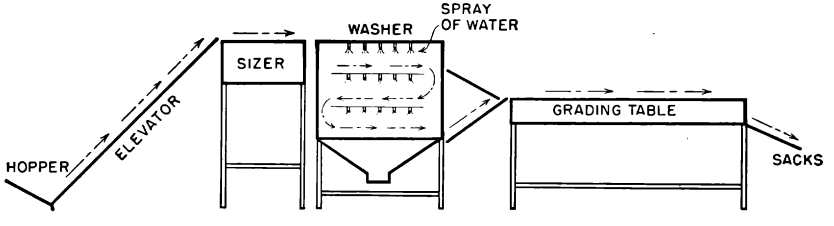

FIGURE 13.—A potato sizer, washer, and grading table. The sizer may be on either side of the washer, the place depending on whether all sizes of potatoes are to be washed. Some of this equipment in washing and grading plants is custom built.

to the potato industry in the more important commercial States to establish a yearly training program for grading crews.

All grades have tolerances for defects and for sizes. Some shippers make a practice of staying well within these tolerances, whereas a few others endeavor to take advantage of the maximum permissible. To eliminate tolerances would materially add to the expense of grading and, in the case of some lots, and some types of defects, it would be impossible if tolerances were eliminated to pick out all defective potatoes.

A study made by Cornell University [2] showed that external grade defects of late crop potatoes in the retail stores averaged 9.1 percent in New York City, 15.2 percent in Philadelphia, and 7 percent in Boston. About 65 percent of these defects were mechanical. The three other most important defects in order of importance were sunburn, insect injury, and dry rot. Based on only external grade defects, one-third of the lots of potatoes that were marked U. S. No. 1 grade in Boston, two-thirds in New York City, and three-fourths in Philadelphia, failed to meet the requirements of the grade; more lots probably would have failed if size and internal grade defects had been considered. Also, spoilage losses increased in late-crop potatoes merchandised from bulk displays as the percentage of external grade defects increased. In the three cities the cleaner and brighter potatoes

[2] Childress, Russell L. External Grade Qualities of Potatoes in Retail Stores. N. Y. (Cornell) Agr. Expt. Sta. A. E. 837. 118 pp. August 1952.

sold at higher prices. Other surveys indicated that mechanical injury during transit and delivery to the retail stores averaged about 4 percent. Potatoes that barely meet the grade requirements at shipping point, therefore, are likely to be out of grade by the time they are delivered to the retail stores.

The three basic grade classifications for potatoes are U. S. No. 1, U. S. No. 2, and culls. Culls or pickouts are not defined in the standards for grade, but they include any potatoes failing to meet, from a quality standpoint, the standards for U. S. No. 2 or better. The other grades such as U. S. Fancy, U. S. Extra No. 1, and U. S. No. 1, size A, are better than U. S. No. 1; and U. S. Commercial is in between the No. 1 and No 2 grades. In conjunction with either the U. S. No. 1 grade or the U. S. No. 2 grade, size A or size B, as well as any other size classification which a particular lot of potatoes meet, may be used. Some of the grades have special requirements for size and cleanliness, and permit fewer defects or more tolerances for certain defects. Special State standards are generally based on modifications of the U. S. standards and have been established to meet certain localized conditions.

U. S. consumer standards for potatoes were developed with respect to small-size consumer packages. Relatively few shippers have used these consumer grades even though they have been in effect several

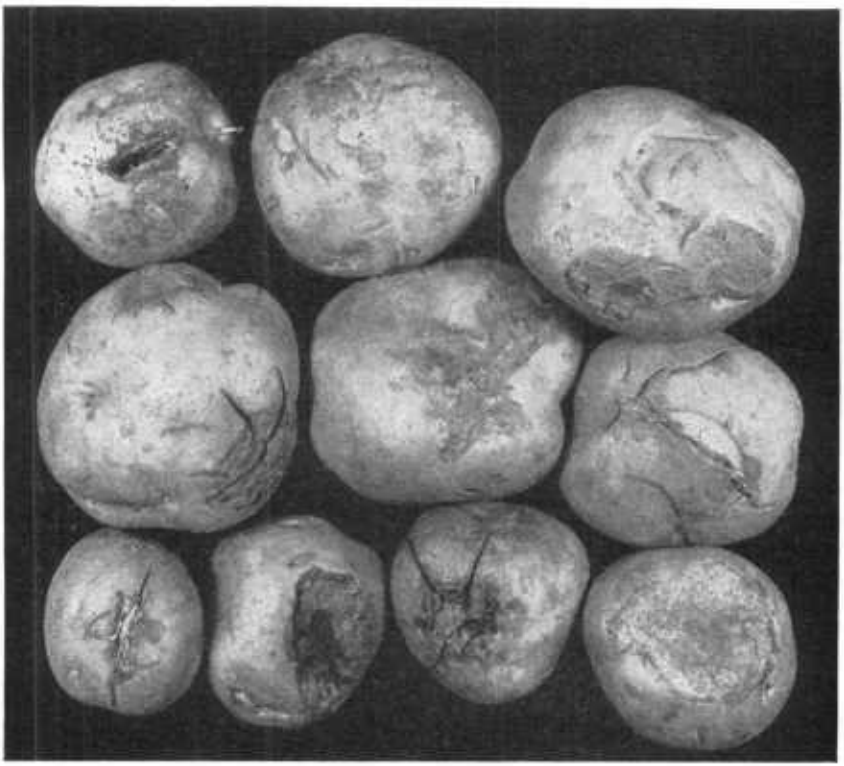

FIGURE 14.—Potatoes showing the effects of mechanical damage. These potatoes were selected from cars on track in Washington, D. C.

years. Most of the consumer-size packages are marked "U. S. No. 1."

There is obviously an upper limitation on the extent to which potatoes can economically be segregated into various grades and sizes. It is doubtful whether the industry has gone far enough in grading the potatoes to obtain the maximum returns. Surveys indicate that there is a real possibility for capitalizing on the special demands of the three major consumer groups; namely, homes, institutions, and processing plants.

In the process of grading potatoes in Colorado, it was found that 15 percent of them were injured by the time they were loaded into rail cars. In Maine the bruising amounted to 14.3 percent in one survey and 20.7 in another, but only about 1 percent of this damage in each instance was scored as serious grade defects. The rough handling of potatoes encountered during the harvest operation is continued in the packing shed. In most areas the potatoes in farm storage are sacked or placed in barrels for hauling to the trackside grading plant. In Idaho, rough grading—which is about what its name implies—is often performed at the farm storage. In this method the cull and small sizes of potatoes are picked out and left on the farm. This practice reduces the quantity to be hauled but adds to the mechanical injury. Some of the potatoes are bruised at the time they are dropped into the grading hopper and many of them drop 30 to 40 inches as they come off the end of the grader. They should never be allowed to drop more than 6 inches. It is not uncommon to see the men at the end of the grader bounce a 100-pound sack of potatoes from 1 to 3 times on an unpadded concrete or wooden floor so that the sack can be more easily sewn. This means that most of the tubers in the bottom layer of the bag are severely bruised and that many other potatoes in the sack probably receive minor bruises.

In most marketing seasons the grower receives a low price for No. 2 potatoes, so naturally he wants as many potatoes as possible to be included in the No. 1 grade. In fact many growers in certain areas will not permit their potatoes to be washed because washing makes more of the borderline defects readily visible and potatoes with such defects are graded out of the No. 1 pack. The shipper likes to eliminate potatoes that have borderline defects in order to make this commodity more acceptable to consumers. The real answer apparently lies with both growers and shippers. Not all the mechanical defects can be eliminated between the digger and the end of the grading belt but careful handling can readily reduce these defects. Many of the bruises are minor and are not scored as grade defects against a No. 1 potato. However, these minor cuts and bruises detract from the general appearance of the potato. A lot barely meeting U. S. No. 1 grade specifications could be very unattractive and it is likely that it would sell at a considerable discount from a lot ranking high in the No. 1 grade.

Where should the potatoes be graded—on the farm where grown, at the country shipping point, or in the terminal market? There are advantages and disadvantages at all three points. During the 1920's and 1930's there was a decided trend toward grading in centralized sheds at country shipping points. The shortage of materials during World War II, however, curtailed any major changes in grading practices.

FIGURE 15.—Potatoes are forked into barrels for moving from the farm storage cellar to the trackside dealer for grading and shipping. Some of the potatoes fall about 30 inches to the unpadded bottom of the barrel and this drop damages them. The few potatoes that stick to the fork tines are also damaged.

Grading on the average-size farm is not too satisfactory and the practice is gradually declining. There are always exceptions to such generalized statements, of course. In New Jersey most of the potatoes are graded on the farm and sales are handled by brokers. During the 1950 and 1951 seasons these growers very satisfactorily operated a grade-and-size marketing agreement and order program which included mandatory Federal-State inspection of all cars and trucks of potatoes. Approximately 97 percent of all shipments in 1951 graded U. S. No. 1, 2-inch minimum, In general, grading on the farm is not nearly as uniform as that in centralized packing sheds, it is doubtful whether it is as efficient in most instances. However, farm grading of late-crop potatoes can afford a better utilization of labor during the winter months.

The country shipper generally has one or more packing sheds in a production area. The strategic locations of these packing sheds emphasize that it is expensive and hazardous to transport potatoes long distances in the production area during extremely hot or cold weather. From an efficiency standpoint, it would be more economical to have the grading performed in larger plants, except for the physical prob-

lem of either hauling or conveying the potatoes to the grader. Some central sheds have no cleaning equipment; others have brushing or washing equipment, or both. When sheds have cleaning equipment, it is necessary to use judgment in determining whether a given lot should be dry-packed or washed. The decision will depend, to some extent, on the wishes of the purchaser. Since both institutional and household consumers are demanding cleaner potatoes, there has been a sharp upward trend in the use of washing equipment.

A number of terminal market operators have grading and repacking equipment located in the terminal market or a centralized diversion point. Some of these plants were started to recondition carloads of potatoes and others were started for repackaging the potatoes into consumer-size packages. Some of these operators purchase fieldrun potatoes f. o. b. country shipping points in second-hand sacks of uneven weight, and they perform the entire grading, cleaning, and packaging service. The advantage of terminal market grading is that the equipment can be operated more nearly for a full year, thus spreading the overhead over a larger volume of potatoes. The potatoes should be within grade and in good condition upon delivery to the retailer under these conditions. The disadvantages are that terminal market grading requires a higher capital investment, labor costs possibly may be higher, and freight must be paid on culls and dirt. One major factor that has a bearing on cost of grading either at country shipping point or in the terminal market is the length of time that the grading facility can be operated.

FIGURE 16.—Repackaging washed potatoes at Chicago in 10-pound open-window paper sacks for consumers.

There are many problems in connection with washing potatoes and no generalized statements could adequately cover the situation. Some washers are constructed locally but most of them are purchased from machinery manufacturers. The development of the practice of washing potatoes in the Red River Valley of Minnesota and North Dakota has resulted in problems caused by black, heavy soil and the decided limits on the water available for washing. Washing problems there are aggravated if soils are wet at harvest, for soil often is then sticky and later it hardens on the potatoes so that it is extremely difficult to wash off. During the last 5 years much progress has been made and a large volume of the potatoes now is successfully washed.

Many arguments have arisen regarding the value of washing potatoes and the benefits of this process to growers. When potatoes are washed, grade defects are more readily visible and more mechanical damage generally results from washing than from dry packing. Also, it is likely that the members of the grading crew pick out more of the tubers barely meeting the grade specifications than they do when sorting unwashed potatoes. Whether drying is necessary after washing is a debatable point and depends to a large extent on climatic conditions, the package, and the type of shipping service. Any one contemplating the installation of washing machinery should check with the experiment stations, both State and Federal, and with machinery manufacturers, to be sure that they get the advantage of the latest improvements in washing and handling potatoes.

The advantages of brushing equipment depend upon the type of soil and the amount adhering to the potatoes. The latter factor depends to some extent on soil conditions at the time of harvest. If conditions are ideal at harvesttime, brushing is a satisfactory method of cleaning the potatoes. However, brushing cannot be depended upon to clean all lots of potatoes in any locality during a given season. If the soil is wet at time of harvest this method would clean very few lots of potatoes. Brushing will not thoroughly clean potatoes grown in heavy dark soil.

Many growers and shippers maintain that dry-packed potatoes will hold up better in transit and through the distribution channels. Both early and late crop potatoes are being successfully washed on a large scale, however, and when properly handled they hold up in transit and during distribution. In dry packing, a higher percentage of the potatoes will grade U. S. No. 1 or better. Less machinery and equipment are needed with this practice, which materially reduces the overhead costs. But each year it is becoming more difficult to sell dirty potatoes. It may be only a few years until most potatoes will be either washed or brushed before they reach the ultimate consumer.

INSPECTION

Potatoes, together with other vegetables and with fruits, are inspected in most areas at shipping point by Federal-State inspectors and, in a few areas, by Federal inspectors. In a Federal-State setup, the inspectors are employed by the State and are licensed by the Federal service. The applicant for inspection is assessed a fee to cover the cost of the service, including necessary supervision. During 1952 these fees ranged from $4.75 to $9 a car, depending on costs within the

State. The United States Department of Agriculture, which is in charge of the service, endeavors at all times to have the standards for grade uniformly interpreted over the entire country. In terminal markets the service is performed by Federal employees operating insofar as possible on a self-supporting basis.

Much of the trading in potatoes, especially that by telephone or telegraph, is based on the inspection certificate accompanying a carload or a truckload of potatoes. This certificate is prima facie evidence in all Federal courts and in most State courts that the produce met the grade and size shown on the certificate at the time of inspection. In several major production areas, nearly all shipments are inspected. If the receiver in the terminal market is of the opinion that the produce fails to meet the grade shown on the certificate, he can call for an appeal inspection.

The inspectors' duty is to certify as to the grade, size, and condition of the potatoes. However, in the larger sheds where an inspector takes his samples during the process of grading a car he can immediately advise the foreman whether the potatoes are meeting a desired grade specification. If samples show that quality is falling, and perhaps getting close to the borderline, the shed foreman can be told so that steps may be taken to have the grading crew bring quality into line again. If the car or truck is already loaded at the time of inspection and the potatoes are out of grade, it is necessary to unload and regrade the lot, or to sell them on the basis of a lower grade. In an area where a Federal marketing agreement program is in effect, the inspectors generally notify the applicant immediately if a lot is below the minimum grade requirements, thus giving the shipper an opportunity to avoid violating the order. The applicant for inspection may request a limited certificate which is usually limited to condition or to size only.

PACKAGES

Before 1920 many potatoes were shipped in bulk or in coffee sacks or any other second-hand container that might be available. Then shippers started using 150-pound burlap sacks and 165-pound wooden barrels, with wooden or burlap covers. With the changeover in merchandising to self-service stores during the 1920's, an increasing demand for smaller packages developed. The 100-pound burlap sack is now the most popular wholesale package, although the use of 50-pound paper or burlap bags is increasing in some areas. The 15- and 10-pound bags of either paper or mesh are the most popular consumer packages.

When there is a plentiful supply of all packages, as at present, it appears that the customer's desire for a certain type of package often outweighs the difference in cost. In other words, the shipper can't say, "I can save 10 cents a hundred packing cost if this package is used rather than another, so I will pack all my potatoes in this kind of package." It is often necessary to use various types of packages to satisfy the demand of the trade.

As larger volumes of foods are distributed through self-service stores, it is likely that the volume of consumer-size packages will increase. It must be recognized, however, that there are a number of specialized problems connected with the use of these small packages

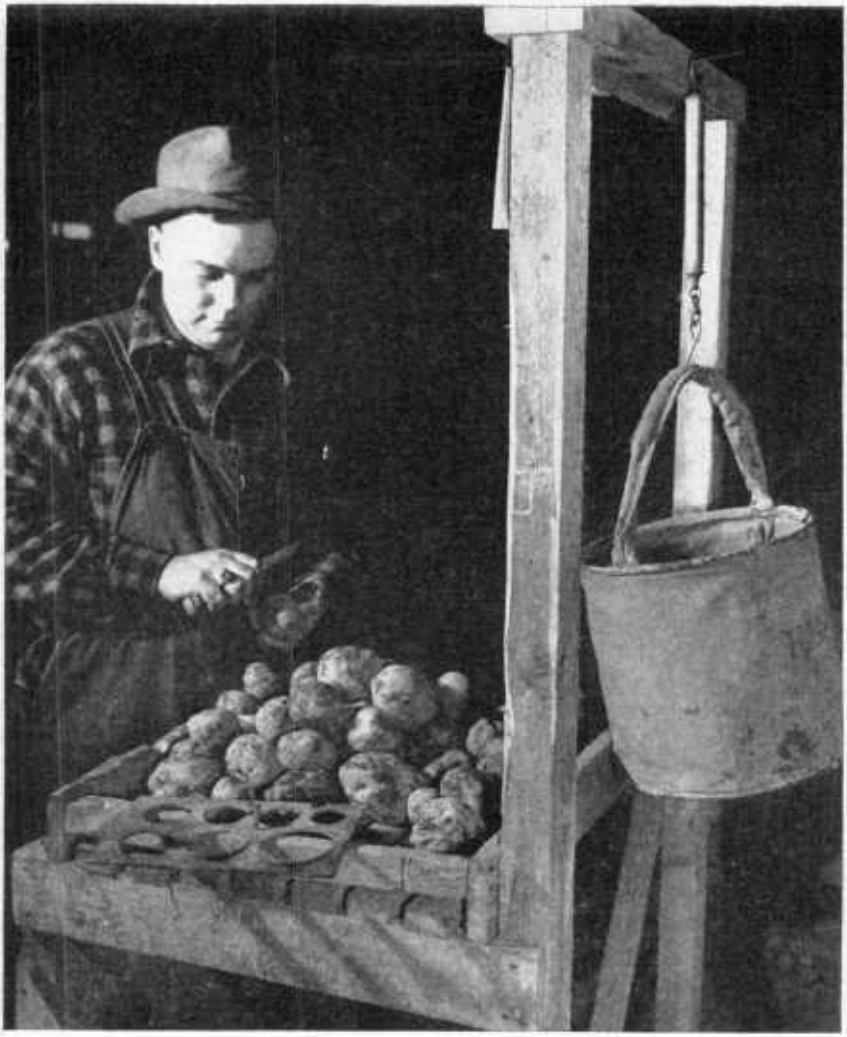

FIGURE 17.—A Federal-State inspector determining the grade of potatoes from samples taken at random from different parts of a load or at time intervals from the grading machine. He checks the potatoes for type, size, cleanliness, external and internal defects, and decay. Defects, sizes, and decay are stated as percentages based on the weight of the samples.

aside from the mechanical operation of filling and closing them. Efficient filling of packages is the more easily solved problem. The major factor is maintaining uniformity of quality. In a carlot of potatoes the average of defects may be well within the grade tolerance but individual packages of these potatoes may show wide variations. From a given lot of U. S. No. 1 potatoes, one consumer package may have no grade defects, whereas another may have 12 percent. The customer who purchases the lot with no defects is happy, whereas the other customer is dissatisfied, and it doesn't matter to him that

the carlot averaged well within the tolerances. The small-size packages require two or three times more overweight per hundredweight than the 100-pound packages. In a survey made in Maine, Michigan, and Pennsylvania in 1950–51, the Farm Credit Administration found that the overweight on 100-pound sacks was 1 to 1½ pounds, and on 10-pound packages 3.2 to 4 pounds a hundredweight.

This survey showed that it cost slightly less to pack 100-pound packages on the farm, but that it cost centralized packers slightly less for the 50-, 15-, and 10-pound packages. During the 1950–51 season the cost of packing potatoes in 100-, 50-, 15-, and 10-pound bags was 52, 44, 55, and 72 cents a hundred pounds, respectively. These data were derived from 19 grower-packers and centralized packers in Maine, Michigan, and Pennsylvania. It should be borne in mind that during the 1950 season the cost of containers was high. The cost of a 100-pound burlap sack averaged 29 cents, whereas ten 10-pound paper sacks cost 34.5 cents.

Several large grading plants that specialize in consumer packages are located in the terminal markets. In most instances the 100-pound burlap sacks used in these plants are carefully handled, cleaned, and returned to the shipping point area for reuse. An Oregon study showed that the country shipper had a cost advantage of 14 cents a hundredweight over a small-scale terminal repacker when both were packing in 10-pound mesh bags.

There are two major types of packages. Those 50 pounds and larger are considered "wholesale" packages, whereas those below 50 pounds are considered "retail" packages for household consumers. The package used must arrive at the wholesale market in a clean and attractive condition. If the package is cloth, it must be heavy enough to absorb a little moisture and dirt and still be attractive. The paper sacks must be tough enough to arrive in good condition. Two carlots of potatoes may be of identical size and quality, yet the one containing potatoes packaged in the more attractive sacks will usually sell at a higher price. Burlap sacks, if carefully handled, could make an average of about 3 trips to market; yet it is estimated that in 1950 when burlap prices were at record high levels, less than 5 percent of the potatoes shipped by rail moved to market in second-hand sacks. The appearance of second-hand containers is unattractive. Second-hand containers are usually associated with inferior quality, and the lower price obtained for potatoes so packaged more than offsets any savings made in using such containers.

During 1950 about 80 percent of the potatoes were marketed in wholesale packages and more than two-thirds of them in new 100-pound burlap sacks. In Maine extensive use is made of the 50-pound paper bag as a wholesale package. Approximately 17 percent were marketed in consumer packages mostly in paper bags holding 15 and 10 pounds and in mesh bags holding 10 pounds, in that order of importance. The other packages were primarily for specialized uses, such as the 100-pound wire-bound crate for military export orders, crates, boxes, and baskets. Some of the plastic films are promising for consumer packages. They are cheap, durable, and permit greater visibility of the potatoes. The development of these packages has been delayed by shortages resulting from the national defense program.

The grower who wishes to sell his field-run potatoes in second-hand sacks should find out whether he can obtain satisfactory bids from

local and terminal packers. He may be at a disadvantage if he ships his potatoes several hundred miles to a terminal grading shed and accepts settlement on a pack-out basis. However, it would be possible for him to obtain a Federal-State inspection certificate showing the percentages of No. 1's, No. 2's, and culls, the size range, and other quality information for a carlot of field-run potatoes, and this certificate would permit satisfactory long-distance trading. If the potatoes were graded U. S. No. 1 at shipping point, then repacked in consumer packages at the terminal market, the amount of mechanical damage would be materially increased unless the potatoes were more carefully handled than they are in most plants. There are insufficient data at the present time on which to establish general recommendations as to where the packaging operation may be carried out most effectively and efficiently.

TRANSPORTATION

A few potatoes are hauled to nearby markets by various methods such as the family automobile or farm truck, but the bulk of the commercial crop is transported in railroad cars and large motortrucks. Several considerations should govern the selection of the mode of transportation, namely—cost of transporting, time of delivery, cost of unloading in the terminal market, and transit damage.

SHIPMENT BY RAIL

Most of the potatoes from the areas located at long distances from the major terminal markets are shipped by rail. In 1951, 205,000 carloads, amounting to about 123 million bushels or about 50 percent of the crop sold, were shipped by rail.

The method of loading is more important for the early and summer potatoes because of the need for good air circulation to prevent deterioration at high summer temperatures. Tests on shipments of early potatoes from the Western States involving long rail hauls indicate that the 3 by 5 and 5–3–2–3 methods of loading are superior to other methods. The 3 by 5 load is made by laying 3 sacks crosswise of the car and stacking sacks 5 high, one sack directly on top of the other. Often a car is loaded by bringing in 5 sacks on a hand truck with the bottom sack on edge so that the stack can be bumped into place. There is a tendency for the bottom bag to roll, thus causing more potatoes to be bruised than when the bags are hand-stacked. The 5–3–2–3 load is made by placing 5 sacks upright across the car then 3 flat layers crosswise, the first flat layer 3 wide, the next 2 wide, and the top layer 3 wide. There appears to be a slight advantage to this method of loading. The aisle method of loading has been largely discontinued because the sacks fall into the aisle and thus block the air circulation.

Potatoes in some rail cars have been severely damaged because of the rough handling that cars received at some diversion points. A few classification yards have been noted for rough handling.

Floor pads materially reduced the bruising injury of early California and Idaho potatoes, particularly in the sacks next to the car floor racks. Two types of floor pads were used. One was one-half of an inch thick, 12 inches wide, and 30 inches long, and filled with excelsior. The other was three-eighths of an inch thick, 12 inches wide,

and 96 inches long, and filled with shredded paper. There was no significant difference in the transit temperatures of Kern County potatoes shipped under refrigeration when floor pads were used. In a shipment of 5 cars of Kern County potatoes the floor bruising in the nonpadded ends of the cars ranged from 3 to 35 potatoes a sack, and in the padded halves of the cars, from 0 to 7.

The results of shipping Kern County Long White potatoes have been summarized as follows:[3]

> In shipping tests * * * the use of floor pads materially reduced bruising and other injury received in transit. Not only did the pads reduce the amount of floor damage, but apparently their cushioning effect extended up through the load and resulted in less injury, less bag marking, and fewer worn holes in the upper layers as well. Apparently there is enough jolting in transit to cause excessive bruising in nonpadded cars even when there is no evidence that the load shifted en route. Floor pads in transit kept enough potatoes from being crushed or from otherwise being made worthless by severe bruising to justify fully the cost of using them. In these tests, it was estimated that the floor pads effected savings of one to four bags of potatoes per car. The effect of this amount of injury upon the wholesale price would depend on many factors. However, the fact remains that the use of floor pads would result in the delivery of more salable potatoes to the retail market.

Potatoes ship best at a temperature of about 50° to 60° F. Any temperatures above 60° may lead to decay. Potatoes will stand temperatures down to 29.6° without freeing, but the low temperatures cause them to become brittle and bruise more easily, and fresh injuries will not heal at low temperatures. This is particularly important for early potatoes. It is conceivable that, to maintain the ideal temperatures, a car could leave Maine under heater service, have the heaters removed in transit and the vents opened, and still need refrigeration before reaching south Florida.

New potatoes shipped during periods of high temperatures should be either precooled or shipped under refrigeration. Many early potatoes shipped a short distance, and some shipped longer distances, arrive in the market place in good condition without refrigeration. Success in shipping depends largely on the weather, care in harvesting and grading, and shipping time. Unfortunately a small percentage of decay virtually ruins the sale of a lot of potatoes. Bacterial soft rot in as little as 1 to 3 percent of the potatoes materially lowers the sale price, and a lot containing more than these amounts in advanced stages is almost unsalable unless the potatoes are washed and regraded. Potatoes with more than 1 percent of soft rot, freezing damage, or wet breakdown will not meet the specifications of either U. S. No. 1 or U. S. No. 2 grades.

The amount of refrigeration depends on the outside temperature and the elapsed time to market. During the summer, Nebraska potatoes can be satisfactorily shipped to Chicago by either pre-icing the cars (filling the bunkers before loading) or by initially icing after loading. Pre-icing is generally preferred. Prompt cooling is preferred and a transit temperature of 60° F. would be about ideal for early potatoes.

White Rose potatoes grown in Kern County, Calif., are shipped longer distances than most other early potatoes. Practically all of

[3] Barger, W. R., Shear, E. V., and Morris, L. L. The Prevention of Mechanical Injury During Transit of New Crop Potatoes. Calif. Agr. Expt. Sta. Leaflet. 7 pp. 1945.

them are shipped under refrigeration. The amount of ice needed depends on the distance to market and the outside temperatures. During May, they can be successfully shipped to New York City by initial icing with one re-icing in transit. There is a modified service known as half-stage icing which calls for filling the top half of the ice bunkers with ice. In shipping tests of Kern County potatoes, the transit temperatures under half-stage icing were about the same as the temperatures under full-stage icing, and this modified service resulted in a saving of about $40 a car based on 1950 costs.

Surface browning of new potatoes is believed to be caused by failure of the skinned areas to heal normally at low temperatures. The colder the potatoes are during transit the greater is the intensity of surface browning and it increases for several days after the potatoes are unloaded from the car. The skinned areas and mechanical wounds will heal best at a temperature of about 60° F. One way to reduce surface browning is to allow the ice bunkers to "run dry" at intervals by delaying re-icing 1 or 2 days beyond the points where the ice supply is depleted.

During the spring and fall, weather conditions are such that potatoes can be successfully shipped without protective service.

When outside temperatures are low, as they often are in northern Maine, the Red River Valley, and several other areas, protection from freezing is necessary. It is a general practice to line the car floor and about 3 feet up the side and end walls from the floor with heavy building paper. This material is furnished by the shipper. Additional protection depends on the outside temperature and the condition of the rail car. During extremely cold weather the car should be preheated from 12 to 24 hours before loading. If this is done and the temperature of the potatoes is from 40° to 50° F. at time of loading they may carry without freezing damage. However, heater service is desirable because freezing damage is like soft rot in that frozen potatoes become wet and spongy, and the appearance of sacks and of many sound potatoes is damaged by the water leaking from the frozen potatoes. When cars are loaded in sub-zero weather, portable canvas corridors between the car door and storage house door have proved effective in preventing freezing that would otherwise occur.

Most "in-transit" heaters use charcoal for fuel. Oil heaters are generally used for preheating cars prior to loading. Oil preheaters of fairly large capacity can be put right into a car and temperatures can be built up quickly, thus saving time. Charcoal heaters often are put in each bunker, and fires are lighted even while the car is being preheated or before it moves from the packing shed, and the heaters remain there as long as heat protection is needed. The placing of heaters in cars while en route depends upon particular shipping and transit practices. Fires in heaters should be extinguished when outside temperatures reach about 40° F. or above. Anyone working around car heaters burning in a closed space should be warned about the dangers of carbon monoxide.

SHIPMENT BY MOTORTRUCK

Estimates indicate that a substantial part, perhaps as much as half of the 1952 and other recent potato crops, moved to market by motortruck. Data on movement of potatoes by trucks are not nearly so

complete as for rail shipments. The same is true on methods of loading and arrival condition of trucked potatoes. It is a commonly accepted fact, however, that tonnages of all perishable products moving by truck have increased steadily during the last three decades and especially since World War II.

Trucks and freight cars compete directly for potato tonnage. Freight costs, transit time, convenience, shipping schedules, location, and a variety of other factors enter into shippers' consideration when deciding whether potatoes shall move by rail or by truck. In general, short hauls on potatoes have been taken over largely by trucks, whereas railroads continue to be important for long hauls.

Small grower-owned trucks or those operated by contractors figure prominently in getting the potato crop to market from areas where grading and packing are usually done at the farm. Many of these areas, such as New Jersey, Long Island and upstate New York, southern New England, Pennsylvania, Ohio, Indiana, and southern Michigan, are relatively close to major markets and often potatoes can be moved in common, all-purpose trucks with a minimum of protection from the weather. In other areas where central grading and packing are followed, or where production is a considerable distance from market, such as Virginia, North Carolina, Maine, Red River Valley, Nebraska, Colorado, Idaho, Washington, Oregon, or northern California, large rather than small trucks offer the chief competition for railroads. Many of the large trucks are insulated and offer heat or refrigeration as special protection for potatoes or other perishable products. Both individual and fleet contract carriers often depend upon truck brokers to find loads for them. The broker who makes a charge for his services, offers a focal point where shipper and carrier can make their needs and offers known.

Because of their flexibility of operation trucks can deliver potatoes direct to the receivers' store or warehouse. Unloads may also be made by truck at more than one point in or adjacent to the terminal markets. The relative advantage of one mode of carrier over another is a matter on which individual shippers often find it difficult to agree and concerning which each individual shipper must exercise his best judgment.

Accurate, comprehensive data on movement of potatoes, as well as other produce, by truck are desirable not only to complete overall data for seasonal market analysis but also in day-to-day trading. Reports of rail movement provided by the Market News Service of the Department of Agriculture have served many useful purposes. It would be helpful if reports providing comparable complete data could be devised and adopted for truck movement. Several terminal markets now report truck arrivals. Also, data on truck shipments are available for a number of important shipping areas. For other markets or shipping areas records of truck shipments are lacking.

MERCHANDISING

METHODS OF SELLING BY GROWERS AND COUNTRY SHIPPERS

Potatoes are sold by growers by almost every method known in the produce business. Long established custom governs the predominant method of sale in many areas. In some instances the method of sale

depends upon the supply and demand situation. The grower who sells his crop in the field may specify whether the buyer or the grower will do the harvesting. The grower may sell to a local shipper, field-run at the field, at the storage, or delivered to the grading shed. In the concentrated commercial areas, sales are more likely to be made delivered to the grading shed on a grade-out basis, at a specified price for the No. 1's and No. 2's, the grower taking back the pick outs or culls in most cases. In a few areas growers sell at the farm storage, the shipper doing the grading, packing, and hauling to trackside. Some growers grade and pack and either sell or consign to a local shipper or sell through a local or terminal broker. A few large growers operate their own sales agencies. A few growers near the large cities sell their potatoes in farmers' markets. Very few potatoes are sold by growers direct to household consumers. Generally speaking, the bulk of the potatoes in a particular production area are sold in the same manner with a few slight variations.

A few growers sell a part of their crop on a forward contract basis at planting time in order to obtain financial assistance in the production of the crop. All the potatoes harvested during the spring and summer months are sold either prior to or at harvesttime. Growers of late-crop potatoes may sell before harvest or at any time from harvest through the normal storage season. Over a long period of years the safest method for the late-crop grower is to sell some potatoes each month rather than attempt to forecast the highest price of the season, and sell his whole crop at the time he thinks that price has been reached. A number of growers in the late potato States plan on storage space for approximately 80 percent of their crop and sell during the harvest season all potatoes in excess of their storage capacity.

Potato shippers' operations vary—from a relatively small business of a few cars a season to several thousand cars. However, only a small percentage of shippers handle more than one thousand cars. Because of the perishability of potatoes in either hot or extremely cold weather and the necessity for saving time and money in handling them, the packing sheds must be located near the farms where the potatoes are grown. This factor, to some extent, governs the quantity of potatoes that can be moved through a single shed. It also explains why a single shipper may operate several sheds in the same production area. Many shippers who operate a storage and grading shed have found it more profitable to have a large shipper or a broker or other sales agency handle their sales on a brokerage basis than to maintain their own sales service. Some of the large chain stores maintain a few packing sheds at shipping points, but others purchase their supplies from country shippers, from brokers, or other sources.

Methods of selling by country shippers vary almost as much as the growers' methods of selling. Much depends on the demand and supply situation although in many sections custom is the principal factor. During a short crop year the shipper can dictate the policy, whereas in a surplus crop year, the terminal market receiver can specify the method of sale. Most shippers probably would prefer to sell f. o. b., acceptance final. On the other hand, many terminal market operators prefer to buy on a delivered sales basis, whereby the shipper assumes transportation costs to market and transit risk unless it is the type of loss that is a fault of the carrier.

The carrier is usually responsible for delays, freezing in transit, and rough handling. The question of what constitutes "suitable shipping conditions" results in many arguments which must be arbitrated. If good, sound potatoes are shipped under approved transportation methods, they should in nearly all instances arrive in good condition. Conversely, it is unlikely that potatoes containing field frost, sun scald, or blight will arrive at the terminal market showing less than 1 percent wet breakdown or decay.

When the market is weak and there is an oversupply of potatoes the country shipper is forced into all kinds of deals. He may "roll the cars to himself" at a railroad diversion point and hope to find a buyer before the cars arrive at that point or before demurrage starts. The cars may move from one diversion point to another, each time getting farther from home, while the shipper becomes more anxious to sell. Although most shippers condemn "rollers," many of them follow the practice during periods of oversupply and when there is a possibility that the market may advance while the car is in transit. It is more efficient to keep grading crews working, and most shippers do this for a period of time, hoping that all cars will be billed to a terminal receiver by the end of the day. Also, shippers know that a certain number of cars must be shipped each week in order to market the supply of potatoes in the warehouse or in the production area.

Under surplus conditions there is extreme pressure to sell a few cars each day or week until, at times, the grower and shipper are merely making day wages in cleaning out the storage. Under these extreme surplus conditions cars may be sold on consignment, joint account, or any other method in the hope of realizing some return for the potatoes.

A few growers and shippers will sell their poorest-quality potatoes at extremely low prices, which, under surplus conditions may be as low as 5 to 10 cents per hundredweight, net. They reason that it is good business because they do not have the expense of hauling the potatoes away from the shed or farm storage. But these poor-quality potatoes come into direct competition with the better-quality product, thereby making it more difficult to sell the best quality.

METHODS OF SELLING IN TERMINAL MARKETS

Wholesale distribution of potatoes varies with the size and type of market. In most larger terminal markets—in cities with a population of a million or more—there are certain dealers who specialize in potatoes and a few closely allied commodities such as onions, sweetpotatoes, and cabbage. As a rule these wholesalers are original receivers. In other words, they obtain their receipts direct from the source of supply. Some buy locally through brokers or receive potatoes for sale on consignment. In some cases they may sell potatoes in carload lots to other wholesalers, jobbers, chain stores, or institutions. As a general practice they sell in less than carlots to jobbers, retailers, or institutional buyers. These specialists do not as a rule sell in single package lots to the small retailer nor do they enter into the service-wholesaler type of operation. Rather they sell in less than carlots to jobbers or service wholesalers who cater to the small retailer or small institutional buyer and they often provide delivery service and credit. Large buyers usually buy in person on the market.

Small retailers or institutional buyers may come to the market

FIGURE 18.—Refrigerator cars loaded with potatoes on track at Wood Street Terminal, Chicago, awaiting unloading or diversion to another market.

but the majority buy by telephone from established jobbers or service wholesalers. In the smaller terminal markets, potatoes are usually handled by wholesalers who sell a rather broad line of fresh fruits and vegetables and in some cases wholesale groceries. In moderate-size terminals, the wholesaler-jobber organization previously described for the large terminals may exist to a lesser degree.

Original receivers in the larger markets mainly operate on the basis of buying and selling with a view to making a sufficient margin to cover operating costs plus a profit. They are more inclined to trade for a speculative profit than are dealers in the smaller markets. Such speculative profits are to some extent balanced by speculative losses with the result that average profits may be relatively small or may, over a period of time, result in net losses.

In the smaller cities dealers do not normally attempt to make speculative profits. As service wholesalers they are primarily interested in maintaining a steady supply of the commodity and in doing business with repeat customers at margins that will assure them a profit on their overall operations. As a result, slightly higher average prices may be received over a period of time in the smaller markets than in the large terminals. On the other hand, the terminals must be used to dispose of volume supplies with the result that shippers with a large volume cannot deal exclusively with the smaller markets.

A few potatoes are handled, especially in the larger terminals, on a consigned basis either by regular receivers who also buy and sell, or by commission merchants who deal exclusively on a consignment basis. On consignment sales the dealer handles the sale for the grower or shipper and remits to him the returns for the sale less

a predetermined commission fee—in the case of potatoes usually 10 percent of the gross returns. In some markets certain local unloading or handling charges, in addition to the commission fee, may be charged to the grower or shipper.

The bulk of the chain store purchases are made direct from the country shippers and the cars go direct to the chain store's warehouse for unloading. There the orders of the individual chain store outlets are assembled and delivered by large trucks. The chain warehouses are not usually located in a congested area. In recent years some independent wholesale grocers and produce receivers have improved their competitive position by acting for a number of retail outlets as service wholesaler for the entire needs of the stores, thereby consolidating many of the operations.

The wholesale markets in a number of cities need to be relocated or modernized to handle produce more efficiently. Obviously such an improvement in efficiency would materially benefit both the growers and the consumers. Either or both growers and consumers pay all the excessive cost of operating an antiquated or inefficient marketing facility. Also the consumer may receive lower-quality produce because a fresh product is damaged a little each time it is handled and standing in a truck several hours in heavy traffic improves neither the quality nor the condition.

A number of large wholesale markets in recent years have been modernized either by relocating or rebuilding. The primary interest of potato growers in such market improvement is the saving in time and costs that it effects in handling potatoes through the market.

FIGURE 19.—Potato prices in the making at Wood Street Terminal, Chicago. The telephone office is in the background.

Additional research is being conducted by Government agencies and by equipment manufacturers in developing new equipment and more efficient methods of moving potatoes and other produce through the terminal markets. The use of labor-saving equipment and close supervision of employees is necessary in the terminal markets to reduce the mechanical damage resulting from the rough handling potatoes receive.

FUTURES TRADING

Futures trading in potatoes started on the Chicago Mercantile Exchange in 1931 and on the New York Mercantile Exchange in 1941. The rules of trading are determined by the exchanges and cover such features as the delivery months in which futures trading is conducted, varieties and grades that are deliverable in settlement of futures contracts, and minimum margins. The contract unit in New York (1953) is a carload of 45,000 pounds and the contract grade is U. S. No. 1, size A, 2-inch minimum size, Maine grown Katahdin, Katahdin-Chippewa type, or Kennebec potatoes. The contract unit in Chicago is a carload of 36,000 pounds and the contract grade is U. S. No. 1, size A, containing approximately 30 percent of potatoes weighing 10 ounces or more, of washed Russet Burbanks grown in Idaho, Oregon, or Washington.

The delivery points in New York are the Harlem River Yards and approved public cold-storage warehouses in New York City (except Staten Island) or Jersey City, N. J., with storage-in-transit privilege. The delivery points in Chicago are Wood Street Terminal, Chicago Produce Terminal, or an approved cold-storage warehouse in Chicago or Blue Island, Ill. Delivery months are November to June and trading may begin 10 to 12 months in advance of the delivery month. The minimum margin is about $240 a car in New York and $400 a car in Chicago. The margin varies, the variations depending on a number of factors. Brokers usually require customers to deposit more than the minimum margin and this amount may vary among the customers.

The exchanges dealing in potato futures are highly specialized markets where trading is conducted in standardized contracts. Because of the standardized nature of the futures contract it affords both a medium for speculation and for hedging. Speculators enter the market in the expectation of making a profit from price fluctuations whereas hedgers enter the futures market in an endeavor to offset the risk of price changes. Thus the futures market is made up of hedgers and speculators. For an exchange to operate effectively both hedging and speculative trading in proper proportion are necessary. It was once said "a market with too little of either is no market at all."

For a grower, dealer, or processor of potatoes, who is interested in obtaining price protection, hedging is the most useful function of a futures market, as it enables him to protect himself for a large part of the market risk while storing, handling, and processing potatoes. However, hedging affords protection only against risks due to changes in futures prices, and none whatever against changes in the spread between spot and futures prices. A futures market, therefore, generally will not afford perfect price protection but will

give enough protection to make hedging worth while in the sense that risks in hedging are generally less than risks of speculation.

Successful hedging of potatoes requires an intimate knowledge of futures trading. Very often persons are misled by the simple mechanics of hedging in a perfect market and do not consider the need to know how, when, and what to hedge and when to lift a hedge. From a broad viewpoint, a person who hedges should consider price variations between varieties and grades of potatoes in the cash market in relation to futures; price variations between futures for different delivery months; whether the futures market is broad enough to absorb a normal volume of hedging sales and purchases without unduly affecting prices; and how to make proper financial arrangements for hedging.

The need of careful consideration when hedging can be shown in the case of a grower desiring to hedge a crop which is not yet harvested. Suppose this grower at planting time sells potato futures for November delivery. If he does not understand futures markets, he could very well be forced out of the market without obtaining hedge protection. If prices advance sharply, the grower runs the risk of being sold out by a broker because he cannot put up sufficient margin to protect the contract until the potatoes are ready for delivery, or until the grower is ready to lift his hedge. Therefore, when growers undertake hedging transactions, they should make adequate financial arrangements with their bank to protect the futures contract.

RETAIL SELLING

Each year a larger percentage of consumers' food purchases are made in self-service stores. There has been a constant improvement in the facilities, appearance, and service in the supermarkets. The newer stores are air-conditioned, well-lighted, conveniently arranged, and everything, including meats, is sold on a self-service basis. Management allocates counter space to the various items and store personnel arrange and maintain the displays. Most food processors, including those in the fresh produce industry, make every effort to enhance the attractiveness of their product in order to gain the purchaser's attention. Food processors are continually redesigning the package, label, or color scheme to attract the purchaser's attention. Most of the produce is washed, neatly trimmed, and there is an increasing tendency toward prepackaging. In most of these stores the produce department has the most colorful display in the entire store.

In a setting of this kind, a display of dirty, bruised, or otherwise unattractive potatoes presents the poorest appearance in the produce department. Most surveys on consumer demand show that consumers prefer clean potatoes. Some consumer surveys indicate that overall appearance of the potato display has a greater effect on the prices consumers are willing to pay than the percentage of external grade defects. Many of the potatoes are not washed or brushed but in a market that receives mostly washed potatoes it is very difficult to sell dirty potatoes.

Many members of the potato industry are confident that the potato is a necessary food item. There is a saying that "In a short crop year, anything that looks like a potato will sell at a high price." During a surplus crop year, on the other hand, it is difficult to sell even the

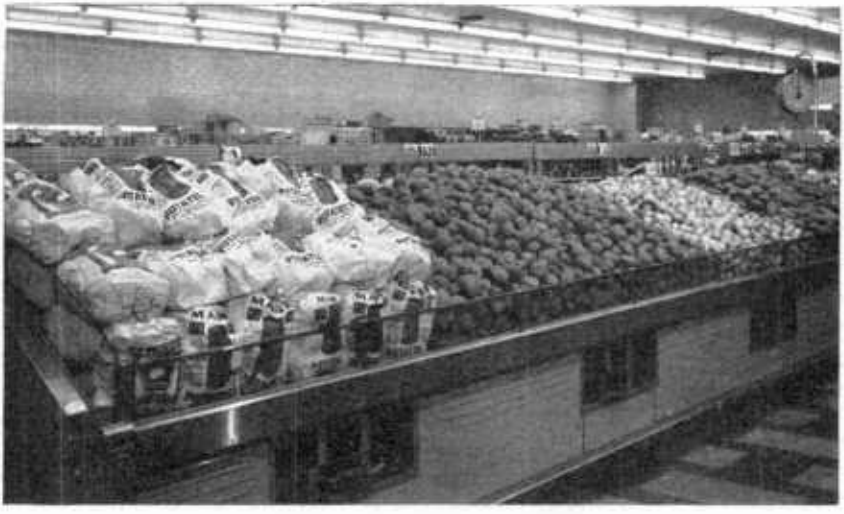

FIGURE 20.—Potato display in a supermarket. The 10-pound packages of potatoes are from Pennsylvania and Maine. The bulk potatoes are from Maine and Idaho.

best quality. In July and August 1951, growers in several areas received less than 10 cents per hundredweight for most of their No. 2 potatoes, whereas in February and March 1952 (same crop year) wholesale buyers eagerly bought these low grades for $2.50 or more per hundredweight.

During 1949 and 1950 the Bureau of Agricultural Economics made a survey of marketing charges for potatoes sold in Cleveland and Pittsburgh. The retail margin for all lots of potatoes in all types of stores averaged approximately 18 percent of the retail sales price. All stores handling consumer packages sold them at a smaller margin than potatoes in bulk. In general, the largest stores handled potatoes on the smallest margin. During the period covered by the study (December 1949 through June 1950) potatoes from 23 States and the Dominion of Canada were sold in Pittsburgh, the bulk of the supplies originating in Maine, California, and Florida. In Cleveland, potatoes from 17 States were sold (February through June) but California and Florida supplied 91 percent of the new potatoes and Maine and Idaho 89 percent of the storage potatoes. Potatoes are bulky and freight rates are relatively high but household consumers will pay this added cost to obtain the desired variety, type, and quality of potato.

The amount of display space devoted to potatoes varies with the size of the store and space needed for other stocks. All stores in Philadelphia included in a potato marketing study in the northeast region averaged 2.2 lots (for this purpose a lot means a distinctive grade, size, variety, or package) of potatoes per store compared with only 1.8 in New York City and 1.5 lots in Boston. The chain supermarkets averaged almost 6 lots per store in Philadelphia; 3.2 lots in New York City; and 2.9 lots in Boston. Regardless of the city, the independent grocery stores, delicatessens, and hucksters offered customers the least choice in potatoes. In these cities 3 out of 5 in-

dependent stores offered only 1 lot of potatoes. From this and other studies potato growers and shippers should realize that the amount of display space, as well as the varieties, grades, and sizes that a store will display or carry, is limited. Almost all the research in recent years indicates that the household consumer is willing to pay a reasonable price for the quality, size, and variety of potatoes preferred. Therefore, it is to the advantage of potato growers and distributors to encourage research to determine the wishes of the consumer and to make use of the findings to the greatest extent practicable as a guide in their grading, sizing, packaging, and marketing operations.

CONSUMER PREFERENCES

Most sellers of both food and industrial products need to know what consumers like or dislike about their particular product. In 1948 the United States Department of Agriculture started on a limited scale to determine the likes and dislikes for potatoes by both the household and the hotel and restaurant consumers. The sample survey of homemakers was national in scope. That dealing with hotels and restaurants was limited to intensive studies in New Orleans and Cincinnati.

The survey showed that household consumers rate quality, size, and price in that order of importance when they purchase potatoes. In fact, the item of quality outweighed the 2 other items by approximately 12 to 1. Size over price was in a ratio of only 3 to 2. When prices advance, only 12 percent reported that they buy fewer potatoes and only 20 percent buy more on a declining market. When potatoes are of poor quality, even when the price is low, 44 percent of the homemakers stated that they purchased fewer potatoes.

Very few of the institutional buyers indicated that price had any effect on their purchases. Nearly all reported purchases of about the same quantity of potatoes regardless of the ordinary fluctuations in price. These buyers rated quality, type, size, and price in the order of importance. The institutional buyers want high quality of a size and type to suit their needs. They reported that inferior potatoes are high at any price.

Inasmuch as these surveys indicate that the majority of all buyers gage the volume of their purchases more on quality than on any other factor it appears that one of the best ways for the potato industry to maintain or increase consumption is to offer consumers the quality and type of potato they want.

These surveys indicated that homemakers were most emphatic in wanting clean potatoes. About half of the women interviewed spontaneously specified their demand for clean potatoes. Most of the institutional buyers also specified washed potatoes and gave their reasons for wanting them, as follows: Washed potatoes save time and work; are more sanitary; are more economical, in that it isn't necessary to pay for dirt; and are easy to look over for defects.

Of the buyers interviewed, only a few knew about United States grades and grade terminology as used by the wholesale trade. Most of the hotel and restaurant buyers purchase from only one wholesale firm and many of them order their potatoes by telephone. The principal reasons given for regularly purchasing from one source was "more consideration" and "better service." There appear to be ex-

cellent opportunities for service wholesalers to build a steady volume of business for a quality product.

It is likely that the household consumer will buy fewer potatoes when the quality offered by the local store is poor. Many household consumers, apparently want a clean, medium-sized, smooth potato with few or shallow eyes, bright color, and no mechanical damage. Also, for most purposes, the potato should cook up soft, mealy, and evenly throughout, without falling apart.

Institutional buyers want about the same quality potato as household consumers except that they will buy larger sizes, and they place more emphasis on potatoes for special purposes, such as baking, french frying, and salads. Also, they will buy the very large potatoes that are segregated from the smaller sizes. Most of the institutional buyers are satisfied with the current wholesale packages, particularly the 100-pound burlap sacks and 50-pound paper sacks.

There has been a continual increase in the volume of sales in consumer-size packages, although bulk sales are still greater in volume than sales of prepackaged units. Homemakers prefer 10- and 15-pound, mesh- and paper-bag containers. Practically none of the consumers purchased more than a 2-week supply of potatoes. This practice appears to be largely due either to lack of space or to lack of suitable and convenient storage places. In most instances shrinkage losses increased with heavier purchases.

Reference is often made to a "premium" variety, that is, one that will command a higher price than most other varieties. Unless the quality, size, and appearance are superior, no variety will command a premium. Good-quality Russet Burbank or White Rose potatoes will generally sell at relatively high prices. Poor-quality stock of these varieties will command no premium and may be discounted. Red McClure potatoes that are deep-colored will sell at higher prices than those showing pale color, even though other quality and size factors may be identical.

In general, the East prefers the round, white-type potato; the Midwest uses all varieties but some markets prefer red types; and the Far West prefers the long types. Russet Burbanks—a long-type potato—are distributed to all States and many people prefer them, especially for baking purposes. It is likely that high freight rates preclude a wider distribution of these western-grown potatoes.

SUPPLY-PRICE RELATIONSHIPS

ESTIMATING THE SUPPLY

The potato dealer is continually trying to estimate the daily, monthly, and seasonal supply of potatoes available for market. Growers, shippers, and dealers depend largely upon the Crop Reporting Board of the Bureau of Agricultural Economics for their estimates of production and stocks. The potato crop is a difficult one to estimate. For early potatoes, the yield depends to a large extent on the time the potatoes are harvested. If the market is high or current returns appear to be favorable in relation to future prospects, the grower may elect to harvest immature potatoes in the hope of obtaining a higher immediate price; but in doing so he may make a material sacrifice in yield. A grower or shipper must carefully evaluate these factors to

obtain the highest cash returns from his crop. If a grower in a late area is delayed by rain or snow in harvesting his crop a part of it may be frozen in the ground.

The Crop Reporting Board issues acreage, production, and price reports as follows:

Progress—Commercial Early Crop.—The approximate schedule of release dates for estimates and reports for commercial early potatoes.

Seasonal group	State	Prospective acreage (intentions)	Preliminary acreage	Acreage for harvest and production indicated			Annual summary
				First	Second	Third	
Winter	Florida and Texas [1]	Sept. 10 [1]	Dec. 10 [1]	Dec. 10	Jan. 10	Feb. 10	Dec. 18
Early spring	do. [1]	Dec. 10	Mar. 10	Apr. 10	May 10	June 10	Do.
Late spring	Alabama, Arkansas, California, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas and Arizona.	Jan. 10	Apr. 10	May 10	June 10	July 10	Do.
Summer	Georgia, Kansas, Kentucky, Maryland, Missouri, Nebraska, New Jersey, Texas, and Virginia.	Feb. 10	May 10	June 10	July 10	Aug. 10	Do.

[1] Reports relate to the crop for the following year.

Total potato crop:

(a) *Acreage*—3 estimates of acreage are released in the following schedule:
  (1) Prospective plantings in March.
  (2) Acreage planted and preliminary acreage for harvest in July.
  (3) Acreage planted and acreage harvested in December.

(b) *Yield per acre and production*—The General Crop Reports for July and for each month through December carry forecasts and estimates of yield per acre and total production. In December of the following year, production is revised on the basis of check data.

Merchantable Stocks.—Estimates of merchantable potato stocks held in the late and intermediate States on January 1 by growers and local dealers, in areas where produced, are issued about the 18th of January.

Price and Value.—Prices of all potatoes are reported on a monthly and seasonal basis. Monthly prices appear in "Agricultural Prices." The first preliminary estimate of season average prices which is shown by States, is published in December in the report "Season Average Prices and Value of Production." The second estimate of season average price is reported in "Farm Production, Farm Disposition, and Value of Principal Crops" which is published in May. The third estimate is for the season average price of potatoes by States and for the United States, which is reported in August. These three estimates are based on monthly prices and preliminary estimates of monthly marketings.

Publications.—The following publications may be obtained from Bureau of Agricultural Economics, United States Department of Agriculture, Washington 25, D. C., each year in accordance with the approximate release dates indicated.

Prospective Plantings Report. Released on March 19.
General Crop Reports. Release dates are about July 10, August 10, September 10, October 10, and November 10.
Annual Crop Summary. Release date about December 18 each year.
Season Average Prices and Value of Production. Release date about December 18 each year.
Farm Production, Farm Disposition, and Value of Principal Crops. Release date about May 5 each year.
Agricultural Prices. Release date is about 29th of each month.

Even with this elaborate and timely setup it is difficult for the potato trade to estimate the extent of the overlap between early and late potatoes. As supply is the most important factor affecting prices that growers receive for potatoes, it is necessary to have an accurate estimate of the crop at the earliest possible date. The end-of-season estimate for the total crop is not available until mid-December. However, the Crop Reporting Board starts in December to estimate various segments of the early crop and continues for each month through August. The first estimate of the total crop is issued about July 10 based on harvestings to date and July 1 condition of the growing crop. Almost half of the total crop is marketed before the December report for all potatoes is available.

The present monthly forecasts of yield by the Crop Reporting Board represent an interpretation of expected final yields based on condition and probable yield reported by growers at a given date and on the assumption that average conditions will prevail throughout the remainder of the growing season. Prospective yields per acre can change drastically between July 1 and harvesttime, depending on weather conditions after July 1, and these variations must be recognized in using estimates of the Crop Reporting Board. No system of yield forecasting will approach perfection without both an accurate long-range weather forecast and an accurate measure of the effect of various weather factors.

In the meantime, each potato grower should be certain that his operations are reported correctly to the Bureau of the Census, which makes an enumeration every 5 years. Also, greater cooperation by potato producers in filling out the various questionnaires of the Crop Reporting Board will improve the accuracy of the estimates.

The potato harvest begins in Florida and Texas in December and gradually moves northward until the completion of harvest in the Northern States in November. If these States, particularly the early States, could follow a consistent time period, the marketing problem would be materially helped. But the only consistent thing about potatoes is their inconsistency. These early areas can be 1 to 3 weeks later than normal or they can be 1 to 2 weeks earlier. When several of the early areas are later than normal and several are on time, the abnormal overlap in marketing can shift the supply from an acute shortage to a burdensome surplus in 1 to 2 weeks.

Maryland, Delaware, and New Jersey are classed as "intermediate" States, and growers there start marketing in July. But some growers

in Idaho, Washington, Oregon, Colorado, Long Island, and several other "late" States also start harvesting potatoes in July, and continue to harvest into October and November. In the Greely, Colo., area, 50 percent or more of the crop can be harvested as early potatoes, or 75 percent or more can be harvested as late, depending on prices when the potatoes are ready for harvest. Only a small part of the crop in Maine is currently marketed before January 1. Maine growers wait to market their crop until the bulk of the Long Island crop is sold. Along in March, however, Maine growers must think about completing the bulk of their marketings by late April or early May because a big volume of early potatoes will be on the way.

Twenty years ago there were very few early potatoes in Kern County, Calif., Idaho growers had virtually all the western market as their own during the late spring. Now the bulk of the Idaho growers' stock must be marketed by May 1, and the Kern County crop must be largely sold by July 1 because producers in the Caldwell area of Idaho and Malheur County, Oreg., and Washington take over the western market in early July with the same White Rose variety that is grown in Kern County. Many problems arise in measuring the effect on supplies and prices at a given time because of the variation from year to year in the time the potatoes are ready for harvest in the early areas.

PRICE FACTORS

Potato prices are extremely variable from one season to another as well as within the same season. During the 20-year period 1920–39, the smallest crop—in 1925—had a production value of $505,000,000 and the largest crop—in 1928—had a value of only $223,000,000. In these 20 years the three smallest crops averaged 314 million bushels with an average value of $433,000,000 and the three largest crops averaged 416 million bushels with an average value of only $226,000,000. These figures emphasize the inelasticity of demand for potatoes. The growers receive less total money for a large supply of potatoes than for a small supply. It appears that there is a current market demand for about 24 million bushels of potatoes a month for food purposes. Prices within a season go up or down as offerings decrease or increase.

No one has been able to develop a correlation among the various factors affecting prices with sufficient accuracy to be of much value in trading at the time the trades are being consummated. As a rule of thumb, a 1-percent change in production from average will cause approximately a 3.5- to 4-percent change in price in the opposite direction, when other factors affecting prices remain constant. This means that 5- to 10-percent change in production can cause extremely high or low prices. The level of consumer income is the second most important factor affecting prices.

Psychological factors which defy quantitative measure are involved in marketing any perishable commodity. The crop is fast moving and the persons deciding the prices have little time to pause and reflect. The timing in the marketing of a crop is important in this way—if the early commercial crop in most areas is 2 weeks early, then the late-crop marketing season is shortened by 2 weeks, because people, in general, prefer new-crop potatoes. Conversely, if the

new crop is 2 weeks late, the late-crop season is extended and this length of time could amount to a full month in comparing one season with another.

Maine potatoes are marketed in all the States along the Atlantic coast and move as far west as competition permits. In a fairly normal season the line varies from Pittsburgh to Detroit. In the 1951 season the westward movement of Maine potatoes extended to San Francisco and Korea as a result of the short supply of western potatoes. In contrast, Idaho potatoes are shipped to all States and they have relatively favorable freight rates either east or west, whereas all Colorado potatoes move east and southwest because freight rates on them to the west coast are high, as this area is not a normal marketing area for Colorado potatoes and through rates have not been established.

Using New York City as an example, it appears that consumers will pay a very high premium for a small volume of Russet Burbank potatoes and the premium decreases as the volume increases until the high freight rates from the Western States to New York effectively stop any further increase in shipments. Such a situation happens in other areas, but this example is a striking one.

In the winter of 1951 Maine potatoes were being shipped to San Francisco, and Idaho potatoes were being shipped to New York City and Boston. Price ceilings may have influenced this distribution, but it is likely that the distribution would have happened anyway because of a specific demand for certain packs of Idaho potatoes and the larger supply and lower price of Maine potatoes.

Most of the annual change in potato acreage is a result of prices received for potatoes during the preceding 2 years. Prices during the first preceding year have the greatest effect on the amount of increase or decrease in acreage. During the period between World War I and World War II, a 10-percent change in price was generally associated with a 2-percent change in acreage. Some growers may fail to realize the effect that even a small change in acreage can have on prices, provided growing conditions are average. This is especially true if a small crop and attendant high prices were caused largely by low yield per acre, or if a large crop and attendant low prices were caused by above-average yields.

MARKET REPORTS

The successful marketing of any commodity depends on timely and accurate information concerning a number of factors that affect the day-to-day trading. For a given production of potatoes it is possible to forecast the approximate season average price, but to obtain this season average price it is necessary for growers and shippers to supply adequately every available market throughout the country with its daily needs. A temporary surplus can be brought about by harvesting early potatoes at a too rapid rate or by shipping potatoes out of storage faster than necessary to market the remaining supplies. Conversely a temporary shortage can be caused by several days of rain in the early areas or by blizzards that hamper the loading and movement of cars from storage areas and by a temporary shortage of cars and trucks. These situations either depress the market or cause it to advance, depending on the direction of the change in supplies.

Through their daily trading operations, potato shippers and buyers gather a great deal of information on which to base sound decisions. However, nearly all successful market operators supplement this information with the daily reports of the Market News Service which is conducted independently by the U. S. Department of Agriculture in some sections and in cooperation with States in other sections. This service compiles and releases current information locally and on a national basis on supplies, demand, movement, prices, and similar factors, affecting the current market for potatoes as well as for other vegetables and fruits.

Many of the major producing areas and terminal markets have leased wire service which means rapid transmission of important market information to all major markets. Information on prices and shipments are transmitted from coast to coast in a relatively short time after it is available. Figure 4 shows the Fruit and Vegetable Market News leased wire circuit. Growers who are on the mailing list of their local Market News office will have this information by mail the next day. In addition many radio stations and newspapers carry marketing information issued by the Market News Service.

The Market News reports contain any weather data that might have an effect on prices. Daily shipments of potatoes by rail and boat and by State of origin are reported each morning about 9 o'clock (eastern standard time). These reports cover all shipments to the previous midnight. Most truck shipments are unreported, but a few States or areas report truck shipments on a basis comparable with rail shipments. Rail and boat receipts are reported each morning in 26 major terminal markets, by State of origin, and number of cars held on track. Truck receipts are reported in 17 major markets. The potato traders closely watch these reports on shipments, receipts, and stocks on hand, to determine the rate of movement from shipping areas to market, rate of movement through the market, and whether there is an excessive accumulation of stocks in any particular market.

The price is the ultimate objective of potato growers, country shippers, and terminal buyers. Trained market reporters personally cover the major terminal markets and most of the important shipping areas during the active trading hours to determine the prevailing prices for the potatoes offered for sale both in the shipping areas and in the terminal markets. Prices are reported on the basis of State of origin, variety, grade, size, container, quality, condition, and any other factors affecting price. The prices are reported in a range of the high and the low with a "mostly" price if the range is wide. Reports show whether the demand is good or poor, whether the market is stronger or weaker. Shipping point reports also show whether cars are being rolled unsold. The New York and Chicago offices also report the futures trading on the mercantile exchanges.

The Market News reports are distributed free of charge to all who need them. Seasonal potato reports may be obtained during the approximate shipping season shown by addressing the Market News Service at the following points: Bakersfield, Calif., April–June; Belle Glade, Fla., November–March; Benton Harbor, Mich., September–April; Charleston, S. C., May–June; Foley, Ala., April–May; Hastings, Fla., April–May; Idaho Falls, Idaho, September–April; Onley, Va., June–July; Presque Isle, Maine, September–May; River-

head, N. Y., July–January; Rochester, N. Y., August–May; and Washington, N. C., May–June. The office at Denver covers Colorado points; the Kansas City office covers Nebraska, and the Philadelphia office covers New Jersey and Pennsylvania shipping points.

Terminal reports that include other vegetables and fruits are issued in most major markets. A list of the offices and their addresses can be obtained from the Washington, D. C., office of the Market News Service.

REGULATORY PROGRAMS

MARKETING AGREEMENTS

The origin of marketing agreements is not entirely clear, but traces of their basic ideas can be found in the efforts by growers and handlers, particularly on the west coast during the 1920's, to improve the quality of produce going to market, to keep culls and other low grades at home, and to avoid market gluts. The soundness of the basic idea was tested through experience. Agreements were developed and signed. When all growers and handlers entered into the agreement and observed the spirit as well as the letter of the program, success usually attended their efforts but at the risk of violating the antitrust laws. All too often, however, it was impossible to get all growers and handlers to sign an agreement, or if one were signed a few persons might fail to live up to its terms. These early efforts, however, proved to many growers and handlers that discounts for culls and other poor merchandise could be avoided by keeping low-quality produce at home. These same efforts also pointed out the need for some assistance in helping the majority of any particular group of fruit or vegetable growers to develop a sound marketing program.

The Agricultural Adjustment Act of 1933 contained several sections authorizing the Secretary of Agriculture to enter into marketing agreements with processors, producers, associations of producers, and others engaged in the handling of agricultural products. The statute also provided that, upon proper grower approval, the Secretary could issue licenses (amended to "orders" in 1935) embodying terms similar to those of the marketing agreement and which would apply to all handlers of the commodity rather than only to those who signed the marketing agreement.

The Agricultural Marketing Agreement Act of 1937, which reenacted the marketing agreement sections of the Agricultural Adjustment Act, set apart the marketing agreement and other provisions of law as a separate act. The act has been slightly amended since 1937, but its basic marketing provisions have remained substantially the same since the first marketing agreement provisions were enacted into Federal statute.

The similarity between the basic marketing ideas of the early voluntary agreements and those developed under the Agricultural Marketing Agreement Act is impressive. The interest and support of growers, and usually both growers and handlers, are essential prerequisites of a marketing agreement program. When growers and handlers of a particular commodity within a given area are informed and interested to the point that a marketing agreement type of program appears feasible then they may request the Department of Ag-

riculture to help them carry through the various legally required steps necessary to get a program in operation.

The law requires that a hearing be held to determine the feasibility of a program, the factual basis for its operations, and whether the objectives of the act—the promotion of orderly marketing to attain parity prices, and the effectuation of orderly marketing as will be in the public interest—can be attained.

Before the program can become effective, however, the Agricultural Marketing Agreement Act requires that the Secretary must ascertain whether the issuance of an order is approved or favored by producers and the act further states that he may conduct a referendum to make that determination.

Potato marketing agreements and orders are administered by a local committee composed of growers or of growers and handlers, depending on the terms of the particular program. The committee makes recommendations on the kind of regulation, if any, it wants issued within the terms of the basic order. The committee also provides the main focal point through which growers and handlers may establish and maintain working relationships with the program.

The Agricultural Marketing Agreement Act authorizes the following major types of programs for fresh fruits and vegetables: (1) Grade, size, or quality regulations; (2) volume proration; (3) surplus pools; and (4) inspection and maturity requirements.

The grade, size, and quality programs have had the most appeal to fresh vegetable groups. The provision for maturity requirements has proved popular with western early potato growers. Volume proration has been successfully used on some of the tree fruits, such as lemons and other citrus fruit. Surplus pool programs have been adopted for some of the nut and dried fruit crops which have longer storage life than fresh vegetables or fresh fruits.

Seven marketing order programs for potatoes were in effect during the early part of 1952. They covered the following areas: Idaho and Malheur County, Oreg.; the State of Washington; central Oregon and northern California (Modoc and Siskiyou Counties); the State of Colorado; eastern South Dakota; all of New England, except Maine; and the tidewater counties of Virginia and North Carolina.

The Idaho-Malheur County, Oreg., program, also the central Oregon-northern California agreement; and the Colorado agreement have been in effect since just before World War II. These programs were not in operation during the war because of prevailing price situations, but they were revived shortly after the war and they have been in operation every season since. Idaho-Malheur County is an exception to this statement in that its committee recommended suspension of grade and size regulations during the latter part of the 1951 season and, consequently, its quality control was terminated for the remainder of that season, but the committee recommended grade and size regulations with the opening of the 1952 crop season. Eastern South Dakota operated under the program in some seasons but not in others. Virginia and North Carolina operated under it during the 1948, 1949, and 1950 seasons, but their committee recommended against such operation during the 1951 and 1952 seasons. New England operated under it during the 1950 season and again in the 1951 season, but suspended operations during the 1952 season.

PERISHABLE AGRICULTURAL COMMODITIES ACT, 1930, AS AMENDED

The purpose of the Perishable Agricultural Commodities Act is to suppress unfair and fraudulent practices in the marketing of fresh fruits and fresh vegetables—whether frozen or packed in ice, and including cherries in brine—in interstate or foreign commerce. It seeks to accomplish this by: (1) Requiring that commission merchants, dealers, and brokers subject to the act, obtain from the Secretary of Agriculture a license for which they must pay an annual fee of $15; (2) requiring that licensee keep such accounts, records, and memoranda as will fully and correctly disclose all transactions; (3) prohibiting fraudulent accounting, unjustifiable rejections or failures to deliver, and misbranding and other misrepresentation; and (4) authorizing the investigation of complaints, the issuance of reparation orders, the publication of facts concerning violations, and the suspension or revocation of licenses.

The produce industry strongly supported the enactment of this law and all amendments thereto, to correct the unethical practices of a few irresponsible shippers and receivers. Also, the administration of the act and regulations provides a code of ethics between the traders in fresh produce and for the expeditious handling of disputes without long-drawn-out and expensive lawsuits. No appropriations are made by the Congress for carrying on this work. The administration of the act is paid for by the money collected as fees and such money is placed in a special fund for this purpose only. Approximately half of the complaints received regarding contract disputes involve potatoes.

In case of dispute, a shipper or receiver must file a complaint within 9 months from the time the cause of action occurs. Many contractual disputes are settled by a telephone call to one of the field offices or to the Washington office administering this act. When a case is first received it is treated informally in an effort to expedite settlement between the parties involved. If this action does not result in a settlement, a personal investigation may be made to determine the facts, and if this fails to result in a settlement, the case must go through a formal procedure.

Another method of handling disputes which has been accepted favorably by the trade is by arbitration whereby the parties agree to abide by a decision of the Secretary or agents designated by him. The case must be reviewed by three investigators and they must be in complete agreement on the decision.

If the contracting parties do not agree with the formal decision of the Secretary they may take their dispute to a U. S. District Court or a State court. Such suits in the district court proceed in all respects like other civil suits for damages, except that the findings and orders of the Secretary are prima facie evidence of the facts therein stated, and the petitioner is not liable in the district court, nor for costs at any subsequent state of the proceedings, unless they accrue upon his appeal. However, very few cases are carried to the courts and as a matter of fact, a relatively small percentage of the cases are carried through the formal procedure within the Department.

As a result of experience gained in the operation of this program, the Department offers the following suggestions to produce traders.

Be Contractwise.—Any person in the business should be sure that the contract is a valid and binding one—and clearly provable as such.

A contract may be defined as an agreement between two or more parties to do certain things. In order to make an enforcible contract there must be a complete meeting of minds on all essential specifications. All parties to a contract must agree to the same terms and specifications describing the commodity and the terms of sale. In the absence of an agreement to the contrary, the seller is within his rights in billing the shipment "order notify" or "advise" in order to insure payment before acceptance of the goods. On the other hand, open billing might prove to be an embarrassing and costly experience for the seller in the case of insolvency on the part of the buyer.

Be Explicit.—It is highly important to use descriptive terms that have definite, generally understood meanings. Stipulations that are understandable are also enforcible. Avoid the use of such terms as "beautiful," "good color," "good quality," "best," and so forth. There are no established standards for the determination of the meanings of these terms. Those in charge of enforcement of the PAC Act find that the seller is inclined to undervalue and the buyer to overvalue the meaning of these terms. Misunderstandings may be avoided if contracts are made on the basis of U. S. Standards established by the Department of Agriculture and these are inclusive enough to furnish a satisfactory basis for wholesale trading.

Stick to the Contract.—Since contracts obligate as well as protect, it is necessary that licensees deliver goods meeting all specifications of the contract. Careful compliance with terms of the contract serves as inexpensive assurance of a good business reputation—and good business. Enforcement of contract provisions is one of the more important objectives of the PAC Act.

Know Business Reputations.—Under the act all commission merchants, dealers, and brokers handling fruits and vegetables in interstate or foreign commerce are required to be licensed, but it is still important for the tradesman to know that he is dealing with a reputable firm. Holding a license under the PAC Act does not guarantee that the party is reliable. Licenses can be denied only in rare instances, such as when it is found after a formal hearing that the applicant is unfit to engage in the business. Accordingly it is wise to investigate the ethical and financial reputation of unknown individuals and firms through one of the well-recognized commercial credit-rating agencies. Similar information may often be obtained through banks, better business bureaus, and chambers of commerce.

Handle Quality Products.—One of the significant truths turned up in the years that the PAC Act has been in force is that good quality creates business and poor quality destroys it. Generally, with fresh fruits and vegetables inferior quality increases risk and cuts down profits and the range of outlets. In the produce channels it tends to act as a deterrent to trading and it increases the incidence of complaint under the act.

Don't Take a Gamble on Low-Grade or Inferior Produce.—When there is a buyer's market, quality will mean more in fruit and vegetable transactions than in other types of transactions. Consumers have good memories and with an increasing volume of produce on the market they will be able to trade more and more where they are pleased, rather than simply where they have been able to obtain produce.

Don't Take Checks From Strangers.—During the PAC Act's existence, scarcely a day has passed without a complaint about a bad check.

Don't Extend Too Much Credit.—The produce business is a fast-moving trade, often temporary and seasonal in duration. The act has largely restricted the activities of fly-by-night traders but over-extension of credit leads to default of payment. Of a total of more than 53,000 complaints received since 1930, over 50 percent alleged failure truly and correctly to account and pay for either consigned or purchased goods.

Don't Deal With Chronic Kickers.—In the produce industry a few individuals have gained the reputation of being constant kickers because of their steady complaints against all produce, regardless of its quality. Generally, these complaints have only nuisance value but unnecessary difficulties ought to be avoided in any business.

Don't Hesitate To Report a Violation.—Finally, it is extremely important that defaults of contract, fraudulent practices, and other violations be reported without delay.

CONCLUSIONS

During the last decade the efficiency of producing, harvesting, and marketing potatoes has been materially improved. This is shown by increases in current (1950–52) yields per acre which are about double the 1937–41 average for the United States. Combines, self-unloading trucks, and pallet boxes are beginning to replace much of the hand labor in harvesting the crop; at the same time mechanical damage is being reduced. Consumer-size packages which are packed either at country shipping points or in the terminal markets save much time and labor in retail stores.

Higher cash returns can be attained by growers through more careful harvesting and handling of potatoes—from digging to loading on cars or trucks for shipment to market. Growers should be primarily interested in the quantity of U. S. No. 1 potatoes that are loaded, because each U. S. No. 1 potato that is lowered in grade because of rough handling is materially lowered in value. During periods of large supplies poor-quality potatoes have little value except for uses such as starch, livestock feed, and for spreading on the fields as fertilizer. Although grower returns are considerably less for poor-quality potatoes, consumers pay almost as much for poor-quality as for good-quality commodities, because marketing costs are about equal.

New ways of handling potatoes in the distributive system are constantly being developed. The new ways may or may not contribute to greater marketing efficiency, but they usually do. Retailers have reduced the margin on handling potatoes but transportation rates have been increased. Retailers handle consumer packages on a smaller margin than they handle bulk potatoes, but it costs more to pack potatoes in 10- and 15-pound packages.

The demand for potatoes is very inelastic in that each 1 percent in supply is associated with approximately 3.5 percent change in price in the opposite direction. As such a small change in supply results in such a large change in price, growers should strive to plant an acreage

that under average growing conditions will produce a crop to satisfy the demand for potatoes. Variations in yields may result in surpluses or shortages. Appearance and cleanliness are more important factors than price in affecting consumers' choice of potatoes. Therefore, a surplus can be more effectively handled by keeping the poorer quality on the farm rather than by lowering the price in an effort to ship all grades, and short supplies can be increased by marketing low grades of potatoes.

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